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LTE Radio Access, Rel. FDD-LTE 16A, Operating Documentation, Pre-release, Issue 01

FDD-LTE16A, Feature Descriptions and Instructions

DN09237915
Issue 01 Draft
Approval Date 2016-04-24

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Summary of changes

This is the first issue of FDD-LTE16A (2016-04-24, FDD-LTE16A)

1 Introduction

This document provides the list of feature descriptions for the LTE Radio Access Network Release.

Hardware (HW) requirements indicate if the feature requires specific HW from the RAN LTE portfolio. If the feature has no specific hardware requirements, it means that only LTE System Module should be used.

The subchapter *Interdependencies between features* lists only dependencies among Nokia RAN LTE features.

2 Activating and deactivating LTE features using BTS Site Manager

Purpose

Follow this general BTS Site Manager (BTSSM) procedure to activate or deactivate LTE features.

Before you start

The eNB must already be commissioned. The BTS Site Manager can be connected to the eNB either locally, or from a remote location. For information on feature-specific prerequisites, see section *Before you start* of every feature-specific procedure.

Steps

1 Start the BTSSM application and establish the connection to the eNB.

For details, see *Launching BTS Site Manager* in *Commissioning Flexi Multiradio BTS LTE* or the BTSSM online help (section *Instructions*).

2 Upload the configuration plan file from the eNB.

When the BTSSM is connected to the eNB, it automatically uploads the current configuration plan file from the eNB.

a) Select **View ► Commissioning** or click **Commissioning** on the View bar.
b) The **BTS Site** checkbox, located in the **Target** section, is selected by default. This is the recommended setting.
c) Choose the commissioning type. Use the **Template**, **Manual**, or **Reconfiguration** option depending on the actual state of the eNB.

For details, see *Manual commissioning*, *Performing template commissioning*, and *Performing reconfiguration commissioning* in *Commissioning Flexi Multiradio BTS LTE*.

3 Modify the feature-specific eNB configuration settings.

The feature-related settings are found in the set of *Commissioning pages*. In the top right-hand corner of the BTSSM window, there is a location bar that shows at which stage of the *Commissioning process* the user is. It is recommended that the user carefully reads the pages containing full eNB configuration information.

4 **Send the commissioning plan file to the eNB.**

Sub-steps

a) **Go to the Send Parameters page.**

b) **In section Send, choose whether the BTSSM should send to the eNB only the changed parameters: Only changes (may require reset), or a whole set of parameters: All parameters (requires reset).**

c) **Click the Send Parameters button.**

5 **The new commissioning plan file is automatically activated in the eNB.**

Sub-steps

a) **After successful transmission of the parameters, the new configuration is automatically activated.**

The BTSSM automatically sends an activation command after finishing the file download.

b) **If the configuration changes require restart, the eNB performs the restart now.**

Note: For information on possible restarts, see section *Before you start* of every feature -specific procedure.

3 Descriptions of radio resource management and telecom features

3.1 LTE1092: Uplink Carrier Aggregation – 2CC

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature introduces inter-band and intra-band uplink (UL) carrier aggregation (CA) with a combined bandwidth of up to 40 MHz. It also introduces dynamic uplink traffic steering across component carriers (CCs). The feature supports combination of UL-CA-capable and UL-CA-non-capable UEs.

3.1.1 LTE1092 benefits

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature provides the following benefits:

- up to twice as high peak uplink throughput per UE in areas with overlapping cell deployments and within supported band combinations
- balancing the UL load across two UL component carriers (2CC UL), thus maximizing the utilization of each carrier
- enabling 2CC UL CA is supported in combination with up to three carrier component downlink carrier aggregation (3CC DL CA)

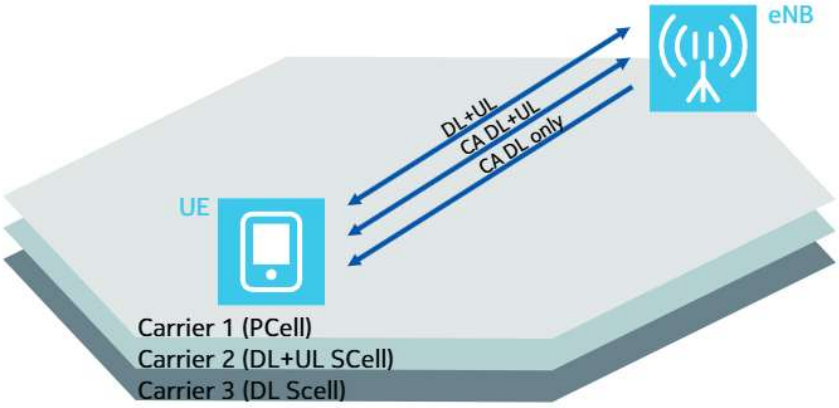
3.1.2 LTE1092 functional description

Functional overview

Carrier aggregation consists of a primary cell (PCell) and one or more secondary cells (SCells). With the *LTE1092: Uplink Carrier Aggregation – 2CC* feature, uplink carrier aggregation (UL CA) only works in combination with downlink carrier aggregation (DL CA).

Both DL and UL CA share the same PCell. The SCells can be DL-only SCells, or DL+UL SCells. There is no such thing as a UL-only SCell; UL CA can be enabled only if DL CA is enabled. The physical uplink control channel (PUCCH) is transmitted on the PCell only.

Figure 1 Example of co-located cells with a specified PCell, DL+UL SCell, and DL-only SCell



LTE1092: Uplink Carrier Aggregation – 2CC supports the following 3CC DL + 2CC UL band combinations:

- DL (1+3+5) + UL (1+3, 1+5, 3+5)
- DL (1+3+8) + UL (1+3, 1+8, 3+8)
- DL (1+5+7) + UL (1+5, 1+7, 5+7)
- DL (1+18+28) + UL (1+18, 1+28, 18+28)
- DL (2+4+12) + UL (2+4, 4+12)
- DL (2+5+13) + UL (2+13)
- DL (3+3+7) + UL (3+3, 3+7) – band 3 contiguous
- DL (3+7+7) + UL (3+7, 7+7) – band 7 contiguous
- DL (3+7+20) + UL (3+7, 3+20, 7+20)
- DL (4+5+13) + UL (4+13)

Note: *LTE1092: Uplink Carrier Aggregation – 2CC* supports only deployment scenarios 1, 2, and 3; bandwidth combination sets and deployment scenarios are described in *3GPP TS 36.300*.

LTE1092: Uplink Carrier Aggregation – 2CC supports the following cell bandwidth combinations:

- 5 MHz + 5 MHz
- 5 MHz + 10 MHz
- 5 MHz + 15 MHz
- 5 MHz + 20 MHz
- 10 MHz + 10 MHz
- 10 MHz + 15 MHz
- 10 MHz + 20 MHz
- 15 MHz + 15 MHz
- 15 MHz + 20 MHz
- 20 MHz + 20 MHz

A mix of non-carrier aggregation UEs and carrier aggregation DL or DL+UL UEs is supported. UE capabilities are considered when applying uplink carrier aggregation.

LTE1092: Uplink Carrier Aggregation – 2CC can coexist with up to 4CC DL CA; however, to enable DL+UL CA, the existing SCells need to be reconfigured either to 3CC DL + 2CC UL or 2CC DL + 2CC UL.

Configured carrier aggreation relations (CARELs) for DL CA also apply to UL CA. PCell/SCell pairs must be co-located to be eligible for UL CA as *LTE1092: Uplink Carrier Aggregation – 2CC* supports only a single UL timing alignment group.

Note: Since there is no software enforcement of this restriction, it is up to the operator to ensure the configuration is correct.

Note: *LTE1092: Uplink Carrier Aggregation – 2CC* does not support the physical random access channel (PRACH) on an SCell, cross-CC scheduling, and it is not supported with FZ Micro TD-LTE.

Functional extensions

Radio admission control

UE's AMBR and the nominal bit rate (NBR), if enabled, are enforced in the PCell only. The same timing advance group (TAG) is used in uplink component carriers. UEs that support UL CA will be configured to supply an extended BSR report when configured with UL CA.

The UE TX power split between two CCs is done dynamically, considering a potential back-off for intra-band cases and the power headroom report (PHR) of both component carriers.

3.1.3 LTE1092 system impact

Interdependencies between features

The following features must be activated before activating the *LTE1092: Uplink Carrier Aggregation – 2CC* feature:

- *LTE1089: Downlink Carrier Aggregation – 20 MHz*
- *LTE1332: Downlink Carrier Aggregation – 40 MHz*
  2CC DL CA features must be enabled for *LTE1092* for band combinations 2CC DL + 2CC UL CA.
- *LTE1803: Downlink Carrier Aggregation 3 CC – 40 MHz*
- *LTE1804: Downlink Carrier Aggregation 3 CC – 60 MHz*
  3CC DL CA features must be enabled for *LTE1092* for band combinations 3CC DL + 2CC UL CA.
- *LTE2006: Flexible SCell Selection*
  Required for 3GPP Scenario 3 support.

For the inter-eNB UL CA, the following features must be activated before activating the *LTE1092: Uplink Carrier Aggregation – 2CC* feature:

- *LTE2007: Inter-eNodeB Carrier Aggregation*
- *LTE2305: Inter-eNodeB Carrier Aggregation for 2 Macro eNodeBs*
  LTE1092 supports both intra-eNB UL CA and inter-eNB UL CA when inter-eNB DL CA is enabled.

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature impacts the following features:

- *LTE2275: PCell Swap*
  UEs with a configured DL+UL SCell will not be eligible for a PCell swap.
- *LTE1059: Uplink Multi-cluster Scheduling*
  LTE1092 will exclude UEs with an activated DL+UL SCell from being eligible for multi-cluster scheduling.

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature is impacted by the following features:

- *LTE907: TTI Bundling*
  UEs in TTI bundling cannot perform UL CA; UEs configured for TTI are deconfigured from CA.
- *LTE117: Cell Bandwidth – 1.4 MHz*
- *LTE116: Cell Bandwidth – 3 MHz*
  LTE1092 cannot be activated with these bandwidths.
- *LTE1541: Advanced SCell Measurement Handling*
  Changing the SCell can change the SCell for UL CA.

- *LTE2233: N-out-of-M Downlink Carrier Aggregation*
  The SCell used for UL CA can be dynamically changed.
- *LTE1402: Uplink Intra-eNB CoMP*
  The nominal bit rate for a UL CA is be supported on the PCell.
- *LTE2531: FDD Downlink Carrier Aggregation 4CC*
  LTE1092 and *LTE2531* can be enabled on the same eNB; however, that eNB will not support 2CC UL CA on the same UE when 4CC CA is active.
- *LTE2557: Supplemental Downlink Carrier Extensions*
  Supplemental cells that are barred will be eligible neither for a connection nor for UL CA.
- *LTE73: UL MU MIMO 4RX*
  The eNB will not prevent *LTE1092* and *LTE73* from being simultaneously enabled, but it is not reccommended in the field as this point.

Impact on interfaces

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature has no impact on interfaces.

Impact on network management tools

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE1092: Uplink Carrier Aggregation – 2CC* feature impacts system performance and capacity with up to twice as high UE's peak uplink throughput and increased load across two UL component carriers.

3.1.4 LTE1092 reference data

Requirements

Table 1 LTE1092 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	3GPP R10-R12 UE capabilities	NetAct 16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE1092: Uplink Carrier Aggregation – 2CC* feature.

BTS faults and reported alarms

There are no faults related to the *LTE1092: Uplink Carrier Aggregation – 2CC* feature.

Commands

There are no commands related to the *LTE1092: Uplink Carrier Aggregation – 2CC* feature.

Measurements and counters

Table 2 Existing counters related to LTE1092

Counter ID	Counter name	Measurement
M8001C 284	Average number of UL CA UE with one activated Scell	LTE Cell Load
M8011C 171	Number of SCell configuration attempts with UL CA	LTE Cell Resource
M8011C 172	Number of successful SCell configurations with UL CA	LTE Cell Resource
M8012C 174	PCell RLC data volume in UL via Scell	LTE Cell Throughput
M8051C 53	Average number of CA UE with one configured UL Scell	LTE UE Quantity
M8051C 54	Average Number of UL carrier aggregated capable UEs for 2CCs	LTE UE Quantity

For counter descriptions, see *LTE Performance Measurements*.

Key performance indicators

3.2 LTE1130: Dynamic PUCCH Allocation

The *LTE1130: Dynamic PUCCH Allocation* feature introduces support for a dynamic allocation of the physical uplink control channel (PUCCH) resources. This is done by adjusting the channel state indicator (CSI) and uplink scheduling request (SR) periodicity for the UEs, based on system load. Dynamic adaptation of CSI and SR periodicity with respect to cell load, allows to serve more UEs compared to the number of UEs assigned with static periodicities.

3.2.1 LTE1130 benefits

The *LTE1130: Dynamic PUCCH Allocation* feature provides the following benefits:

- The operator can configure the physical uplink control channel (PUCCH) with simplified O&M settings.
- In higher load conditions, the freature enables economizing the PUCCH resource allocation, thus increasing the number of users in a cell.
- In low load conditions all UEs have a short CSI or SRI periodicity. Thanks to that performance is improved. When the load increases, all UEs get a slower pace periodicity, and the eNB tries to allocate CSI or SR in an optimal way. Depending on which features are active in the cell (for example carrier aggregation-related features), it is possible that CSI resources distribution is based on the UE capability (UE configured or not configured for CA support), and not on the cell load. However, SR resources are always allocated according to the cell load method.

3.2.2 LTE1130 functional description

The *LTE1130: Dynamic PUCCH Allocation* feature introduces dynamic switching between channel state indicator (CSI) and scheduling request (SR) periodicity. Switching between periodicities depends on cell load which is related with number of RRC Connected UEs in the cell.

The adaptation of the CSI or SR periodicity is done only for UEs for which reconfiguration needs to be applied. To avoid generating extra signaling, new CSI or SR periodicity is given to every UE experiencing one of the following events:

- RRC Idle to RRC Connected state transition
- UE entering the cell via handover
- secondary cell (SCell) configuration or reconfiguration

The functionality can be enabled or disabled per cell with the O&M setting, which requires cell locking.

The following CSI and SR periodicity values are used by *LTE1130*:

Table 5 CSI and SR periodicity values

CSI Period	SR Period
40 ms	10 ms
80 ms	20 ms

The *LTE1130: Dynamic PUCCH Allocation* feature has no impact on system capacity.

3.2.4 LTE1130 reference data

Requirements

Table 6 LTE1130: Dynamic PUCCH Allocation hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8 mandatory	NetAct 16.8	support not required	support not required

The following features must be enabled if the feature functionality is required for Home eNBs:

- *LTE55: Inter-frequency Handover*
- *LTE1060: TDD–FDD Handover*
- *LTE1127: Service-based Mobility Trigger*
- *LTE1387: Intra-eNodeB Inter-frequency LB*
- *LTE1170: Inter-frequency Load Balancing Management Data*
- *LTE1531: Inter-frequency Load Balancing Extension*

The *LTE1723: S1-based Handover towards Home eNB* feature impacts the following features:

- *LTE2503: Emergency-call-based Mobility Trigger*
  The *LTE2503: Emergency-call-based Mobility Trigger* feature is supported for home eNB targets.

Impact on interfaces

The *LTE1723: S1-based Handover towards Home eNB* feature has no impact on interfaces.

Impact on network management tools

The *LTE1723: S1-based Handover towards Home eNB* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE1723: S1-based Handover towards Home eNB* feature impacts system performance and capacity as follows:

- Latency: Instead of redirection (*LTE1442*), the feature allows mobility to an HeNB with an S1-based handover. This reduces the service interrupt time, since the UE does not have to release the active connection and reconnect to the target HeNB. The execution time of the S1 handover is not different from usual Intra-LTE S1 HO times, but the HO preparation time is longer due to the CGI measurement.
- Quality: slight increase in the E-RAB drop rate due to a longer handover preparation time
- Throughput: possible temporary reduction during a handover
- VoLTE: Due to longer handover preparation times, a slight increase in the voice packet loss rate, and a slight degradation of voice quality and VoLTE call drop rates are possible.

3.3.4 LTE1723 reference data

Requirements

Table 13 LTE1723 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Multiradio S4	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL17	FL16A	FL16A

Table 13 LTE1723 hardware and software requirements (Cont.)

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8 UE capabilities	NetAct 16.8	support not required	support not required

Alarms

There are no alarms related to the *LTE1723: S1-based Handover towards Home eNB* feature.

BTS faults and reported alarms

There are no faults related to the *LTE1723: S1-based Handover towards Home eNB* feature.

Commands

There are no commands related to the *LTE1723: S1-based Handover towards Home eNB* feature.

Measurements and counters

Table 14 New counters introduced by LTE1723

Counter ID	Counter name	Measurement
M8008C24	Requested SI reports for Home eNB	LTE RRC
M8008C25	Successful SI reports for Home eNB	LTE RRC
M8008C26	Incomplete SI reports for Home eNB	LTE RRC
M8042C1	Inter-eNB S1 Handover preparations for VoLTE (QCI1) to Home eNB	LTE Inter Home eNB Handover
M8042C2	Inter-eNB S1 Handover attempts for VoLTE (QCI1) to Home eNB	LTE Inter Home eNB Handover
M8042C3	Successful Inter-eNB S1 Handovers for VoLTE (QCI1) to Home eNB	LTE Inter Home eNB Handover
M8042C4	Inter-eNB S1 HO preparations to Home eNB	LTE Inter Home eNB Handover
M8042C5	Failed Inter-eNB HO preparations per neighbor HENB due to expiry of guarding timer	LTE Inter Home eNB Handover
M8042C6	Failed Inter-eNB S1 HO preparations per neighbor HENB due to AC in the target eNB	LTE Inter Home eNB Handover
M8042C7	Failed Inter-eNB S1 HO preparations per neighbor HENB due to other reasons	LTE Inter Home eNB Handover
M8042C8	Inter-eNB S1 Handover attempts per neighbor Home eNB	LTE Inter Home eNB Handover
M8042C9	Successful Inter-eNB S1 Handovers to Home eNB	LTE Inter Home eNB Handover
M8042C10	Failed Inter-eNB S1 Handover to Home eNB	LTE Inter Home eNB Handover
M8042C11	Inter-Frequency Handover to Home eNB	LTE Inter Home eNB Handover
M8042C12	Successful Inter-Frequency Handover to Home eNB	LTE Inter Home eNB Handover

3.4.2.2 Inter-frequency handover

The eNB supports an inter-frequency handover in which the handover decision is based on reference symbol received power (RSRP) or reference signal received quality (RSRQ) (DL measurement). Triggers can be "coverage HO" and "Better Cell HO." Typically, a UE requires measurement gaps for doing inter-frequency measurements, depending on the UE capability.

The UE performance measurements are typically done while data transmission between the UE and source eNB is still performed. Therefore, such KPIs as a U-plane break duration or C-plane break duration do not depend on these UE performance measurements, and the system performance of an inter-frequency HO is expected to be the same as for an intra-frequency HO.

An inter-frequency handover enables service continuity for an LTE deployment in different frequency bands as well as for LTE deployments within one frequency band but with different center frequencies. These center frequencies can also cover cases with different bandwidths, for example 5 MHz and 10 MHz.

3.4.2.3 LTE2057 overview

Final frequency list

The main idea of the *LTE2057: Extended Measurement Control* feature is to support the enhanced mechanism of managing the inter-frequency measurement configuration. It allows the operator to select and organize LTE frequencies for the A3, A4, and A5 measurements. The specific priority groups determine the way frequencies are handled when configuring the UE for inter-frequency measurements. This list of frequencies is composed according to different inputs: group priority and frequency priority. The selection of frequencies belonging to one group is done according to an operator-configurable preference.

With the *LTE2057: Extended Measurement Control* feature, the operator is able to assign:

- frequencies to different frequency groups
- frequency priority (within the assigned group) to a frequency
- group priority to each defined group that determines the group's position in the final frequency list
- group size to each defined group to reserve a certain number of places in the final frequency list for the related group's frequencies
- frequency selection method to each defined group that determines the way frequencies are selected from the related group

Frequency selection methods

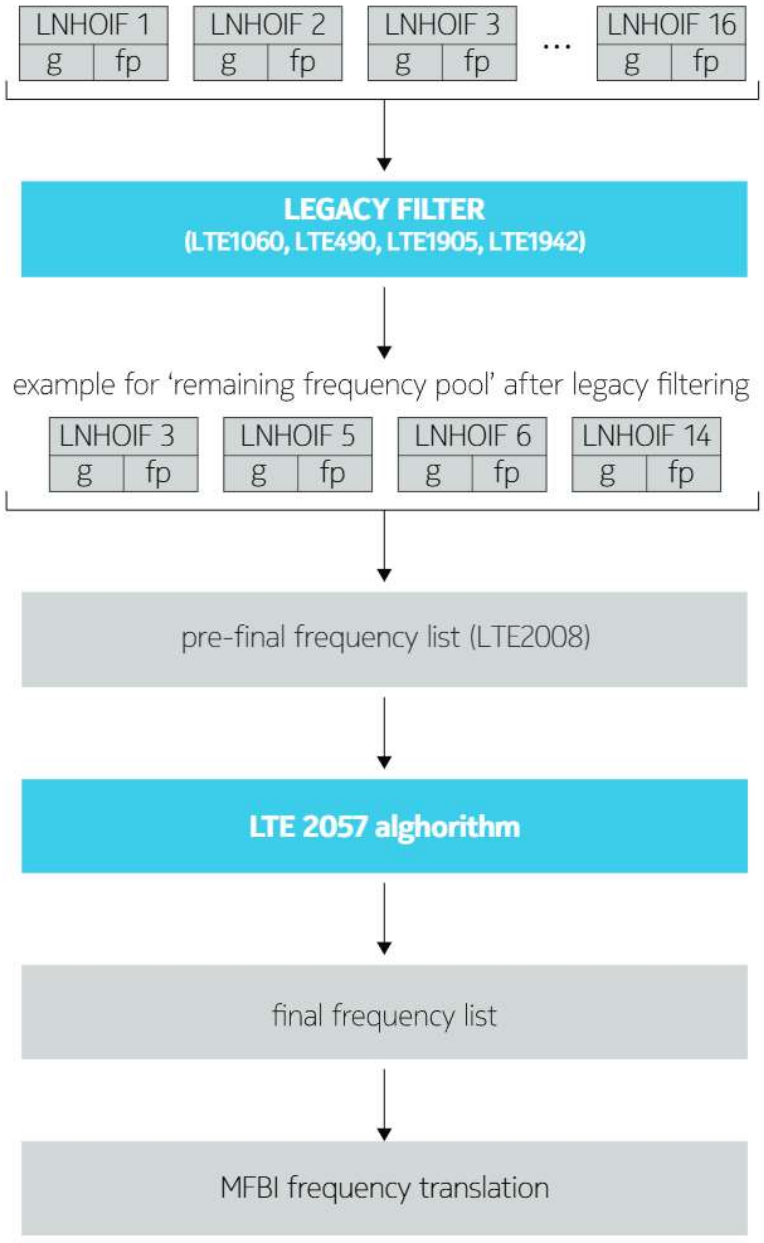
Several groups can be defined in one cell. For each group, a selection method can be established (which is independent from the selection methods defined for other groups in a cell).

Frequency selection methods are:

1. Fixed order within a group – the frequencies are selected for the final list in descending order of priority.

Figure 2 LTE2057 functionality

LNHOIF=frequencies in a network
g=group
fp=frequency priority



There is an expansion of additional algorithm for selecting target frequencies based on filters from mobility profiles selected with SPID.

- *LTE1905: PLMN ID and SPID Selected Mobility Profiles*
  There is an expansion of additional algorithm for selecting target frequencies. It is based on filters from mobility profiles selected with public land mobile network (PLMN) ID or combined values of service provider identification (SPID) and PLMN ID.
- *LTE1942: Dedicated VoLTE Inter-frequency Target Frequency List*
  An expansion of additional filter criteria from *LTE1942* has to be taken into account before the *LTE2057* selection algorithm becomes active.

Impact on interfaces

The *LTE2057: Extended Measurement Control* feature has no impact on interfaces.

Impact on network management tools

The *LTE2057: Extended Measurement Control* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2057: Extended Measurement Control* feature impacts system performance and capacity as follows:

- The *LTE2057* algorithm selects frequency based on available neighbor relation knowledge (the default selection method is weighted probability randomization). This leads to an improved measurement success rate and faster handover decisions. The usage of group priorities and selection methods leads to a UE contribution to the preferred frequency layers.
- If the feature is configured, all available frequencies are used for inter-frequency mobility. This can lead to a more balanced usage of different frequencies and have a positive impact on system capacity.

3.4.4 LTE2057 reference data

Requirements

Table 18 LTE2057 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8 UE capabilities	NetAct 16.8	support not required	support not required

Alarms

There are no alarms related to the *LTE2057: Extended Measurement Control* feature.

Commands

There are no commands related to the *LTE2057: Extended Measurement Control* feature.

Measurements and counters

3.5 LTE2276: Measurement-based SCell Selection

The *LTE2276: Measurement-based SCell Selection* feature introduces a measurement-based secondary cell (SCell) selection for carrier aggregation (CA).

3.5.1 LTE2276 benefits

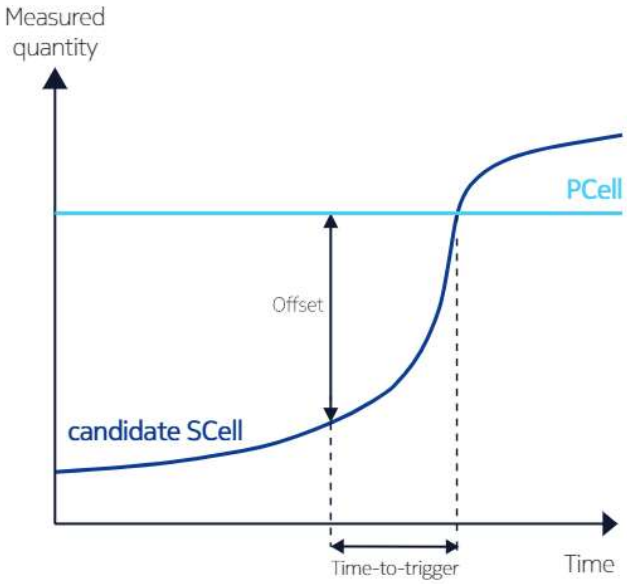
The main benefit of the *LTE2276: Measurement-based SCell Selection* feature is that the eNB can select the secondary cells (SCells) which are to be added, based on the respective UE quality indication rather than blindly via configuration parameters. Additionally, by selecting the SCells for carrier aggregation (CA) based on the UE measurements, the *LTE2276* feature optimizes:

- SCell resource utilization
- UE power consumption
- data throughput

3.5.2 LTE2276 functional description

The *LTE2276: Measurement-based SCell Selection* feature enhances the eNB secondary cell (SCell) selection criteria for carrier aggregation (CA). It is done by supplying the list of candidate SCells that are measured by the UE with a pre-defined minimum channel quality. The operator can decide per frequency layer whether to enable a measurement-based SCell selection or a blind SCell selection. The measurement type to apply to SCell discovery is the A3 event with "report on leave" – a neighbor cell becomes offset better than a serving cell.

Figure 3 SCell discovery measurement



In order to minimize the impacts on the UE throughput, the inter-frequency measurements are activated only on those frequencies for which the UE does not require measurement gaps. The eNB first tries to add SCells that have been measured

Figure 4 Scenario 1 for LTE2276

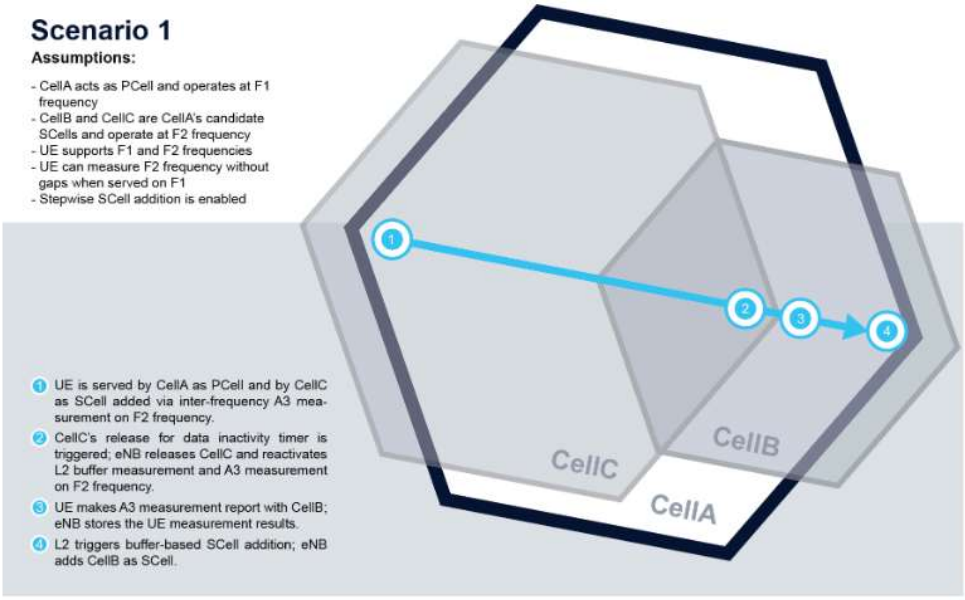
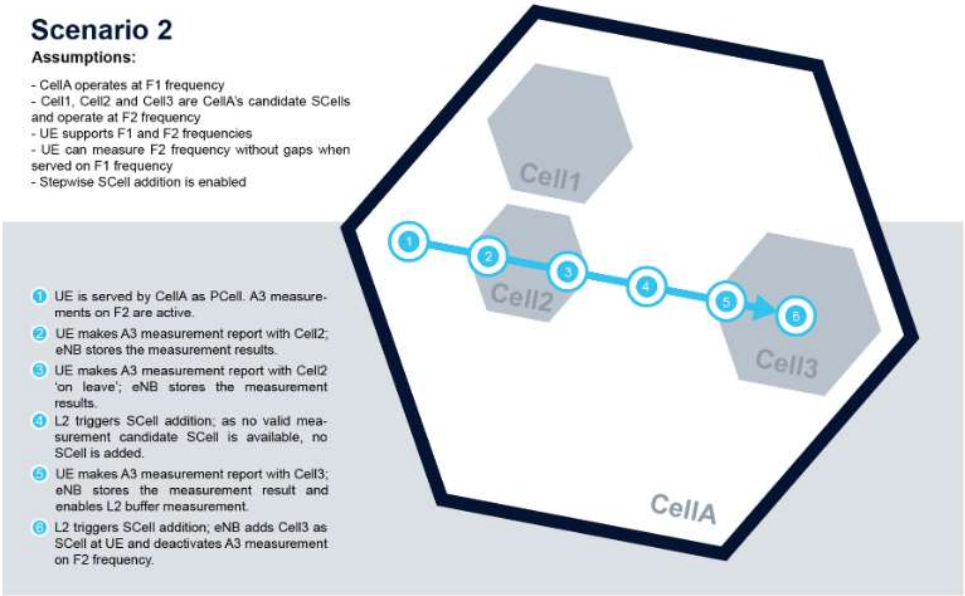


Figure 5 Scenario 2 for LTE2276



3.5.3 LTE2276 system impact

Interdependencies between features

The following features must be activated before activating the *LTE2276: Measurement-based SCell Selection* feature:

- At least one of the following downlink (DL) carrier aggregation features:
  - *LTE1089: Downlink Carrier Aggregation – 20 MHz*
  - *LTE1558: TDD Downlink Carrier Aggregation*
  - *LTE1858: FDD Inter-band/Intra-band Carrier Aggregation with Two Flexi Zone Micro BTSs*
  - *LTE1332: Downlink Carrier Aggregation – 40 MHz*
  - *LTE1803: Downlink Carrier Aggregation 3CC – 40 MHz*

The *LTE2276: Measurement-based SCell Selection* feature is impacted by the following features:

- *LTE1541: Advanced SCell Measurement Handling*
  In the step-wise Scell selection, UE measured candidate SCells as well as candidate SCells on a frequency layer not enabled for A3 event Scell discovery measurements have highest priority in the Scell addition selection.

Impact on interfaces

The *LTE2276: Measurement-based SCell Selection* feature has no impact on interfaces.

Impact on network management tools

The *LTE2276: Measurement-based SCell Selection* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2276: Measurement-based SCell Selection* feature has no impact on system performance and capacity.

3.5.4 LTE2276 reference data

Requirements

Table 22 LTE2276 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R10 UE capabilities 3GPP R11 UE capabilities 3GPP R12 UE capabilities	NetAct 16.8	Support not required	Support not required

BTS faults and reported alarms

There are no faults related to the *LTE2276: Measurement-based SCell Selection* feature.

Commands

The *LTE2291: Support for Carrier Aggregation on CL16A Release* feature has no impact on interfaces.

Impact on network management tools

The *LTE2291: Support for Carrier Aggregation on CL16A Release* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2291: Support for Carrier Aggregation on CL16A Release* feature has no impact on system performance or capacity expectations of CRAN for UL outside of what is already specified in the *LTE2564: CRAN Evolution CL16A* feature.

The *LTE2291: Support for Carrier Aggregation on CL16A Release* feature has no impact on system performance or capacity expectations of DL CA outside of what is already specified in the *LTE2007: Inter-eNB Carrier Aggregation* feature.

3.6.4 LTE2291 reference data

Requirements

Table 26 LTE2291 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Multiradio S4	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	

OTDOA feature configured with the *LTE2445: Combined Supercell* feature ensures PRS transmission from all subcells. Hence, any location result provided by a supercell is inherently inaccurate.

3.8.3 LTE2445 system impact

Interdependencies between features

The following features can interwork with the *LTE2445: Combined Supercell* feature:

- *LTE1089: Downlink Carrier Aggregation – 20 MHz*
- *LTE1332: Downlink Carrier Aggregation – 40 MHz*
- *LTE1562: Carrier Aggregation for Multicarrier eNBs*
- *LTE1803: Downlink Carrier Aggregation 3CC – 40 MHz*
- *LTE1804: Downlink Carrier Aggregation 3CC – 60 MHz*

Note: Any combination of normal cells and supercells might interoperate in DL CA. Supercells may take both PCell and SCell roles.

- *LTE2233: N-out-of-M Downlink Carrier Aggregation*

Note: Can be supported with restrictions made for the *LTE2445* feaure and DL CA (maximum 3CC, no inter-eNB CA).

- *LTE1541: Advanced SCell Measurement Handling*
- *LTE2006: Flexible SCell Selection*
- *LTE2276: Measurement-based SCell Selection*

Note: It is recommended to activate the *LTE1541: Advanced SCell Measurement Handling*, *LTE2006: Flexible SCell Selection*, *LTE2276: Measurement-based SCell Selection* features together with the *LTE2445: Combined Supercell* feature because it is likely that the cells involved in CA have different coverage.

- *LTE2275: PCell Swap*

Note: The shape of a supercell might have an impact on the UL SINR seen at different locations across the supercell area. As the UL SINR must exceed a lower limit for a PCell swap to be triggered, this might impact the probability of a PCell swap and its success. For example, in a supercell consisting of a macro + low-power RRHs to fill coverage gaps at the cell border, the boundary up to which PCell swaps are initiated might be shifted to the cell border. The target SCell of the swapping should still provide sufficient coverage for smooth operation.

- *LTE1092: Uplink Carrier Aggregation*
- *LTE1367: Automatic Cell Combination Assignment for Carrier Aggregation*
- *LTE1951: Automatic Configuration Support for Multi-Carrier eNBs*
- *LTE468: PCI Management*
- *LTE1103: Load-based Power Saving for Multi-Layer Networks*
- *LTE783: ANR Inter-RAT UTRAN*
- *LTE784: ANR Inter-RAT GERAN*
- *LTE27: Open Loop UL Power Control and DL Power Setting*
- *LTE28: Closed Loop UL Power Control*
- *LTE1336: Interference-aware UL Power Control*

Note: The *LTE1336: Interference-aware UL Power Control* feature is:

- supported when the subcells of the supercell have the same power levels
- not allowed when the subcells of the supercell have different power levels

- *LTE46: Channel-aware Scheduler*
- *LTE619: Interference-aware UL Scheduling*
- *LTE979: IRC for 2Rx Antennas*
- *LTE48: Support of High-speed Users*
- *LTE2080: LTE-WCDMA RF Sharing with Full FBBC Support*

Note: The interoperation with RF sharing features refers to FSMr3 only. RF sharing for FSMr4 is not in the scope of FL16A.

- *LTE2628: FHCG Repeater Interface Module 2-pipe*

Note: For appropriate system operation, the repeaters must have symmetric gains in UL and DL direction.

- *LTE2630: Uplink-control-information-only Transmission*
- *LTE2479: 256 QAM in DL*
- *LTE2612: ProSe Direct Communication for Public Safety*
- *LTE2661: FDD-LTE 16A FSMr3 Capacity and Dimensioning*
- *LTE2776: FDD-LTE 16A FSM4 Capacity and Dimensioning*
- *LTE2477: 3GPP Baseline R12 06/2015*
- *LTE1117: MBMS*
- *LTE556: ANR Intra-LTE, Inter-Frequency, UE-based*
- *LTE782: ANR Fully UE-based*

The *LTE2445: Combined Supercell* feature impacts the following features:

- *LTE495: OTDOA*

For more information, see *Support of location services* section.

The following features are not supported in combination with the *LTE2445: Combined Supercell* feature:

- *LTE72: 4-way Rx Diversity*
- *LTE980: 4Rx IRC for 4Rx Path*
- *LTE1195: FHCC Flexi 850 Repeater Interface Unit*
- *LTE568: 4x2 MIMO or any Higher Order MIMO*
- *LTE1987: Downlink Adaptive Closed Loop SU MIMO (4x4)*
- *LTE2605: 4Rx Diversity 20MHz Optimized Configurations*
- *LTE1709: Liquid Cell*
- *LTE187: Single TX Path Mode*
- *LTE1203: Load-based Power Saving with Tx Path Switching Off*
- *LTE1542: FDD Supercell*

Note: The *LTE2445* and the *LTE1542* are mutually exclusive on a cell level, but might coexist in the same eNB. The features have different feature activation flags. The *LTE1542* and *LTE2091* have the same activation flag.

Table 34 LTE2445 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale FDD	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	LTE OMS16A	3GPP R8 UE capabilities	NetAct 16.8	support not required	support not required

Table 39 LTE2460 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8-R12	NetAct 16.8	Flexi NS4.0	Support not required

- Increased UE peak throughput
- Increased downlink peak data rates of up to 780 Mbps with 4CC carrier aggregation

3.10.4 LTE2479 reference data

LTE2479: 256QAM in Downlink requirements, measurements and counters, parameters, and sales information.

Requirements

Table 45 LTE2479 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	3GPP R12 UE capabilities	NetAct 16.8	Support not required	Support not required

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature supports additional band combinations for downlink (DL) FDD-TDD carrier aggregation (CA).

3.11.1 LTE2511 benefits

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature provides higher DL peak rates in areas with overlapping cell deployments for the supported FDD-TDD band combinations.

3.11.2 LTE2511 functional description

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature allows the Flexi Multiradio 10 BTS to support the following band combinations for FDD-TDD CA:

- FDD-TDD 2CC:
  - band 3 (FDD 15 MHz or 20 MHz, TM3 or TM4) + band 38 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 3 (FDD 5 MHz, 10 MHz, 15 MHz, or 20 MHz; TM3 or TM4) + band 41 (TDD 20 MHz, frame configuration 1 or 2; TM3, TM4, or TM9)
  - band 3 (FDD 5 MHz, 10 MHz, 15 MHz, or 20 MHz; TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 8 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 41 (TDD 20 MHz, frame configuration 1 or 2; TM3, TM4, or TM9)
  - band 8 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4) *
  - band 20 (FDD 5 MHz, 10 MHz, 15 MHz, or 20 MHz; TM3 or TM4) + band 38 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 20 (FDD 10 MHz, 15 MHz, or 20 MHz; TM3 or TM4) + band 40 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 28 (FDD 5 MHz, 10 MHz, 15 MHz, or 20 MHz; TM3 or TM4) + band 40 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 28 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 41 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 28 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
- FDD-TDD 3CC:
  - band 3 (FDD 5 MHz, 10 MHz, 15 MHz, or 20 MHz; TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
  - band 8 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 41 (TDD 20 MHz, frame configuration 1 or 2; TM3, TM4, or TM9) + band 41 (TDD 20 MHz, frame configuration 1 or 2; TM3, TM4, or TM9)
  - band 8 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2; TM3, TM4, or TM9) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4) *

- band 28 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 41 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4) + band 41 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)
- band 28 (FDD 5 MHz or 10 MHz, TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4) + band 42 (TDD 20 MHz, frame configuration 1 or 2, TM3 or TM4)

Note: The bandwidth combination set is 0 if not indicated as described in 3GPP TS 36.101. The combinations marked with an asterisk (*) are not covered in 3GPP TS 36.101.

3.11.3 LTE2511 system impact

LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I impact on features.

Interdependencies between features

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature is enabled together with the following features:

- *LTE2180: FDD-TDD Downlink Carrier Aggregation 2CC*
- *LTE2316: FDD-TDD Downlink Carrier Aggregation 3CC*

Impact on interfaces

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature has no impact on interfaces.

Impact on network management tools

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature has no impact on system performance or capacity.

3.11.4 LTE2511 reference data

LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I requirements and sales information

Requirements

Table 50 LTE2511 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Table 50 LTE2511 hardware and software requirements (Cont.)

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	• 3GPP R11 UE capabilities • 3GPP R12 UE capabilities	NetAct 16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature.

Commands

There are no commands related to the *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature.

Parameters

There are no parameters related to the *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations - I* feature.

Sales information

Table 51 LTE2511 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	No

3.12 LTE2527: Additional Carrier Aggregation Band Combinations – IV

The *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature supports additional downlink (DL) carrier aggregation (CA) band combinations, expanding the functionality introduced by *LTE2200: Additional Carrier Aggregation Band Combinations – III*, *LTE2168: Additional Carrier Aggregation Band Combinations – II*, and *LTE2033: Additional Carrier Aggregation Band Combinations – I* features.

3.12.1 LTE2527 benefits

The *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature provides the following benefits:

- when carrier aggregation (CA) is enabled, it supports more band combinations; this guarantees higher peak data rates for the users within the network
- the operator is offered additional downlink (DL) CA band combinations

3.12.2 LTE2527 functional description

Functional overview

In addition to the allowed CA band combinations from:

- *LTE1089: Downlink Carrier Aggregation – 20 MHz*
- *LTE1332: Downlink Carrier Aggregation – 40 MHz*
- *LTE2033: Additional Carrier Aggregation Band Combinations – I*
- *LTE2168: Additional Carrier Aggregation Band Combinations – II*
- *LTE2200: Additional Carrier Aggregation Band Combinations – III*

the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature allows the Flexi Multiradio 10 BTS to support:

- band 1 + band 11
- band 1 + band 26 *
- band 2 + band 5 (bandwidth combination set 0, 1)
- band 2 + band 7
- band 2 + band 12 (bandwidth combination set 2)
- band 2 + band 66 (bandwidth combination set 0, 1, 2)
- band 3 + band 3 (non-contiguous, bandwidth combination set 1)
- band 3 + band 5 (bandwidth combination set 3)
- band 3 + band 26 *
- band 3 + band 31
- band 3 + band 32
- band 4 + band 4 (non-contiguous, bandwidth combination set 1)
- band 4 + band 7 (bandwidth combination set 1)
- band 4 + band 12 (bandwidth combination set 5)
- band 5 + band 5 (non-contiguous)
- band 5 + band 5 (contiguous)
- band 5 + band 7 (bandwidth combination set 1)
- band 5 + band 13
- band 5 + band 66
- band 7 + band 7 (bandwidth combination set 2)
- band 7 + band 12
- band 7 + band 32
- band 8 + band 8 (contiguous)
- band 8 + band 11
- band 8 + band 20
- band 11 + band 18
- band 11 + band 28
- band 12 + band 66 (bandwidth combination set 0, 1, 2, 3, 4, 5)
- band 13 + band 66
- band 20 + band 28
- band 20 + band 31

- band 20 + band 32 (bandwidth combination set 0, 1)
- band 66 + band 66 (contiguous)
- band 66 + band 66 (non-contiguous)

Note: The bandwidth combination set is 0 if not indicated otherwise. CA bandwidth combination sets are covered by 3GPP (TS 36.101 V13.0.0). For more details, see the *LTE1089: Downlink Carrier Aggregation – 20 MHz* and *LTE1332: Downlink Carrier Aggregation – 40 MHz* feature descriptions.

* denotes band combinations required for fallback from a three-component carrier (3CC) aggregation (band 1 + band 3 + band 26) of *LTE2528: Additional Carrier Aggregation Band Combinations 3CC – II* feature.

3.12.3 LTE2527 system impact

Interdependencies between features

The *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature is enabled together with *LTE1089: Downlink Carrier Aggregation – 20 MHz* and *LTE1332: Downlink Carrier Aggregation – 40 MHz* features.

Impact on interfaces

The *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature has no impact on interfaces.

Impact on network management tools

The *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature has no impact on system performance or capacity.

3.12.4 LTE2527 reference data

Requirements

Table 52 LTE2527: Additional Carrier Aggregation Band Combinations – IV hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	3GPP R11 UE capabilities, 3GPP R12 UE capabilities	NetAct 16.8	Not supported	Not supported

Alarms

There are no alarms related to the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature.

Commands

There are no commands related to the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature.

Parameters

There are no parameters related to the *LTE2527: Additional Carrier Aggregation Band Combinations – IV* feature.

Sales information

Table 53 LTE2527: Additional Carrier Aggregation Band Combinations – IV sales information

Product structure class	License control	Activated by default
Application software (ASW)	SW asset monitoring	No

3.13 LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II

Benefits, functionality, system impact, and reference data of the feature.

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature supports additional band combinations for a three component carrier (3CC) downlink (DL) carrier aggregation (CA).

3.13.1 LTE2528 benefits

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature provides higher DL peak rates in areas with overlapping cell deployments for the supported band combinations.

3.13.2 LTE2528 functional description

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature allows Flexi Multiradio 10 BTS to support the following band combinations for 3CC DL CA:

- band 1 + band 3 + band 3 (band 3 contiguous)
- band 1 + band 3 + band 26
- band 1 + band 7 + band 7 (band 7 contiguous) *
- band 1 + band 7 + band 8
- band 1 + band 7 + band 20
- band 1 + band 8 + band 11

- band 2 + band 2 + band 4 (band 2 non-contiguous)
- band 2 + band 2 + band 5 (band 2 contiguous)
- band 2 + band 2 + band 12 (band 2 contiguous)
- band 2 + band 2 + band 30 (band 2 contiguous)
- band 2 + band 4 + band 7 *
- band 2 + band 4 + band 30
- band 2 + band 5 + band 12
- band 2 + band 5 + band 13
- band 2 + band 7 + band 12 *
- band 3 + band 3 + band 8 (band 3 non-contiguous)
- band 3 + band 3 + band 20 (band 3 contiguous, non-contiguous) *
- band 3 + band 3 + band 28 (band 3 contiguous) *
- band 3 + band 7 + band 7 (band 7 contiguous)
- band 3 + band 7 + band 32 *
- band 3 + band 20 + band 32 *
- band 4 + band 4 + band 29 (band 4 non-contiguous) *
- band 4 + band 4 + band 30 (band 4 non-contiguous) *
- band 4 + band 5 + band 13
- band 4 + band 5 + band 29
- band 4 + band 7 + band 12 (BCS 0)
- band 4 + band 7 + band 12 (BCS 1)
- band 5 + band 12 + band 12 (band 12 contiguous)
- band 7 + band 7 + band 28 (band 7 contiguous)
- band 7 + band 8 + band 20
- band 7 + band 20 + band 32 *

Note: The bandwidth combination set is 0 if not indicated as described in 3GPP TS 36.101. The combinations marked with an asterisk (*) are not covered in 3GPP TS 36.101.

3.13.3 LTE2528 system impact

LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II impact on features.

Interdependencies between features

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature is enabled together with the following features:

- *LTE1803: Downlink Carrier Aggregation 3CC - 40 MHz*
- *LTE1804: Downlink Carrier Aggregation 3CC - 60 MHz*

Impact on interfaces

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature has no impact on interfaces.

Impact on network management tools

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature has no impact on system performance or capacity.

3.13.4 LTE2528 reference data

LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II requirements and sales information.

Requirements

Table 54 LTE2528 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	• 3GPP R11 UE capabilities • 3GPP R12 UE capabilities	NetAct 16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature.

Commands

There are no commands related to the *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature.

Parameters

There are no parameters related to the *LTE2528: Additional Carrier Aggregation Band Combinations 3CC - II* feature.

Sales information

Table 55 LTE2528 sales information

Product structure class	License control	Activated by default
Application software (ASW)	SW Asset Monitoring	No

3.14 LTE2531: FDD Downlink Carrier Aggregation 4CC

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature enables aggregating air interface resources of up to four overlapping cells in order to reach high downlink peak rates for an individual user. The maximum bandwidth aggregated with the feature is 80 MHz.

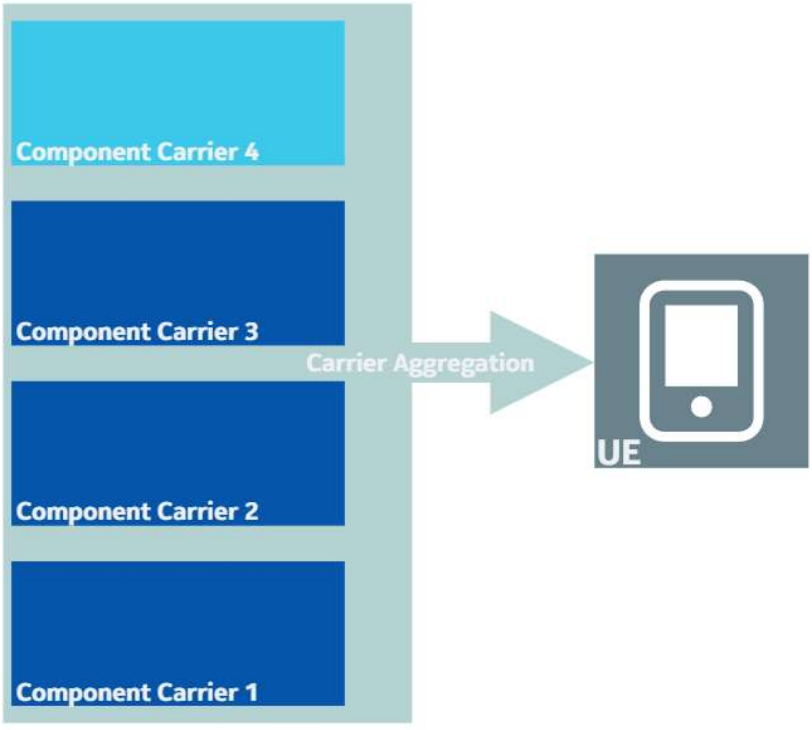
3.14.1 LTE2531 benefits

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature provides the benefit of downlink peak rates of up to 780 Mbps enabled in combination with the *LTE2479: 256 QAM in Downlink* feature. Without 256 QAM, the maximum possible downlink peak rates are up to 600 Mbps in ideal conditions (downlink peak rates are determined by UE capabilities, radio conditions, other traffic, and HW capabilities).

3.14.2 LTE2531 functional description

Feature overview

Figure 7 Downlink carrier aggregation for four component carriers



The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature enables eNB to support carrier aggregation in downlink for up to four component carriers (CCs). The feature is a continuation of the *LTE1804: Downlink Carrier Aggregation 3CC – 60 MHz* and *LTE2233: N-out-of-M Downlink Carrier Aggregation* features with the following functionality improvements and enhancements:

- Third SCell configuration/deconfiguration (4CC)
- Extension of SCell selection, based on normalized load compare value (NLCV) to three SCells out of up to six frequency layers
- Stepwise activation of the third SCell
- Extension of UE-throughput-based division algorithms to 4CC for:
  - Buffer division
  - Peak data rate division
  - Aggregate maximum bit rate (AMBR) division
  - Nominal bit rate (NBR) division
- Aperiodic channel state information (CSI) triggering for 4CC
- Periodic CSI handling for 4CC by static PUCCH configuration only
- A 15-bit long, extended packet data convergence protocol sequence number (PDCP-SN) is supported (applicable to all 3GPP R11 UEs and higher)
- RLC parameter modifications to handle increased peak data rates and to handle an increased number of transmission buffers

The maximum aggregated downlink bandwidth is up to 80 MHz. 4CC 80 MHz CA in combination with 256 QAM allows achieving downlink peak rates of up to 780 Mbps in ideal conditions. Without 256 QAM, maximum possible downlink peak rates for 4CC 80 MHz CA are up to 600 Mbps and for 4CC 60 MHz CA are up to 450 Mbps. Downlink peak rates are determined by UE capabilities, radio conditions, other traffic, and hardware capabilities.

The supported band combinations, with the bandwidth combination set 0 for the deployment scenario 1 and 2 as described by 3GPP TS 36.300, are:

- Band 3 + Band 7 + Band 20 + Band 32; maximum aggregated bandwidth: 80 MHz
- Band 2 + Band 2 + Band 12 + Band 30; Band 2 contiguous; maximum aggregated bandwidth: 60 MHz
- Band 2 + Band 2 + Band 5 + Band 30; Band 2 contiguous; maximum aggregated bandwidth: 60 MHz
- Band 2 + Band 2 + Band 29 + Band 30; Band 2 contiguous; maximum aggregated bandwidth: 60 MHz
- Band 2 + Band 4 + Band 12 + Band 30; maximum aggregated bandwidth: 60 MHz
- Band 2 + Band 4 + Band 5 + Band 30; maximum aggregated bandwidth: 60 MHz
- Band 2 + Band 4 + Band 5 + Band 29; maximum aggregated bandwidth: 60 MHz
- Band 2 + Band 4 + Band 29 + Band 30; maximum aggregated bandwidth: 60 MHz
- Band 4 + Band 4 + Band 5 + Band 30; Band 4 non-contiguous; maximum aggregated bandwidth: 60 MHz
- Band 4 + Band 4 + Band 12 + Band 30; Band 4 non-contiguous; maximum aggregated bandwidth: 60 MHz
- Band 4 + Band 4 + Band 29 + Band 30; Band 4 non-contiguous; maximum aggregated bandwidth: 60 MHz

On Flexi Multiradio 10 System Module, the following bandwidth combinations are supported (for three-sector per eNB per eNB cluster deployment):

- The supported bandwidth combinations for 4CC for a 2RX/2TX configuration per component carrier are any combinations up to:
  - 5/10 + 5/10 + 15/20 + 15/20 MHz in the intra-eNB scenario
  - 15/20 + 15/20 + 15/20 + 15/20 MHz in the inter-eNB scenario
- The supported bandwidth combinations for 4CC with a 4RX/4TX configuration (maximum two layers per CC) on one or two component carriers with the highest cell bandwidths are any combinations up to:
  - 5/10 + 5/10 + 5/10 + 5/10 MHz in the intra-eNB scenario
  - 15/20 + 15/20 + 15/20 + 15/20 MHz in the inter-eNB scenario

Note: 4RX/4TX + 4RX/4TX + 4RX/4TX + 4RX/4TX can be supported even for 20 MHz + 20 MHz + 20 MHz + 20 MHz 4CC CA with a limited number of cells per eNB.

A mix of non-carrier aggregation UEs and carrier aggregation UEs with up to four aggregated CCs is supported in downlink on each cell. Downlink carrier aggregation is only applied to UEs with the related UE capabilities. The feature serves guaranteed bit rate data radio bearers (GBR DRBs) only on the PCell.

SCell handling

- Each SCell is configured/deconfigured individually.
- Each SCell is activated/de-activated individually.
- DL AMBR and DL NBR enforcements on 4CC are introduced.
- Barred cells are handled according to the rules of *LTE2557: SCell Configuration of Barred Cells* and *LTE2149: Supplemental Downlink Carrier*.

Scheduling

UEs with activated SCells are scheduled by separate and coordinated downlink schedulers. Handling the discontinuous reception (DRX) as well as measurement gap is synchronized between the four downlink schedulers.

The aperiodic channel quality indicator (CQI) report is extended to report four CCs.

Physical uplink control channel (PUCCH)

PUCCH format 3 is used for downlink carrier aggregation with four CCs.

Mobility

The mobility for CA-configured UEs is based on PCell measurements. The same measurement configurations as for non-CA-configured UEs are applied, for example A3 and/or A5.

The feature does not support cross-CC scheduling (PDCCH and the corresponding PDSCH cannot be on different cells).

- *LTE2091: FDD Supercell Extension*
- *LTE2445: Combined Supercell*

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature impacts the following features:

- *LTE1042: Nominal Bitrate for Non-GBR Bearers*
- *LTE1092: Uplink Carrier Aggregation – 2CC*
  LTE1092 and *LTE2531* can be enabled on the same eNB; however, that eNB will not support 2CC UL CA on the same UE when 4CC CA is active.
- *LTE1638: Inter-frequency RSTD Measurement Support*
  CQI reporting of SCells can be reconfigured for more than two SCells.
- *LTE2133: eICIC for HetNet eNodeB Configurations*
- *LTE2275: PCell Swap*
  4CC-configured UEs are excluded from the PCell swap procedure.
- *LTE2276: Measurement-based SCell Selection*
- *LTE2479: 256 QAM in Downlink*

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature is impacted by the following features:

- *LTE1103: Load-based Power Saving for Multi-layer Networks*
  In the case of multi-eNB CA, *LTE1103* can power up/shut down cells if the current load requires it.

Impact on interfaces

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature has no impact on interfaces.

Impact on network management tools

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2531: FDD Downlink Carrier Aggregation 4CC* feature impacts system performance and capacity by increasing a single UE's DL throughput peak rates up to 780 Mbps for 4CC with 80 MHz with 256 QAM (or, alternatively, up to 600 Mbps without 256 QAM).

3.14.4 LTE2531 reference data

Requirements

Table 56 LTE2531 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	3GPP R12 UE capabilities,	NetAct 16.8	Support not required	Support not required

Note: The *LTE2551: RSRQ-based A5* feature does not increase the number of simultaneously active measurements at UEs. Either the A5 RSRP or A5 RSRQ measurement is active at a given time. If the feature is disabled, the legacy RSRP A5 behavior applies. If A5 RSRQ parameters are not configured for a target carrier, the legacy RSRP A5 behavior applies to the target carrier.

3.15.2.2 A5 RSRQ and RSRP conditions

The A5 RSRQ and A5 RSRP measurements start when the quality conditions listed in the Table 61: A5 RSRP and A5 RSRQ activation conditions are fulfilled. During that period, a decision on whether to initiate an inter-frequency handover is made by the eNB; consequently, after a successful target cell selection a handover preparation phase is initiated.

Table 61 A5 RSRP and A5 RSRQ activation conditions

A5 RSRP measurement is deactivated, and A5 RSRQ is activated when:	A5 RSRQ measurement is deactivated, and A5 RSRP is activated when:
A5 RSRP is already active	A5 RSRQ is already active
the A2 RSRQ event occurs	the A2 RSRP even occurs
the serving cell RSRP measurement is greater than the inter-frequency A2 RSRP threshold	the serving cell RSRQ measurement is greater than the A2 RSRQ threshold
If the serving cell RSRP is lower or equal to the inter-frequency A2 RSRP threshold, then A5 RSRQ is not configured, and the A5 RSRP measurement is retained.	If the serving cell RSRQ is lower or equal to the A2 RSRQ threshold, then A5 RSRP is not configured, and the A5 RSRQ measurement is retained.

Note: There is only one A2 RSRQ treshold, and there are multiple A2 RSRP tresholds.

3.15.3 LTE2551 system impact

Interdependencies between features

The following features must be activated to enable the A5 RSRQ in the *LTE2551: RSRQ-based A5* feature:

- *LTE55: Inter-frequency Handover*
- *LTE1198: RSRQ Triggered Mobility*

The *LTE2551: RSRQ-based A5* feature impacts the following features:

- *LTE64: Service-based Handover Thresholds*
  LTE64 introduces the QCI1-based RSRP offset and thresholds for the A3 and A5 events. This feature has to be enabled if the QCI1-specific RSRP thresholds are used when the combined check on RSRP and RSRQ is supported at the eNB. It also has to be enabled if the RSRP measurement is compared with a QCI1-specific threshold for the A2 event.
- *LTE556: ANR Intra-LTE, Inter-frequency – UE-based*
  New A5-RSRQ reports are considered for passive automated neighbor relation (ANR).
- *LTE1060: TDD-FDD Handover*

This feature must be enabled if *LTE2551* is active and the FDD handover needs to be supported.

- *LTE2008: Extended Inter-frequency Measurements*
  Up to eight inter-frequency layers (combination of FDD and TDD) can be broadcasted with SIB5 for a cell reselection. Up to six inter-frequency measurements (combination of FDD and TDD) can be configured per UE, depending on the configured inter-frequency bands.

Impact on interfaces

The *LTE2551: RSRQ-based A5* feature has no impact on interfaces.

Impact on network management tools

The *LTE2551: RSRQ-based A5* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2551: RSRQ-based A5* feature has no impact on system performance or capacity.

3.15.4 LTE2551 reference data

Requirements

Table 62 LTE2551 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL 16A	FL 16A	FL 16A	FL 16A

Flexi Zone Controller	

  - *LTE2006: Flexible SCell Selection*
    An SDLC cells play a role of candidates for SCell swap.
  - *LTE2233: N-out-of-M Downlink Carrier Aggregation*
    An SDLC cells play a role of candidates for SCell swap based on A6 measurement reports or average cell load.
  - *LTE2007: Inter-eNodeB Carrier Aggregation*
    An SDLC cells can be configured in inter-eNB CA deployments (including cases where one of the eNBs hosts SDLC cells only).

- *LTE1944: Dynamic Handover Blacklisting*
  This feature allows temporarily blacklisting the neighbor relation. It is recommended to use *LTE1944* together with *LTE2557* to avoid unnecessary signaling and measurements for a handover to DL-only cells (SDLC cells).

Impact on interfaces

The *LTE2557: Supplemental DL Carrier Extension* feature has no impact on interfaces.

Impact on network management tools

The *LTE2557: Supplemental DL Carrier Extension* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2557: Supplemental DL Carrier Extension* feature can improve peak and download throughput for non-GBR UEs with the secondary cell (SCell) configured. Additionally, a system capacity gain is expected. It can be doubled for bandwidth combinations with an equal bandwidth of two involved cells.

3.16.4 LTE2557 reference data

Requirements

Table 65 LTE2557 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R10 UE capabilities is the minimum	NetAct 16.8	support not required	support not required

BTS faults and reported alarms

There are no faults related to the *LTE2557: Supplemental DL Carrier Extension* feature.

Commands

There are no commands related to the *LTE2557: Supplemental DL Carrier Extension* feature.

Measurements and counters

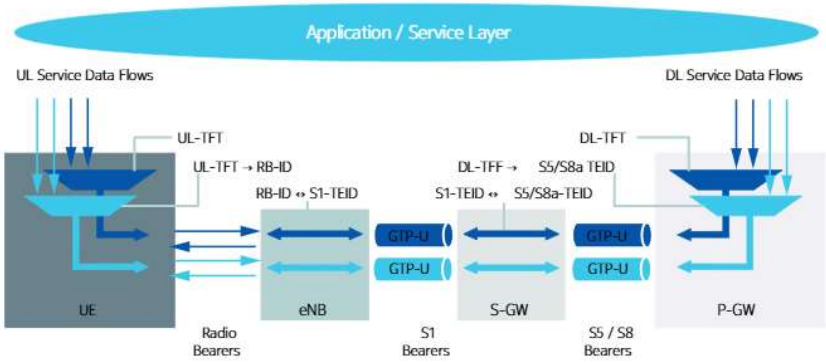
There are no measurements or counters related to the *LTE2557: Supplemental DL Carrier Extension* feature.

Evolved packet system (EPS) defines a packet data network (PDN) connection service as an IP connection between a UE and an external PDN of the public land mobile network (PLMN). The PDN connection service supports the transmission of one or more service data flows (SDFs). SDF is a virtual connection which carries data plane traffic. SDFs mapped to the same EPS bearer receive the same bearer-level packet forwarding treatment, for example, scheduling policy, queue management policy, rate shaping policy.

For a group-termination-point (GTP)-based S5/S8 reference point, PDN connectivity is provided by an EPS bearer running between the UE and the packet data network gateway (P-GW). Figure 9: LTE/EPC service data flows illustrates the LTE/EPC service data flow in more detail.

A traffic flow template (TFT) defines which data flows can be mapped to which bearers. It exists in the UE for the uplink, and in P-GW for the downlink.

Figure 9 LTE/EPC service data flows



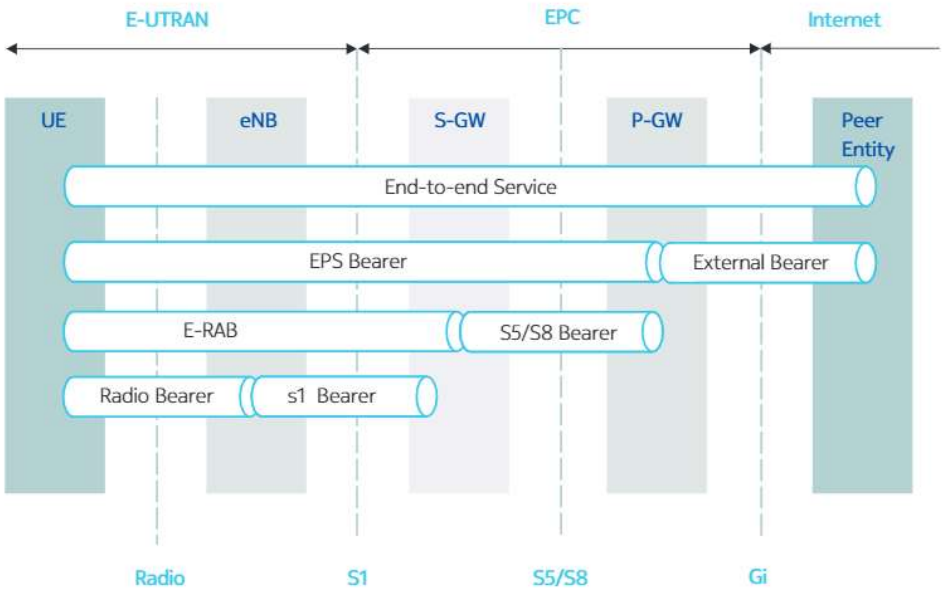
The EPS bearers correspond to the packet data protocol (PDP) context in 2G/3G networks, composed of the sub-bearers, as illustrated in Figure 10: LTE/EPC EPS high-level bearer model.

- A radio bearer transports the packets of an EPS bearer between the UE and the eNB. If a radio bearer exists, there is a one-to-one mapping between an EPS bearer and this radio bearer.
- An S1 bearer transports the packets of an EPS bearer between the eNB and the serving gateway (S-GW).
- An S5/S8a bearer transports the packets of an EPS bearer between the serving GW and the PDN gateway (P-GW).

An E-UTRAN radio access bearer (E-RAB) refers to the connection of an S1 bearer and a corresponding radio bearer. A data radio bearer transports the packets of an EPS bearer between a UE and an eNB. When a data radio bearer exists, there is a one-to-one mapping between this data radio bearer and the EPS bearer/E-RAB.

Figure 10: LTE/EPC EPS high-level bearer model shows the EPS bearer services' layered architecture.

Figure 10 LTE/EPC EPS high-level bearer model



When the UE is active, all sub-bearers exist for the UE, but when it moves to an idle state, S1 and radio bearers are released. However, the EPS bearer and associated contexts in a UE and EPS remain even though the UE is in an idle state.

An EPS bearer can be a default bearer or a dedicated bearer.

A default EPS bearer is set up when a UE attaches to the EPS network. There will be one default EPS bearer setup per PDN. The default EPS bearer is a non-GBR bearer, and it is “always-on”; that is, it is not released until the UE detaches from the PDN. The default EPS bearer's traffic flow template (TFT) matches all packets, which means, it can be used for any kind of traffic.

In addition to a default EPS bearer, dedicated EPS bearers can be set up for the UE. The dedicated EPS bearer can be either a GBR or a non-GBR bearer, and it is set up on network control, for example, for VoIP calls.

The Flexi Multiradio BTS supports up to three GBR EPS radio bearers per UE. Up to six data radio bearers (DRBs) can be established per UE. Multiple DRBs can be either multiple default EPS bearers or a combination of default and dedicated EPS bearers. The different EPS bearers per UE can have the same or a different QCI. The operator is able to offer additional service combinations. Some data might be treated in a special way, for example, a flow of data might be provided a guaranteed bit rate while another one may face a low transfer.

3.17.2.1.1 Bearer management

Bearer management provides basic procedures to establish the default EPS bearer that provides an always-on service to the user.

Bearer management is part of the LTE control plane and handles the establishment, modification, and release of bearers.

Bearer management includes:

- establishment and release of S1 bearers on the S1 interface

Table 68 QoS scheme for LTE (Cont.)

3G (QoS-aware)	LTE (non-QoS-aware)
Traffic priority handling	
Allocation and retention priority (ARP)	
Maximum bit rate (MBR)	
Guaranteed bit rate (GBR)	
	Aggregate maximum bit rate (AMBR)

The following summarizes the main features of the LTE/EPC QoS model:

- network-centric QoS scheme, deployed in LTE, reduces the complexity of UE implementations
- always-on default EPS bearer available after initial access
- further dedicated EPS bearer setup on network control (for example, for VoIP calls)
- no need for support from terminal application clients or the device operating system

Table 69: Standard QCI characteristics (3GPP TS 23.203) shows an example of standard QCI characteristics, identifying the possible packet delay budgets, packet loss rates, and appropriate services.

Table 69 Standard QCI characteristics (3GPP TS 23.203)

QCI	Resource Type	Priority	Packet Delay Budget	Packet Loss Rate	Example of Services
1	GBR	2	100 ms	10^{-2}	Conversational voice (VoIP)
2		4	150 ms	10^{-3}	Conversational video (Live streaming)
3		3	50 ms	10^{-3}	Real time gaming
4		5	300 ms	10^{-6}	Non-conversational video (Buffered Streaming)
5	Non-GBR	1	100 ms	10^{-6}	IMS signaling
6		6	300 ms	10^{-6}	Video (Buffered streaming) TCP-based (for example, www, e-mail, chat, ftp, p2p file sharing, progressive video)
7		7	100 ms	10^{-3}	Voice, Video (Live streaming) interactive gaming

Table 69 Standard QCI characteristics (3GPP TS 23.203) (Cont.)

QCI	Resource Type	Priority	Packet Delay Budget	Packet Loss Rate	Example of Services
8		8	300 ms	10^{-6}	Video (Buffered streaming) TCP-based (for example, www, e-mail, chat, ftp, p2p file sharing, progressive video)
9		9			

Note: The standardized characteristics are not signaled on any interface. They should be understood as guidelines for the pre-configuration of node-specific parameters for each QCI. The goal of standardizing a QCI with corresponding characteristics is to ensure that applications/services mapped to that QCI receive the same minimum level of QoS in multi-vendor network deployments and in the case of roaming. A standardized QCI and its corresponding characteristics are independent of the UE's current access (3GPP or non-3GPP).

3.17.2.1.3 ARP

The primary purpose of allocation and retention priority (ARP) is to decide whether a

Table 70 Partial admission decision table (Cont.)

Handover type	Topology	X2AP/S1AP cause value	Emergency session	Admission concept	Admitted bearers
Service-based handover	X2 or S1	Resource optimisation handover	Yes	Partial admission	E-RAB with vulnerability non-pre-emptable
Load-based handover	Any	Reduce load in a serving cell	Not relevant	All-or-Nothing	All
Foreign vendor source eNB	X2 or S1	Anything else	Not relevant	All-or-Nothing	All

3.18.2 LTE2564 functional description

The *LTE2564: Centralized RAN CL16A Release* feature is the successor of the *LTE2470: Centralized RAN CL16 Release* feature. The feature enables increasing throughput in DL. A mix of 4Tx per cell and 2Tx per cell is allowed in the same CRAN system.

Additionally, untill the *LTE2564: Centralized RAN CL16A Release* feature, any change in configuration required a reset of CRAN. The feature ensures a dynamical CRAN gain configuration without the reset. It is possible by option **enable/disable** of all helper cells so that only a serving cell is considered a baseline (non-CRAN) gain.

Migration from FL16 to FL16A

During migration from FL16 (*LTE2470: Centralized RAN CL16 Release*) to FL16A (*LTE2564: Centralized RAN CL16A Release*), the same helper cell association is preserved. This provides identical system functionality as the one in FL16 (*LTE2470: Centralized RAN CL16 Release*).

The *LTE2564: Centralized RAN CL16A Release* feature does not change the general CRAN configuration concept introduced by the *LTE2470: Centralized RAN CL16 Release* feature and allows only the same chain/loop configuration as the legacy *LTE2470: Centralized RAN CL16 Release* feature. The *LTE2564: Centralized RAN CL16A Release* feature supports the same system size of the CRAN system (up to 9 FSMFs) and the same topology as the *LTE2470: Centralized RAN CL16 Release* feature.

3.18.3 LTE2564 system impact

Interdependencies between features

The following features have to be activated before activating the *LTE2564: Centralized RAN CL16A Release* feature:

- *LTE1710: Sync Hub Direct Forward*
- *LTE2901: Centralized RAN Supported Configurations CL16 Release*
- *LTE2883: Application of Diagnostic and Maintenance for Intelligent Network*
- In case 4T2R MIMO per cell needs to be configured, the *LTE568: DL Adaptive Closed Loop MIMO (4x2)* feature must be activated.

Note: The *LTE2883: Application of Diagnostic and Maintenance for Intelligent Network* (ADMIN) feature introduces a web-based tool for eNB diagnostic and maintenance tasks. ADMIN is an embedded eNB tool, and it does not require any additional package installation at the end user's station. The ADMIN tool provides the same possibility of enabling and disabling the CRAN gain as BTS SM or NetAct. With ADMIN, it is possible to have CRAN-related counters updated every other minute (instead of standard 15-minute intervals). ADMIN utilizes an eNB-internal data model; thus, the enabling and disabling of CRAN gain is performed directly by eNB mechanisms. As a result, the whole reconfiguration process takes place much faster.

For more information, see
LTE2883: Application of Diagnostic and Maintenance for Intelligent Network feature.

The *LTE2564: Centralized RAN CL16A Release* feature impacts the following features:

- *LTE2291: Support for Carrier Aggregation on CL16A Release*
  The *LTE2291* feature utilizes the *LTE2564* feature.

The following legacy features are not supported by the *LTE2564: Centralized RAN CL16A Release* feature:

- *LTE1092: Uplink Carrier Aggregation – 2CC*
- *LTE180: Cell Radius Max 100 km*
- *LTE2387: Classical LTE(MORAN)–GSM(MOBSS) RF Sharing with One SM per Operator*
- *LTE2445: Combined Supercell*
- *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations – I*
- *LTE2516: FRIJ Flexi RRH 4-pipe 1700/2100 160 W*
- *LTE2528: Extension of Downlink 3CC Carrier Aggregation – II*
- *LTE2531: FDD Downlink Carrier Aggregation 4CC/5CC*
- *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller*
- *LTE2605: 4RX Diversity 20 MHz Optimized Configurations*
- *LTE2609: Dual Carrier Support LTE1.4 and LTE3*
- *LTE2629: FDD-LTE Dual Carrier (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS*
- *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W*
- *LTE2637: Quad Carrier on Single RF Unit*
- *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W*
- *LTE2680: FHEL Flexi RRH 2-pipe 1800 120 W*
- *LTE2729: FW2FIWA – Flexi Zone G2 Indoor Pico Dual Band BTS (Band AWS & Band 2)*
- *LTE2880: Support of Classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)*
- *LTE2920: Classical WCDMA/LTE-RF Sharing Support for Narrowband LTE (LTE 1.4 and 3 MHz)*
- *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W*
- *LTE3092: Support for Dual-Band Indoor/Outdoor FZ BTS (Pre–Rel 13) – Enhanced CSAT for LTE-U*
- *LTE3093: Support for Dual-Band Indoor/Outdoor FZ BTS (Pre–Rel 13) – UNII-1 Band Support*
- All legacy features not supported by the *LTE2470: Centralized RAN CL16 Release* feature.

Impact on interfaces

The *LTE2564: Centralized RAN CL16A Release* feature has no impact on interfaces.

Impact on network management tools

The *LTE2564: Centralized RAN CL16A Release* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2564: Centralized RAN CL16A Release* feature increases throughput and service quality for the UEs on the cell edge regions of the cells from the CoMP set.

3.18.4 LTE2564 reference data

Requirements

Table 76 LTE2564 feature hardware and software requirements

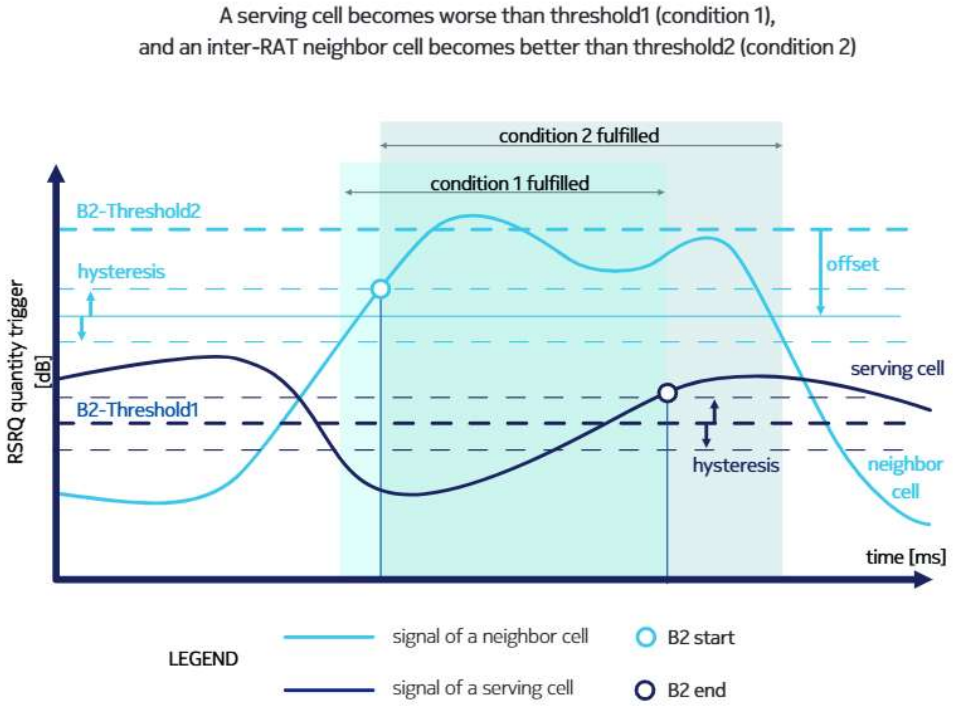
System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Airscale	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	LTE OMS16A	3GPP R8 mandatory	NetAct 16.8	support not required	support not required

3.19.2.1 LTE2572 overview

The *LTE2572: RSRQ-based B2* feature introduces an additional trigger, which is represented by the quantity of reference signal received quality (RSRQ). The trigger activates the quality-related B2 event, which takes place when the quality of serving cell becomes worse than B2-threshold1 (that is, during the RSRQ-based A2 event), and the quality of inter-RAT neighbor cell becomes better than B2-threshold2. The new event is introduced in addition to the already existing B2 RSRP event. Figure 11: LTE B2 event illustrates this scenario in detail.

Figure 11 LTE B2 event



Note: Without *LTE2572: RSRQ-based B2*, the B2 event was intended only for the RSRP. With *LTE2572: RSRQ-based B2*, it is possible to have also a B2 event for the RSRQ which allows to monitor the quality of service.

Note: The *LTE2572: RSRQ-based B2* feature does not increase the number of simultaneously active measurements at UEs, and either the B2 RSRP or B2 RSRQ measurement is active at a given time. However, the same B2 target thresholds are applied regardless of the source quantity. If the feature is disabled, the legacy RSRP B2 behavior applies. If the B2 RSRQ parameters are not configured for a target carrier, the legacy RSRP B2 behavior applies to the target carrier.

3.19.2.2 B2 RSRQ conditions

The conditions for beginning and end of inter-RAT measurements are listed in Table 80: Conditions for the inter-RAT measurements period. During that period, a decision about whether to initiate an inter-RAT handover or not is made; consequently, after a successful target cell selection, a handover preparation phase is initiated.

Table 80 Conditions for the inter-RAT measurements period

Beginning of inter-RAT measurements	End of inter-RAT measurements
The quality of serving cell becomes worse than threshold1.	The quality of serving cell becomes better than threshold1.
The quality of inter-RAT neighbor cell becomes better than threshold2.	The quality of inter-RAT neighbor cell becomes worse than threshold2.

3.19.3 LTE2572: system impact

Interdependencies between features

The following feature must be activated before activating the *LTE2572: RSRQ-based B2* feature:

- *LTE1198: RSRQ-triggered Mobility*
  The RSRQ-based A2 event takes a major role in the RSRQ-based B2 event; therefore, the *LTE1198: RSRQ-triggered Mobility* feature needs to be enabled.

Impact on interfaces

The *LTE2572: RSRQ-based B2* feature has no impact on interfaces.

Impact on network management tools

The *LTE2572: RSRQ-based B2* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2572: RSRQ-based B2* feature has no impact on system performance or capacity.

3.19.4 LTE2572 reference data

Requirements

Table 81 LTE2572 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS 16A	3GPP R8	NetAct 16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE2572: RSRQ-based B2* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2572: RSRQ-based B2* feature.

Commands

There are no commands related to the *LTE2572: RSRQ-based B2* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2572: RSRQ-based B2* feature.

Key performance indicators

criterion which is based on the UE's transmission power is different for UEs of power-class-1 and power-class-3 and cannot be deduced simply by evaluating the power headroom reports (PHRs).

The main principle of the interference-aware UL scheduler (IAS) is to separate in the UL spectrum the UEs with high inter-cell interference power between adjacent cells. For this purpose, the IAS evaluates the power conditions of the UEs by means of the power headroom report (PHR) and, based on the evaluation, deduces the transmission power spent for the UL transmission the PHR is carried. The higher the UE's transmission power, the higher the inter-cell interference the UE is contributing.

3.20.3 LTE2583 system impact

Interdependencies between features

The *LTE2583: Support of High-power UE* feature impacts the following features:

- *LTE619: Interference Aware UL Scheduling*
  Even though UEs with different power classes (power-class-1 and 3) remain in the same cell, the UL scheduler must schedule all the UEs jointly. In this context, the scheduling criterion of the interference-aware UL scheduler (IAS) is affected. The scheduling criterion which is based on the UE's transmission power is different for UEs of powerclass- 1 and power-class-3 and cannot be deduced simply by evaluating the power headroom reports (PHRs).
  The main principle of the IAS is to separate in the UL spectrum the UEs with high inter-cell interference power between adjacent cells. For this purpose, the IAS evaluates the power conditions of the UEs by means of the power headroom report (PHR) and, based on the evaluation, deduces the transmission power spent for the UL transmission the PHR is carried. The higher the UE's transmission power, the higher the inter-cell interference the UE is contributing.

Impact on interfaces

The *LTE2583: Support of High-power UE* feature impacts interfaces as follows:

- Uu interface
  - the extended power headroom report (ePHR) has to be supported in the E-UTRAN band 14

Impact on network management tools

The *LTE2583: Support of High-power UE* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2583: Support of High-power UE* feature has no impact on system performance or capacity.

3.20.4 LTE2583 reference data

Requirements

Table 84 LTE2583 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	LTE OMS16A	3GPP R11 UE capabilities	NetAct 16.8	support not required	support not required

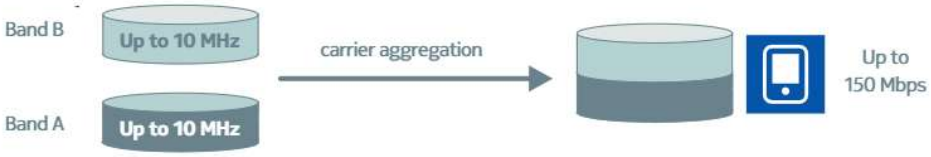
Carrier aggregation is used in LTE-Advanced in order to increase the bandwidth and data rate. Each aggregated carrier is referred to as a component carrier (CC). The component carrier can have a bandwidth of up to 20 MHz, and a maximum of five component carriers can be aggregated. The individual component carriers can also be of different bandwidths.

There are several features which support different carrier aggregation scenarios.

Note: Aggregation of carriers can be performed only for certain band combinations. To make carrier aggregation possible, a dual-band configuration is needed.

The figure below presents an overview of the carrier aggregation functionality for two bands with the same frequency.

Figure 12 Inter-band carrier aggregation example



CA-based idle mode load balancing for intra-LTE target selection

The carrier-aggregation-based (CA) idle mode mobility is achieved by introducing dedicated CA-specific weights. The weights are used to determine dedicated cell reselection priorities for the CA-capable user equipment (UE). Moreover, the CA-specific weights and dedicated priorities are differentiated depending on the UE capabilities, that is, depending on the maximum number of supported intra-LTE CA component carriers (CCs): 2CC, 3CC, 4CC, and 5CC. For example, there are different reselection priorities defined for the 2CC UE (targeting 20 + 20 MHz CA) than for the 3CC UE (targeting 10 + 15 + 20 MHz CA).

The CA-based algorithm for idle mode load balancing optimizes the intra-LTE primary target selection for the highest possible CC combination supported by the UE. If the UE does not support that combination, an eNB tries to assign a primary target configured for a lower CC combination. When the primary target is found within a specific CC combination, then also the intra-LTE secondary target of the same CC combination is used. Otherwise, if the primary target is empty, then the intra-LTE secondary target of the lowest possible CC combination configured by the operator is used.

Note: For inter-RAT secondary targets and a non-CA-capable UEs, the parameters defined within the *LTE1677: Idle Mode Mobility Balancing Extensions* and the *LTE2166: Support of Dedicated Idle Mode Mobility Priorities* features are used for all the idle mode load balancing algorithms.

New parameters

The *LTE2601: CA-aware Idle Mode Load Balancing* feature introduces the following parameters for configuring the CA-based idle mode load balancing for the CA-capable UEs:

- A percentage of UEs for a CA-based idle mode load balancing (a

3.21.4 LTE2601 reference data

Requirements

Table 89 LTE2601 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	FL16A	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8	NetAct 16.8	Support not required	Support not required

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature introduces new evolved packet system (EPS) unicast QoS Class Identifier (QCI) bearers to support public safety (PS) push-to-talk (PTT) and data services.

3.22.1 LTE2611 benefits

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature deploys unicast EPS bearers with optimized QCI support to enable the operator to support PS PTT and data services.

3.22.2 LTE2611 functional description

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature enables PTT communication service to support mission-critical applications for PS and commercial applications with faster setup times and priority handling.

The PTT service provides an arbitration method where two or more users can engage in communication. This differs from the regular voice over LTE (VoLTE). The PTT service allows users to request for a permission to talk (transmit voice or audio) and provides a mechanism to decide between requests that are in contention (for example, floor control). This feature establishes, maintains, and terminates communication paths among PTT users.

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature supports the following standardized QCI bearer values (For more details, see *3GPP Release 12 TS 23.203*.):

- QCI65 (mission-critical user plane PTT voice)
- QCI66 (non-mission-critical user plane PTT voice)
- QCI69 (mission-critical delay sensitive signaling)
- QCI70 (mission-critical data)

The new QCIs are supported within the existing quality of service (QoS) and service differentiation framework. The QCI69 and QCI70 are handled with proportional scheduling based on an operator-configurable weight and with no delay based on the scheduling needs to be introduced.

The following deployment of the discontinuous reception (DRX) profiles with operator-configurable priorities are recommended for PS QCIs:

- QCI65: DRX profiles 1 and 2
- QCI66: DRX profiles 1 and 2
- QCI69: DRX profiles 1, 2, and 3
- QCI70: DRX profiles 1, 3, 4, and 5

The same packet data convergence protocol (PDCP) and radio link control (RLC) characteristics in QCI1 are used for PTT voice QCI65 and QCI66 bearers. The range of inactivity timer for calls with QCI69 bearer is extended to ensure faster call setup. The value of the inactivity timer is operator-configurable and ranges up to 30 minutes.

Note: The default value of the inactivity timer is increased with this feature. Therefore, the battery life and the eNB capacity of the UEs might be affected because of the extended inactivity timer.

The parameters for radio link failure and re-establishment control with established PTT voice QCI bearers (T310 and N310) are optimized to ensure faster re-establishment.

Note: Transmission time interval (TTI) bundling can be activated or deactivated individually for each PS QCI.

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature deploys counters as specified in the *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles* and *LTE2766: Counter Profiling per Service (QCI)* features.

3.22.3 LTE2611 system impact

LTE2611: Introduction of Public Safety Specific QCI Bearers impact on features, interfaces, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature:

- *LTE7: Support of Multiple EPS Bearers*
- *LTE9: Service Differentiation*
- *LTE10: EPS Bearers for Conversational Voice*
- *LTE497: Smart Admission Control*
- *LTE534: ARP-based Admission Control for E-RABs*

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature is dependent on the following features:

- *LTE11: Robust Header Compression*
- *LTE42: DRX in RRC Connected Mode*
- *LTE496: Support of QCI Classes 2, 3, and 4*
- *LTE 519: eRAB Modification*
- *LTE1321: eRAB Modification - GBR*
- *LTE1042: Nominal Bitrate for Non-GBR Bearers*
- *LTE1569: QCI1 Specific RLF and Re-establishment Control*

Note: These features are designed for the QCI configuration framework. A consistency check and an independent feature flag are required to enable them.

- *LTE2559: ARP-based Partial Admission Control for Handover*
  The user equipment (UE) with PS bearers and higher address resolution protocol (ARP) values can benefit from this feature because it increases the probability of a successful handover of the E-UTRAN radio access bearers (E-RABs).
- *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles*
- *LTE2766: Counter Profiling per Service (QCI)*

Note: These features reuse and support all the counters that are relevant to QCI65, QCI66, QCI69, and QCI70 bearers.

- *LTE2465: CSG Cell Support*
- *LTE1723: S1-based Handover towards Home eNodeB*

- *LTE2351: S1-based Handover towards CSG Cells*
- *LTE1442: Open-access Home eNodeB Mobility*

Note: The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature has to block handovers to the caller subscriber geography (CSG) or home evolved Node B (eNB) if there are any PS bearers that exist for the UE.

- *LTE1804: Downlink Carrier Aggregation 3 CC - 60 MHz*
- *LTE2531: FDD Downlink Carrier Aggregation 4 CC*

Note: The QCI70 bearer configuration can have an optimized RLC setting when configured with RLC acknowledged mode (AM) for these carrier aggregation (CA) features.

Impact on interfaces

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature affects interfaces as follows:

- S1-AP
  - Setup of multiple E-RABs to include new QCI values (QCI65, QCI66, QCI69, and QCI70)
  - QCI modifications and switching support between QCI5 and QCI69
- X2-AP
  - Handover support of multiple E-RABs to include new QCI values (QCI65, QCI66, QCI69, and QCI70)

Impact on network management tools

The *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature has no impact on network management tools.

Impact on system performance and capacity

When the *LTE2611: Introduction of Public Safety Specific QCI Bearers* feature is activated, the selection of the QCI priority values influence the congestion handling within the radio access network (RAN). Congestion handling might be configured based on the QCI priority or based on the ARP priority which the admission control also uses. To ensure that the PS bearers are handled accordingly during congestion, they are expected to have higher priority as compared to the normal UEs. The operator must be careful with the ARP setting when congestion handling is based on ARP. The ARP value assigned to the PS bearer reflects the QCI priority so that the admission control allows new incoming PS bearers.

The eNB must meet the performance requirements from the standard specification since the standardized QCIs carry a specific packet delay budget and packet error loss rate.

Note: The existing bearer-handover interruption time requirements also apply to these QCIs.

Because of high uncertainty on the core network architecture, the mission-critical push-to-talk (MCPTT)-related requirements are omitted. The specific bearer QCI packet loss rate and delay budget requirements contributes to the eNB end-to-end quality.

The control plane latency must be considered given the PS context of the new bearers. The MCPTT call setup time required is less than 300 ms; this is the sum of all delayed components from various network entities. The eNB contribution is limited to service request and bearer setup call flow latencies. They form the eNB latency budget within the MCPTT call setup time.

PTT (QCI65 or QCI66) mirrors VoLTE. The existing VoLTE call setup success and retainability requirements are applied. For mission-critical data calls (QCI69), the existing E-RAB setup success and retainability requirements are applied.

3.22.4 LTE2611 reference data

LTE2611: Introduction of Public Safety Specific QCI Bearers requirements, measurements and counters, parameters, and sales information

Requirements

Table 93 LTE2611 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R12 UE capabilities	NetAct 16.8	Support not required	Support not required

Sales information

Table 97 LTE2611 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	No

3.23 LTE2612: ProSe Direct Communications for Public Safety

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2612: ProSe Direct Communications for Public Safety* feature introduces one of the functions of proximity service (ProSe) that is defined in the 3GPP Release 12 standards called ProSe direct communication. This function enables the user equipment (UE) to perform a device-to-device (D2D) communication.

3.23.1 LTE2612 benefits

The *LTE2612: ProSe Direct Communications for Public Safety* feature is intended for public safety (PS) operators trying to leverage the long-term evolution (LTE) technology to replace the existing mobile radio systems. The PS provider can support ProSe direct communication among the PS UEs in proximity.

3.23.2 LTE2612 functional description

The *LTE2612: ProSe Direct Communications for Public Safety* feature includes the following components:

- ProSe authorization indication on S1 and X2
- ProSe direct communications with UE-selected resource allocation

The *LTE2612: ProSe Direct Communications for Public Safety* feature is supported in the 5 MHz and 10 MHz bandwidth. The *LTE2612: ProSe Direct Communications for Public Safety* feature allows communication between an in-coverage UE and another UE using ProSe D2D communication, which is also known as sidelink (SL). Coverage refers to being in the coverage of an LTE cell operating on a PS carrier. A UE is considered in-coverage for SL direct communication whenever it detects a cell on a PS carrier, and out-of-coverage when it does not. SLs use uplink resources and physical channel structure that is similar to the uplink transmissions. UEs directly communicate with each other using the SLs.

To use the D2D communication channels, the UE must be authorized. It is expected that most PS UEs are configured and pre-authorized. When the authorized and capable SL UEs are in-coverage, they rely on the system information broadcast 18 (SIB18) to attain SL communications configuration from the PS cell.

The evolved Node B (eNB) needs provisioning data to configure the information in the SIB18. The resources specify the time domain and the frequency domain information corresponding to the receiving SL direct communications. To reduce interference issues with the Uu transmissions, the scheduler reserves the UL resources that can be used for SL communication transmissions.

If the UE is in the RRC idle state, the information on transmit pool is broadcasted in SIB18. An authorized UE expresses an interest in ProSe direct communication using a SidelinkUEInformation message to the eNB in an RRC connected state when it receives an SIB18 broadcast from a PS cell. Mobility management is modified to try and keep the UEs interested in PS communication on a PS carrier. Regardless of whether SIB18 is configured with transmit pool resources, a dedicated transmit resource must be provided to a connected UE, that is, the UE is RRC connected on a PS carrier. The eNB sends an RRC reconfiguration message with an independent resource selection and provides the dedicated transmit resources. The transmit pool configuration is identical in the dedicated configuration and in the SIB18. The same procedure is used to remove SL resources to UEs that are no longer interested in SL communications or when ProSe authorization is stopped.

In the UE-independent resource allocation selection scheme, the eNB has a slight involvement in the specific SL transmission resource selection process. This scheme is applicable to both RRC idle and RRC connected states using transmit pool resources, which the dedicated signaling or the SIB18 broadcasts.

An out-of-coverage UE must be synchronized in the system before communicating with other elements. In this feature, the eNB provides a reference symbol received power (RSRP) threshold in the SIB18 to indicate when the UE has to send SL synchronization information.

Note: The SL resource pool configuration is highly flexible to provide various situations that allow different trade-off. The SL resource pool must not overlap with the physical random access channel (PRACH) and other blocked regions like the *LTE944: PUSCH Masking* feature. Also, it must not overlap with the physical uplink control channel (PUCCH) and must be configured between the upper and lower PUCCH regions. It is expected that the preconfigured pool and the broadcast pool are configured the same as in the standard deployment. Depending on the configuration and trade-offs between quality and capacity, the HARQ retransmission, TTI bundling, and DRX performance can sustain different degree of impact. If uncertain, it is recommended to start with the default SL pool configuration to minimize impacts.

The *LTE2612: ProSe Direct Communications for Public Safety* feature expects the preconfigured Tx/Rx pools for out-of-coverage UEs to match the corresponding pools broadcasted in SIB18. However, this feature allows the operator to define the second Rx pool to be broadcasted in SIB18 in case the assumption is not true with the following restrictions:

- The preconfigured Rx pools must contain the SIB18 Tx pool so that the out-of-coverage UE can listen to the in-coverage transmission.
- One of the Rx pool broadcasted by the SIB18 must accommodate the out-of-coverage Tx pool so that the in-coverage UEs can listen to the out-of-coverage transmission.

ProSe authorization indication on S1 and X2

The component includes ProSe-authorized indication defined by the 3GPP Release 12 TS 23.303 in the S1-AP and X2-AP messages. This is to indicate whether the PS UE is authorized to use ProSe. The ProSe authorized indication can be included in the following:

- S1-AP messages
  - Initial Context Setup Request

  - UE Context Modification Request
  - Handover Request (in the case of S1 handover)
  - Path Switch Request Acknowledge
- X2-AP message
  - Handover Request

The *LTE2612: ProSe Direct Communications for Public Safety* feature assumes that the eNB receives the ProSe authorization indication over the S1/X2 messages from the mobility management entity (MME) and the neighboring eNBs forwards it. If the ProSe-authorized information element (IE) includes one or more IEs that are set to not authorized in the UE Context Modification Request S1-AP message, the eNB sends an RRC connection reconfiguration message to the UE. This ensures that the UE is no longer accessing the relevant ProSe.

ProSe direct communication with UE-selected resource allocation

The ProSe Release 12 direct communication is only applicable for PS-authorized and PS-capable UEs. From the radio access network (RAN) perspective, both the quality of service (QoS) and session management are transparent and responsible for the PS UE application level. The ProSe direct communication over the SL channel is supported assuming that the UE-selected resource allocation of SL resources is sufficient for this feature. The operator can configure the following:

- pools of SL resources for both receive and transmit
- other SL channel items such as cyclic prefix and power control

To ensure continuous service between cells for ProSe UEs in active SL communication, a common SL configuration in SIB18 and the UE-dedicated SL configuration between adjacent ProSe-enabled carrier cells must be coordinated. This is enabled using an identical and common SL configuration on SIB18 for all ProSe-enabled carrier cell cluster within the same region. Also, to ensure communications with out-of-coverage UEs, the preconfigured SL configuration in the UE must be considered.

3.23.3 LTE2612 system impact

LTE2612: ProSe Direct Communications for Public Safety impact on features, interfaces, and system performance and capacity

Interdependencies between features

The following features must be deactivated before activating the *LTE2612: ProSe Direct Communications for Public Safety* feature:

- *LTE1382: Cell Resource Groups*
- *LTE1092: Uplink Carrier Aggregation - 2 CC*
- *LTE1103: Load Based Power Saving for Multi-layer Networks*
- *LTE1203: Load Based Power Saving with Tx Path Switching Off*
- *LTE1113: eICIC – Macro*
- *LTE1059: Uplink Multi-cluster Scheduling*

Note: The power saving features must be disabled in the PS carrier that has SL resource configured.

- *LTE2275: PCell Swap*
  This feature must consider the PRB assigned for SL purposes.
- *LTE2664: Load Based PUCCH Region*
  This feature must avoid overlapping with SL resources. The PUCCH size changes based on loading.
- *LTE1130: Dynamic PUCCH Allocation*
  This feature must avoid overlapping PUCCH and PRACH locations with SL resources.
- *LTE497: Smart Admission Control*, *LTE534: ARP-based Admission Control for E-RABs*, and *LTE1042: Nominal Bitrate for Non-GBR Bearers*
  These features assess uplink capacity and should adjust accordingly with SL resource pool.

The *LTE2612: ProSe Direct Communications for Public Safety* feature affects the following handover features for UEs that have expressed an interest on the ProSe carrier:

- *LTE423: RRC Connection Release with Redirect*
  A UE that has expressed an interest in SL communication is provided with an A2 SL threshold in addition to the existing A2 redirect thresholds.
- *LTE2166: Support of Dedicated Idle Mode Mobility Priorities*, *LTE1677: Idle Mode Mobility Balancing Extensions*, *LTE2051: Measurement-based Idle Mode Load Balancing*, *LTE487: Idle Mode Mobility Load Balancing*, and *LTE762: Idle Mode Mobility from LTE To WCDMA, GSM or other LTE Bands*
  A dedicated idle mode mobility priority is not assigned to a UE that has expressed an interest in SL communication when the UE is idle.
- *LTE1387: Intra-eNodeB IF Load Balancing*, *LTE1170: Inter-frequency Load Balancing*, *LTE1531: Inter-frequency Load Balancing Extension*, *LTE2008: Extended Inter-frequency Measurements*, *LTE1127: Service-based Mobility Trigger*, *LTE1841: Inter-Frequency Load Equalization*, and *LTE1357: LTE-UTRAN Load Balancing*
  Inter-frequency is delayed for a UE that expresses an interest in SL communication using a dedicated A2-SL thresholds. The A2-SL thresholds remove and replace the existing evolved universal terrestrial radio access (EUTRA) measurements. The UE is not unloaded since the A4 measurements are deactivated.
- *LTE1905: PLMN ID and SPID Selected Mobility Profiles* and *LTE490: Subscriber Profile-based Mobility*
  The ProSe UEs might have a specific public land mobile network (PLMN) ID. The profiles might coexist with ProSe UEs.
- *LTE55: Inter-frequency Handover*, *LTE872: SRVCC to WCDMA*, *LTE873: SRVCC to GSM*, *LTE56: Inter-RAT Handover to WCDMA*, *LTE442: Network Assisted Cell Change To GSM*, *LTE60: Inter RAT Handover to eHRPD/3GPP2*, and *LTE738: SRVCC to 1xRTT/CDMA*
  The SL-specific A2 threshold is used to activate handover measurements. The single radio voice call continuity (SRVCC) measurements are removed when the UE expresses an interest in SL communication.
- *LTE1441: Enhanced CS Fallback to CDMA/1xRTT (e1xCSFB)*, *LTE562: CSFB to UTRAN or GSM via Redirect*, and *LTE736: CS Fallback to UTRAN*
  The circuit switched fallback (CSFB) is supported whether the UEs have expressed interest in SL communication or not.
- *LTE556: ANR Intra-LTE, Inter-frequency - UE-based* and *LTE908: ANR Inter-RAT UTRAN - Fully UE-based*

Impact on network management tools

The *LTE2612: ProSe Direct Communications for Public Safety* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2612: ProSe Direct Communications for Public Safety* provides basic support for SL PS UEs through a set of uplink radio bearer (RB) that is exclusively reserved for SL communication. Since the uplink RB is unavailable to the Uu uplink interface assignment, both the cell and the single UE peak throughput are degraded. A UE that has expressed an interest in the SL communication is not scheduled with an uplink grant for transmission time intervals (TTIs) belonging to the SL pool.

The sounding reference signal (SRS) must be turned off when the *LTE2612: ProSe Direct Communications for Public Safety* feature is enabled. The frequency selective gain is reduced and affects the throughput. The number of RB left for the Uu interface is reduced, which might make it difficult for the scheduler to efficiently utilize all the resources. Additionally, a single UE peak throughput might be reduced if the SL resource pool is provisioned in such a way that the remaining RBs available to the Uu interface are segmented into multiple non-continuous regions.

3.23.4 LTE2612 reference data

LTE2612: ProSe Direct Communications for Public Safety requirements, alarms, measurements and counters, parameters, and sales information

Requirements

Table 98 LTE2612 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

BTS faults and reported alarms

Table 99 New BTS faults introduced by LTE2612

Fault ID	Fault name	Reported alarm	
		Alarm ID	Alarm name
6298	Invalid sidelink transmit pool configuration	7653	CELL FAULTY

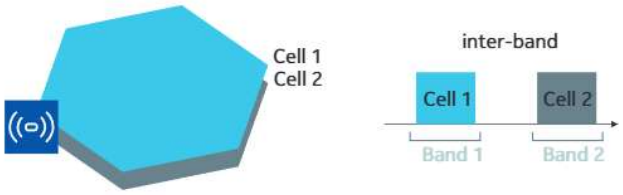
For alarm descriptions, see *FDD-LTE BTS Alarms and Faults*.

Commands

There are no commands related to the *LTE2612: ProSe Direct Communications for Public Safety* feature.

The feature supports dual-carrier operation where the two cells are located on different bands (inter-band, non-contiguous).

Figure 13 An example of deployment of dual-cell operation cells



Any combination of two cells with 5, 10, 15, and 20 MHz bandwidth are supported, including a single 5, 10, 15, and 20 MHz cell deployment.

LTE2629 also supports the cell combination deployment of 20-MHz licensed bandwidth and 20-MHz unlicensed bandwidth. Single cell deployment on the unlicensed bandwidth is not supported.

Two cells can be configured and activated simultaneously or one after another. When it is done separately, any instance of adding/deleting/enabling/disabling of the second cell requires an eNB restart.

With the *LTE2629* feature enabled, two-carrier (2CC) intra-eNB carrier aggregation becomes a possibility.

3.24.3 LTE2629 system impact

Interdependencies between features

The *LTE2629: FDD-LTE Dual-cell (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS* feature impacts the following features:

- *LTE2729: B2+B4/B66 FZ G2 Indoor Multi-Band Pico (FW2FIA, FW2FIWA, FW2FIWC)*
  This feature introduces the first dual-band indoor pico platform with two licensed bands.
- *LTE2357: B4/66+Unlic FZ G2 Indoor Multi-Band Pico (FW2IRA, FW2IRWA, FW2IRWC)*
  This feature introduces a dual-band indoor pico platform supporting one 3GPP-licensed band and a 5-GHz unlicensed band.
- *LTE2424: LTE-U (2CC) Support for Dual-Band Indoor/Outdoor FZ BTS*
  This feature introduces the software support for downlink carrier aggregation with a 5-GHz unlicensed spectrum.
- *LTE1332: Downlink Carrier Aggregation – 40 MHz*
  This feature enables the eNB to support carrier aggregation in downlink for two component carriers of up to 20-MHz cell bandwidth each and two non-aggregated uplink cells.
- *LTE2060: Add New Frequency or Cell Without Reset*
  This feature enables adding a cell or a carrier without a site outage.

Impact on interfaces

The *LTE2629: FDD-LTE Dual-cell (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS* feature has no impact on interfaces.

Impact on network management tools

The *LTE2629: FDD-LTE Dual-cell (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2629: FDD-LTE Dual-cell (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS* feature impacts system performance and capacity as follows:

- It facilitates a peak throughput of up to 300 Mbps in DL and up to 100 Mbps in UL with two cells of 20-MHz bandwidth.
- With an increased bandwidth support (2x20 MHz), up to 600 in total RRC-connected UEs, 250 active UEs, and a total of 12 UEs per transmission time interval (TTI) (six UEs per TTI per cell) can be supported.
  The total of RRC-connected UEs and the total of UEs per TTI are lower for 2x20 MHz compared to 840 UEs in total and 20 in total UEs per TTI, which are possible with 2x10 MHz. This is due to the fact that the increase in total bandwidth doubles the total number of resource blocks to be scheduled.

3.24.4 LTE2629 reference data

Requirements

Table 104 LTE2629 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A					

Key performance indicators

There are no key performance indicators related to the *LTE2629: FDD-LTE Dual-cell (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS* feature.

Parameters

There are no parameters related to the *LTE2629: FDD-LTE Dual-cell (2x20 MHz) Operation Support on a Single Flexi Zone Micro BTS* feature.

Sales information

Table 106 LTE2629 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	No

3.25 LTE2630: Uplink Control Information Only Transmission

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2630: Uplink Control Information Only Transmission* feature introduces uplink control information (UCI)-only grant to a user equipment (UE). This is used to retrieve the UCI via the physical uplink shared channel (PUSCH) if there is no user data transmission, that is, if the evolved Node B (eNB) has not successfully received a periodic or an aperiodic channel state information (CSI) for a carrier during an operator-configurable time.

3.25.1 LTE2630 benefits

The *LTE2630: Uplink Control Information Only Transmission* feature provides an improved downlink channel-aware scheduler performance for scenarios where the eNB cannot receive the channel quality indicator (CQI) information via the existing mechanism.

3.25.2 LTE2630 functional description

The Flexi Multiradio BTS introduces enhancements to retrieve the aperiodic UCI. The following are the types of UCI-only transmissions supported:

- Low-priority UCI
  The uplink UCI-only grants are assigned if:
  - there are free physical downlink control channel (PDCCH) and PUSCH resources.
  - the UE is discontinuous reception (DRX)-active (DRX is applied).
  - the eNB has not received a single periodic CQI report or the eNB has not received an aperiodic CSI report during an operator-configurable time.

Note: Low-priority UCI-only grant cannot be assigned if the UE is in a transmission time interval (TTI) bundling mode or if the UE is out-of-sync. This is also the same as for the high-priority UCI-only grant.

- High-priority UCI
  The uplink UCI-only grants are assigned if:
  - the UE is DRX-active (DRX is applied).
  - the eNB has not received multiple periodic CQI reports and the eNB has not received an aperiodic CSI report during an operator-configurable time.

Note: High-priority grants are prioritized over grants for initial transmission. The operator can configure the maximum number of physical resource blocks (PRBs) assigned for high-priority grants per TTI.

The support of the UCI-only grants are necessary to resolve CSI reporting issues during enhanced inter-cell interference coordination (eICIC) and carrier aggregation (CA) operations in the cell with or without DRX configuration. Therefore, it is strongly recommended to enable the *LTE2630: Uplink Control Information Only Transmission* feature in the respective cells.

This feature also provides means for requesting aperiodic CSI reports from the UEs regardless of the availability of the uplink data, that is, if the uplink scheduler regularly requests the periodic CSI report.

3.25.3 LTE2630 system impact

LTE2630: Uplink Control Information Only Transmission impact on features

Interdependencies between features

The *LTE2630: Uplink Control Information Only Transmission* feature affects all eICIC and CA features. It is recommended to enable this feature when the eICIC or CA features are used in the cell.

Impact on interfaces

The *LTE2630: Uplink Control Information Only Transmission* feature has no impact on interfaces.

Impact on network management tools

The *LTE2630: Uplink Control Information Only Transmission* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2630: Uplink Control Information Only Transmission* feature might cause degradation (less UEs/TTI) because more actions are needed from the media access control protocol stack (MAC PS) side.

3.25.4 LTE2630 reference data

LTE2630: Uplink Control Information Only Transmission requirements, parameters, and sales information

Requirements

Table 107 LTE2630 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8 mandatory	NetAct 16.8	Support not required	Support not required

Sales information

Table 110 LTE2630 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	No

3.26 LTE2754: Frequency Bands Priority Change in mFBI

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2754: Frequency Bands Priority Change in mFBI* feature supports multiple frequency band indicator (mFBI) frequency band prioritization.

3.26.1 LTE2754 benefits

The *LTE2754: Frequency Bands Priority Change in mFBI* feature prioritizes mFBI-mapped band. The feature targets the UE to select the mapped band with higher priority when both bands are supported. In case the mFBI user equipment (UE) supports a native primary cell (PCell) and mapped PCell band, the mapped band is used to support carrier aggregation (CA). Otherwise, CA is not supported with the band combination of the mapped PCell, and an extra intra-cell handover is needed to support CA for these UEs.

3.26.2 LTE2754 functional description

The *LTE2754: Frequency Bands Priority Change in mFBI* feature introduces support for frequency band priority change in the mFBI. The feature is an extension to the *LTE1534: Multiple Frequency Band Indicator* feature for UEs that only support certain band-related features (for example, the UE supports CA if PCell works on the mapped band). For more information, see the *LTE1534: Multiple Frequency Band Indicator* feature description.

Currently, the band-applying rule for accessing a carrier that belongs to a different overlapping frequency band causes an additional intra-cell handover to UEs that support certain band-related features in one of the overlapping bands.

To avoid additional handovers, a new freqBandIndicatorPriority information element (IE) in the system information broadcast 1 (SIB1) is introduced to change the priorities of the overlapping bands and the corresponding UE capabilities. The freqBandIndicatorPriority IE indicates whether the UE supports the prioritization of the frequency band in the multiBandInfoList IE or the band in the freqBandIndicator IE.

The evolved Node B (eNB) considers the UE capabilities to support band priority change and the SIB1 content to determine if the UE uses native or mapped band during initial call setup. During handover, the target eNB considers the UE capabilities to support band priority change and the SIB1 content to select the E-UTRA absolute radio frequency channel number (EARFCN) for the target cell.

- *LTE2275: PCell Swap*
  The *LTE2754: Frequency Bands Priority Change in mFBI* feature can be enabled with this feature. When PCell swap is triggered, the target PCell finds the available CA band combination with the mapped band.
- *LTE2838: CA Steering Intra-cell Handover*
  The *LTE2838: CA Steering Intra-cell Handover* feature targets the UE that selects the native band as the operation band when both bands are supported. If the UE only supports some features on the mapped band, intra-cell handover is triggered to direct the native EARFCN to the mapped EARFCN.
  If the UE supports the mapped band adjustment with higher priority even if a specific feature cannot be performed on the mapped band, the eNB does not trigger an intra-cell handover using the steering PCell mapped EARFCN to the native EARFCN.
- *LTE2612: ProSe Direct Communications for Public Safety*
  The *LTE2612: ProSe Direct Communications for Public Safety* feature covers the interaction with the *LTE2754: Frequency Bands Priority Change in mFBI* feature.

Impact on interfaces

The *LTE2754: Frequency Bands Priority Change in mFBI* feature affects the following interfaces:

- S1 interface
  - freqBandPriorityAdjustment-r12 IE in UE-EUTRA-Capability IE
- X2 interface
  - freqBandPriorityAdjustment-r12 IE in UE-EUTRA-Capability IE
  - freqBandIndicatorPriority IE in X2 setup or X2 eNB configuration update procedure
- RRC interface
  - freqBandPriorityAdjustment-r12 IE in UE-EUTRA-capability
  - new freqBandIndicatorPriority-r12 IE added to SIB1

Impact on network management tools

The *LTE2754: Frequency Bands Priority Change in mFBI* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2754: Frequency Bands Priority Change in mFBI* feature has no impact on system performance or capacity.

3.26.4 LTE2754 reference data

LTE2754: Frequency Bands Priority Change in mFBI requirements, parameters, and sales information

Requirements

Table 111 LTE2754 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R12 UE capabilities	Support not required	Support not required	Support not required

3.27 LTE2832: SRVCC Due to Admission Control Rejection

The *LTE2832: SRVCC Due to Admission Control Rejection* feature allows a VoLTE user, connected to the LTE cell, to be transferred to WCDMA via single radio voice call continuity (SRVCC). The transfer takes place when there are not enough radio and/or transport resources in the LTE network. A VoLTE call can then be temporarily accepted to perform the SRVCC to WCDMA. This leads to a short-term overbooking in the eNB for voice bearer requests.

3.27.1 LTE2832 benefits

The *LTE2832: SRVCC Due to Admission Control Rejection* feature increases the success rate for VoLTE call setups.

3.27.2 LTE2832 functional description

3.27.2.1 VoLTE general information

Voice over LTE (VoLTE) is a technology specification that defines standards and procedures for delivering voice communication over 4G LTE networks using Internet Protocol (IP) multimedia subsystem (IMS).

In general, VoLTE enables:

- improved coverage and connectivity
- superior call quality
- extended battery life
- video calling

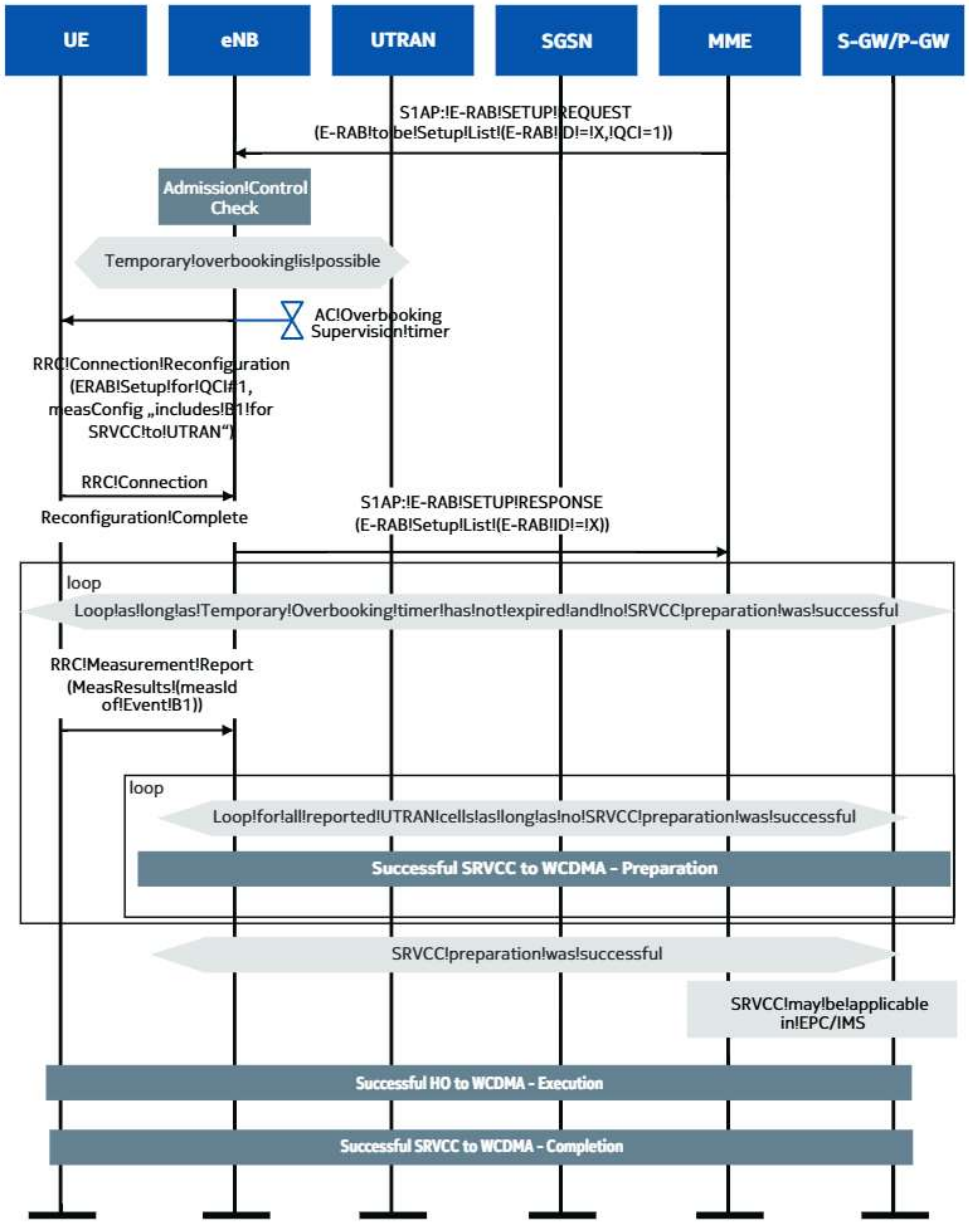
In practice, VoLTE enables making voice calls and sending data packages at the same time, downloading files, streaming, and web browsing. VoLTE is also used to improve the quality of voice calls and decrease the call drop rate. VoLTE traffic is associated by default with the quality of service class indicator 1 (QCI1).

3.27.2.2 SRVCC general information

Single radio voice call continuity (SRVCC) is a procedure which moves the VoLTE users towards WCDMA. This is supported by the *LTE872: SRVCC to WCDMA* feature from RL40 onwards. The goal of the *LTE872* feature is to provide a mechanism to hand over UEs that have the QCI1 bearer activated when changing from an LTE cell to a WCDMA cell. The voice bearer, which is the subject of the handover, is served via the circuit-switched (CS) domain on the WCDMA side.

Before implementing the *LTE2832: SRVCC Due to Admission Control Rejection* feature, SRVCC is triggered only when the QCI1 bearer is established and an ongoing VoLTE call cannot be continued in LTE due to loss of coverage or quality degradation. With *LTE2832*, it is possible to introduce a new trigger for SRVCC.

Figure 15 Example of SRVCC due to admission control rejection (temporary overbooking is possible)



If RAC and/or TAC indicates that an E-RAB was only admitted by overbooking, the eNB configures the UE with the B1 measurement for WCDMA. An Overbooking timer is started then. As long as this timer is running, the eNB attempts to get rid of the UE by SRVCC to WCDMA. If the timer expires, the eNB releases the overbooked bearer and deconfigures the B1 measurement for WCDMA.

The WCDMA targets to measure are the same as for the event B2 used for coverage-triggered SRVCC (see the *LTE872* feature). Also the measurement thresholds are reused from B2 thresholds for the SRVCC (this is possible as B1 parameters are a subset of B2 parameters). After receiving the B1 or B2 report, the eNB attempts SRVCC towards the reported target cells as long as SRVCC is successful. Multiple B1 reports

LTE2503 is an extension of *LTE1127* where a service-based handover is only triggered for UEs with emergency services.

- *LTE1170: Inter-eNodeB IF Load Balancing*
  LTE1170 uses A4 measurements for load balancing. These measurements are deconfigured if the A2 measurement is received. With *LTE2832*, the A4 measurements are also deactivated when WCDMA B1 measurements are activated.
- *LTE1387: Intra-eNodeB IF Load Balancing*
  LTE1387 uses A4 measurements for load balancing. These measurements are deconfigured if the A2 measurement is received. With *LTE2832*, the A4 measurements are also deactivated when WCDMA B1 measurements are activated.
- *LTE1531: Inter-frequency Load Balancing Extension*
  LTE1531 uses A4 measurements for load balancing. These measurements are deconfigured if the A2 measurement is received. With *LTE2832*, the A4 measurements are also deactivated when WCDMA B1 measurements are activated.
- *LTE1841: Inter-frequency Load Equalization*
  LTE1841 uses A4 measurements for load balancing. These measurements are deconfigured if the A2 measurement is received. With *LTE2832*, the A4 measurements are also deactivated when WCDMA B1 measurements are activated.
- *LTE2275: PCell Swap*
  LTE2275 introduces a primary cell (PCell) swap. No PCell swap is triggered as long as WCDMA B1 measurements are activated.
- *LTE1382: Cell Resource Groups*
  LTE1382 introduces separate resource pools for public land mobile network (PLMN) groups in radio admission control (RAC). The number of overbooking resources in RAC, introduced by *LTE2832*, is not split between resource groups.
- *LTE2612: ProSe Direct Communications for Public Safety*
  UEs which are configured for sidelink communication are not subject to overbooking. If an overbooked E-RAB and sidelink communication are set up, *LTE2612* deconfigures all WCDMA measurements (except B1 for CSFB) for a UE. The Admission Control Overbooking Supervision timer expires as no measurement is received. Consequently, admission-control-triggered SRVCC does not work for a UE with a sidelink communication.

The *LTE2832: SRVCC Due to Admission Control Rejection* feature is impacted by the following features:

- *LTE55: Inter-frequency Handover*
  SRVCC triggered due to admission control has a priority over intra-LTE inter-frequency handover as it is assumed that a potential LTE inter-frequency target cell also suffers from an overload. Therefore, any running A3 or A5 measurements are deactivated when WCDMA B1 measurements are activated.

Impact on interfaces

The *LTE2832: SRVCC Due to Admission Control Rejection* feature has no impact on interfaces.

Impact on network management tools

The *LTE2832: SRVCC Due to Admission Control Rejection* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2832: SRVCC Due to Admission Control Rejection* has no impact on system performance and capacity.

3.27.4 LTE2832 reference data

Requirements

Table 115 LTE2832 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8 UE capabilities	NetAct 16.8	Flexi NS4.0	support not required

The *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* feature is dependent on the following features:

- *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS*
  The changes in the *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* feature are based on the *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS* feature.
- *LTE2357: B4/66+Unlic FZ G2 Indoor Multi-band Pico (FW2IRA, FW2IRWA, FW2IRWC)*
  This feature introduced the first LTE-U-capable hardware.
- *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells*
  This feature defines an LTE-U enhancement to allow scanning of both UNII-1 and UNII-3 bands, permitting frequency changes to either band.

Impact on interfaces

The *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* feature has no impact on interfaces.

Impact on network management tools

The *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* feature has no impact on network management tools.

Impact on system performance and capacity

The use of LBT instead of duty cycle affects the throughput. This depends on the amount of traffic on the channel and LBT CCA thresholds. For example, in case all CCA measurements are successful, 10 out of 11 subframes are allowed and used for downlink data transmission. A maximum of 89% of the subframes are used for downlink data when the impact of 10-ms scanning interval is added. This is close to the 90% allowed subframes used when the highest duty cycle defined in the *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS* feature (assuming fast SCell activation option).

Up to five UEs are allowed to be SCell-activated in the *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS* feature during the **ON** duration. This restriction is not needed in the *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* feature since there is no need to SCell-activate UEs at the start of each **ON** duration. As a result, the maximum number of SCell-activated UEs is increased.

3.28.4 LTE3092 reference data

LTE3092: Enhanced CSAT Support for LTE-U Small Cells requirements, measurements and counters, parameters, and sales information

Requirements

Table 120 LTE3092 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	Not supported	FL16A	FL16A

3.29 LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells

Benefits, functionality, system impact, and reference data of the feature

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature provides support for the unlicensed national information infrastructure-1 (UNII-1) and UNII-3 bands. LTE Unlicensed (LTE-U)-capable small cells can alternately scan the two bands and select the least loaded unlicensed channel from one of the 5-GHz UNII bands.

3.29.1 LTE3093 benefits

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature provides better frequency range in the unlicensed 5-GHz spectrum to support LTE-U for supplemental downlink capacity.

3.29.2 LTE3093 functional description

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature provides support of unlicensed LTE bands UNII-1 and UNII-3 for supplemental downlink (SDL) transmission to the Flexi Zone BTS with LTE-U-capable hardware. LTE-U is deployed in the 5-GHz spectrum. The following are the frequency ranges supported:

- UNII-1: 5150-5250 MHz (band 252)
- UNII-3: 5735-5835 MHz (band 255)

The *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS (Pre-Rel 13)* feature only provides support of LTE-U band UNII-3 for SDL transmission. It is possible to perform SDL transmission to UEs through a secondary cell (SCell) that uses a secondary component carrier (SCC) from either the UNII-1 band or the UNII-3 band with the *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature. The bandwidth of the frequency ranges supported in both bands is 100 MHz each. However, only four 20-MHz channels in the UNII-1 band can be used because of hardware limitation.

The Flexi Zone BTS scans all the five 20-MHz channels of each band alternately every 500 ms and collects the received signal strength indicator (RSSI) from each channel. The channel activity measurement (CAM) reports that contain the RSSI information are processed periodically to select the carrier from one of the nine channels (four channels of UNII-1 band are used) as the SCC for LTE-U SDL transmission. The least loaded carrier is the selected SCC. The scanning is done during **OFF** period.

The Flexi Zone BTS scans all the five 20-MHz channels of the UNII-3 band once every 500 ms, and the CAM reports are received every 500 ms with the *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS (Pre-Rel 13)* feature. The **OFF** period is always the first LTE frame in the 500-ms interval. With the *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature, each band is scanned alternately every 500 ms. Therefore, if both bands are configured, the CAM reports are received only once every second. With the *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature, the **OFF** period used to scan in both 500-ms intervals is configurable.

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature uses the dual band indoor Flexi Zone Pico BTS which the *LTE2357: B4/66+Unlic FZ G2 Indoor Multi-Band Pico (FW2IRA, FW2IRWA, FW2IRWC)* feature has introduced. The RF module hardware incorporates a change for support of UNII-1 band.

3.29.3 LTE3093 system impact

LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells impact on features, and system performance and capacity

Interdependencies between features

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature is dependent on the following features:

- *LTE2357: B4/66+Unlic FZ G2 Indoor Multi-band Pico (FW2IRA, FW2IRWA, FW2IRWC)*
  This feature introduces a dual-band indoor pico platform that supports a 3GPP licensed band and a 5-GHz unlicensed band.
- *LTE2424: LTE-U (2CC) Support for Dual-band Indoor/Outdoor FZ BTS (Pre-Rel 13)*
  This feature introduces a software support for downlink carrier aggregation (CA) with 5-GHz unlicensed spectrum. The feature provides prestandard implementation of LTE in the unlicensed spectrum.
- *LTE3092: Enhanced CSAT Support for LTE-U Small Cells*
  This feature introduces software support for downlink CA with 5-GHz unlicensed spectrum (UNII-1 and UNII-3). The feature uses an enhanced carrier sensing adaptive transmission (CSAT) algorithm to provide a prestandard implementation of LTE in the unlicensed spectrum. The feature is released with the *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature. Therefore, it assumes Flexi Zone support of UNII-1 and UNII-3 bands for SDL transmission in the SCell.

Impact on interfaces

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature has no impact on interfaces.

Impact on network management tools

The *LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells* feature has no impact on network management tools.

Impact on system performance and capacity

The impact on system performance and capacity is the same as in the *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* feature. For more information, see the *LTE3092: Enhanced CSAT Support for LTE-U Small Cells* reference data.

3.29.4 LTE3093 reference data

LTE3093: UNII-1 and UNII-3 Support for LTE-U Small Cells requirements, measurements and counters, parameters, and sales information

Requirements

Table 124 LTE3093 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	Support not required	Support not required	Support not required	Support not required

4 Descriptions of transport and transmission features

4.1 LTE563: Synchronous Ethernet Generation

With the *LTE563: Synchronous Ethernet Generation* feature, the eNB can generate a frequency-synchronized output signal to other base stations via its transport Ethernet ports (SyncE master). The frequency synchronization of the SyncE outgoing signal can be derived from different synchronization sources. The eNB uses the same source for both its own synchronization and for SyncE output(s).

4.1.1 LTE563 benefits

The *LTE563: Synchronization Ethernet Generation* feature provides the following benefit:

There is no need for an additional cable or grandmaster load (as in timing over packet). It is possible due to the fact that Synchronous Ethernet generation allows collocated/daisy chained BTS to obtain frequency synchronization on the already connected Ethernet link needed for backhaul traffic.

4.1.2 LTE563 functional description

The objective of the *LTE563: Synchronous Ethernet Generation* feature is to enable generating/regenerating the synchronous Ethernet signal in the eNB and thus enhancing the use of synchronous Ethernet locally at a site and also between different sites.

The eNB can generate an output synchronous Ethernet signal from the following synchronization inputs:

- the plesiochronous digital hierarchy (PDH) interface, see Figure 18: SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference
- the 2.048-MHz interface, see Figure 18: SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference
- 1 pps/time of day (ToD) sync from sync hub master, see Figure 18: SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference
- 1 pps/ToD sync from an internal/external GNSS receiver (Internal GNSS receiver not supported in FDD), see Figure 18: SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference
- Timing over packet (ToP) with frequency synchronization, see Figure 17: SyncE master functionality – ToP is synchronization reference
- Timing over packet with phase synchronization, see Figure 17: SyncE master functionality – ToP is synchronization reference
- Synchronous Ethernet, Figure 16: SyncE master functionality – SyncE is synchronization reference)
- BTS clock during holdover/free run, see Figure 19: SyncE master functionality in an eNB holdover mode

The synchronous Ethernet output is supported on optical and electrical transport backhaul interfaces.

It is possible to synchronize up to seven hops maximum in a SyncE chain of eNBs/BTSs with this feature. Moreover, the eNB can optionally inform the subsequent nodes about the clock quality level, sending out a synchronization status message (SSM).

The use of synchronous Ethernet generation on the FSMF system module requires a FTIF transport sub-module. All transport interfaces of the eNB can serve as SyncE master ports then, with the exception, that if the eNB itself is synchronized by SyncE, the used interface for Sync-in is a slave port.

Synchronous Ethernet generation on the FSIH system module works without a separate transport sub-module.

The following figures provide an overview of the SyncE master functionality.

- Figure 16: SyncE master functionality – SyncE is synchronization reference
- Figure 17: SyncE master functionality – ToP is synchronization reference
- Figure 18: SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference
- Figure 19: SyncE master functionality in an eNB holdover mode

Figure 16: SyncE master functionality – SyncE is synchronization reference shows the eNB SyncE master functionality when the eNB receives synchronization reference from SyncE (only applicable to FDD eNB).

Figure 16 SyncE master functionality – SyncE is synchronization reference

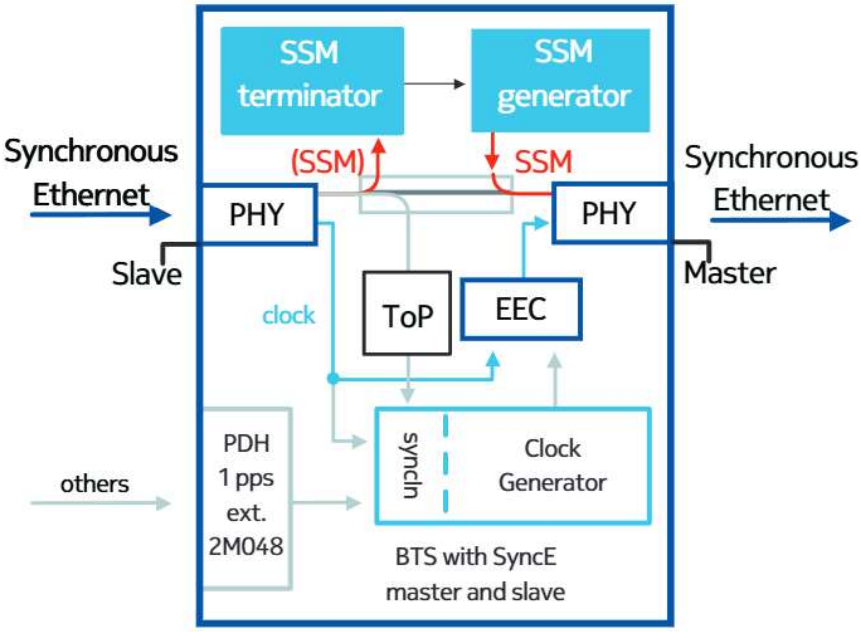


Figure 17: SyncE master functionality – ToP is synchronization reference shows the eNB SyncE generation functionality when the eNB SyncE master receives a timing signal recovered from timing over packet (ToP) synchronization reference.

Figure 17 SyncE master functionality – ToP is synchronization reference

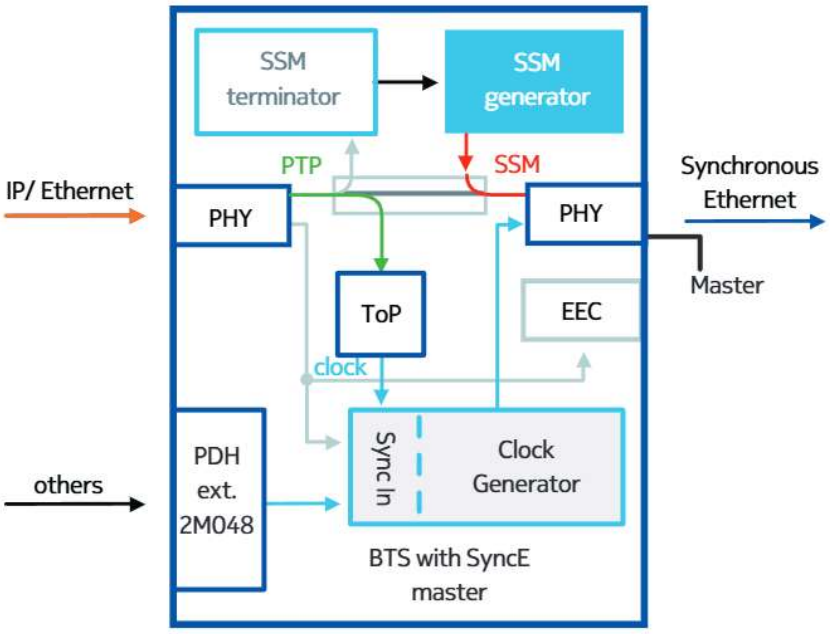


Figure 18: SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference shows the eNB SyncE master functionality when the eNB SyncE generator receives synchronization reference from E1/T1/JT1, 1 pps or ext. 2M048.

Figure 18 SyncE master functionality in eNB – E1/T1/JT1, 1 pps or ext. 2M048 is synchronization reference

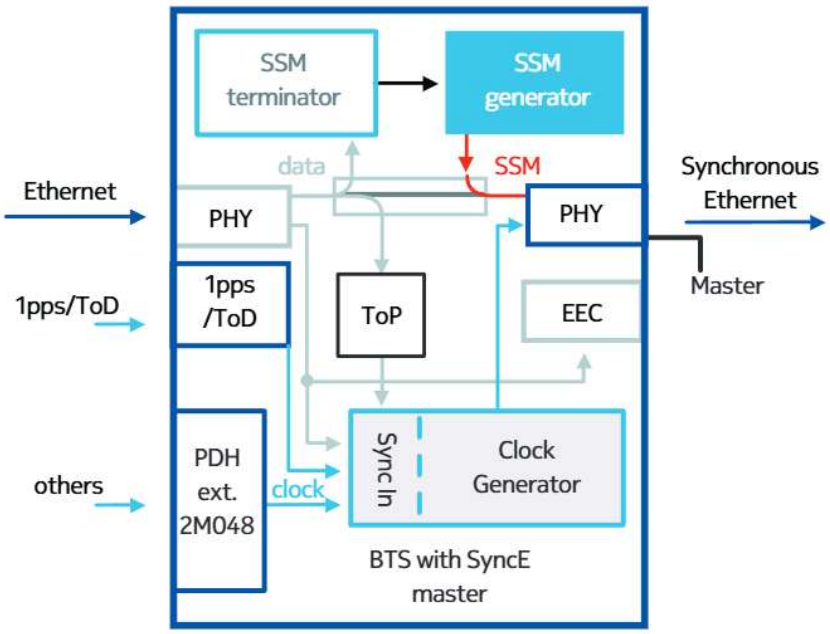
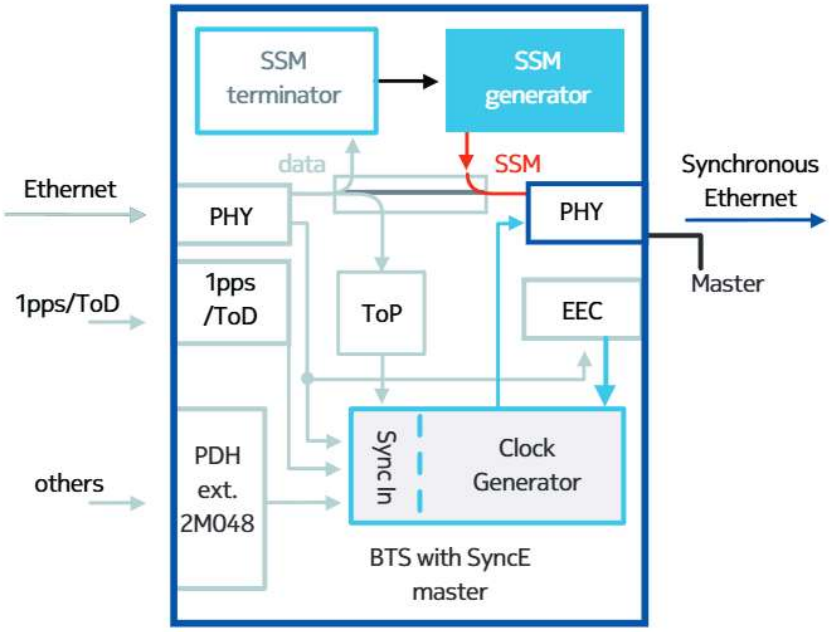


Figure 19: SyncE master functionality in an eNB holdover mode shows the eNB SyncE master functionality when the eNB is in a holdover mode.

Figure 19 SyncE master functionality in an eNB holdover mode



4.1.3 LTE563 system impact

Interdependencies between features

There are no interdependencies between the *LTE563: Synchronous Ethernet Generation* feature and any other feature.

Impact on interfaces

The *LTE563: Synchronous Ethernet Generation* feature has no impact on interfaces.

Impact on network management tools

The *LTE563: Synchronous Ethernet Generation* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE563: Synchronous Ethernet Generation* feature has no impact on system performance or capacity.

4.1.4 LTE563 reference data

Requirements

Table 128 LTE563 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia Airscale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	support not required	not applicable	not applicable

Table 132 LTE563 sales information

Product structure class	License control	Activated by default
Application software (ASW)	SW Asset Monitoring	No

4.2 LTE1554: 10GBase-SR Optical GE Interface, LTE1652: Small Form Factor Pluggable (Plus) Slot (SFP/SFP+ Slot), LTE1738: 10GBase-LR Optical GE Interface

With the *LTE1652*, *LTE1554*, and *LTE1738* features, a new slot for small form factor pluggable (SFP) transceiver and SFP+ transceiver is introduced. The SFP+ slot supports optical 10-Gigabit Ethernet (10GE) interfaces of type 10GBase-LR and 10GBase-SR, which are developed by Nokia.

Multi-sourcing agreement (MSA) transceiver modules according to SFF-8074 (SFP) and SFF-8431, SFF-8432 (SFP+) with a limiting amplifier are supported.

4.2.1 LTE1554, LTE1652, LTE1738 benefits

The *LTE1554: 10GBase-SR Optical GE Interface, LTE1652: Small Form Factor Pluggable (Plus) Slot (SFP/SFP+ Slot), LTE1738: 10GBase-LR Optical GE Interface* features provide the following benefits:

- The small form factor pluggable plus slot (SFP+ slot) supports 10-Gigabit Ethernet interfaces (*LTE1652*).
- Optical 10-Gigabit Ethernet interfaces of type 10GBase-SR (short reach) are supported *(LTE1554*).
- Optical 10-Gigabit Ethernet interfaces of type 10GBase-LR (long reach) are supported (*LTE1738*).

The new optical 10-Gigabit Ethernet interfaces are developed by Nokia.

4.2.2 LTE1554, LTE1652, LTE1738 functional description

SFP/SFP+ slot (*LTE1652*)

The *LTE1652: Small Form Factor Pluggable (Plus) Slot (SFP/SFP+ Slot)* feature makes an SFP/SFP+ slot available by providing generic functions usable with SFP/SFP+ transceiver modules. The mechanical slot for plugging in multi-sourcing-agreement (MSA)-compliant SFP/SFP+ transceiver modules provides:

- Module detection
- SFP transceiver type validation
- Basic SFP diagnostic support
- Up to 2.5 Watt SFP transceiver power consumption
- Loss of signal (LOS) detection pin support
- Field pluggable/replacable

Utilized SFP/SFP+ transceiver modules have to:

- be compliant with an industrial temperature range from -40°C to +85°C

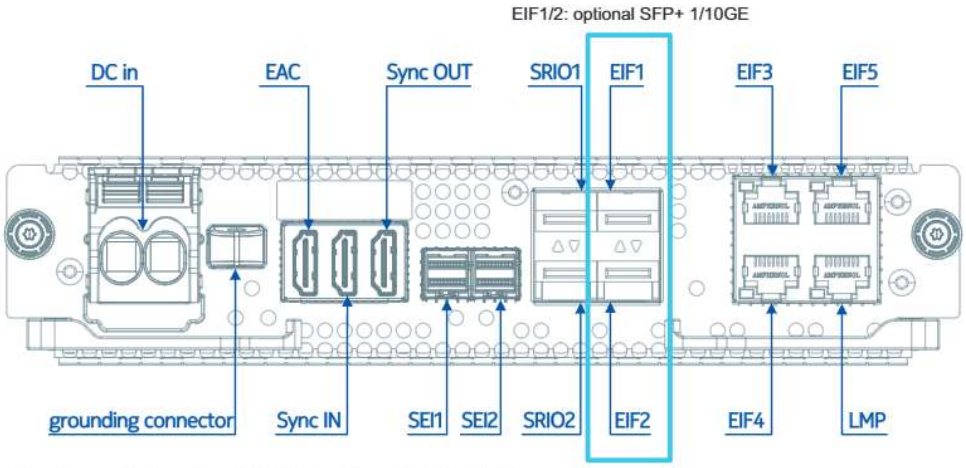
- be Laser Class1 compliant
- provide extraction bail latch actuator

Note: Do not use SFPs with MSA direct/standard push pull, dog leg latch actuator, with plastic pull tab, or without any extraction handle. Only Nokia branded SFP+ transceivers are supported.

Utilized SFP+ tranceiver modules have to provide a limiting amplifier (modules with linear amplifier are not supported).

Figure 20: SFP+ slot shows the small form factor pluggable slot (plus) (SFP+ Slot).

Figure 20 SFP+ slot



10GBase-SR optical GE interface (*LTE1554*)

The *LTE1554: 10GBase-SR Optical GE Interface* feature provides the capability to operate a 10-Gigabit Ethernet interface of type 10GBase-SR (short reach) at the transport SFP+ slot.

10GBase-SR according to IEEE802.3-2008, clause 49, 51 and 52:

- Wavelength: 850 nm
- Up to a 33-m distance with a 62.5-um multimode fiber, up to a 300-m distance with 50-um multimode fiber
- Full-duplex transmission mode only
- Supported via an optional SFP+ transceiver module (SFF-8431, SFF-8432, SFF committee) with a limiting amplifier
- Auto-negotiation is not defined anymore with IEEE802.3-2008 for 10-Gigabit Ethernet interfaces of the family 10GBase-R.
- No support for the FEC option per IEEE802.3-2008 clause 74.

Figure 21: 10GBase interface shows an example of the 10GBase-SR/LR optical 10-Gigabit Ethernet interface, which can be used for the SFP+ slot.

Figure 21 10GBase interface

10GBase-LR optical GE interface (*LTE1738*)

The *LTE1738: 10GBase-LR Optical GE Interface* feature enables operating a 10-Gigabit Ethernet interface of type 10GBase-LR (long reach) at the transport SFP+ slot.

10GBase-LR according to IEEE802.3-2008, clause 49, 51 and 52:

- Wavelength: 1310 nm
- Up to a 10-km distance with a single mode fiber
- Full-duplex transmission mode only
- Supported via an optional SFP+ transceiver module (SFF-8431, SFF-8432, SFF committee) with a limiting amplifier
- Auto-negotiation is not defined anymore with IEEE802.3-2008 for 10-Gigabit Ethernet interfaces of the family 10GBase-R.
- No support for the FEC option per IEEE802.3-2008 clause 74.

4.2.3 LTE1554, LTE1652, LTE1738 system impact

The *LTE1554: 10GBase-SR Optical GE Interface, LTE1652: Small Form Factor Pluggable (Plus) Slot (SFP/SFP+ Slot), LTE1738: 10GBase-LR Optical GE Interface* features have no impact on other features, interfaces, network management tools, and system performance and capacity.

Note: Connections, and here Ethernet connections via SFPs, are relevant life lines between eNBs ↔ Backhaul, and eNBs ↔ eNBs. So as long as eNB interfaces, operating and equipped with *LTE1554*, and/or *LTE1652*, and/or *LTE1738*, are working well the SFPs do not affect services.

4.2.4 LTE1554, LTE1652, LTE1738 reference data

Requirements

Table 133 LTE1554, LTE1652, LTE1738 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	not supported	FL16A	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	support not required	support not required	support not required	support not required	support not required

Table 135 Parameters modified by LTE1554, LTE1652, LTE1738 (Cont.)

Full name	Abbreviated name	Managed object
Layer 2 switch member egress shaping rate	l2ShaperRate	ETHLK
Shaper information rate	sir	IVIF
Shaper information rate	sir	IEIF
Total shaper information rate	sirTotal	IEIF

They are IEIF:sir, IVIF:sir, ETHLK:speedAndDuplex, ETHLK:l2IngressRate, ETHLK:l2ShaperRate, IEIF:sirTotal.

For parameter descriptions, see *LTE Radio Access Operating Documentation/ Reference/Parameters*.

Sales information

Table 136 LTE1554, LTE1652, LTE1738 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	Pool license	Yes

4.3 LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature complements the IPv6 support in the eNB by enabling the IPv6 also for the IPsec functionality. With this feature, the IPsec tunnels can use both IPv4 and IPv6 endpoints for tunnel origination or termination.

4.3.1 LTE1980 benefits

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature provides the following benefits:

- flexible configuration of IPv4 and/or IPv6 IPsec policies
- support of a combination of IPv4 and IPv6 tunnels on the same BTS
- IPv4 application traffic can be carried inside IPv6 tunnel or the other way around

4.3.2 LTE1980 functional description

Internet Protocol Security (IPsec) is a protocol suite which provides confidentiality and integrity protection for the eNB traffic.

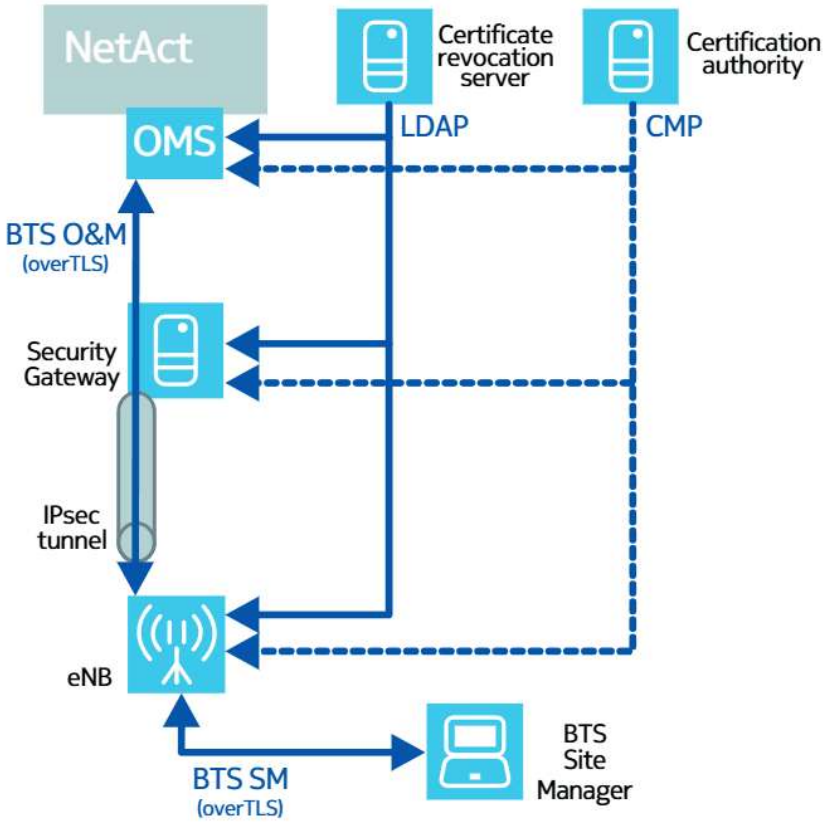
IPsec provides three essential security functions:

- confidentiality, through the use of encryption
- integrity, through the use of checksums
- authentication

These functions are performed by creating a dedicated VPN tunnel to carry the traffic. Tunneling also ensures separation of different types of traffic, for example, control, user, synchronization, and management plane traffic.

The IPsec tunnel is created between two endpoints: the eNB and security gateway.

Figure 22 Overview of IPsec implementation in LTE O&M network

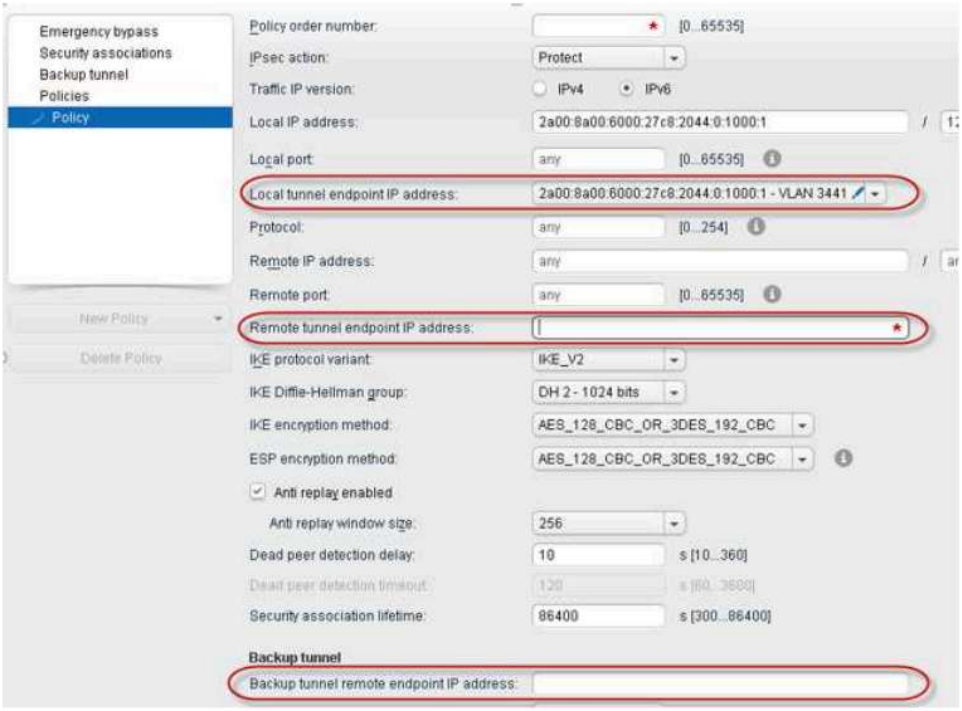


For more information on the IPsec protocol, see *LTE Operating Documentation/Integrate and Configure/Configuring Security in eNB/IPsec support.*

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature does not change the existing IPsec functionality. It only updates the IPsec policies with the possibility to configure the IPv6 addresses for

- local IPsec tunnel endpoint IP address
- remote IPsec tunnel endpoint IP address
- IPsec emergency bypass control server IP address
- IPsec backup tunnel remote endpoint
- IPSec backup tunnel current remote endpoint
- IPsec local tunnel endpoint
- IPsec remote tunnel endpoint

Figure 23 IPv6 in the IPsec policy



4.3.3 LTE1980 system impact

Interdependencies between features

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature is an independent feature (does not require activation of any other feature). However, it complements the following IPv6 features:

- *LTE125: IPv6 for C/U-plane*
- *LTE2299: Dualstack IPv4/IPv6 for S1/X2*
- *LTE955: IPv4/IPv6 for Management Plane*
- *LTE1981: IPv6 for S-Plane*

and the following IPsec features:

- *LTE689: LTE IPsec Support*
- *LTE1753: Backup IPsec Tunnel*
- *LTE1390: IPsec Emergency Bypass*

Impact on interfaces

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature has no impact on interfaces.

Impact on network management tools

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature has no impact on system performance or capacity.

4.3.4 LTE1980 reference data

Requirements

Table 137 LTE1980 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	FL16A	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	OMS16A	support not required	16.8	support not required	support not required

Alarms

There are no alarms related to the *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature.

Commands

There are no commands related to the *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature.

Measurements and counters

There are no measurements or counters related to the *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature.

Key performance indicators

There are no key performance indicators related to the *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature.

Parameters

There are no new parameters related to the *LTE1980: IPv4/IPv6 Concurrent IPsec Tunnels* feature.

Sales information

Table 138 LTE1980 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool licence	Yes

4.4 LTE1981: IPv6 for S-plane

The *LTE1981: IPv6 for S-plane* feature supports the timing over packet (ToP) synchronization (IEEE1588) based on the precision time protocol (PTP) over IPv6 transport.

4.4.1 LTE1981 benefits

The *LTE1981: IPv6 for S-plane* feature provides the following benefits:

It complements the IPv6 support in the eNB by introducing the IPv6 transport option also for the synchronization plane (S-plane). So this feature allows the migration to IPv6 for the ToP synchronization feature.

- With IPv6 addressing, the system address spacing will increase significantly in the whole network. However, the number of IP addresses per NE does not change.

4.4.4 LTE1981 reference data

Requirements

Table 139 LTE1981 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	support not required	not applicable

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
support not required	LTE OMS 16A	support not required	NetAct 16.8	support not required	support not required

Alarms

There are no alarms related to the *LTE1981: IPv6 for S-plane* feature.

BTS faults and reported alarms

There are no faults related to the *LTE1981: IPv6 for S-plane* feature.

Measurements and counters

There are no measurements or counters related to the *LTE1981: IPv6 for S-plane* feature.

Key performance indicators

There are no key performance indicators related to the *LTE1981: IPv6 for S-plane* feature.

Parameters

Table 140 Existing parameters related to LTE1981

Full name	Abbreviated name	Managed object	Parent structure
Feature Activation Flag ToP with freq synchronization	actTopFreqSynch	TOPF	-
Feature Activation Flag ToP with phase synchronization	actTopPhaseSynch	TOPP	-
Timing over Packet masters properties table	topMasters	TOPF	
Master visibility	masterVisibility	TOPF	topMasters
IP Address of the ToP master	masterIpAddr	TOPF, TOPP	topMasters
Configured priority 1 for ToP master	priority_1	TOPF	topMasters
Configured priority 2 for ToP master	priority_2	TOPF	topMasters
ToP Master lock status	lockState	TOPF	topMasters
ToP Master working status	masterClockState	TOPF	topMasters

Table 140 Existing parameters related to LTE1981 (Cont.)

Full name	Abbreviated name	Managed object	Parent structure
Received clock quality level from master	receivedClockQuality	TOPF	topMasters
Received priority 1 for ToP master	receivedPriority_1	TOPF	topMasters
Received priority 2 for ToP master	receivedPriority_2	TOPF	topMasters
ToP Master active status	topMasterActive	TOPF	topMasters
Synchronization plane application IP address	sPlaneIpAddress	IPNO	-

Sales information

Table 141 LTE1981 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	No

4.5 LTE2417 IP Traffic Capacity

The *LTE2417: IP Traffic Capacity* feature enables monitoring and controlling IP transport capacity licenses. Nokia trades in two different types of IP capacity licenses:

- Daily IP traffic volume of the user-plane data
- Quarterly (90 days) IP traffic volume of user-plane data

The eNB measures the traffic and sends measurement results to the NetAct, where the Software Entitlement Management (SWEM) assesses how they fit the allocated IP transport capacity.

4.5.1 LTE2417 benefits

The *LTE2417: IP Traffic Capacity* feature provides the following benefits:

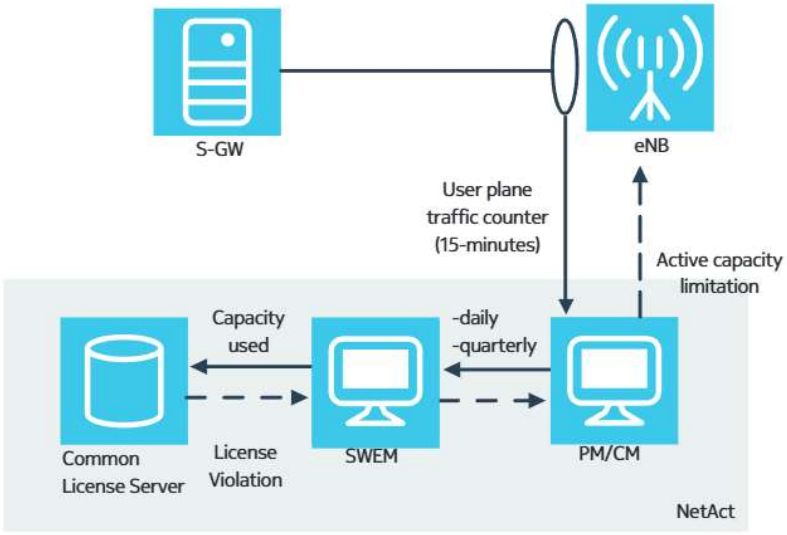
- The operator can align his LTE software capacity costs with the subscriber revenues and profits so that he can justify a higher OPEX.
- The operator can see the current and historical information on the capacity usage; thus, he can predict future needs and act quickly on capacity bottleneck or licensed capacity quota excess.
- The operator can notice traffic limitations due to licensed capacity quota excess immediately. This prevents unnecessary corrective actions and helps to directly address the issue by forwarding the information to the procurement department to increase the capacity of license pool.
- The operator can use an automated license management so that no manual work is required.

4.5.2 LTE2417 functional description

Overview

Figure 25: Overview of the LTE2417: IP Traffic Capacity feature shows a context diagram for the *LTE2417: IP Traffic Capacity* feature.

Figure 25 Overview of the *LTE2417: IP Traffic Capacity* feature



Each eNB counts the user-plane data traffic in one 15-minute interval counter. This counter contains the total of uplink and downlink traffic volume for the S1-U (X2 traffic is excluded). NetAct retrieves the counter values from all eNBs.

KPI

In the NetAct the Software Entitlement Manager (SWEM) calculates key performance indicators for each eNB:

- KPI average daily IP traffic volume of the last 14 days: summing up 15-minute user-plane-traffic counter values for each day and averaging over 14 days (rolling window).
- KPI quarterly IP traffic volume: the sum total of the last 90 values of daily IP traffic volume.

Figure 26: KPI generation summarizes the calculation of the KPIs by using an intermediate step in NetAct PM that determines the KPI daily IP traffic volume of a day.

Figure 26 KPI generation

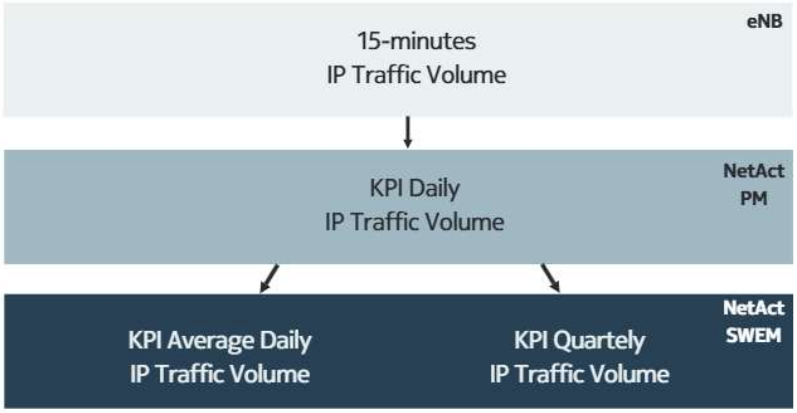


Figure 27: KPI average daily IP traffic volume sketches the calculation of KPI average daily IP traffic volume:

- A BTS delivers the 15-minute-period IP traffic volume counter to NetAct.
- NetAct sums up all the 15-minute interval values over an entire day (0:15 to 24:00).
- SWEM averages the values of the last 14 days (sum of 14 days/14).

Figure 27 KPI average daily IP traffic volume

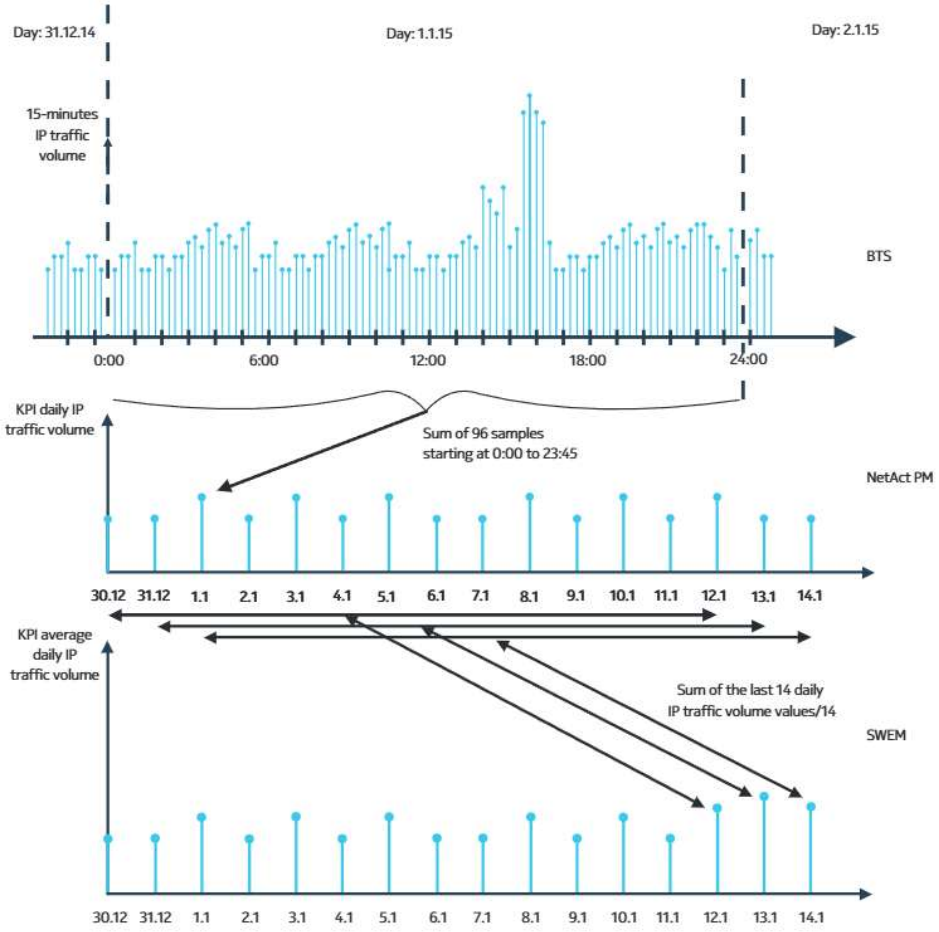
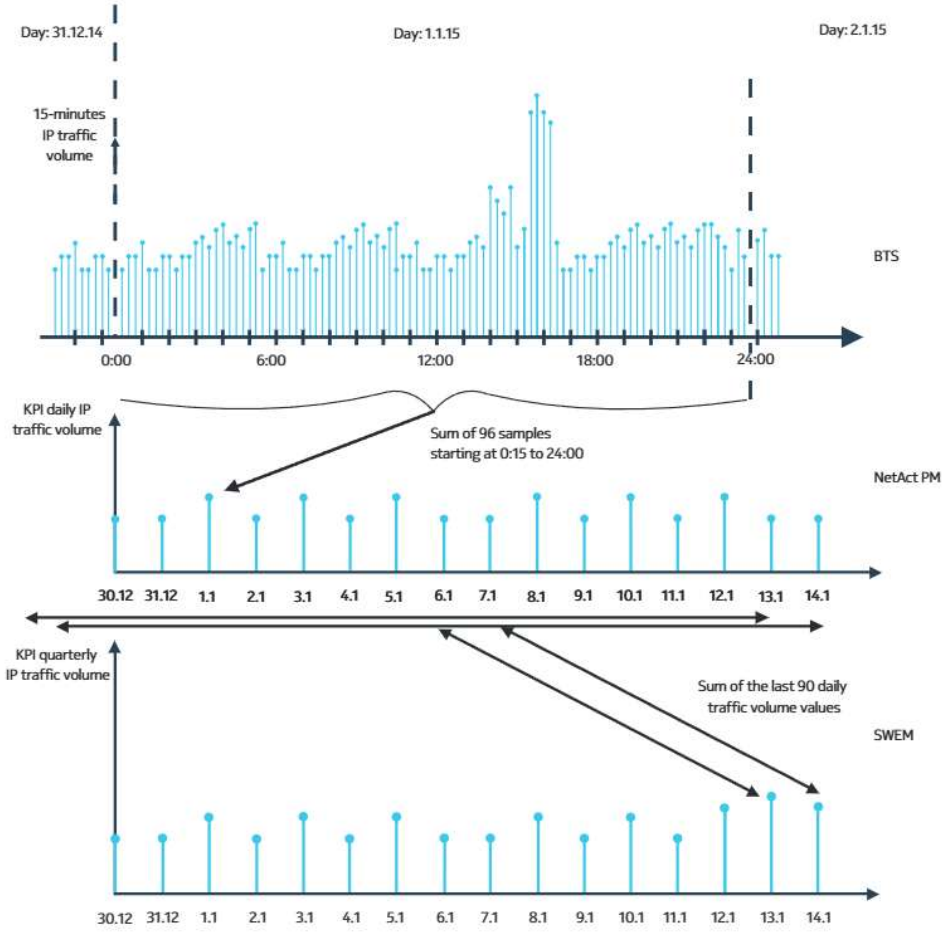


Figure 28: KPI quarterly IP traffic volume sketches the calculation of the KPI quarterly IP traffic volume:

- A BTS delivers the 15-minute-period IP traffic volume counter to NetAct.
- NetAct sums up all the 15-minute interval values over an entire day (0:15 to 24:00).
- SWEM sums up the values of the last 90 days.

Figure 28 KPI quarterly IP traffic volume



Software Entitlement Manager (SWEM)

The Software Entitlement Manager (SWEM) allocates capacity from the capacity license pool maintained in the Centralised SW License Server (CLS). The license pool contains all the capacity that the mobile network operator purchases for his network from Nokia. SWEM checks the consumed capacity (indicated by the used KPI, the default KPI is average daily IP traffic volume) against the allocated capacity for a given BTS. If the consumed capacity exceeds above the allocated capacity, SWEM attempts to allocate more IP traffic capacity from the capacity license pool, managed by the CLS.

In case of the capacity of the CLS pool has been used up, SWEM is initiating a limitation action (CM command) to reduce the throughput of that eNodeB.The limitation will start smoothly, but will become impacting more and more over time. There will be a weekly throughput reduction up to 50 %.The traffic limitation starts at 100% of maximum traffic rate and is reduced by 5% - 6% every week down to 50% until CLS is refilled with new licenses. The current traffic volume and throughput can be retrieved by SWEM data. Subject for packet dropping is the low priority traffic in downlink. Once the limitation is enabled the eNB controls the peak rate of this traffic (leaky bucket).

If the consumed capacity does not exceed the allocated capacity, SWEM does not free capacity.

Alarms / License Violation

Table 148 LTE2417 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

4.6 LTE2645: GNSS Manual Location Entry for Macro BTS

The *LTE2645: GNSS Manual Location Entry for Macro BTS* feature introduces a Global Navigation Satellite System (GNSS) Manual Location Entry to macro BTS. This allows a GNSS phase and time synchronization with connectivity to at least two GNSS satellites. The feature is used for macro BTS site locations that are not optimal for satellite reception.

4.6.1 LTE2645 benefits

The *LTE2645: GNSS Manual Location Entry for macro BTS* feature provides the following benefits:

- GNSS phase and time synchronization with connectivity to at least two GNSS satellites (versus four that are typically required).
- Indoor deployments or BTSs in urban canyons that tend to deal with poor GNSS reception.

4.6.2 LTE2645 functional description

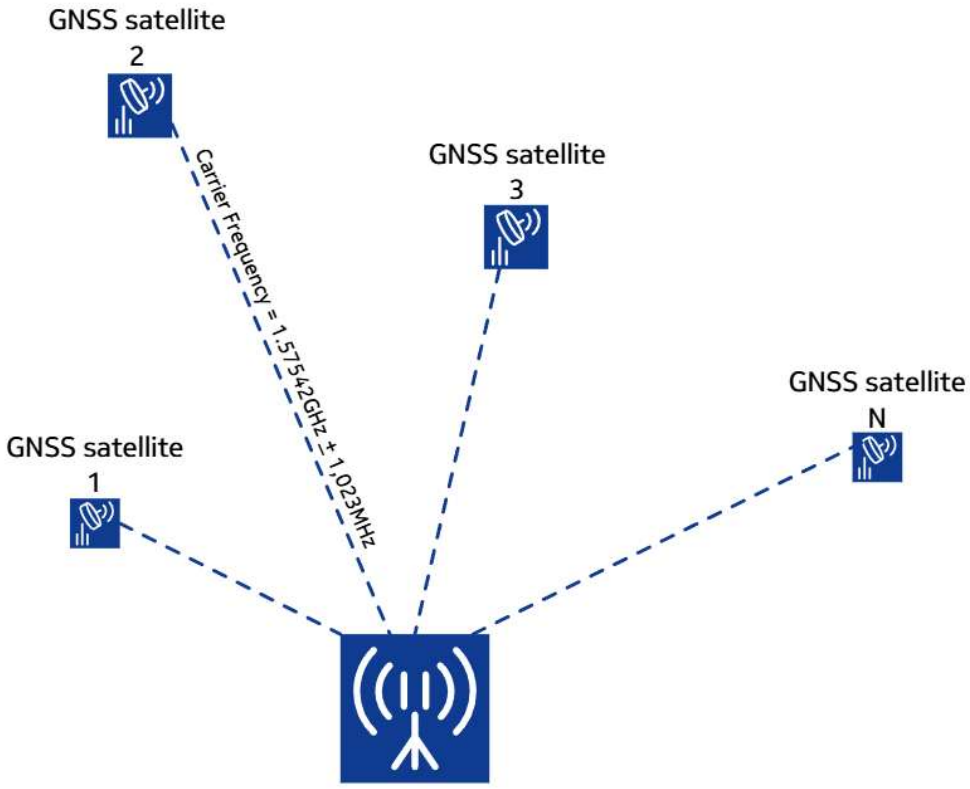
A global positioning system (GPS) is a space-based radio-navigation system that provides precise three-dimensional (3D) positioning (latitude, longitude, altitude) by using time signals transmitted from satellites. The signals also allow the receivers to calculate the current local time with great precision, which is used by the BTS for frequency, phase and time synchronization. This satellite navigation system with global coverage is called a Global Navigation Satellite System (GNSS).

GNSS receivers used for synchronization purposes operate in two phases.

First phase

During start-up the receiver automatically determines the geographical position of the GNSS receiver antenna. In the context of this document this mode is called an **automatic mode**. Typically, a minimum GPS constellation is arranged so that a minimum of four satellites are in an unobstructed view to determine latitude, longitude, altitude, and the time for a BTS as demonstrated in the Figure 29: Typical environment with a minimum of four satellites:

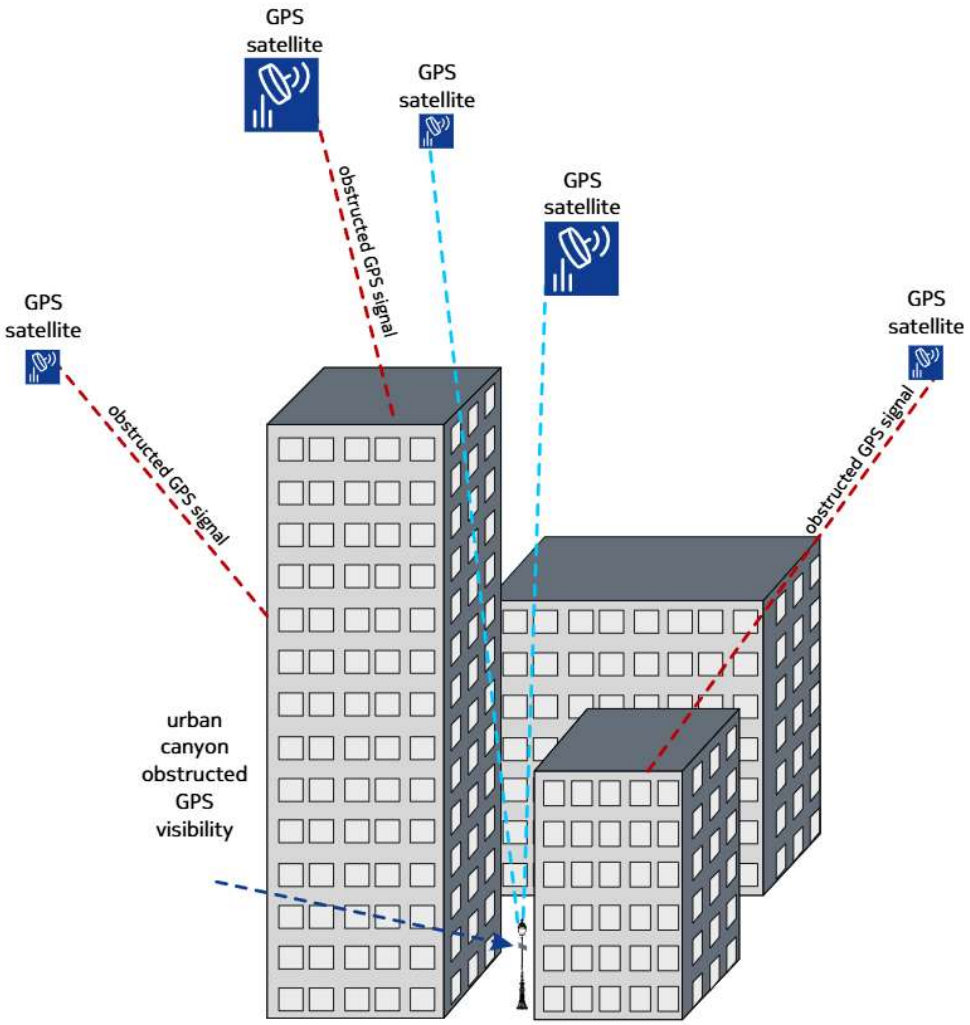
Figure 29 Typical environment with a minimum of four satellites



Second phase

In a second phase, when the GNSS receiver has determined the antenna position, the receiver uses the signals from all visible satellites for calculating exact time information. In this phase, it is possible to recover time information from fewer than four satellites; as a minimum, two satellites must be visible all the time. In some cases, the physical obstructions may prevent the required four-or-more-satellite reception from determining the antenna's position. Such a case can be observed when a BTS is placed in an urban canyon environment (see figure Urban canyon environment) or inside a building.

Figure 30 Urban canyon environment



When a BTS is placed in environments with poor reception of the minimum four GPS satellites, it can result in a huge BTS initialization time increase, or it may fail to be initialized at all. This feature enables the user to manually pre-configure the position coordinates for the GNSS-receiver antenna in a BTS. In addition, the GNSS is configured to operate in a mode where it does not attempt to determine the position itself, and in which it uses the pre-configured antenna coordinates, instead. In the context of this feature, this mode of operation is called a **manual mode**. In this mode, when the GNNS receiver is constantly receiving signal from at least two satellites, it is able to calculate the exact time, based on the pre-configured position coordinates.

The operators have various methods available to collect the coordinate information of the GNSS antenna. Below, there are a few examples:

- using a surveyor company
- using a hand-held GNSS receiver to measure the position of a nearby location; a calculation which is based on the nearby location's coordinates and the distance of the measured location from the actual BTS
- using Google Maps

- *LTE80: GPS Synchronisation*
- *LTE1125: GNSS Receiver FYGB*
-
- *LTE2028: Outdoor External GNSS Module with Enhanced Holdover – FYGG*
- *LTE2335: Outdoor GNSS Receiver FYGM*

The *LTE2645: GNSS Manual Location Entry for Macro BTS* feature is impacted by the following features:

- *LTE2645* is inherited from *LTE2063: GNSS Manual Location Entry* (implemented in the FZM in FL/TL15A). *LTE2645* is functionally compatible with *LTE2063*. The same parameters are used for controlling the feature in the FZM and in the macro eNB.

Impact on interfaces

The *LTE2645: GNSS Manual Location Entry for Macro BTS* feature has no impact on interfaces.

Impact on network management tools

The *LTE2645: GNSS Manual Location Entry for Macro BTS* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2645: GNSS Manual Location Entry for Macro BTS* feature has no impact on system performance or capacity.

4.6.4 LTE2645 reference data

LTE2645: GNSS Manual Location Entry for macro BTS requirements, alarms and faults, commands, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 149 LTE2645 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not applicable	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

Additional hardware requirements

This feature is supported with the following GNSS receiver types:

- FYGB (external GNSS antenna/receiver from Trimble)
- FYGG (external receiver supporting holdover)
- FYGM (external receiver for outdoor use)

BTS faults and reported alarms

The *LTE2763: Fronthaul Passive WDM* feature introduces fronthaul passive wavelength division multiplexing (WDM) components (mux\demux\CWDM SFPs) to multiplex\demultiplex these CPRI\OBSAI links.

4.7.1 LTE2763 benefits

The *LTE2763: Fronthaul Passive WDM* feature provides the following benefits:

With the multiplexing/demultiplexing technics the optical fibers are used more efficiently and this leads to a reduction of costs for the operator.

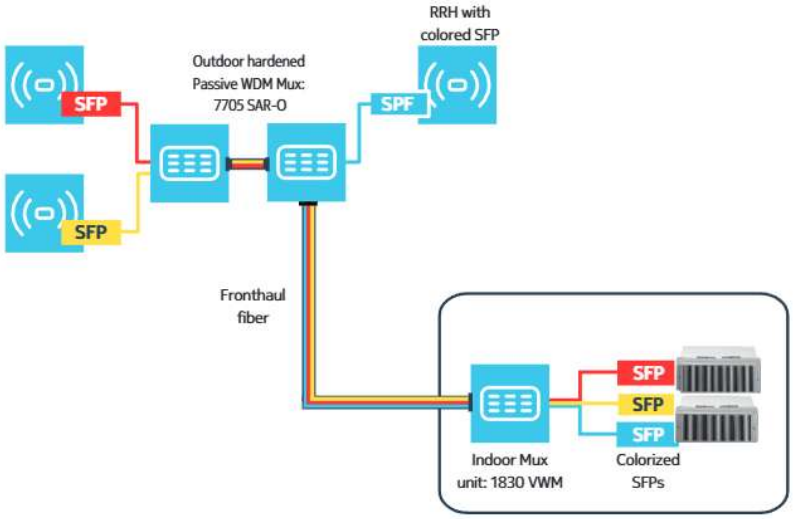
4.7.2 LTE2763 functional description

The *LTE2763: Fronthaul Passive WDM* feature offers the following characteristics:

- The fronthaul passive wavelength division multiplexing (7705 SAR-O, 1830 VWM) is connected between the system module (SM) and the radio frequency (RF) modules.
- Up to 16 Coarse Wavelength Division Multiplexing (CWDM) channels can be optically multiplexed over a single fiber using SAR-O/VWM.
- The SAR-O/VWM support a maximum distance of up to 20 km.
- The SAR-O permits outdoor installation, the VWM is the indoor mux unit .
- The SAR-O/VWM support point-to-point and linear topology.
- The SAR-O/VWM have proven interoperabilty with base band system modules and RFMs/RRHs.

An overview is given in the Figure 31: Possible Deployment of SAR-O/VWM.

Figure 31 Possible Deployment of SAR-O/VWM



4.7.3 LTE2763 system impact

Interdependencies between features

There are no interdependencies between the *LTE2763: Fronthaul Passive WDM* feature and any other feature.

Impact on interfaces

The *LTE2763: Fronthaul Passive WDM* feature has no impact on interfaces.

Impact on network management tools

The *LTE2763: Fronthaul Passive WDM* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2763: Fronthaul Passive WDM* feature has no impact on system performance or capacity.

4.7.4 LTE2763 reference data

Requirements

Table 154 LTE2763 Fronthaul Passive WDM

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	FL16A	not applicable	not applicable

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not applicable	support not required	support not required	support not required	support not required	support not required

Alarms

There are no alarms related to the *LTE2763: Fronthaul Passive WDM* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2763: Fronthaul Passive WDM* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2763: Fronthaul Passive WDM* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2763: Fronthaul Passive WDM* feature.

Parameters

There are no parameters related to the *LTE2763: Fronthaul Passive WDM* feature.

Sales information

Table 155 LTE2763 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

Table 156 LTE678 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not applicable	FL16A	not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS 16A	not applicable	NetAct 16.8	not applicable	not applicable

- If a radio module is chained, BTS SM informs the user that the radio module is chained and that radio modules further down the chain will also be reset (the operator can cancel or proceed with the reset).
- If a BTS site reset is initiated or a software download is in progress, BTS SM informs the user that a reset operation has failed.

5.2.3 LTE2121 system impact

LTE2121: Radio Unit Reset has no impact on features, interfaces, network management tools, and system performance and capacity.

5.2.4 LTE2121 reference data

Requirements

Table 160 LTE2121 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	support not required	support not required	16.8	support not required	support not required

Table 162 LTE2121 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

5.3 LTE2202: Addition of MAC Measurements to Cell Trace

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature introduces new measurements to the cell trace content. They are related to the MAC layer, collected periodically, and reported per UE basis.

5.3.1 LTE2202 benefits

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature provides the following benefits:

- Better monitoring, diagnosis, and optimization of the UE throughput or transmission due to broader possibilities of data collection

5.3.2 LTE2202 functional description

Functional description

The cell trace functionality allows to follow the connections ongoing in a cell and verify the intended functionalities within a cell. It can be used for a deeper analysis if problems occur and when various performance measurements do not give a clear indication of the problem. It is the most common form of general troubleshooting within the network. With the cell trace, all the UEs in a target cell that are in the connected state are traced simultaneously.

The medium access control (MAC) layer is a part of the LTE air interface user plane (U-plane). MAC covers circuit-switched, packet-switched, as well as signaling traffic.

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature introduces new measurements to the cell trace content, which are related to the MAC layer, collected periodically, and reported per UE basis. The following newly-added measurements, listed in Table 163: Measurements newly added to the cell trace content, can be enabled or disabled per cell trace session with a common switch:

Table 163 Measurements newly added to the cell trace content

Uplink	Downlink
Cumulative number of bytes received on GBR bearers	Cumulative number of bytes sent on GBR bearers
Cumulative number of bytes received on non-GBR bearers	Cumulative number of bytes sent on non-GBR bearers
Maximum delay of GBR in ms	Max delay of GBR in ms; delay inside eNB between PDCP and MAC layers

Table 163 Measurements newly added to the cell trace content (Cont.)

Uplink	Downlink
Number of first received transmissions	Single CW Transmission: number of first transmissions
Number of overall received transmissions	Single CW Transmission: number of overall transmissions
Number of first receptions with NACK or DTX	Single CW Transmission: number of first transmissions with NACK or DTX
Number of last retransmissions failed	Single CW Transmission number of failed last retransmissions
Number of TTIs UL buffer status greater than 0	Dual CW Transmission: number of transmissions, first or overall
Mean MCS at first transmission	Dual CW Transmission: number of first transmissions with NACK or DTX
Mean PUSCH RSSI for all transmissions	Dual CW Transmission: number of failed last retransmissions
Mean PUSCH SINR for all transmissions	Number of transmissions leading to no reliable ACK or NACK on PDSCH; DTX received
Mean power headroom at first transmission	Number of TTIs with DL buffer status greater than 0
Mean PUCCH RSSI	Mean delta CQI at first transmission
Mean AGG (1–16) for UL grant; required aggregation for UL grant	Mean WB CQI at first transmissions
Mean AGG (1–16) for DL grant; required aggregation for DL grant	

Note: For UEs that are configured for carrier aggregation (CA), it is not possible to provide MAC layer measurements for secondary cells (SCells).

5.3.3 LTE2202 system impact

LTE2202: Addition of MAC Measurements to Cell Trace impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2202: Addition of MAC Measurements to Cell Trace* feature:

- *LTE433: Cell Trace*

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature impacts the following features:

- *LTE2535: UE Throughput Measurements with BTS Log*
  The *LTE2202: Addition of MAC Measurements to Cell Trace* feature can be active at the same time as the *LTE2535: UE Throughput Measurements with BTS Log* feature.

- *LTE1803: Downlink Carrier Aggregation 3CC – 40 MHz*
  The activated *LTE1803: Downlink Carrier Aggregation 3CC – 40 MHz* feature allows to provide more than one UE UL/DL measurement report with full trace content, for one PCell and each SCell, available inside an eNB.

Impact on interfaces

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature impacts interfaces as follows:

- U-plane
  - It updates the LTE protocol interface specification to include descriptions of new UE measurement reports for the uplink (UL) and downlink (DL).

Impact on network management tools

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2202: Addition of MAC Measurements to Cell Trace* feature impacts system performance and capacity as follows:

- The additional provisioning of MAC layer measurements has an impact on the performance at a system level in that processing capacity as well as additional bandwidth on the cell trace interface are required. The reduce overload is caused by:
  - Limitations to upload UE trace comes from additional CPU load
  - Backhaul traffic will be increased by more than 0.3 Mbps per BTS with 900 RRC connected users

  By limitation of more than 300 RRC connected users per cell or nore than 900 RRC connected users per BTS can increase bandwidth around 8.5%. Also the load effect will be highest for the system module MCU CPU, which will increase to more than 10% units.

5.3.4 LTE2202 reference data

LTE2202: Addition of MAC Measurements to Cell Trace requirements, alarms and faults, commands, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 164 LTE2202 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS 16A	not applicable	NetAct 16.8	not applicable	not applicable

Alarms

The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature extends the functionality of the *LTE1099: Event Triggered Symptom Data Collection and Provisioning* feature's concept of an automatic event-triggered BTS symptom data (troubleshooting logs) collection. This model allows commissioning a BTS with a new category of automated snapshots collection trigger based on a fault cancellation.

5.4.1 LTE2237 benefits

The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature provides the following benefits:

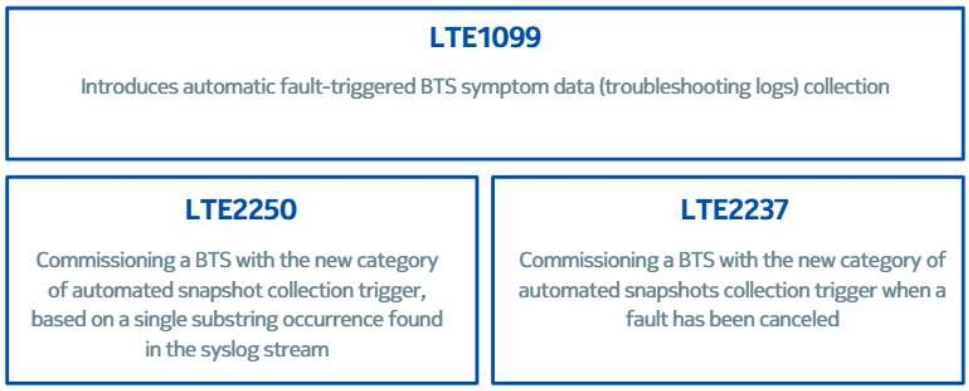
- Symptom data for trouble analysis collection time is reduced - automated collection process selects only relevant information
- Troubleshooting data collection of fault cancellation is guaranteed for further error analysis

5.4.2 LTE2237 functional description

Feature description

The automated log collection helps to find and solve troubles caused by environment equipment (e.g. cables, antennas, wrong parameter's configuration.) Figure 32: Features related to the log collection functionality presents the family of log collection functionality features.

Figure 32 Features related to the log collection functionality



The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature is designed for collecting and sending fault cancellation data as a snapshot for further analysis. Troubleshooting data is compressed and named in a common way upon data collection. The symptom data file has a catalog which describes the reason for the symptom's creation. The name of troubleshooting data contains information if data was collected at the start or at the end of the fault cancellation. If a snapshot is triggered, and data collection has been started, any further triggers are ignored untill it has finished.

A daily limit for collecting snapshots is a maximum of five per 24h per BTS and trigger. When this limit has been exceeded, automated snapshots are blocked for a given trigger. Troubleshooting data transfer takes place automatically in OMS, immediately when the file is ready.

Note: Triggered snapshot collection of fault cancellations is configurable by the operator.

Note: The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature can be activated together with the *LTE1099: Event Triggered Symptom Data Collection and Provisioning* feature.

5.4.3 LTE2237 system impact

LTE2237: Log Collection Triggered by BTS Fault Cancellation impact on features and system performance and capacity

Interdependencies between features

The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature is impacted by the following features:

- *LTE1099: Event-triggered Symptom Data Collection*
  The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature depends on the *LTE1099: Event-triggered Symptom Data Collection* feature; it reuses the existing implementation of the *LTE1099: Event-triggered Symptom Data Collection* feature.
- *LTE2250: Syslog-triggered Symptom Data Collection*
  The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature reuses the existing implementation of the *LTE2250: Syslog-triggered Symptom Data Collection* feature.

Impact on interfaces

The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature has no impact on interfaces.

Impact on network management tools

The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2237: Log Collection Triggered by BTS Fault Cancellation* feature impacts system performance and capacity as follows:

- System capacity may be impacted in relation to reduced system performance by 10% as long as data collection is ongoing.

5.4.4 LTE2237 reference data

LTE2237: Log Collection Triggered by BTS Fault Cancellation requirements, alarms and faults, commands, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 168 LTE2237 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD LTE16A	not supported	FL16A	not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	OMS 16A	support not required	NetAct 16.8	support not required	support not required

5.5 LTE2331: Multi-language Support for Selected Parameters

Benefits, functionality, system impact, reference data of the feature

The *LTE2331: Multi-language Support for Selected Parameters* feature introduces:

- possibility of using Chinese and Japanese in BTS Site Manager (BTS SM) for selected parameters related to network elements
- a search mechanism which supports local language characters

5.5.1 LTE2331 benefits

The *LTE2331: Multi-language Support for Selected Parameters* feature provides the following benefits:

- Improving the management of a fast growing network by employing local language characters to name network elements
- Support Chinese and Japanese language on BTSSM for some specific BTS parameters (fulfilling the Chinese regulations)

5.5.2 LTE2331 functional description

Functional description

So far the eNB and the site configuration file have provided support for non-ASCII (American Standard Code for Information Interchange) or non-UTF-8 (Universal Coded Character Set + Transformation Format-8-bit) characters for text parameters.

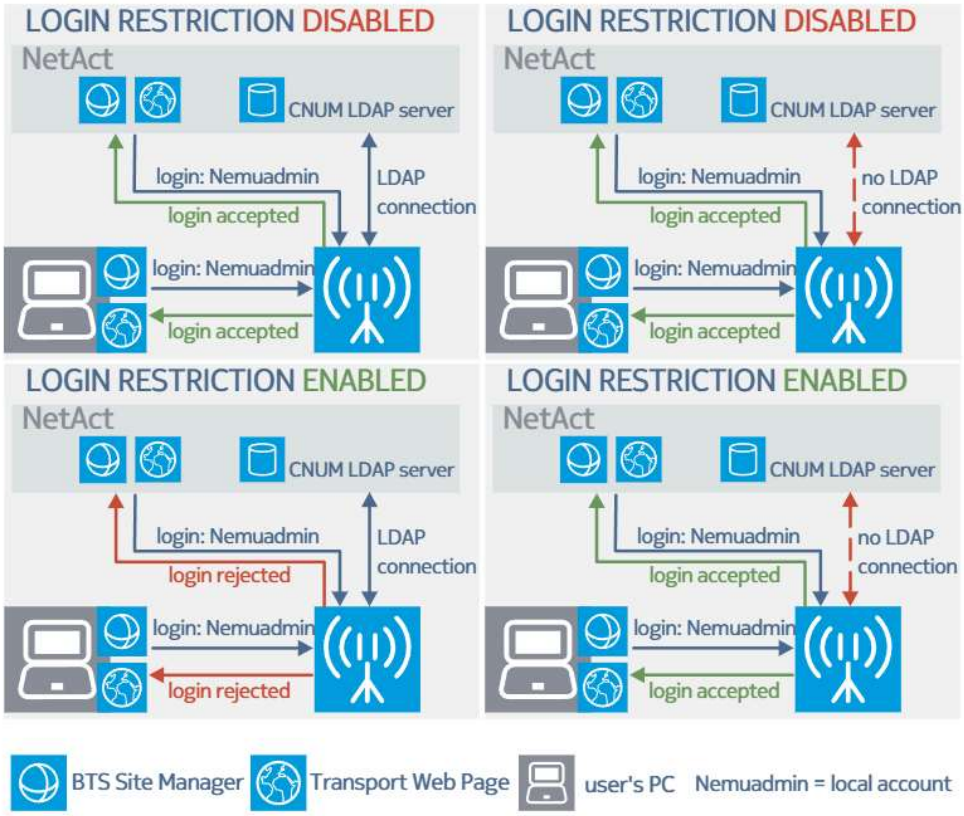
The *LTE2331: Multi-language Support for Selected Parameters* feature makes possible to input network element's name by a selected parameter in Chinese or Japanese into BTS Site Manager (BTS SM) and NetAct by using local language characters in the UTF-8 system. In addition, this feature introduces a search mechanism for BTS SM to support local language characters. The supported languages are listed in Table 171: Supported local language characters. This change does not have an impact on eNB operations (for example, site name, location, description, etc.).

Note: The *LTE2331: Multi-language Support for Selected Parameters* feature fulfills Chinese regulations for BTS SM and NetAct functionalities.

Table 171 Supported local language characters

Language	Local language
Chinese	Chinese (Simplified)
	Chinese (Traditional)
Japanese	Kanji
	Hiragana
	Katakana

Figure 33 Local account log-in scenarios



This procedure applies to both users and machines (scripts) attempting to log in by means of a local user account.

If user was able to log in with the local user account credentials due to login restriction being disabled, or due to the LDAP server being unavailable, those local user account sessions will not be impact if login restriction is subsequently enabled or the LDAP server becomes available. New attempts to login with the local user account credentials would be blocked.

5.6.3 LTE2360 system impact

Interdependencies between features

The *LTE2360: Login Restriction with CNUM* feature impacts the following features:

- *LTE580: Session Login Delay*
  When attempting to log in with the local user account credentials, the system will only apply the user-based delay and locking functionality of *LTE580* to the account if it is not blocked due to *LTE2360*.
- *LTE967: Password Aging and Account Locking*
  When attempting to log in with the local user account credentials, the system will only apply aging and locking functionality to the account if it is not blocked due to *LTE2360*.

Impact on interfaces

The *LTE2360: Login Restriction with CNUM* feature has no impact on interfaces.

Impact on network management tools

The *LTE2360: Login Restriction with CNUM* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2360: Login Restriction with CNUM* feature has no impact on system performance or capacity.

5.6.4 LTE2360 reference data

Requirements

Table 175 LTE2360 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	16A	support not required	16.8	support not required	support not required

5.7.4 LTE2361 reference data

Requirements

Table 178 LTE2361 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	support not required	support not required	16.8	support not required	support not required

5.8.3 LTE2403 system impact

Interdependencies between features

There are no interdependencies between the *LTE2403: MHAs Auto-detection and Configuration* feature and any other feature.

Impact on interfaces

The *LTE2403: MHAs Auto-detection and Configuration* feature has no impact on interfaces.

Impact on network management tools

The *LTE2403: MHAs Auto-detection and Configuration* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2403: MHAs Auto-detection and Configuration* feature has no impact on system performance or capacity.

5.8.4 LTE2403 reference data

Requirements

Table 182 LTE2403 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16	FL16	FL16	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	NetAct 16.2	Support not required	Support not required

Additional hardware requirements

This feature requires the following hardware:

All MHAs supporting the antenna interface standards group (AISG 2.0)

The following hardware is not supported:

- MHAs that are configured as external or AISG non-compliant are excluded from this feature
- Nokia-harmonized MHAs are excluded from this feature
- Dual-band MHAs with one LNA per band are not supported

Parameters

Table 183 New parameters introduced by LTE2403

Full name	Abbreviated name	Managed object
Activate MHA auto-configuration	actMhaAutoConfig	MRBTS

Table 184 Parameters modified by LTE2403

Full name	Abbreviated name	Managed object	Structure
Antenna band list	antBandList	MHA	-
Antenna beamwidth	antBeamwidth	MHA	antBandList
Antenna operating frequency band	antOperFreqBand	MHA	antBandList
Antenna operation gain	antOperGain	MHA	antBandList
Antenna line identifier	antIId	MHA	-
LNA number	lnaNumber	MHA	-

- There are no queued messages for Earthquake and Tsunami Warning System (ETWS) or Commercial Mobile Alert System (CMAS) in the cell.
- The aggregated load in the cells in the PSGRP is below the low-load threshold for at least five minutes.
- The estimated aggregated load for the PSGRP after the cell switches off does not exceed the high-load threshold.

Note: The eNB does not switch off a PSGRP cell, and it switches on a cell in energy saving mode, if eNB degraded or cell impacting faults are detected on the eNB.

Note: When all radio access technologies have switched off the pipes that share the power amplifier (PA), the PA is automatically switched off.

Note: Power amplifier switch-off is applicable for non-broadcast control channel (non-BCCH) pipe only.

Switching on the cell

After switching off the PSGRP cell, the eNodeB monitors the load of the active cells in the PSGRP. When the traffic load in the active cells exceeds the high-load threshold for at least two minutes, the switched-off cells are activated again in a reversed switch-off order.

Note: When a pipe that shares the PA is switched on, the PA is automatically switched on.

5.9.3 LTE2507 system impact

LTE2507 impact on features

Interdependencies between features

To realize the benefits of the *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature, the *LTE1103: Load Based Power Saving for Multi-layer Networks* feature and at least one of the following features must be activated (depending on a radio acces technologies supported by the eNodeB):

- *RAN955: Power Saving Mode for BTS* for 3G
- *RG301936: Intelligent MCPA TRX Shutdown* for 2G

For activating the *LTE1103: Load Based Power Saving for Multi-layer Networks* feature, see *Activating and configuring LTE1103: Load Based Power Saving for Multi-layer Networks*.

The *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature is impacted by the following features:

- *LTE1203: Load-based Power Saving with Tx Path Switching Off*

The *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature has mirror features for other radio access technologies:

- *RG602496: Energy efficiency Shut Down Mode with RF Sharing* for GSM
- *RAN3247: Energy Efficiency Shut Down Mode with RF Sharing* for WCDMA

Impact on interfaces

The *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature has no impact on interfaces.

Impact on network management tools

The *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature has no impact on system performance or capacity.

5.9.4 LTE2507 reference data

LTE2507: Energy Efficiency Shut Down Mode with RF Sharing requirements and sales information

Requirements

Table 186 LTE2507 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	Not supported	FL16A	Not supported	Support not required	Support not required

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Support not required	LTE OMS16A	Support not required	16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature.

Commands

There are no commands related to the *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2507: Energy Efficiency Shut Down Mode with RF Sharing* feature.

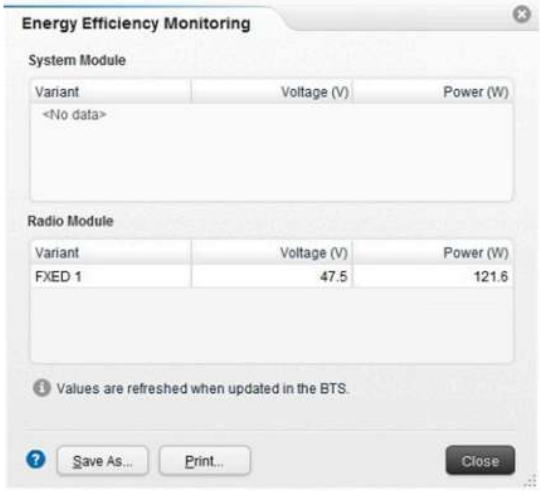
Parameters

Note: The Energy Efficiency Monitoring display in BTS SM shows no voltage or power measurements from LTE for the radio if LTE is a slave RAT.

BTS SM: Displaying the Energy Efficiency Monitoring window

The *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature introduces a new Energy Efficiency Monitoring display in BTS Site Manager (BTS SM). The new display window presents the voltage and power information of RF and system modules, based on power reports from OAM (the values are updated every one minute, if changed). Figure 36: An example of Energy Efficiency Monitoring display in BTS SM (may differ in later releases) shows voltage and power values for an FSMF system module (no power meter on board) with an FXED RF module (power meter capable).

Figure 36 An example of Energy Efficiency Monitoring display in BTS SM (may differ in later releases)



NetAct: Displaying energy consumption counters

New counters introduced by the *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature can be viewed in NetAct (as well as in BTS SM). Counters are based on a sum of measurement samples (by default, in 15- minute blocks, but the counter measurement period is adjustable).

5.10.3 LTE2508 system impact

Interdependencies between features

There are no interdependencies between the *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature and any other feature.

Impact on interfaces

The *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature has no impact on interfaces.

Impact on network management tools

The *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature impacts network management tools as follows:

- BTS Site Manager (BTS SM):
  - New data fields (voltage and power) have been added to the SiteConf file for radio modules and system modules.
  - A new Energy Efficiency Monitoring display has been added (it can be reached from the Tests menu bar).

Impact on system performance and capacity

The *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature has no impact on system performance or capacity.

5.10.4 LTE2508 reference data

Requirements

Table 188 LTE2508 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

Additional hardware and software requirements:

Note: The *LTE2508 compatible RF modules and system modules* list is not binding and should be treated only as a starting point before confirming power meter support with Nokia sales representatives. The power meter support for any new RF or system modules can be found in a corresponding HW description.

LTE2508 compatible RF modules and system modules (with a power meter on board):

- The requirements of system modules for the *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature:
  - FSMr2: not supported
  - FSMr3 (FSMF, FBBA, FBBC): instead of power meter measurements, the static values are used to create counters (there is no power meter HW in FSMr3 system modules). See the Table 189: Static values used to create energy consumption counters for FSMr3 modules section for more details.
  - AirScale system modules: not supported
- The requirements of radio frequency (RF) module or remote radio head (RRH) for the *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring* feature:
  - FHEB, FHDB, FHEF, FHEG and FHEJ are supported
  - FRGU, FXED, FRMF, FRSA are supported
  - FXEE, FXEF and FRGX are supported
  - FRGY, FHFB, FRBE, FRBF, FRNC, FRCC, FRCG, FRBG, FRAA, FHED, FHEH, FRHG, FRGB and FRGA are supported

Table 197 LTE2562: ANR InterRat 1xRTT - O&M Assisted sales information

Product structure class	License control	Activated by default
Application software (ASW)	-	No

5.12 LTE2591: UE-level MRO

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2591: UE-level MRO* feature adds a configurable offset to the cell individual offset (CIO) value of a neighbor cell to avoid further unnecessary handovers (HOs) when a ping pong HO is detected between a serving cell and a neighbor cell.

5.12.1 LTE2591 benefits

The *LTE2591: UE-level MRO* feature provides the following benefits:

- The handover performance is improved because of reduced number of unnecessary handovers.
- A more aggressive CIO can be applied to match the high-speed users' demands while the static users are protected against the ping pong HOs.

5.12.2 LTE2591 functional description

Ping pong detection

The same rule is applied as for a centralized Mobility Robustness Optimization (MRO) ping pong described in the *LTE1768: MRO Ping Pong* feature. The eNB detects the ping pong occurrences by analyzing the UE history information during the HO preparation phase. When the eNB detects that the UE previously visited a serving cell and the elapsed time is lower than the configurable threshold, the HO is considered to be a ping pong. The ping pong can be either of the following scenarios:

- **cell 1 ► cell 2 ► cell 1**
- **cell 1 ► cell 2 ► cell 3 ► cell 1**

This feature covers only scenarios, where the cell 2 is an LTE cell. The cell 3 and the potential further cells can be a UTRAN cell as long as the UTRAN network supports passing of the UE history.

Ping pong prevention

When the UE enters a cell by a handover that is considered to be a ping pong, the eNB alters the original CIO value for the neighbor cell (cell 2 in the given scenario) by a configurable offset. The neighbor cell can be either an intra-frequency or an inter-frequency LTE cell. The altered CIO value is sent to the UE within the measurement configuration.

Interworking with centralized MRO

Table 198 LTE2591 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale FDD	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	3GPP R8 mandatory	NetAct 16.8	Support not required	Support not required

5.13.4 LTE2621 reference data

Requirements

Table 204 LTE2621 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	support not required	support not required	support not required	support not required	support not required

For parameter descriptions, see *LTE Operating Documentation/Reference/Parameters*

Sales information

Table 208 LTE2621 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

5.14 LTE2633: System Upgrade to FDD-LTE 16A

Benefits, functionality, system impact, and reference data of the feature

The *LTE2633: System Upgrade to FDD-LTE 16A* feature supports system upgrade for the following releases:

- From FDD-LTE 15A to FDD-LTE 16A
- From FDD-LTE 16 to FDD-LTE 16A

The system upgrade from FDD-LTE 15A release or FDD-LTE 16 release to FDD-LTE 16A release for Flexi Zone (FZ) standalone outdoor and indoor small cells and controller configuration is also supported.

5.14.1 LTE2633 benefits

The *LTE2633: System Upgrade to FDD-LTE 16A* feature provides the operator with a smooth system upgrade.

5.14.2 LTE2633 functional description

The system upgrade is possible in one step, and installation of intermediate software version is not needed. The *LTE2633: System Upgrade to FDD-LTE 16A* feature includes backward compatibility and provides the possibility of automatic fallback or rollback to the previous release that had been activated before the upgrade. The following network elements (NEs) are impacted:

- Flexi Multiradio BTS
- Flexi Zone (FZ)
- NetAct including the Optimizer, TraceViewer, and Northbound interfaces
- Operation and management server (OMS)
- Traffica
- Layer 3 Data Collector (L3DC) with its applications as layer 2 data analyzer
- Self-organizing network (SON) manager

The system upgrade is performed in a top-down approach, which starts with NetAct and ends when all the evolved Node Bs (eNBs) are upgraded. During the upgrade, the management and network elements should maintain compatibility with other management and network elements that are in the active release or in the previous release before the upgrade.

Note: The operator can perform the activation of the new software from NetAct or BTS site manager (BTSSM). The Traffica and L3DC support local software management.

Software upgrade from FDD-LTE 15A to FDD-LTE 16A

The system upgrade supports the following software upgrades:

- NetAct 15.5 to NetAct 16.8
- LTO15A to LOMS16A
- Traffica15.5 to Traffica16.5
- L3DC15 to L3DC16.5
- eNB upgrades:
  - FL15A to FL16A
  - FLF15A to FLF16A
  - FLC15A to FLC16A

Software upgrade from FDD-LTE 16 to FDD-LTE 16A

The system upgrade supports the following software upgrades:

- NetAct 16.2 to NetAct 16.8
- LOMS16 to LOMS16A
- Traffica16 to Traffica 16.5
- L3DC16 to L3DC16.5
- eNB upgrades:
  - FL16 to FL16A
  - FLF16 to FLF16A
  - FLC16 to FLC16A

Backward compatibility

Backward compatibility means that interworking between the upgraded and the non-upgraded NEs is possible during the system upgrade. Because of the top-down approach, the following backward compatibilities are supported:

- NetAct 16.8 supports the OMS and eNB with FDD-LTE 15A and FDD-LTE 16 releases.
- LOMS16A supports the eNB with FDD-LTE 15A and FDD-LTE 16 releases.
- Traffica16.5 supports the L3DC and eNB with FDD-LTE 15A and FDD-LTE 16 releases.
- L3DC16.5 supports the eNB with FDD-LTE 15A and FDD-LTE 16 releases.

Data migration

All operator-configured data are maintained in the system. Configuration data created in the earlier release are automatically converted into a new format that is valid for the new release during the upgrade. The data include the following:

- All configuration data of the Flexi Multiradio BTS, OMS, NetAct, L3DC, and Traffica
- Customized view in the BTSSM or NetAct user-specified accounts and passwords
- User-specified accounts and passwords

The following system data should be uploaded or backed up before the upgrade:

- Network security-related system data (such as certificates and keys)
- User security-related data (such as user accounts and passwords)
- Performance measurement (PM) data

Note: Failure to backup the data or upload it to NetAct might cause the data to be lost.

If there are used command lines or scripts, they must be backward compatible, or a converter must be available for the supported upgrade paths. The software converter is available in online or offline mode.

Software fallback

Software fallback is an automatic activation of an earlier software version that is active before the software upgrade. Fallback is triggered when the eNB or OMS cannot activate its new software version or use a new database configuration version. After a successful fallback, the passive software build is active in all the hardware units. All of the components activate the stored configuration data without reverse migrating or converting to a new configuration data.

Note: In case of minor failures, no software fallback is initiated but the error information is indicated. The failures are logged in a non-volatile memory and include a detailed information about the reason for the failure.

Note: In case of an inconsistent fallback where in the eNB does not locally store the complete fallback software for all the hardware units, software download from NetAct is requested.

Software rollback

Software rollback is a manually initiated software fallback using the BTSSM or NetAct software management (SWM). The operator can trigger software rollback when key services are not successfully activated after the software upgrade. Any configuration updates done with the new software are lost as soon as software rollback is triggered. Software rollback is only guaranteed if the source software version has not been removed or overwritten in a non-volatile storage (NVS). Software rollback is done with the software stored in the passive file system and when no software download from the server is part of the operation. If the passive software has been overwritten with a different software version, rollback to the former release is not possible.

Note: Software rollback to the stored software load restores the earlier configuration. If there has been a major network reconfiguration after the upgrade, such as reconfiguring the eNB from IPv4 to IPv6 or updating operator certificates, then network connectivity issues can occur after the rollback. Reconfigurations after the software upgrade must be evaluated before triggering software rollback to avoid service outage.

Software rollback for a single eNB or for eNBs in bulk can be done using the NetAct SWM. For more information, see the *Software Manager Help* document under Network Administration in NetAct Operating Documentation. Software rollback for a single eNB can also be done using the **Rollback to Passive SW** function in the **Update SW to BTS Site** window on the BTSSM.

If the operator selects a software version that is lower than the current software version in the **Update SW to BTS Site** window on the BTSSM and clicks **Update**, a software downgrade occurs.

Note: Software downgrade must not be executed. Software downgrade to an earlier software version is not guaranteed and might end up in an uncommissioned state of the eNB.

Note: Software rollback operation from the NetAct might interrupt ongoing local operations triggered from the BTSSM such as commissioning without local user warning.

5.14.3 LTE2633 system impact

LTE2633: System Upgrade to FDD-LTE 16A impact on features, system performance, and capacity

Interdependencies between features

The *LTE2378: FSM D/E (FSMr2) Support after FDD-LTE 15A* feature supports the upgrade of the FSMr2 evolved Node Bs (eNBs) to the latest FDD-LTE 15A software using the FDD-LTE 16A software package. The FDD-LTE 16 software package might contain the updates, but the FSMr2 reports its software version as FDD-LTE 15A.

Impact on interfaces

The *LTE2633: System Upgrade to FDD-LTE 16A* feature has no impact on interfaces.

Impact on network management tools

The *LTE2633: System Upgrade to FDD-LTE 16A* feature impacts the BTS site manager (BTSSM) and NetAct for the FSMr2. The BTSSM and NetAct maintain the FDD-LTE 15A configuration management (CM), performance measurements (PM), alarms, and faults. The topology version for the FSMr2 is FDD-LTE 15A as displayed in NetAct.

Impact on system performance and capacity

The *LTE2633: System Upgrade to FDD-LTE 16A* feature impacts system performance and capacity as follows:

- The end user will experience a service degradation and partial service loss during the system upgrade.
- The downtime for the network entities is reduced to the activation of the new software during the system upgrade.

5.14.4 LTE2633 reference data

LTE2633: System Upgrade to FDD-LTE 16A requirements and sales information

Requirements

Table 209 LTE2633 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	FLF16A	FLF16A

5.15.2 LTE2816 functional description

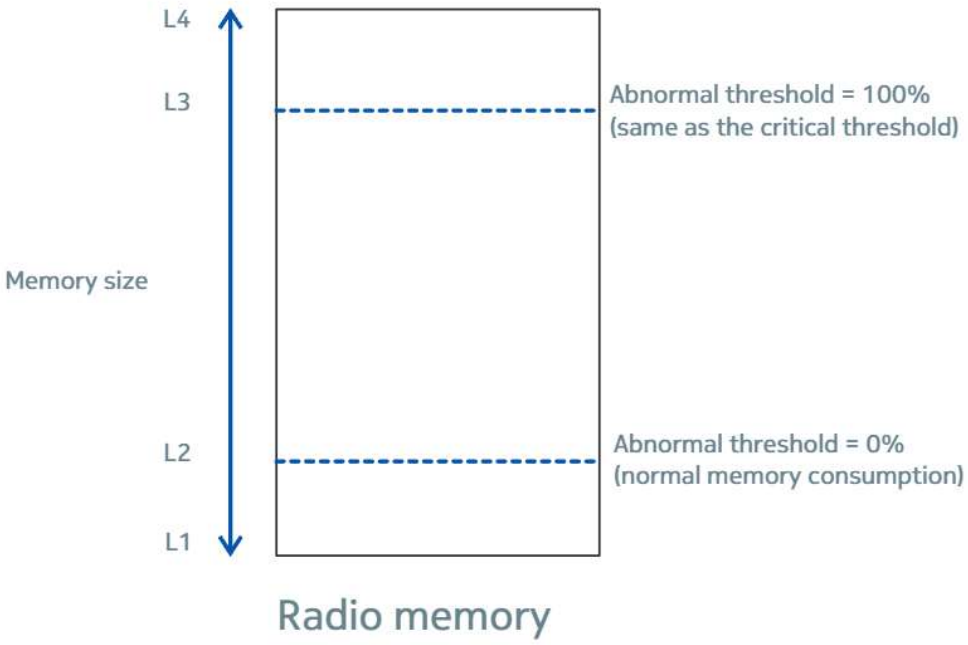
This feature introduces the sending of the alarm to the BTS that is related to the high memory consumption on the RF module. The RF module supports two thresholds:

- Abnormal
- Critical

If the memory consumption exceeds the abnormal level, the BTS generates a new alarm with a minor severity. However, if the memory consumption exceeds the critical level, the BTS clears an abnormal alarm and generates the alarm with a major severity.

The abnormal threshold is configurable and can be set by a new parameter that has a relative value. It has a range of 0% to 100%, and the default value is 50%. For the critical threshold, it is fixed and has a value of 100%. The abnormal and the critical thresholds can have the same value of 100% (as shown in the following figure), but if the threshold level of 100% is reached, only the alarm with the major severity is displayed.

Figure 37 Radio module memory threshold level



The absolute abnormal and the critical memory thresholds depend on the RF module configuration. The feature is applicable for radio units with OBSAI/RP1 and CPRI/L3B protocols.

5.15.3 LTE2816 system impact

LTE2816: High Memory Consumption Alarm for Nokia RP1/L3B Radio Modules has no impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

There are no interdependencies between the *LTE2816: High Memory Consumption Alarm for Nokia RP1/L3B Radio Modules* feature and any other feature.

Impact on interfaces

The *LTE2816: High Memory Consumption Alarm for Nokia RP1/L3B Radio Modules* feature has no impact on interfaces.

Impact on network management tools

The *LTE2816: High Memory Consumption Alarm for Nokia RP1/L3B Radio Modules* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2816: High Memory Consumption Alarm for Nokia RP1/L3B Radio Modules* feature has no impact on system performance or capacity.

5.15.4 LTE2816 reference data

LTE2816: High Memory Consumption Alarm for Nokia RP1/L3B Radio Modules requirements, alarms and faults, parameters, and sales information

Requirements

Table 212 LTE2816 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale FDD	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Support not					

The *LTE2828: LNCEL LNBTS Refactoring* feature reduces the number of **LNBTS** and **LNCEL** parameters by moving groups of parameters to new MOCs. The scope of changes covers transfer of the following parameters:

Table 216 LNBTS and LNCEL refactoring changes

Before	After
SIB related parameters under **LNCEL** instance	SIB related parameters inside the new cell specific **SIB** instance
DRX related parameters under **LNCEL** instance	DRX related parameters insice the new cell specific **DRX** instance
Smart DRX related parameters under **LNCEL** instance	Smart DRX related parameters inside the new cell specific **SDRX** instance
ENB level ANR related parameters	ENB level ANR related parameters inside the new eNB specific **ANR** instance
RIM related parameters under **LNBTS** instance	RIM related parameters inside the new eNB specific **RIM** instance

Note: All parameters will be automatically migrated to the new model with the same value during a release upgrade.

Figure 1 New MOC in the LNBTS tree shows a new instance created for grouping transferred parameters according to their operating range. Changes in the LNCEL instance are shown in a similar way in Figure 2 New MOC in the LNCEL tree.

Figure 38 New MOCs in the LNBTS tree

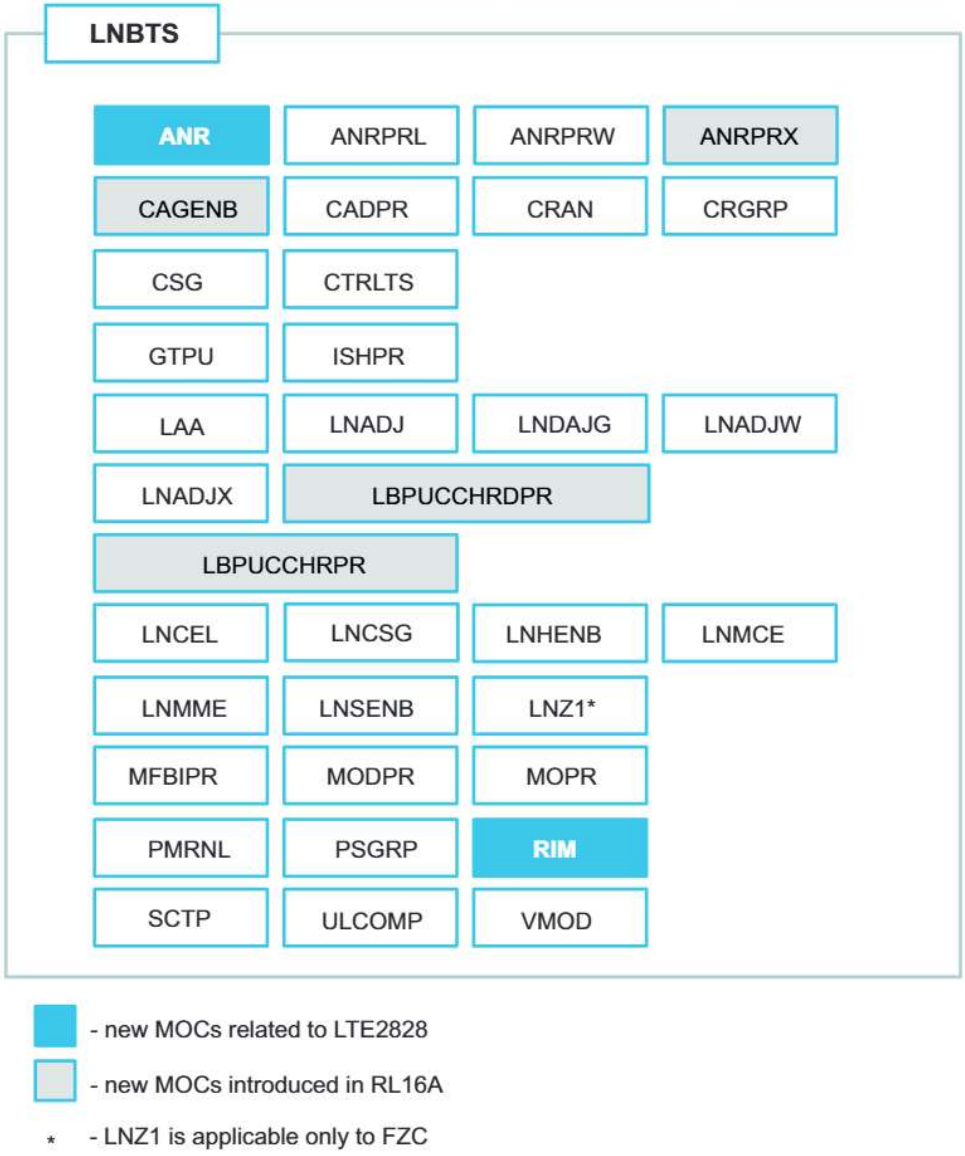
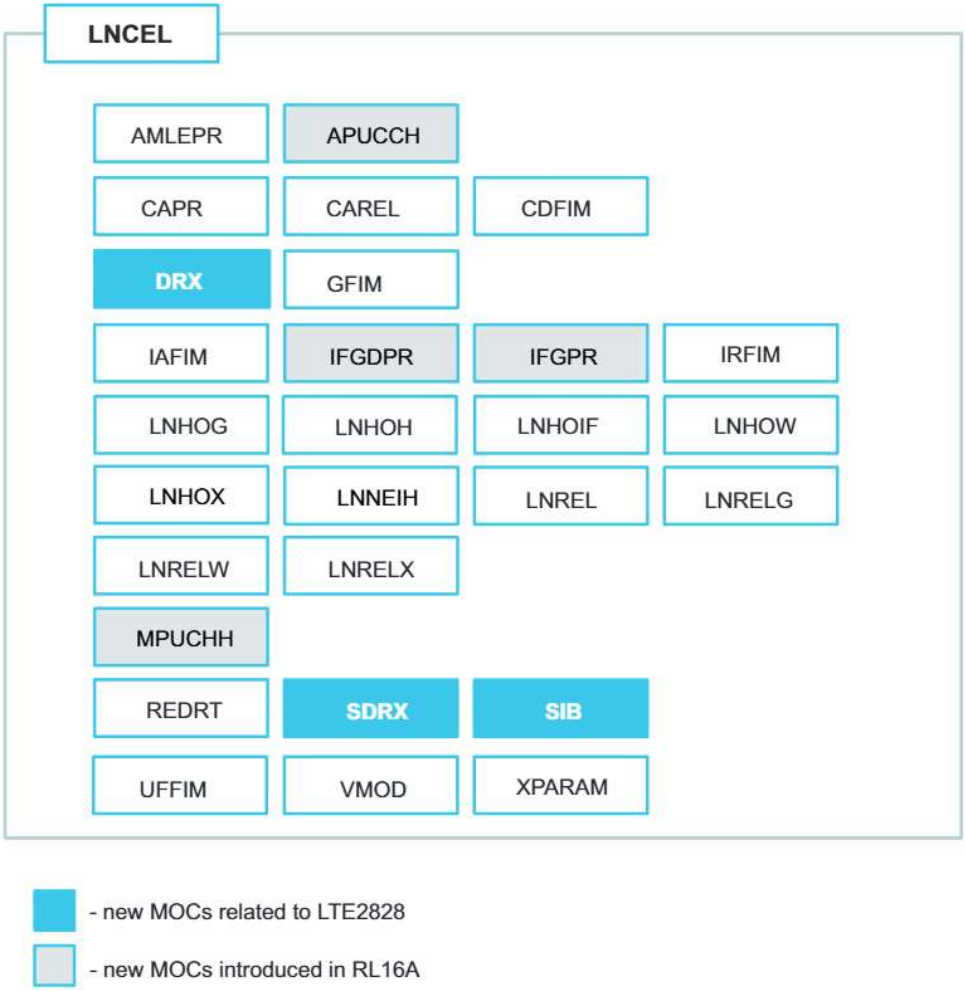


Figure 39 New MOCs in the LNCEL tree



For list of moved mandator parameters, see *Parameter section*.

5.16.3 LTE2828 system impact

LTE2828: LNCEL LNBTS Refactoring impact on features, interfaces, and network management tools.

Interdependencies between features

The *LTE2828: LNCEL LNBTS Refactoring* feature impacts the following features from the **SIB** area:

- LTE16A
  - *LTE2562: ANR InterRat 1xRTT – O&M Assisted*
- LTE16
  - *LTE1709 Liquid Cell – TM9*

- *LTE1858: FDD Inter-band/Intra-band Carrier Aggregation with Two Flexi Zone Micro BTSs*
- *LTE1891: eNodeB Power Saving – Micro DTX*
- *LTE1987: Downlink Adaptive Close Loop SU MIMO (4x4)*
- *LTE2351: S1-based Handover Towards CSG Cells*
- *LTE2370: Flexi Zone Inter-FZAP Carrier Aggregation*
- *LTE2465: CSG Cell Support*
- *LTE2505: Access Class Barring Skip*

- LTE15A
  - *LTE738: SRVCC to 1xRTT/CDMA*
  - *LTE1117: LTE MBMS*
  - *LTE1788: Automatic Access Class Baring*
  - *LTE1804: Downlink Carrier Aggregation 3CC – 60 MHz*
  - *LTE2085: SIB Reception with Parallel Measurement Gaps*
- LTE70
  - *LTE1113: eICIC – Macro*
  - *LTE1496: eICIC – Micro*
  - *LTE1803: Downlink Carrier Aggregation 3CC – 40 MHz*
- LTE60
  - *LTE874: CSFB to CDMA/1xRTT for Dual RX UEs*
  - *LTE1332: Downlink Carrier Aggregation – 40 MHz; Subset A*
  - *LTE1441: Enhanced CS Fallback to CDMA/1xRTT (e1xCSFB)*
- LTE50
  - *LTE116: Cell Bandwidth – 3 MHz*
  - *LTE117: Cell Bandwidth – 1.4 MHz*
  - *LTE494: Commercial Mobile Alert System*
  - *LTE495: OTDOA*
  - *LTE807: Idle Mode Mobility LTE to CDMA/1xRTT*
  - *LTE1036: RSR–based Cell Reselection*
- LTE10
  - *LTE39: System Information Broadcast*

The *LTE2828: LNCEL LNBTS Refactoring* feature impacts the following features from the **DRX** and **SDRX** areas:

- LTE16A
  - *LTE1130: Dynamic PUCCH Allocation*
- LTE15A
  - *LTE1117: LTE MBMS*
- LTE70

  - *LTE1113: eICIC – Macro*
  - *LTE1406: Extended VoLTE Talk Time*
  - *LTE1496: eICIC – Micro*
- LTE60
  - *LTE1382: Cell Resource Groups*
- LTE50
  - *LTE116: Cell Bandwidth – 3 MHz*
  - *LTE117: Cell Bandwidth – 1.4 MHz*
  - *LTE495: OTDOA*
  - *LTE585: Smart DRX*
- LTE30
  - *LTE42: DRX in RRC Connected Mode*
  - *LTE473: Extended DRX Settings*

The *LTE2828: LNCEL LNBTS Refactoring* feature impacts the following features from the **ANR** and **RIM** areas:

- LTE15A
  - *LTE1196: RAN Information Management for WCDMA*
  - *LTE1996: Flexi Zone Controller Application*
  - *LTE2062: Inter-RAT UTRAN Neighbor Relation Robustness*
- LTE70
  - *LTE908: ANR Inter-RAT UTRAN – Fully UE-based*
  - *LTE1685: Neighbor Relation Robustness*
- LTE60
  - *LTE125: IPv6 for U/C-Plane*
  - *LTE498: RAN Information Management for GSM*
  - *LTE556: ANR Intra-LTE, Inter-frequency – UE-based*
  - *LTE1708: Extend Maximum Number of X2 Links*
- LTE50
  - *LTE556: ANR Intra-LTE, Inter-frequency – UE-based*
  - *LTE1383: Cell-specific Neighbour Relation/PCI handling*
- LTE40
  - *LTE782: ANR Fully UE-based*
- LTE20
  - *LTE492: ANR*

Impact on interfaces

The *LTE2828: LNCEL LNBTS Refactoring* feature impacts interfaces as follows:

- BTS SM
  - Modified object model
- NetAct
  - Modified object model

Impact on network management tools

The *LTE2828: LNCEL LNBTS Refactoring* feature impacts network management tools as follows:

- BTS SM
  - Modified object model
- NetAct
  - Modified object model

Impact on system performance and capacity

The *LTE2828: LNCEL LNBTS Refactoring* feature has no impact on system performance or capacity.

5.16.4 LTE2828 reference data

LTE2828: LNCEL LNBTS Refactoring requirements, parameters, and sales information

Requirements

Table 217 LTE2828 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	FL16A	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS 16A	not applicable	NetAct 16.8	support not required	support not required

Alarms

There are no alarms related to the *LTE2828: LNCEL LNBTS Refactoring* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2828: LNCEL LNBTS Refactoring* feature.

Commands

There are no commands related to the *LTE2828: LNCEL LNBTS Refactoring* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2828: LNCEL LNBTS Refactoring* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2828: LNCEL LNBTS Refactoring* feature.

5.17 LTE3043: Remote Power Port Control for FPFD PDU

Benefits, functionality, system impact, reference data of the feature

The *LTE3043: Remote Power Port Control for FPFD PDU* feature provides additional options in BTS Site Manager (BTS SM) for managing remotely the power ports feeding RF niodules. It enables selecting the power port to be switched on or off. The feature provides an option to use power reset functionality for maintenance purposes without site visits. Functionality will be used for recovery actions in cases where the radio unit has to be rebooted remotely. Additionally this feature enables operator to switch off the radio unit for a longer time to save energy used by this equipment.

5.17.1 LTE3043 benefits

The *LTE3043: Remote Power Port Control for FPFD PDU* feature provides the following benefits:

- Accelerates the removal of faults related to the lack of power supply at the PDU power port providing remote access for power control
- Reduces energy consumption due to easier management of PDU power ports via BTS Site Manager (BTS SM)

5.17.2 LTE3043 functional description

Functional description

The *LTE3043: Remote Power Port Control for FPFD PDU* feature will be mainly used for maintenance purposes. For instance, based on a received alarm, it is possible to temporarily switch off a PDU power port connected to a faulty RM or permanently switch off a radio module in order to reduce costs. So far, such actions have been performed manually on site, but the *LTE3043: Remote Power Port Control for FPFD PDU* feature enables executing them by means of BTS SM. Additionally it prevents excessive energy consumption by controlling power feeds to PDU power ports for example by switching off the power totally from the radio unit when required.

Note: A BTS reset switches on all PDU power ports connected to it, that have not been switched off from the front panel. If switched off from the front panel, then the power port remains switched off.

Every PDU power port is configured separately. This makes it possible to decide which one should be switched off for a longer period of time for energy saving purposes. It is highly recommended to have knowledge of the relations between connected RM and PDU power ports since the *LTE3043: Remote Power Port Control for FPFD PDU* feature cannot determine the specific connection structure of any eNB.

The decision to switch off the power feed can be made after checking what impact a switched-off RM has on cells. The list of impacted cells includes cells directly supported by the switched-off radio unit as well as cells which are supported by radio units further in the radio unit optical link chain. When the radio unit to be switched off is configured for RF sharing, it is necessary to consider the impact on cells of other RATs since these cells will be in a disabled state.

The *LTE3043: Remote Power Port Control for FPFD PDU* feature impacts network management tools as follows:

- BTS SM
  - Added control to a PDU power port
  - Added view of the PDU power ports' status
- NetAct
  - Added view of the alarms related to the PDU power ports

Impact on system performance and capacity

The *LTE3043: Remote Power Port Control for FPFD PDU* feature has no impact on system performance or capacity.

5.17.4 LTE3043 reference data

LTE3043: Remote Power Port Control for FPFD PDU requirements, alarms and faults, and sales information

Requirements

Table 226 LTE3043 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	not applicable	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	

5.18.1 LTE3051 benefits

The *LTE3051: Eden-NET Replacing iSON as Centralized SON Solution* feature provides the following benefits:

The operator obtains new functions offered by Eden-NET while at the same time the functions of the legacy Optimizer/iSON manager are preserved.

5.18.2 LTE3051 functional description

Overview

Nokia Eden-NET is a leading centralized, multi-vendor, multi-technology SON solution. Eden-NET provides a wide range of SON modules in LTE, WCDMA, and GSM. The platform provides an open SON framework which enables the operator to build and deploy new customized SON modules on their own.

Eden-NET provides a complete SON operating system as well as an established toolbox of essential SON modules. Furthermore, Eden-NET is highly extensible; it enables the operator to effectively customize the existing SON modules and create new ones. It provides a data adaptor functionality block, offering its services through a specific application programming interface (API) following a service-oriented architecture model.

Eden Net as Centralized SON (cSON)

Eden-NET works in a centralized architecture (commonly known as cSON). This allows access to a broader view of network configuration and performance. Eden-NET allows optimization benefits beyond those that can be achieved by distributed SON implementations.

Eden-NET SON modules' overview

The following is a list of the current and planned Eden-NET SON modules, categorized into four main areas:

1. **Autonomous network optimization modules**
   These modules substantially improve network performance and reliability through a dynamic optimization of RAN parameters. Updated parameters produced by these modules persist within the network until the parameters are updated manually. Additional runs of the modules for further optimization are updating the parameters as well. These modules run on a continual basis, determining new optimal settings as networks evolve. The following modules are part of the optimization:
   - Automatic neighbor relations (ANR) optimization
   - PCI optimization
   - Coverage and capacity optimization (CCO)
   - Mobility robustness optimization (MRO)
   - PRACH parameter optimization
   - CA dynamic configuration
2. **Dynamic network adaptation modules**
   These modules improve network performance by dynamically re-configuring network elements to optimally serve the demands of active subscribers during periods of special conditions. The following modules automatically restore the baseline configuration once the condition subsides.

- Mobility load balancing (MLB)
- Special events
- Green networks (Energy Savings)

3. **Workflow automation modules**
   The follwing modules substantially improve operational efficiency, eliminate sources of manual error within the network, and help to ensure proper network operation by producing critical actionable reports as well as alerts for operators and automating configuration of network elements.

   - Automatic performance reports (includes worst performing cells)
   - Real time alerts
   - Parameter consistency enforcement
   - Automatic site creation

4. **Network reliability automation modules**
   These modules substantially improve network reliability by dynamically detecting and responding to failures within the network. This includes the dynamic re-configuration of other network elements to compensate for the failure of a network element so that the network can provide optimal services during the period of such a failure. The following modules are concerned:

   - Sleeping cell detection and resolution
   - Cell outage compensation
   - Crossed antenna detection
   - Alarm based outage resolution

Interaction between cSON tool and operator

cSON provides an open-loop mode and a closed-loop mode:

this applies generically to all cSON modules existing after execution, regardless of whether they are triggered manually or by a scheduler. See use cases in chapter Other instructions.

Open-loop mode

In the open-loop mode, the modules are running the algorithms, but no changes are applied to the network. The module output consists of a report that lists the proposed changes to improve network performance.

In this mode, the modules retrieve configuration information from the Eden-NET internal configuration management cache, and not from the network. It does not force any reading from the OSS for data in the cache that has been modified or that has expired. The open-loop mode therefore places no additional load on the OSS and its interfaces. However, this also means that the data that the module processes in the open-loop mode may not be that which is present in the OSS or in the network elements at that time.

To force a refresh of the Eden-NET internal configuration management cache, a 4G_Export module can be run on selected LTE cells for the IRAT neighbor relations managed objects. Eden-NET also enables real-time visualizations of the impact of SON actions. When a SON action is brought up in an alert, users are provided a visualization that portrays different states of network operation – the current state and the simulated state that would follow the proposed SON action.

Closed-loop mode

SON actions executed in the closed-loop mode are fully automated and run without operator intervention. As a precondition, the operator must define the scope and the parameters to control the algorithm. Once started by a scheduler or triggered manually by the operator, the module executes the following steps:

- cSON refreshes the cache of CM data; if relevant, also the PM data.
- cSON executes the algorithm.
- cSON exports the result as a plan to the Configurator and provisions automatically to the network

One principal goal of the closed-loop mode of operation in Eden-NET is to facilitate the workload in such a way that repetitive, time-consuming tasks are executed automatically. Some tasks that would be automated under closed-loop operation include the remote steering of antennas and the gathering of cell power profiles.

5.18.3 LTE3051 system impact

Interdependencies between features

Since FDD/TD-LTE 16A, Eden-NET replaces iSON as a centralized SON platform. The following features, which were previously supported by iSON or NetAct Optimizer, are supported by Eden-NET:

RL10:

- *LTE720: SON LTE BTS Auto Configuration*
- *LTE468: PCI Management*

Note: Differencies in Eden Net

PCI collision or PCI confusion: only intra frequency are resolved not inter frequency. For example, there are three cells:

- Cell S has LNREL relation to A (S -> A).
- Cell S has LNREL relation to B (S -> B).
- Cell A and Cell B have the same PCI and same frequency.
- When S uses the same frequency as A and B (intra HO) the confusion will be resolved by PCI Optimization with Eden-Net.
- When S uses a different frequency as A and B (inter HO) the confusion will be not resolved by PCI Optimization with Eden-Net.

PCI collision resolution: only when there is a confusion. For example there are 2 cells:

- Cell A has a LNREL relation to B (A -> B) created by the operator.
- Cell A and Cell B have the same PCI and same frequency. That means there is a collision.
- This collision is not resolved by the operator.

Collision is only resolved when there is also a confusion:

- Cell S has LNREL relation to A (S -> A).
- Cell S has LNREL relation to B (S -> B).
- Cell A and Cell B have the same PCI.

With iSON it was not necessary that LNRELs are created. With iSON only the distance between the cells with same PCI and same frequency was considered. If the distance was smaller than a specified value the PCI conflict was resolved; if it was bigger it was not resolved.

RL20:

- *LTE771: Optimization of Intra-LTE Neighbor Relations*

Note: Differencies in Eden Net

Common trigger of blacklisting algorithm for all technologies (*LTE771/LTE507*). From the GUI there is no option to selectively trigger the blacklisting separetely for 4G, or for 3G or for 2G neighbors. The blacklisting is done for all technologies at the same time.

- *LTE783: ANR Inter-RAT UTRAN*

Note: Differencies in Eden Net

The ANR algorithm is based also on KPI, not only on distance (LTE783/LTE784). For example the automatic configuration of inter-RAT neighbors is executed towards 2G/3G cells which are co-located with LTE sites whose LTE KPIs are sufficient.

RL30:

- *LTE784: ANR Inter-RAT GERAN*
- *LTE533: Mobility Robustness*
- *LTE581: PRACH Management*

RL40:

- *LTE1019: SON Reports*
- *LTE1222: SON Automation Modes*

RL50:

- *LTE507: Inter-RAT Neighbor Relation Optimization (LTE, UTRAN, GERAN)*

Note: Differencies in Eden Net

Common trigger of blacklisting algorithm for all technologies (*LTE771/LTE507*). From the GUI there is no option to selectively trigger the blacklisting separetely for 4G, or for 3G or for 2G neighbors. The blacklisting is done for all technologies at the same time.

- *LTE962: RACH Optimization*
- *LTE1367: Automatic Cell Combination Assignment for Carrier Aggregation*
- *LTE1383: Cell-specific Neighbor Relation / PCI Handling*

RL60:

- *LTE1332: Downlink Carrier Aggregation – 40 MHz*

RL70:

- *LTE1685: Neighbor Relation Robustness*
- *LTE1768: MRO Ping Pong*
- *LTE1803: Downlink Carrier Aggregation 3 CC – 40 MHz*
- *LTE1821: Neighbor Detection Optimization for HetNet*
- *LTE1822: PCI Assignment Optimization for HetNet*
- *LTE1823: Neighbor Prioritization Optimization for HetNet*
- *LTE1951: Automatic Configuration Support for CA for Multi-carrier eNBs*
- *LTE2020: PRACH Management Optimization for HetNet*

FDD-LTE15A:

- *LTE1058: Plug & Play Extensions*
- *LTE1103: Load-based Power Saving for Multi-layer Networks*
- *LTE1117: LTE MBMS*
- *LTE1635: SIB 8 AC Barring for 1xRTT*
- *LTE1951: Automatic Configuration Support for CA for Multi-carrier eNBs*
- *LTE1804: Downlink Carrier Aggregation 3 CC – 60 MHz*
- *LTE1996: Flexi Zone Controller Application*
- *LTE2006: Flexible SCell Selection*
- *LTE2062: Inter-RAT UTRAN Neighbor Relation Robustness*
- *LTE2149: Supplemental Downlink Carrier*
- *LTE2168: Additional Carrier Aggregation Band Combinations – II*
- *LTE2172: BTS Configurations Optimized for Distributed RRH Deployment*
- *LTE2305: Inter-eNodeB Carrier Aggregation for 2 Macro eNodeBs*

FDD-LTE16:

- *LTE955: IPv6 for Management Plane*
- *LTE1203: Load-based Power Saving with Tx Path Switching Off*
- *LTE1462: Neighbor Optimization: Non-reachable Neighbors*
- *LTE1858: FDD Inter-band/Intra-band Carrier Aggregation with Two Flexi Zone Micro BTSs*
- *LTE1996: Flexi Zone Controller Application*
- *LTE1997: Discovery Mode Self Configuration for Flexi Zone AP*
- *LTE1998: Dynamic FZAP Plug & Play*
- *LTE2007: Inter-eNodeB Carrier Aggregation*
- *LTE2167: Additional Carrier Aggregation Band Combinations 3 CC – I*
- *LTE2180: FDD-TDD Downlink Carrier Aggregation 2 CC*
- *LTE2205: Configurable Uplink Interference Regions*
- *LTE2233: N-out-of-M Downlink Carrier Aggregation*
- *LTE2270: LTE TDD+FDD Inter-eNB CA Basic BTS Configurations*
- *LTE2316: FDD-TDD Downlink Carrier Aggregation 3CC*
- *LTE2370: Flexi Zone Inter-FZAP Carrier Aggregation*
- *LTE2465: CSG Cell Support*
- *LTE2539: MRO Inter-RAT UTRAN*

The following features are not supported by Eden-NET:

- RL10: *LTE539: Central ANR*
- RL20: *LTE492: ANR* - eNB functionality remains unchanged, but the PCI-IP address map is not generated automatically. The operator needs to provide the map manually or with some external tooling.
- RL70: *LTE1808: Automatic PUCCH Capacity Optimization*

The following LTE16A features consider Eden-NET as a cSON platform and will not be supported in the iSON Manager:

- *LTE1092: Uplink Carrier Aggregation – 2 CC*
- *LTE2531: FDD Downlink Carrier Aggregation – 4 CC/5 CC*
- *LTE2564: Centralized RAN CL16A Release*
- *LTE2557: Supplemental Downlink Carrier Extensions*
- *LTE2605: 4RX diversity 20 MHz Optimized Configurations*
- *LTE2633: System Upgrade to FDD-LTE 16A*

Impact on interfaces

The *LTE3051: Eden-NET replacing iSON as centralized SON solution* feature has no impact on interfaces.

Impact on network management tools

The LTE3051: Eden-NET replacing iSON as centralized SON solution feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE3051: Eden-NET replacing iSON as centralized SON solution* feature has no impact on system performance or capacity.

5.18.4 LTE3051 reference data

Requirements

Table 230 LTE3051 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not applicable	not applicable	not applicable	not applicable	not applicable

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not applicable	not applicable	not applicable	NetAct 16.8	not applicable	not applicable

Sales information

Table 231 LTE3051 sales information

Product structure class	License control	Activated by default
Application software (ASW) NetAct	-	No

5.18.5 Other instructions

Generic operator use cases and the interoperability with the Configurator describe how cSON handles the interaction with the operator in order to trigger the SON algorithms and how cSON interworks with NetAct Configurator.

Example: Use case: execution of a cSON module in an open-loop mode, triggered manually
Example: Use case: execution of a cSON module in an open-loop mode, triggered by the scheduler

Precondition

- NetAct Configurator and cSON are up and running.
- The corresponding module of cSON is available and licensed.
- The periodical refresh of the CM cache is running.
- The periodical refresh of the PM data is running.

Description

1. The operator selects the cells or an operator-defined set of cells (cluster) that shall be optimized.
2. The operator sets the parameters to control the SON module. For example in carrier aggregation:
   - frequency layers to aggregate
   - the number of cells to aggregate
   - in PCI Management: forbidden PCI, re-use distance, etc.

3. a) Manually triggered: the operator runs the cSON module in an open-loop mode.
   b) Scheduler triggered: the operator defines the time/schedule for cSON to trigger the module in an open-loop mode.
4. cSON runs the module, either immediately or as scheduled:
   - cSON evaluates the data and generates a report that lists the proposed changes. This report cannot be activated in the network automatically.

Post-condition

cSON presents a report file with the modifications proposed by the module.

Example: Use case: execution of a cSON module in a closed-loop mode, triggered manually

Example: Use case: execution of a cSON Module in a closed-loop mode, triggered by the scheduler

Precondition

- NetAct Configurator and cSON are up and running.
- The corresponding module of cSON is available and licensed.
- The periodical refresh of the CM cache is running.
- The periodical refresh of PM data is running.

Description

1. The operator selects the cells or an operator-defined set of cells (cluster) that shall be optimized.
2. The operator sets the parameters to control the SON module. For example in carrier aggregation:
   - frequency layers to aggregate
   - the number of cells to aggregate
   - in PCI Management: forbidden PCI, re-use distance, etc.
3. a) Manually triggered: the operator runs the cSON module in a closed-loop mode.
   b) Scheduler triggered: the operator defines the time/schedule for cSON to trigger the module in a closed-loop mode.
4. cSON runs the module, either immediately or as scheduled:
   - cSON evaluates the data and generates a RAML file that contains the changes (only changes, not non-changes). cSON provides context information according to *LTE1019: SON Report* to indicate the origin of the change in the Configurator's CM history.
   - cSON transfers the result to the Configurator.
   - cSON initiates to validate, download, and activate the results in the network.

Post-condition

- cSON presents a log file with the modifications proposed by the module.
- The latest refreshed configuration of the network is optimized, and the network is configured according to the results of cSON.

Example: Use case: Interactive, tool-assisted planning

Precondition

- NetAct Configurator and cSON are up and running.
- The corresponding module of cSON is available and licensed.
- The periodical refresh of the CM cache is running.

Description

1. The operator selects the cell or an operator-defined set of cells (cluster) that shall be optimized.
2. The operator sets the parameters to control the SON module. For example in carrier aggregation:
   - frequency layers to aggregate
   - the number of cells to aggregate
   - in PCI Management: forbidden PCI, re-use distance, etc.
3. The operator runs the cSON module in an open-loop mode.
4. cSON runs the algorithm and provides proposed optimizations in a log file.
5. The operator uses the log file and the map view to inspect the results.
6. In case the result is not as expected and parameters need tuning, the operator goes back to (2.); otherwise, the operator continues to the next step.
7. Optional: In case the result is as expected, the operator triggers, either manually or by using the scheduler, the cSON module in a closed-loop mode to download and activate the changes in the network. cSON provides context information according to *LTE1019: SON Report* to indicate the origin of the change in the Configurator's CM history

Post-condition

cSON presents a report with the modifications proposed by the module.

6 Descriptions of performance monitoring features

6.1 LTE2140: New Performance Counters LTE16A

The *LTE2140: New Performance Counters LTE16A* feature introduces new counters which improve performance monitoring capabilities in areas such as multiple inputs multiple outputs (MIMO), carrier aggregation (CA), quality of service (QoS), and voice over LTE (VoLTE).

6.1.1 LTE2140 benefits

The *LTE2140: New Performance Counters LTE16A* feature provides the following benefits:

- improved performance monitoring capabilities, especially in areas such as MIMO, CA, or VoLTE

6.1.2 LTE2140 functional description

The *LTE2140: New Performance Counters LTE16A* feature improves performance monitoring in the following areas:

MIMO

- MIMO rank indication attemps

Carrier aggregation (CA)

- the maximum number of users with a configured/activated second cell (SCell) or third CA cell

QoS class identifier (QCI)

- QCI2 bearers release per cause

Voice over LTE (VoLTE)

- inter-system handover preparation attempts with single radio voice call continuity (SRVCC) to UTRAN and GERAN
- failed inter-system handover preparation attempts with SRVCC to UTRAN and GERAN per cause

Terminal capabilities

- terminal-type distribution in cells for appropriate network configuration and planning
- UE distribution with regard to feature support and such capabilities as CA UL, CoMP UL, inter-frequency ANR, inter-RAT ANR, access stratum RL., CA bandwidth A–F.

Inter-frequency load balancing

- handover preparation failures due to admission control (AC) or not supported QCI

Exemples of features where *LTE2140's* counters might be activated

- *LTE1092: Uplink Carrier Aggregation – 2CC*
- *LTE2416: TDD Uplink 2CC Carrier Aggregation Extension*
- *LTE2493: Enhanced VoLTE Performance Monitoring*
- *LTE2511: Additional FDD-TDD Carrier Aggregation Band Combinations – I*
- *LTE2527: Additional Carrier Aggregation Band Combinations – IV*
- *LTE2528: Extension of Downlink 3CC Carrier Aggregation – II*
- *LTE2531: FDD Downlink Carrier Aggregation 4CC/5CC*
- *LTE2532: TDD Downlink Carrier Aggregation with 4 Layers MIMO*
- *LTE2611: Introduction of Public-safety-specific QCI Bearers*
- *LTE2766: Flexible QCI/ARP PM Counter Profiles*
- *LTE2782: RRC Reestablishment and RLF PM Counters per QCI Profile*

6.1.3 LTE2140 system impact

Interdependencies between features

There are no interdependencies between the *LTE2140: New Performance Counters LTE16A* feature and any other feature.

Impact on interfaces

The *LTE2140: New Performance Counters LTE16A* feature has no impact on interfaces.

Impact on network management tools

The *LTE2140: New Performance Counters LTE16A* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2140: New Performance Counters LTE16A* feature has no impact on system performance or capacity.

6.1.4 LTE2140 reference data

Requirements

Table 232 LTE2140 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Multiradio S4	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	support not required	NetAct 16.8	support not required	support not required

Measurements and counters

Table 233 New counters introduced by the LTE2140: New Performance Counters LTE 16A feature

Counter ID	Counter name	Measurement
M8006C282	EPC initiated QCI2 E-RAB releases due to Path Switch	LTE EPS Bearer
M8006C283	eNB initiated QCI2 E-RAB releases due to a failed Handover Completion phase at target cell	LTE EPS Bearer

Table 233 New counters introduced by the LTE2140: New Performance Counters LTE 16A feature (Cont.)

Counter ID	Counter name	Measurement
M8006C284	Total number of released QCI2 E-RABs initiated by the eNB	LTE EPS Bearer
M8006C285	eNB initiated QCI2 E-RAB releases due to user inactivity	LTE EPS Bearer
M8006C286	eNB initiated QCI2 E-RAB releases due to loss of connection to the UE	LTE EPS Bearer
M8006C287	eNB initiated QCI2 E-RAB releases due to insufficient transport resources	LTE EPS Bearer
M8006C288	eNB initiated QCI2 E-RAB releases due to redirect to another cell	LTE EPS Bearer
M8006C289	eNB initiated QCI2 E-RAB releases due to E-UTRAN Generated Reason	LTE EPS Bearer
M8006C290	eNB initiated QCI2 E-RAB releases due to "Radio Network Layer Cause - Radio resources not available"	LTE EPS Bearer
M8006C291	QCI2 E-RABs released due to partial Handover	LTE EPS Bearer
M8006C292	QCI2 E-RABs attempted to release due to outgoing Handover	LTE EPS Bearer
M8006C293	QCI2 E-RABs released due to successful outgoing Handover	LTE EPS Bearer
M8006C294	QCI2 E-RABs released due to failed Handover	LTE EPS Bearer
M8006C295	EPC initiated EPS Bearer Release requests per QCI2 due to Radio Network Layer cause	LTE EPS Bearer
M8006C296	EPC initiated EPS Bearer Release requests for QCI2 due to Other causes	LTE EPS Bearer
M8006C297	EPC initiated EPS Bearer Release requests for QCI2 due to Normal release by UE	LTE EPS Bearer
M8006C298	EPC initiated EPS Bearer Release requests for QCI2 due to Detach procedure by UE or MME	LTE EPS Bearer
M8010C115	UE reported RI 3	LTE Power and Quality DL
M8014C41	Failed Inter-eNB X2 Handover preparations due to not supported QCI	LTE Inter eNB Handover
M8014C42	Failed Inter-eNB S1 Handover preparations due to not supported QCI	LTE Inter eNB Handover
M8014C43	Failed Inter-eNB S1 Handover preparations to CSG cell due to not supported QCI	LTE Inter eNB Handover
M8014C44	Failed Inter-eNB X2 Load Balancing Handover preparations due to target admission control	LTE Inter eNB Handover

Table 233 New counters introduced by the LTE2140: New Performance Counters LTE 16A feature (Cont.)

Counter ID	Counter name	Measurement
M8014C45	Failed Inter-eNB S1 Load Balancing Handover preparations due to target admission control	LTE Inter eNB Handover
M8015C23	Failed Inter-eNB Handover preparations per neighbor cell relationship due to not supported QCI	LTE Neighbor cell related Handover
M8016C50	Inter-System Handovers preparations to UTRAN with SRVCC	LTE Inter System Handover
M8016C51	Failed Inter-System Handover preparations to UTRAN with SRVCC due to timer	LTE Inter System Handover
M8016C52	Failed Inter-System Handover preparations to UTRAN with SRVCC due to target eNB admission control	LTE Inter System Handover
M8016C53	Failed Inter-System Handover preparations to UTRAN with SRVCC caused by other reasons	LTE Inter System Handover
M8016C54	Inter-System Handover preparations to GERAN with SRVCC	LTE Inter System Handover
M8016C55	Failed Inter-System Handover preparations to GERAN with SRVCC due to timer	LTE Inter System Handover
M8016C56	Failed Inter-System Handover preparations to GERAN with SRVCC due to target eNB admission control	LTE Inter System Handover
M8016C57	Failed Inter-System Handover preparations to GERAN with SRVCC caused by other reasons	LTE Inter System Handover
M8042C0	Failed Inter-eNB S1 Handover preparations to Home eNB due to not supported QCI	LTE Inter Home eNB Handover
M8051C23	Maximum number of DL carrier aggregated capable UEs for 2 CCs.	LTE UE Quantity
M8051C24	Maximum number of DL carrier aggregated capable UEs for 3 CCs	LTE UE Quantity
M8051C25	Maximum number of UEs with one configured SCell	LTE UE Quantity
M8051C26	Maximum number of UEs with two configured SCells	LTE UE Quantity
M8051C27	Maximum number of UEs with one activated SCell	LTE UE Quantity
M8051C28	Maximum number of UEs with two activated SCells	LTE UE Quantity
M8051C29	Maximum number of UEs with three activated SCells	LTE UE Quantity
M8051C30	Maximum number of UEs with four activated SCells	LTE UE Quantity
M8051C39	Average number of active UEs with UE Category 9	LTE UE Quantity

Table 233 New counters introduced by the LTE2140: New Performance Counters LTE 16A feature (Cont.)

Counter ID	Counter name	Measurement
M8051C40	Average number of active UEs with UE Category 10	LTE UE Quantity
M8051C41	Maximum number of active UEs with UE Category 1	LTE UE Quantity
M8051C42	Maximum number of active UEs with UE Category 2	LTE UE Quantity
M8051C43	Maximum number of active UEs with UE Category 3	LTE UE Quantity
M8051C44	Maximum number of active UEs with UE Category 4	LTE UE Quantity
M8051C45	Maximum number of active UEs with UE Category 5	LTE UE Quantity
M8051C46	Maximum number of active UEs with UE Category 6	LTE UE Quantity
M8051C47	Maximum number of active UEs with UE Category 7	LTE UE Quantity
M8051C48	Maximum number of active UEs with UE Category 8	LTE UE Quantity
M8051C49	Maximum number of active UEs with UE Category 9	LTE UE Quantity
M8051C50	Maximum number of active UEs with UE Category 10	LTE UE Quantity
M8051C51	Maximum number of active UEs with UE Category 11	LTE UE Quantity
M8051C52	Maximum number of active UEs with UE Category 12	LTE UE Quantity
M8051C64	Average number of UEs supporting Inter-frequency ANR	LTE UE Quantity
M8051C65	Average number of UEs supporting Inter-RAT ANR	LTE UE Quantity
M8051C66	Average number of UEs supporting Rel-10 Access Stratum Release	LTE UE Quantity
M8051C67	Average number of UEs supporting Rel-11 Access Stratum Release	LTE UE Quantity
M8051C68	Average number of UEs supporting Rel-12 Access Stratum Release	LTE UE Quantity
M8051C69	Average number of UEs supporting Rel-8 Access Stratum Release	LTE UE Quantity
M8051C70	Average number of UEs supporting Rel-9 Access Stratum Release	LTE UE Quantity
M8051C71	Average number of UEs supporting UL CA	LTE UE Quantity
M8051C72	Average number of UEs supporting UL CoMP	LTE UE Quantity

Table 233 New counters introduced by the LTE2140: New Performance Counters LTE 16A feature (Cont.)

Counter ID	Counter name	Measurement
M8051C73	Average number of UEs with CA bandwidth class A	LTE UE Quantity
M8051C74	Average number of UEs with CA bandwidth class B	LTE UE Quantity
M8051C75	Average number of UEs with CA bandwidth class C	LTE UE Quantity
M8051C76	Average number of UEs with CA bandwidth class D	LTE UE Quantity
M8051C77	Average number of UEs with CA bandwidth class E	LTE UE Quantity
M8051C78	Average number of UEs with CA bandwidth class F	LTE UE Quantity
M8051C79	Maximum number of UEs supporting Inter-frequency ANR	LTE UE Quantity
M8051C80	Maximum number of UEs supporting Inter-RAT ANR	LTE UE Quantity
M8051C81	Maximum number of UEs supporting Rel-10 Access Stratum Release	LTE UE Quantity
M8051C82	Maximum number of UEs supporting Rel-11 Access Stratum Release	LTE UE Quantity
M8051C83	Maximum number of UEs supporting Rel-12 Access Stratum Release	LTE UE Quantity
M8051C84	Maximum number of UEs supporting Rel-8 Access Stratum Release	LTE UE Quantity
M8051C85	Maximum number of UEs supporting Rel-9 Access Stratum Release	LTE UE Quantity
M8051C86	Maximum number of UEs supporting UL CA	LTE UE Quantity
M8051C87	Maximum number of UEs supporting UL CoMP	LTE UE Quantity
M8051C88	Maximum number of UEs with CA bandwidth class A	LTE UE Quantity
M8051C89	Maximum number of UEs with CA bandwidth class B	LTE UE Quantity
M8051C90	Maximum number of UEs with CA bandwidth class C	LTE UE Quantity
M8051C91	Maximum number of UEs with CA bandwidth class D	LTE UE Quantity
M8051C92	Maximum number of UEs with CA bandwidth class E	LTE UE Quantity
M8051C93	Maximum number of UEs with CA bandwidth class F	LTE UE Quantity

Note: Counters presented in Table 4 are existing counters moved from M8001 to M8051 measurement type LTE UE quantity. For more information see *RISE*.

Table 234 Existing counters realted to the LTE2140: New Performance Counters LTE 16A feature

Counter ID	Counter name	Measurement
M8051C31	Average number of active UEs with UE Category 1	LTE UE Quantity
M8051C32	Average number of active UEs with UE Category 2	LTE UE Quantity
M8051C33	Average number of active UEs with UE Category 3	LTE UE Quantity
M8051C34	Average number of active UEs with UE Category 4	LTE UE Quantity
M8051C35	Average number of active UEs with UE Category 5	LTE UE Quantity
M8051C36	Average number of active UEs with UE Category 6	LTE UE Quantity
M8051C37	Average number of active UEs with UE Category 7	LTE UE Quantity
M8051C38	Average number of active UEs with UE Category 8	LTE UE Quantity
M8051C53	Average number of CA UE with one configured UL Scell	LTE UE Quantity
M8051C54	Average Number of UL carrier aggregated capable UEs for 2CCs	LTE UE Quantity
M8051C55	RRC Connected UEs Avg	LTE UE Quantity
M8051C56	RRC Connected UEs Max	LTE UE Quantity
M8051C57	Active UE per Cell average	LTE UE Quantity
M8051C58	Active UE per Cell max	LTE UE Quantity
M8051C59	Average number of active UEs with UE supporting TM9 and 4 layers transmission simultaneously	LTE UE Quantity
M8051C60	Sum of RRC Connected UEs per cell	LTE UE Quantity
M8051C61	Denominator for RRC Connected UEs per cell	LTE UE Quantity
M8051C62	Sum of Active UEs per cell	LTE UE Quantity
M8051C63	Denominator for Active UEs per cell	LTE UE Quantity
M8051C96	Average number of paired UEs per TTI in UL MU-MIMO mode.	LTE UE Quantity
M8051C97	UEs with buffered UL data for DRB with QCI 1	LTE UE Quantity
M8051C98	UEs with buffered UL data for non-GBR DRB	LTE UE Quantity
M8051C99	Sum of Active UEs with buffered data in UL per cell	LTE UE Quantity

Table 234 Existing counters realted to the LTE2140: New Performance Counters LTE 16A feature (Cont.)

Counter ID	Counter name	Measurement
M8051C100	Denominator for Active UEs with buffered data in UL per cell	LTE UE Quantity
M8051C101	Sum of Active UEs with buffered data in DL per cell	LTE UE Quantity
M8051C102	Denominator for Active UEs with buffered data in DL per cell	LTE UE Quantity
M8051C103	Sum of active UEs per cell, which had data scheduled in UL.	LTE UE Quantity
M8051C104	Denominator for active UEs per cell, which had data scheduled in UL.	LTE UE Quantity
M8051C105	Sum of active UEs per cell, which had data scheduled in DL.	LTE UE Quantity
M8051C106	Denominator for active UEs per cell, which had data scheduled in DL.	LTE UE Quantity
M8051C107	Average number of UEs with buffered data in DL	LTE UE Quantity
M8051C108	Max number of UEs with buffered data in DL	LTE UE Quantity
M8051C109	Average number of UEs with buffered data in UL	LTE UE Quantity
M8051C110	Max number of UEs with buffered data in UL	LTE UE Quantity
M8051C111	UEs with buffered DL data for DRB with QCI 1	LTE UE Quantity
M8051C112	UEs with buffered DL data for QCI2 bearer	LTE UE Quantity
M8051C113	UEs with buffered DL data for QCI3 bearer	LTE UE Quantity
M8051C114	UEs with buffered DL data for QCI4 bearer	LTE UE Quantity
M8051C115	UEs with buffered DL data for non-GBR DRB	LTE UE Quantity
M8051C116	Average number of UEs with one activated SCell	LTE UE Quantity
M8051C117	Average number of UEs with two activated SCells	LTE UE Quantity
M8051C118	Average number of UL CA UE with one activated Scell	LTE UE Quantity
M8051C119	Average number of UEs using UL intra-eNB CoMP	LTE UE Quantity
M8051C120	Average number of UEs considered by L3 RRM for UL intra-eNB CoMP	LTE UE Quantity
M8051C121	Average number of DL carrier aggregated capable UEs for 2 CCs	LTE UE Quantity
M8051C122	Average number of DL carrier aggregated capable UEs for 3 CCs	LTE UE Quantity

Table 234 Existing counters realted to the LTE2140: New Performance Counters LTE 16A feature (Cont.)

Counter ID	Counter name	Measurement
M8051C123	Average number of UEs with one configured SCell	LTE UE Quantity
M8051C124	Average number of UEs with two configured SCells	LTE UE Quantity

For counter descriptions, see *LTE Radio Access Operating Documentation/Reference/Counters*.

Parameters

There are no parameters related to the *LTE2140: New Performance Counters LTE 16A* feature.

Sales information

Table 235 LTE2140 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

6.2 LTE2493: Enhanced VoLTE Performance Monitoring

The *LTE2493: Enhanced VoLTE Performance Monitoring* feature introduces new counters for monitoring quality of service (QoS) for voice over LTE (VoLTE).

6.2.1 LTE2493 benefits

The *LTE2493: Enhanced VoLTE Performance Monitoring* feature provides the following benefit:

- Deeper insight into the VoLTE performance

6.2.2 LTE2493 functional description

The *LTE2493: Enhanced VoLTE Performance Monitoring* feature enables collecting information about voice over LTE's (VoLTE) performance.

VoLTE BLER distribution

BLER is a ratio of the number of erroneous transport blocks to the total number of transport blocks. BLER distributions, separately for DL and UL, might be portrayed on an 11-bin histogram as follows:

Bin1: 0 <= Residual BLER Rate <= 0.5

Bin2: 0.5 < Residual BLER Rate <= 1

Bin3: 1 < Residual BLER Rate <= 1.5

Bin4: 1.5 < Residual BLER Rate <= 2

Bin5: 2 < Residual BLER Rate <= 2.5

Bin6: 2.5 < Residual BLER Rate <= 3

Bin7: 3 < Residual BLER Rate <= 3.5

Bin8: 3.5 < Residual BLER Rate <= 4

Bin9: 4 < Residual BLER Rate <= 4.5

Bin10: 4.5 < Residual BLER Rate <= 5

Bin11: 5 < Residual BLER Rate

Note: The sampling period for histogram counters is 10240 ms, for which at least 200 HARQ transmissions are performed in order to obtain reliable values of BLER samples in the standard loaded cells. The residual BLER is a BLER after maximum number of HARQ transmissions

6.2.3 LTE2493 system impact

Interdependencies between features

There are no interdependencies between the *LTE2493: Enhanced VoLTE Performance Monitoring* feature and any other feature.

Impact on interfaces

The *LTE2493: Enhanced VoLTE Performance Monitoring* feature has no impact on interfaces.

Impact on network management tools

The *LTE2493: Enhanced VoLTE Performance Monitoring* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2493: Enhanced VoLTE Performance Monitoring* feature has no impact on system performance or capacity.

6.2.4 LTE2493 reference data

Requirements

Table 236 LTE2493 hardware and software requirements

System release	Flexi Multiradio 10 BTS	Flexi Multiradio 10 Indoor BTS	AirScale	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	support not required	NetAct 16.8	support not required	support not required

BTS faults and reported alarms

There are no faults and alarms related to the *LTE2493: Enhanced VoLTE Performance Monitoring* feature.

Commands

There are no commands related to the *LTE2493: Enhanced VoLTE Performance Monitoring* feature.

Measurements and counters

Table 237 New counters introduced by *LTE2493*

Counter ID	Counter name	Measurement
M8026C264	PDCP SDUs QCI1 (VoLTE) received within preconfigured delay in DL	LTE QoS
M8026C265	QCI1 (VoLTE) UEs in good conditions in DL	LTE QoS
M8026C266	QCI1 (VoLTE) UEs in bad conditions in DL	LTE QoS
M8026C267	Number of failed TB transmissions after max HARQ count for QCI1(VoLTE) in DL	LTE QoS
M8026C268	Total number of initial HARQ transmissions for QCI1(VoLTE) in DL	LTE QoS
M8026C269	Number of failed TB transmissions after max HARQ count for QCI1(VoLTE) in UL	LTE QoS
M8026C270	Total number of initial HARQ transmissions for QCI1(VoLTE) in UL	LTE QoS
M8026C272	Average UL Grant after SR reception delay for QCI1 UEs	LTE QoS
M8054C0	Downlink QCI1 (VoLTE) Residual BLER Bin1	LTE VoLTE BLER Histogram
M8054C1	Downlink QCI1 (VoLTE) Residual BLER Bin2	LTE VoLTE BLER Histogram
M8054C2	Downlink QCI1 (VoLTE) Residual BLER Bin3	LTE VoLTE BLER Histogram
M8054C3	Downlink QCI1 (VoLTE) Residual BLER Bin4	LTE VoLTE BLER Histogram
M8054C4	Downlink QCI1 (VoLTE) Residual BLER Bin5	LTE VoLTE BLER Histogram
M8054C5	Downlink QCI1 (VoLTE) Residual BLER Bin6	LTE VoLTE BLER Histogram
M8054C6	Downlink QCI1 (VoLTE) Residual BLER Bin7	LTE VoLTE BLER Histogram
M8054C7	Downlink QCI1 (VoLTE) Residual BLER Bin8	LTE VoLTE BLER Histogram
M8054C8	Downlink QCI1 (VoLTE) Residual BLER Bin9	LTE VoLTE BLER Histogram
M8054C9	Downlink QCI1 (VoLTE) Residual BLER Bin10	LTE VoLTE BLER Histogram
M8054C10	Downlink QCI1 (VoLTE) Residual BLER Bin11	LTE VoLTE BLER Histogram
M8054C11	Uplink QCI1 (VoLTE) Residual BLER Bin1	LTE VoLTE BLER Histogram
M8054C12	Uplink QCI1 (VoLTE) Residual BLER Bin2	LTE VoLTE BLER Histogram
M8054C13	Uplink QCI1 (VoLTE) Residual BLER Bin3	LTE VoLTE BLER Histogram

Table 237 New counters introduced by *LTE2493* (Cont.)

Counter ID	Counter name	Measurement
M8054C14	Uplink QCI1 (VoLTE) Residual BLER Bin4	LTE VoLTE BLER Histogram
M8054C15	Uplink QCI1 (VoLTE) Residual BLER Bin5	LTE VoLTE BLER Histogram
M8054C16	Uplink QCI1 (VoLTE) Residual BLER Bin6	LTE VoLTE BLER Histogram
M8054C17	Uplink QCI1 (VoLTE) Residual BLER Bin7	LTE VoLTE BLER Histogram
M8054C18	Uplink QCI1 (VoLTE) Residual BLER Bin8	LTE VoLTE BLER Histogram
M8054C19	Uplink QCI1 (VoLTE) Residual BLER Bin9	LTE VoLTE BLER Histogram
M8054C20	Uplink QCI1 (VoLTE) Residual BLER Bin10	LTE VoLTE BLER Histogram
M8054C21	Uplink QCI1 (VoLTE) Residual BLER Bin11	LTE VoLTE BLER Histogram

Table 239 LTE2493 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	–	Yes

6.3 LTE2766: Flexible QCI/ARP PM Counter Profiles

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature introduces new configurable counters and provides an additional function with more flexible and dynamic configuration options especially for the operator-configurable QoS class indicators (QCIs). The existing statically defined performance management (PM) counters that are QCI-differentiated are untouched and are available as before.

6.3.1 LTE2766 benefits

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature provides the ability to investigate into details the performance of the eNB on a per-QCI and on a per-allocation and retention priority (ARP) resolution.

6.3.2 LTE2766 functional description

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature provides a configurable selection or groups of counters with certain QCIs and ARPs that are selected by the operator.

A profile is defined as one certain QCI or a combination of one certain QCI and one certain ARP.

The QCIs can be chosen from the following:

- Overall range of the standardized (*3GPP 23.203*) QCIs:
  - 1 to 9
  - 65, 66, 69, and 70
- Operator-specific QCIs (range is 128 to 254)

The ARP further differentiates each profile set up by a certain QCI from a range of 1 to 15, defined as:

Profile_x = {QCI_y; ARP_z} or {QCI_y}

where

- 1 <= x <= 20
- 1 <= y <= 9 or y = {65, 66, 69, 70} or 128 <= y <= 254
- 1 <= z <= 15

Note: A maximum of 20 profiles can be configured. Configuring a large number of profiles is not recommended as it has an impact on the overall eNB capacity and performance.

The following categories can be enabled or disabled separately for every profile collection of the PM counters:

- Maximum and average number of active users per cell having established bearers with the specific QCI or ARP combination
- Data volume in the uplink (UL) and downlink (DL)
- E-RAB accessibility
  - Setup attempts and successes
  - For initial and additional E-RAB setups
- E-RAB retainability
  - Normal E-RAB releases
  - Abnormal E-RAB releases (while having data in buffer)
  - E-RAB activity
- Integrity
  - Average active packet data convergence protocol (PDCP) cell throughput in the UL and DL
  - Latency

6.3.3 LTE2766 system impact

LTE2766: Flexible QCI/ARP PM Counter Profiles impact on features and system performance and capacity

Interdependencies between features

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature affects the following features:

- *LTE7: Support of Multiple EPS Bearers*
- *LTE9: Service Differentiation*
- *LTE10: EPS Bearer for Conversational Voice – Support of QCI 1*
- *LTE496: Support of QCI 2, 3, and 4*
- *LTE497: Smart Admission Control*
- *LTE518: Operator-specific QCIs*
- *LTE519: eRAB Modification*
- *LTE534: ARP-based Admission Control for E-RABs*
- *LTE1231: Operator-specific GBR QCIs*
- *LTE1321: eRAB Modification GBR*

Impact on interfaces

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature has no impact on interfaces.

Impact on network management tools

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature affects system performance and capacity. Keeping the number of PMQAP profiles as low as possible is advised because a high number of PMQAP profiles have significant impact on system performance and capacity.

6.3.4 LTE2766 reference data

LTE2766: Flexible QCI/ARP PM Counter Profiles requirements, measurements and counters, parameters, and sales information

Requirements

Table 240 LTE2766 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale FDD	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

Table 246 New counters introduced by *LTE2804*

Counter ID	Counter name	Measurement
M8052C 0	Number of RSRP measurements bin1	LTE RSRP and RSRQ Histogram
M8052C 1	Number of RSRP measurements bin2	LTE RSRP and RSRQ Histogram
M8052C 2	Number of RSRP measurements bin3	LTE RSRP and RSRQ Histogram
M8052C 3	Number of RSRP measurements bin4	LTE RSRP and RSRQ Histogram
M8052C 4	Number of RSRP measurements bin5	LTE RSRP and RSRQ Histogram
M8052C 5	Number of RSRP measurements bin6	LTE RSRP and RSRQ Histogram
M8052C 6	Number of RSRP measurements bin7	LTE RSRP and RSRQ Histogram
M8052C 7	Number of RSRP measurements bin8	LTE RSRP and RSRQ Histogram
M8052C 8	Number of RSRP measurements bin9	LTE RSRP and RSRQ Histogram
M8052C 9	Number of RSRP measurements bin10	LTE RSRP and RSRQ Histogram
M8052C 10	Number of RSRP measurements bin11	LTE RSRP and RSRQ Histogram
M8052C 11	Number of RSRP measurements bin12	LTE RSRP and RSRQ Histogram
M8052C 12	Number of RSRP measurements bin13	LTE RSRP and RSRQ Histogram
M8052C 13	Number of RSRP measurements bin14	LTE RSRP and RSRQ Histogram
M8052C 14	Number of RSRP measurements bin15	LTE RSRP and RSRQ Histogram
M8052C 15	Number of RSRP measurements bin16	LTE RSRP and RSRQ Histogram
M8052C 16	Number of RSRP measurements bin17	LTE RSRP and RSRQ Histogram
M8052C 17	Number of RSRP measurements bin18	LTE RSRP and RSRQ Histogram
M8052C 18	Number of RSRQ measurements bin1	LTE RSRP and RSRQ Histogram
M8052C 19	Number of RSRQ measurements bin2	LTE RSRP and RSRQ Histogram
M8052C 20	Number of RSRQ measurements bin3	LTE RSRP and RSRQ Histogram
M8052C 21	Number of RSRQ measurements bin4	LTE RSRP and RSRQ Histogram

Table 246 New counters introduced by *LTE2804* (Cont.)

Counter ID	Counter name	Measurement
M8052C 22	Number of RSRQ measurements bin5	LTE RSRP and RSRQ Histogram
M8052C 23	Number of RSRQ measurements bin6	LTE RSRP and RSRQ Histogram
M8052C 24	Number of RSRQ measurements bin7	LTE RSRP and RSRQ Histogram
M8052C 25	Number of RSRQ measurements bin8	LTE RSRP and RSRQ Histogram
M8052C 26	Number of RSRQ measurements bin9	LTE RSRP and RSRQ Histogram
M8052C 27	Number of RSRQ measurements bin10	LTE RSRP and RSRQ Histogram

For counter descriptions, see *LTE Radio Access Operating Documentation/Reference/Counters*.

Key performance indicators

There are no key performance indicators related to the

6.5.3 LTE2915 system impact

LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles impact on features and network management tools

Interdependencies between features

The *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles* feature affects the following features:

- *LTE2766: Flexible QCI/ARP PM Counter Profiles*
  This feature provides a configurable selection or groups of counters with certain QCIs and ARPs including the range of the operator-specific QCIs (128 to 254).
- *LTE2782: RRC Re-establishment and RLF PM Counters per QCI Profile*
  This feature introduces counters for monitoring RLF statistics separately for every QCI-ARP profile (introduced in the *LTE2766: Flexible QCI/ARP PM Counter Profiles* feature), which allows optimization of QCI-dependent parameters.

Impact on interfaces

The *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles* feature has no impact on interfaces.

Impact on network management tools

The *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles* feature affects system performance and capacity. Keeping the number of PMQAP profiles as low as possible is advised because a high number of PMQAP profiles have significant impact on system performance and capacity.

6.5.4 LTE2915 reference data

LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles requirements, measurements and counters, and sales information

Requirements

Table 249 LTE2915 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale FDD	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	SBTS16A	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE2915: Flexible QCI/PLMN-ID PM Counter Profiles* feature.

7 Description of Flexi Zone Controller features

7.1 LTE2576: Integrated GMC and BC Support on Flexi Zone Controller

The *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature provides an integrated IEEE1588v2 Grand Master Clock (GMC) and Boundary Clock (BC). An integrated GMC and BC eliminates the need for an external GMC within or outside the operator's Local Area Network (LAN). It also supports both Time and Phase synchronization.

7.1.1 LTE2576 benefits

The *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature provides the following benefits:

- complete Zone Controller solution with support for Phase and Time 1588v2 ToP
- accurate Phase/Time Synchronization sent to FZAPs from the FZC
- eliminates the need for an external GMC and BC
- occupies less space and requires less cabling thereby lowering backhaul requirements
- increases savings and reduces costs for operators

7.1.2 LTE2576 functional description

The Flexi Zone Controller hardware platform supports the optional integrated IEEE1588v2 GMC/BC Module. The module provides the following capabilities:

- Multi-GNSS antenna with integrated receiver
- Front panel Serial Port for debugging and maintenance
- Optional 1PPS output for maintenance
- RS-422 connector for 1PPS and "Time at the Pulse" serial data
- 100 FZAP supported for a single GMC License with an option to scale up to 500 FZAPs
- Support for both Time and Phase synchronization
- Accuracy at client ~±1 us or better
- Support for ITU-T G.8275.2 Telecom Profile for phase synchronization in non-daisy chained deployments
- Support for ITU-T G.8261 and G.8271 Telecom Profiles
- Clock performance to meet TDD-LTE and LTE-A synchronization requirements
- Support for both Unicast and Multicast modes (G8275.1)

7.1.3 LTE2576 system impact

Interdependencies between features

The *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature impacts the following features:

- *LTE1996: Flexi Zone Controller Application*
  This feature provides the basic capability to host the Flexi Zone Controller Application on the BCN platform.
- LTE2203 (Base FZC features): Flexi Zone Controller Application on BCN Platform
  The platform provides scalability, capacity, and redundancy required by the Flexi Zone Controller Applications.

Impact on interfaces

The *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature has no impact on interfaces.

Impact on network management tools

The *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature has no impact on system performance or capacity.

7.1.4 LTE2576 reference data

Requirements

Table 254 LTE2576 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Support not required	Support not required	Support not required	Support not required	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FLC16A	Support not required	Support not required	NetAct 16.8	Support not required	Support not required

Alarms

Information on alarms for the *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature will be made available in a future release.

Measurements and counters

There are no measurements or counters related to the *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature.

Parameters

Information on parameters for the *LTE2576: Integrated GMC & BC Support on Flexi Zone Controller* feature will be made available in a future release.

Sales information

Table 255 LTE2576 sales information

Product structure class	License control	Activated by default
Application software (ASW)	SW Asset Monitoring	Yes

7.2 LTE2373: Vendor Certificate Usage for Flexi Zone Controller

The *LTE2373: Vendor Certificate Usage for Flexi Zone Controller* feature uses the installed vendor certificates on the Flexi Zone Controller for various applications. It extends the support for Certificate Management Protocol (CMP) implementation and secures the Site Manager interface.

7.2.1 LTE2373 benefits

The *LTE2373: Vendor Certificate Usage for Flexi Zone Controller* feature provides enhanced security by using vendor certificates on the Flexi Zone Controller together with the operator's Public Key Infrastructure.

7.2.2 LTE2373 functional description

Flexi Zone Controller supports the installation of vendor certificates through factory and repair centers. These installed vendor certificates (including Nokia's intermediate factory CA and Root certificates) are stored in a secure storage on the BCN platform.

This feature uses the installed Nokia's certificates for:

- Securing Site Manager interface using Transport Layer Security (TLS)
- CMP Implementation

The feature also provides alarms to notify the operators when the installed certificates are about to expire. Additionally, the feature supports auto-renewal of installed certificates.

7.2.3 LTE2373 system impact

Interdependencies between features

The *LTE2373: Vendor Certificate Usage for Flexi Zone Controller* feature has no interdependencies with other features.

Impact on interfaces

The *LTE2373: Vendor Certificate Usage for Flexi Zone Controller* feature has no impact on interfaces.

Impact on network management tools

The *LTE2373: Vendor Certificate Usage for Flexi Zone Controller* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2373: Vendor Certificate Usage for Flexi Zone Controller* feature has no impact on system performance and capacity.

7.2.4 LTE2373 reference data

Requirements

Table 256 LTE2373 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Support not required	Support not required	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FLC16A	Support not required	Support not required	NetAct 16.8	Support not required	Support not required

Table 259 FDD RTWP threshold values (Cont.)

Bandwidth (MHz)	Value (dBm)
15	-107
20	-106

8.1.3 LTE2805 system impact

LTE2805: Monitoring RX Sensitivity has no impact on features, interfaces, network management tools, and system performance and capacity.

8.1.4 LTE2805 reference data

Requirements

Table 260 LTE2805 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point	Flexi Zone Controller
FDD-LTE16A	not supported	FL16A	not supported	not supported	not supported	

ADMIN can be triggered from BTS SM, NetAct, or the operator's PC. When executed from NetAct, it supports the single sign-on. The operator can invoke a maximum of 10 instances of the ADMIN tool on an eNB simultaneously without influencing the throughput of eNB connection.

Note: The operator must have a read-write access to the eNB in order to launch the ADMIN tool.

As long as the ADMIN tool remains launched and open, it is continuously updated so that it always has the latest BTS information.

8.2.3 LTE2883 system impact

LTE2883: Application of Diagnostic and Maintenance for Intelligent Network has no impact on features, interfaces, network management tools, and system performance and capacity.

8.2.4 LTE2883 reference data

Requirements

Table 264 LTE2883 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	LTE OMS 16A	support not required	16.8	support not required	support not required

Alarms

There are no alarms related to the *LTE2883: Application of Diagnostic and Maintenance for Intelligent Network* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2883: Application of Diagnostic and Maintenance for Intelligent Network* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2883: Application of Diagnostic and Maintenance for Intelligent Network* feature.

Parameters

There are no parameters related to the *LTE2883: Application of Diagnostic and Maintenance for Intelligent Network* feature.

Sales information

Table 265 LTE2883 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

With extended cell radius configured, sufficient coding rate used for message 2 and message 4 transmissions of Random Access Procedure must be ensured. Sufficient code rate must also be ensured for System Information Blocks (SIB) and paging messages.

The following features should be carefully considered in very long range cells due to potentially degraded KPIs:

- *LTE10: EPS Bearers for Conversational Voice*
- *LTE496: Support of QCI 2, 3 and 4*

The following features are not supported with the *LTE180: Cell radius max 100 km* feature:

- *LTE48: Support of High Speed Users*
- *LTE72: 4-way RX diversity*
- *LTE980: IRC for 4 RX paths*
- *LTE568: DL adaptive closed loop MIMO (4x2)*
- *LTE1987: Downlink Adaptive Close Loop SU MIMO (4x4)*
- *LTE117: Cell Bandwidth - 1.4.MHz*
- *LTE1542: FDD Supercell*
- LTE2445: Combined Supercell
- *LTE1709: Liquid Cell*
- *LTE2091: FDD SuperCell extension*

Impact on interfaces

The *LTE180: Cell radius max 100 km* feature impacts interfaces as follows:

- Air interface (Uu)
  Packet Random Access Channel (PRACH) format3 length is 2.28 ms, thus spanning over three Transmission Time Intervals (TTIs) in uplink.

Impact on network management tools

The *LTE180: Cell radius max 100 km* feature has no impact on network management tools.

Impact on system performance

The *LTE180: Cell radius max 100 km* feature impacts system performance in three areas as shown in the table below:

Table 266 LTE180 impact on system performance

Throughput	Quality	Latency
The slight impact on the UL throughput is caused by three TTIs being used by PRACH preamble format3 per PRACH opportunity. Compare that to one TTI allocated to PRACH format0, or two TTIs to PRACH format1.	The 3GPP PRACH receiver performance requirements specified by TS 36.104 and TS 36.141 are met.	Since extended cell radius with PRACH format3 requires three TTIs for the RACH reception, there is a greater delay compared to format0 (one TTI) or format1 (two TTIs).

9.1.4 LTE180 reference data

LTE180: Cell radius max 100 km requirements, parameters, and sales information

Requirements

Table 267 LTE180 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL17	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	NetAct 16.8	Support not required	Support not required

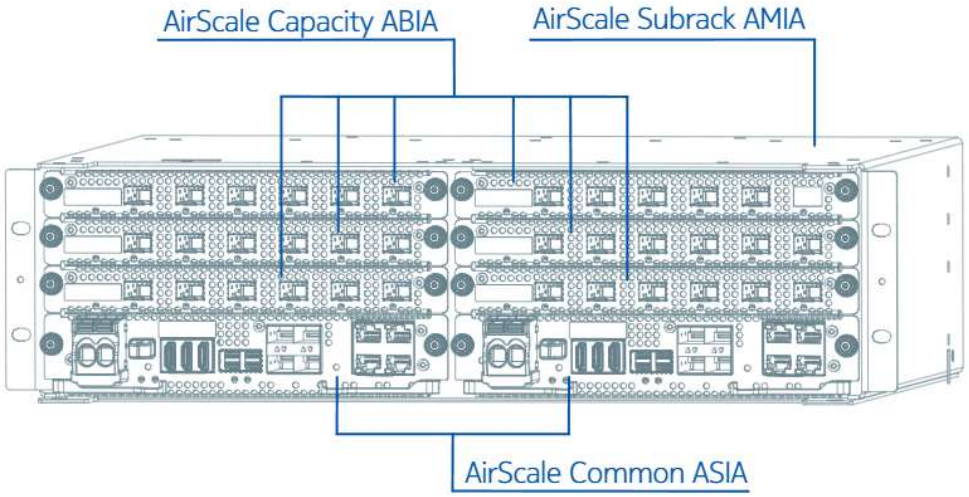
9.2.2 LTE2114 functional description

Nokia AirScale System Module Indoor consists of the following items:

- One AirScale Subrack (AMIA), including backplane for high bandwidth connectivity between processing plug-in units
- One or two AirScale Common (ASIA) plug-in units for transport interfacing and for centralized processing
- Up to six AirScale Capacity (ABIA) plug-in units for baseband processing and for optical interfaces with radio units

The figure below presents the AirScale System Module Indoor.

Figure 42 AirScale SM Indoor



AirScale System Module Indoor consists of the following items in minimum starting configuration:

- One AirScale Subrack (AMIA)
- One AirScale Common (ASIA)
- One AirScale Capacity (ABIA)

The processing capacity of the AirScale SM Indoor can be extended by adding more ABIA plug-in units. One half of the AMIA can accommodate one ASIA plug-in unit and up to three ABIA plug-in units within the left or right half of the indoor subrack. Further, one AMIA can accommodate two of the above sub-configurations within 3U height.

For supported HW configurations, see the *Creating Nokia AirScale BTS FDD-LTE Configurations* document.

The AirScale SM Indoor is IP20 ingress protected and operates at the temperature range from -5 to +55 °C.

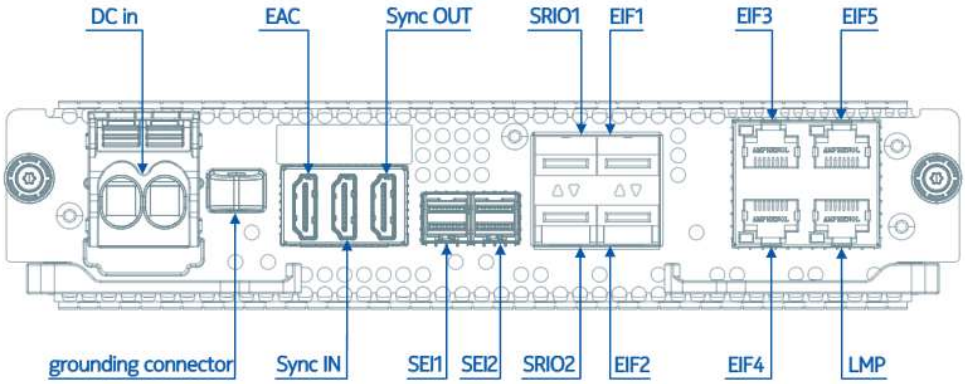
The following functions are integrated in the ASIA:

- Ethernet transport
- Clock and control functions

- Fan control
- Status LEDs

The figure below presents the front view of the AirScale Common (ASIA).

Figure 43 Front panel of the ASIA



The ASIA plug-in card provides the following interfaces:

- three electrical 1000Base-T transport interfaces
- two optical 1000/10GBase-X/R transport interfaces
- two Mini SAS-HD connectors for an external System Module extension
- two SRIO (Serial Rapid Input/Output) for an external System Module extension
- one electrical interface 1000Base-T as an LMP (Local Management Port)
- one Sync IN and one Sync OUT interface
- one EAC (External Alarm and Control) interface
- one -48 VDC power input
- grounding connector

For more information, see the *Nokia AirScale Base Station Product Description* document.

9.2.3 LTE2114 system impact

LTE2114 impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features are required for AirScale System Module Indoor:

- *LTE2114: AirScale Common ASIA* (described in this document)
- *LTE2261: AirScale Capacity ABIA*
- *LTE2262: AirScale Subrack AMIA*

Impact on interfaces

The *LTE2114: AirScale Common ASIA* feature has no impact on interfaces.

Impact on network management tools

The *LTE2114: AirScale Common ASIA* feature has no impact on network management tools.

Impact on system performance and capacity

New configurations are available. For more information, see the *Creating Nokia AirScale BTS FDD-LTE Configurations* document.

9.2.4 LTE2114 reference data

LTE2114 requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 271 LTE2114 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	Support not required	Support not	

- Possibility of vertical and horizontal installation

9.3.2 LTE2252 functional description

The main features of the FCOB are as follows:

- IP55 protection for indoor system module deployment in outdoor environment
- From -40°C (-40°F) to 50°C (122°F) environment operating temperature and from -5°C (23°F) to 55°C (131°F) operating temperature for internal equipment
- From 5% to 85% relative humidity
- 4U internal space
- Working status of the cabinet monitored and collected via system module EAC interface
- Flexible installation options: FCOB is designed to be mounted onto a wall, pole or floor
- 29 kg (63.9 lbs) weight

The dimensions of FCOB are:

- Height: 600 mm (23.6 in.)
- Depth: 600 mm (23.6 in.)
- Width: 380 mm (15.0 in.)

The FCOB has four external alarms:

- Door alarm
- Internal fans alarm
- External fans alarm
- High temperature alarm

The following are the FCOB installation configurations:

- FSIH full configuration (FSIH+2xFBIH) + FYGG/E or other optional unit
- AirScale SM Indoor full configuration (AirScale Subrack (AMIA)+2x AirScale Common (ASIA)+6x AirScale Capacity (ABIA)) + FYGG/E or other optional unit

Note: Consult Nokia about your optional unit configuration.

Note: AirScale SM Indoor installation inside of the FCOB is supported from FDD-LTE 16A onwards.

For more information on FCOB, see *Flexi Multiradio Base Station and Flexi Multiradio 10 Base Station Optional Items Description*.

9.3.3 LTE2252 system impact

LTE2252: FSM OD-Cabinet FCOB has no impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

There are no interdependencies between the *LTE2252: FSM OD-Cabinet FCOB* feature and any other feature.

Impact on interfaces

The *LTE2252: FSM OD-Cabinet FCOB* feature has no impact on interfaces.

Impact on network management tools

The *LTE2252: FSM OD-Cabinet FCOB* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2252: FSM OD-Cabinet FCOB* feature has no impact on system performance or capacity.

9.3.4 LTE2252 reference data

LTE2252: FSM OD-Cabinet FCOB requirements and sales information

Requirements

Table 276 LTE2252: FSM OD-Cabinet FCOB hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2252: FSM OD-Cabinet FCOB* feature.

Sales information

Table 277 LTE2252: FSM OD-Cabinet FCOB sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.4 LTE2261: AirScale Capacity ABIA

Benefits, functionality, system impact, reference data of the feature

The *LTE2261: AirScale Common ABIA* feature introduces AirScale Capacity (ABIA), which is an indoor common plug-in unit for the next generation of a highly integrated System Module, called AirScale System Module Indoor.

AirScale Capacity plug-in unit provides cell-specific baseband processing and optical interfaces to radio units.

9.4.1 LTE2261 benefits

The AirScale System Module Indoor is a successor of the Flexi Multiradio 10 System Modules (FSMF and FSIH) providing enhanced capacity, connectivity and expansion possibilities in the same form factor in indoor installations.

The AirScale System Module Indoor is further optimized for supporting LTE advanced features, such as Carrier Aggregation and Coordinated Multi-Point in high capacity system configurations.

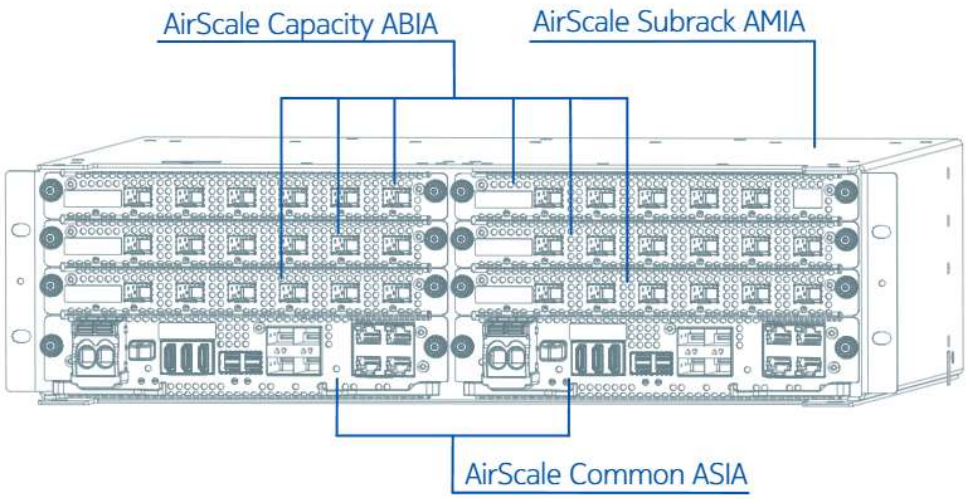
9.4.2 LTE2261 functional description

Nokia AirScale System Module Indoor consists of the following items:

- One AirScale Subrack (AMIA), including a backplane for high bandwidth connectivity between processing plug-in units
- One or two AirScale Common (ASIA) plug-in units for transport interfacing and for centralized processing
- Up to six AirScale Capacity (ABIA) plug-in units for baseband processing and for optical interfaces with radio units

The figure below presents the AirScale System Module Indoor.

Figure 44 AirScale SM Indoor



AirScale System Module Indoor consists of the following items in minimum starting configuration:

- One AirScale Subrack (AMIA)
- One AirScale Common (ASIA)
- One AirScale Capacity (ABIA)

The processing capacity of the AirScale SM Indoor can be extended by adding more ABIA plug-in units. One half of the AMIA can accommodate one ASIA plug-in unit and up to three ABIA plug-in units within the left or right half of the indoor subrack. Therefore, one AMIA can accommodate two of the above sub-configurations within 3U height.

For supported HW configurations, see the *Creating Nokia AirScale BTS FDD-LTE Configurations* document.

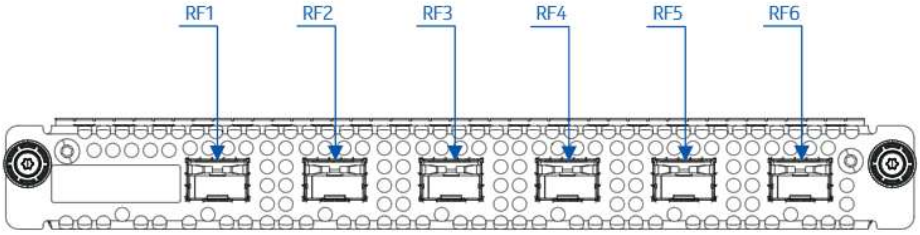
The AirScale SM Indoor is IP20 ingress protected and operates at the temperature range from -5 to +55 °C.

The following functions are integrated in the ASIA:

- Cell-specific baseband processing
- Optical interfaces to radio units
- Status LEDs

The figure below presents the front view of the AirScale Capacity (ABIA).

Figure 45 Front panel of the ABIA



The ABIA plug-in units provides six optical RP3-01/CPRI interfaces to/from RFs.

For more information, see the *Nokia AirScale BTS Product Description* document.

9.4.3 LTE2261 system impact

LTE2261: AirScale Capacity ABIA impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features are required for Nokia AirScale System Module Indoor:

- LTE2114: AirScale Common ASIA
- LTE2261: AirScale Capacity ABIA (described in this document)
- LTE2262: AirScale Subrack AMIA

Impact on interfaces

The *LTE2261: AirScale Capacity ABIA* feature has no impact on interfaces.

Impact on network management tools

The *LTE2261: AirScale Capacity ABIA* feature has no impact on network management tools.

Impact on system performance and capacity

New configurations are available. For more information, see the *Creating Nokia AirScale BTS LTE Configurations* document.

9.4.4 LTE2261 reference data

LTE2261: AirScale Capacity ABIA requirements, alarms and faults, commands, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 278 LTE2261 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	Not supported	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	Support not required	Support not required	Support not required

BTS faults and reported alarms

There are no faults related to the *LTE2261: AirScale Capacity ABIA* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2261: AirScale Capacity ABIA* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2261: AirScale Capacity ABIA* feature.

Parameters

There are no parameters related to the *LTE2261: AirScale Capacity ABIA* feature.

Sales information

Table 279 LTE2261 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.5 LTE2262: AirScale Subrack AMIA

Benefits, functionality, system impact, reference data of the feature

The *LTE2262: AirScale Subrack AMIA* feature introduces indoor subrack for the next generation of a highly integrated System Module, called AirScale System Module Indoor. The AirScale Subrack AMIA provides high bandwidth interconnectivity between *LTE2114: AirScale Common ASIA* and *LTE2261: AirScale Capacity ABIA* plug-in units.

9.5.1 LTE2262 benefits

The AirScale System Module Indoor is a successor of the Flexi Multiradio 10 System Module and it is further optimized for supporting LTE advanced features, such as Carrier Aggregation and Coordinated Multi-Point in high capacity system configurations.

The *LTE2262: AirScale Subrack AMIA* feature provides the following benefits:

- Enhanced capacity
- Enhanced connectivity
- Expanded possibilities in the same 3U form factor in indoor installations

9.5.2 LTE2262 functional description

Nokia AirScale Subrack (AMIA)

Nokia AirScale Subrack (AMIA) main properties:

- It supports up to two AirScale Common plug-in units
- It supports up to six AirScale Capacity plug-in units
- IP20 ingress protected
- Operating temperature range: from -5°C to +55°C
- It might be installed inside a 19-inch wide rack or cabinet

The AirScale Subrack AMIA includes:

- Subrack frame
- Backplane for high bandwidth interconnect between AirScale Common and AirScale Capacity plug-in units
- Fans with changeable airflow direction
- Blind-units to prevent cooling airflow leakage

Nokia AirScale Subrack factory default consists of a subrack frame, one AirScale Common blind-unit and five AirScale Capacity blind-units as shown in Figure 46: AMIA AirScale Subrack (factory default).

Figure 46 AMIA AirScale Subrack (factory default)

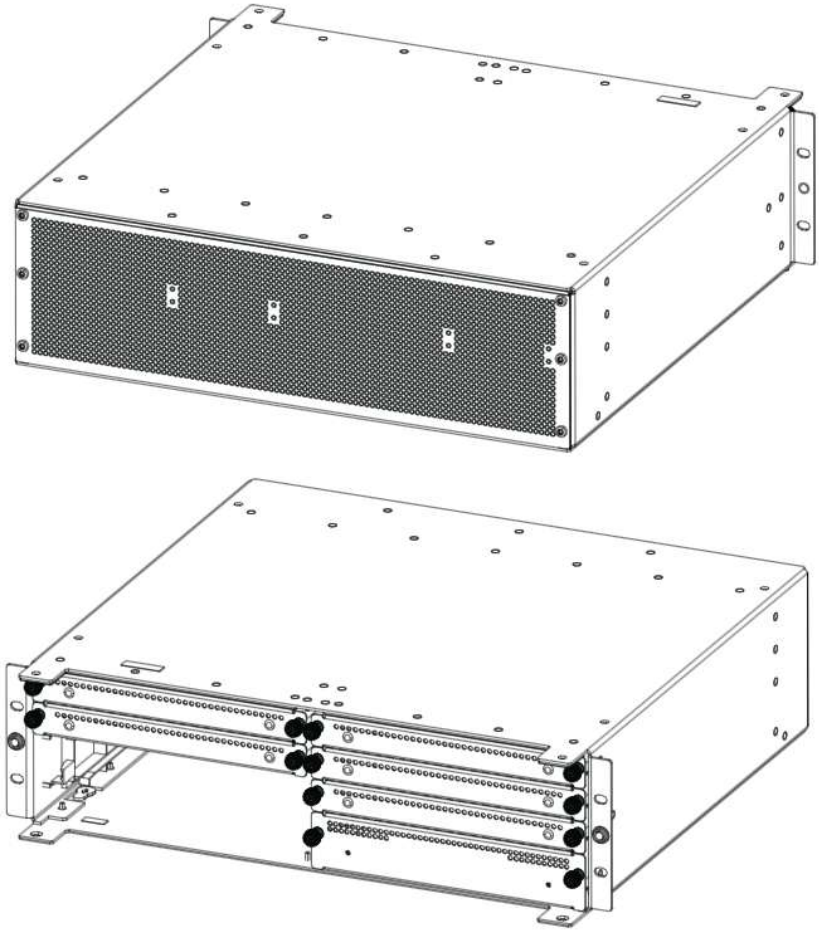
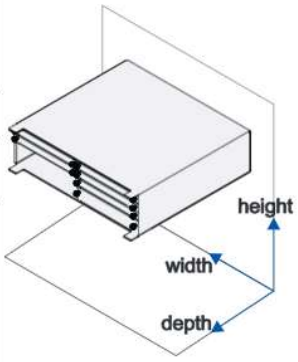


Table 280 AMIA dimensions and weight

Property	Value	Dimensions orientation
Height	128 mm (5 in.)	
Depth	400 mm (15.7 in.)	
Width	447 mm (17.6 in.)	
Weight	Empty: 5.1 kg (11.2 lb) With dummy panels: 6.8 kg (15 lb) With all units: 23.9 kg (52.7 lb)	

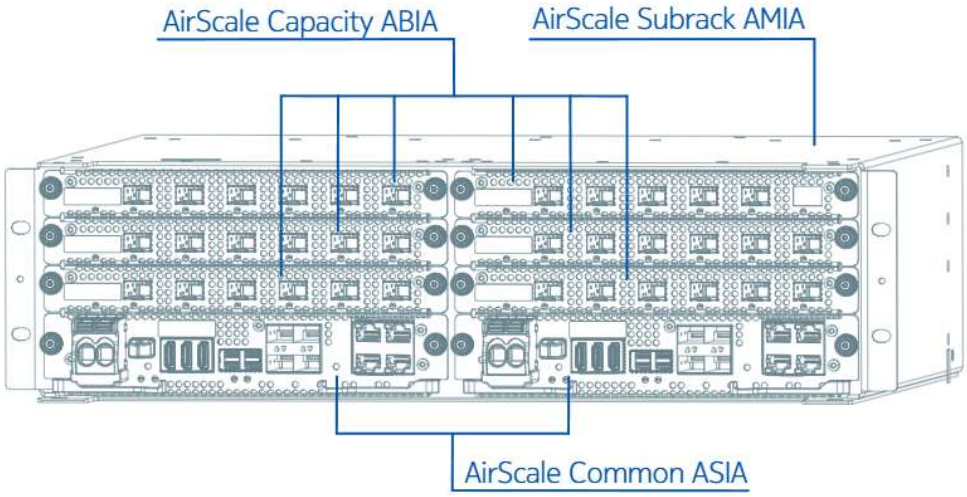
For more information, see the *Nokia AirScale Base Station Product Description* document.

Nokia AirScale System Module Indoor

Nokia AirScale System Module Indoor consists of the following items:

- One AirScale Subrack (AMIA), including backplane for high bandwidth connectivity between processing plug-in units
- One or two AirScale Common (ASIA) plug-in units for transport interfacing and for centralized processing
- Up to six AirScale Capacity (ABIA) plug-in units for baseband processing and for optical interfaces with radio units

Figure 47 Nokia AirScale System Module Indoor in maximum configuration (2xASIA, 6xABIA)



For supported HW configurations, see the *Creating Nokia AirScale BTS FDD-LTE Configurations* document.

9.5.3 LTE2262 system impact

LTE2262: AirScale Subrack AMIA impact on features and system performance and capacity

Interdependencies between features

The following features are required for AirScale System Module Indoor:

- *LTE2114: AirScale Common ASIA*
  AirScale Subrack (AMIA) provides high bandwidth interconnectivity between *LTE2114* and *LTE2261*.
- *LTE2261: AirScale Capacity ABIA*
  AirScale Subrack (AMIA) provides high bandwidth interconnectivity between *LTE2261* and *LTE2114*.

Impact on interfaces

The *LTE2262: AirScale Subrack AMIA* feature has no impact on interfaces.

Impact on network management tools

The *LTE2262: AirScale Subrack AMIA* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2262: AirScale Subrack AMIA* feature impacts system performance and capacity as follows:

- Enhanced capacity
- Expansion possibilities
- New configurations are available
  For more information, see the *Creating Nokia AirScale BTS FDD-LTE Configurations* document.

9.5.4 LTE2262 reference data

LTE2262: AirScale Subrack AMIA requirements and sales information

Requirements

Table 281 LTE2262 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2262: AirScale Subrack AMIA* feature.

Sales information

Table 282 LTE2262 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.6 LTE2335: Outdoor GNSS receiver FYGM

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2335: Outdoor GNSS receiver FYGM* feature introduces the FYGM GNSS receiver to receive the Global Navigation Satellite Systems (GPS, GLONASS, Beidou) signal and provide the synchronization input to Flexi eNB system. FYGM can be deployed in both indoor and outdoor environments, and is compliant to IP65.

9.6.1 LTE2335 benefits

The *LTE2335: Outdoor GNSS receiver FYGM* feature provides the following benefits:

- Improved synchronization input.
- FYGM saves costs by using (or reusing) RF GPS antennas.
- Flexible mounting options available.

- Supported in both indoor and outdoor environments.
- Saved installation space and easy service engineering due to various applicability options.

9.6.2 LTE2335 functional description

FYGM overview

The FYGM is a small GNSS receiver for receiving Global Navigation Satellite System signal from an external RF GNSS antenna, and providing synchronization input to Flexi eNB or Nokia AirScale System Module systems. FYGM provides signal conversion from the RF GPS antenna to 1PPS+TOD that can be used for system module synchronization input. The RF antenna can be shared with other GNSS receivers.

Flexible mounting options are supported:

- both indoor and outdoor
- into free FSMF slot
- on the FSMx side
- as a stand-alone on a wall, pole, or mast

The FYGM receiver provides an in-line solution between the RF GNSS antenna (at site) and the System Module Sync In port. FYGM is GNSS capable (supporting GPS, GLONASS, and Beidou), with the default constellation- GPS + GLONASS. GNSS operation mode selects how many and which GNSS are used for BTS synchronization:

- Multi-GNSS operation mode which allows using RF signals from two GNSS for synchronizing the BTS.
- GNSS operation mode which allows using a dedicated GNSS for the final synchronization of the BTS.

As the FYGM sends sequentially the ToD information to the BTS, the BTS is able to provide a continuous timing reference to the radio interface. The BTS can also provide the exact UTC time for O&M purposes.

The FYGM module is compliant with TSIP protocol (which is used for control communication from BTS to GNSS receiver) and backward compatible with the features and SW functioning of all FYGx devices. With the exception of FYGG and FYGE, the FYGM can replace all FYGx. Additionally, it is compatible with existing legacy Sync-In port and plug-and-play to existing synchronization features in AirScale SM, FSIH and FSMF.

Using the FYGM GNSS receiver, the BTS is able to synchronize to a highly accurate timing reference signal of several Global Navigation Satellite Systems (GPS, GLONASS, and Beidou). The FYGM GNSS receiver can receive the RF signals from one or from two Global Navigation Satellite Systems in parallel. Using the GUI (NetAct, BTSSM) the operator has the possibility to select which GNSS(s) the BTS will synchronize to. Several operation modes can be selected, each defining with which further GNSS(s) the operator wants the FYGM to communicate.

If needed, the FYGM GNSS receiver can be upgraded from the BTS O&M.

External characteristics

The FYGM receiver has:

- A Deutche IMC connector

- DC input from HDMI interface 15 V 125 mA
- Power on and status LEDs
- A grounding terminal

The FYGM can provide 5V DC LNA power supply to the antenna. It can be connected directly to the GPS/GNSS antenna or via the GNSS splitter, sharing the antenna with other GNSS receivers.

FYGM delivery package includes the HDMI-12pin cable and reuses existing Nokia products like GPS antennas, over-voltage protection solutions, cables, GNSS splitters.

9.6.3 LTE2335 system impact

LTE2335: Outdoor GNSS receiver FYGM impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

There are no interdependencies between the features.

Impact on interfaces

The *LTE2335: Outdoor GNSS receiver FYGM* feature has no impact on interfaces.

Impact on network management tools

The *LTE2335: Outdoor GNSS receiver FYGM* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2335: Outdoor GNSS receiver FYGM* feature has no impact on system performance or capacity.

9.6.4 LTE2335 reference data

LTE2335: Outdoor GNSS receiver FYGM requirements, alarms, faults, measurements and counters, key performance indicators, parameters, and sales information

Requirements

Table 283 LTE2335 LTE FDD hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	Support not required	Support not required	Hardware management Software management	Support not required	Support not required

Alarms

The *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature supports site configuration where 2 operators have dedicated LTE and GSM System Modules controlling operator dedicated RF units in the LTE-GSM RF sharing mode (for example 1800 band), but also controlling shared RF units in the dedicated LTE mode (for example 800 band).

One RF Module can either be operated in:

- LTE dedicated mode
- GSM dedicated mode
- LTE-LTE RF sharing
- Classical LTE-GSM RF sharing

This feature supports the following multi-operator cases/solutions:

- LTE MORAN
- GSM MOBSS

This feature combines the LTE-LTE RF sharing (LTE1829) and LTE-GSM RF sharing (LTE447, LTE2079, LTE1895).

Exemplary configurations

Figure 48 Exemplary LTE2387 cabling configuration - Example 1

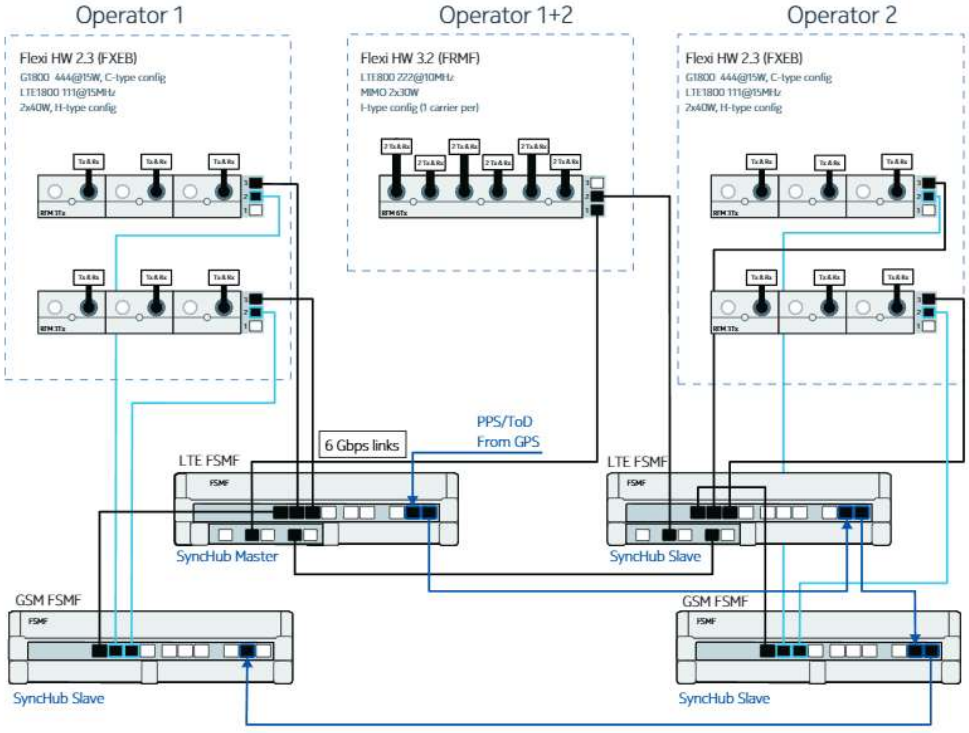
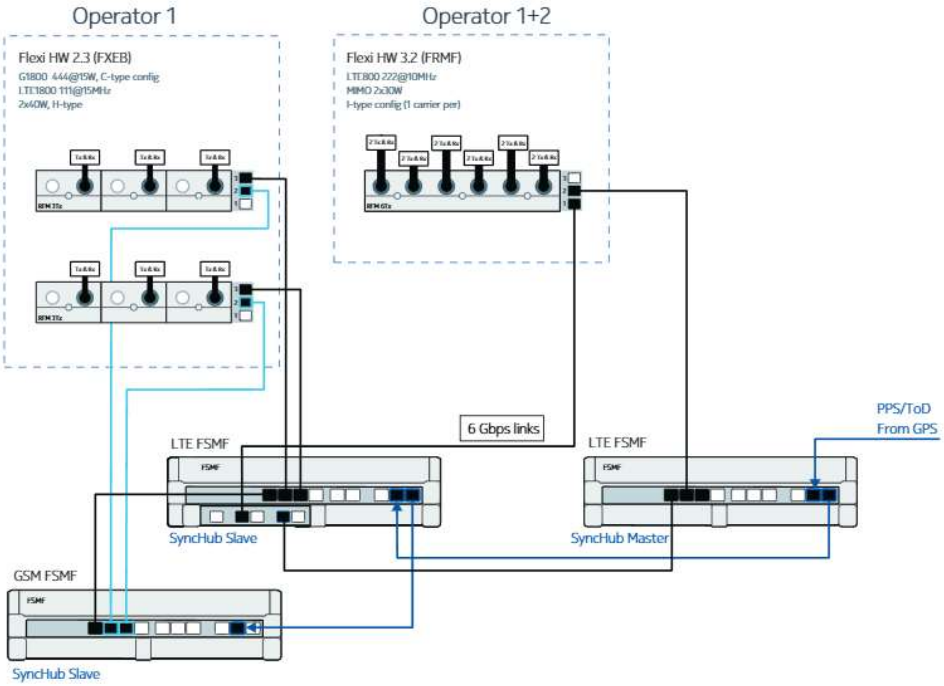


Figure 49 Exemplary LTE2387 cabling configuration - Example 2



The list of RF Modules from Flexi HW 2.3 and Flexi HW 3.2 can be found in the *LTE Base Stations Supported Configurations* document.

HW support

Pre-condition: The following HW is supported with this feature:

- System Modules:
  - LTE: FSMF+FBBA/C+FBBC (second extension card is optional)
  - GSM: FSMF
- RF Modules:
  - FXEB Flexi RF Module 3TX 1800 Triple 90W*
  - FXDB Flexi RF Module 3TX 900*
  - FXCB Flexi RF Module 3TX 850
  - FXFC Flexi RF Module 3TX 1900
  - FXCE Flexi RF Module 3TX 850
  - FXED Flexi RF Module 6TX 1800
  - FRME Flexi RF Module 6TX 800
  - FRGU Flexi RF Module 6TX 2100
  - FRHF Flexi RF Module 6TX 2600*
  - FRHC Flexi RF Module 6TX 2600*
  - FRMC Flexi RF Module 6TX 800*
  - FRPB Flexi RF Module 6TX 700*
  - FRPA Flexi RF Module 6TX 700*
  - FRII Flexi RF Module 6TX 1700/2100

Sync Hub Direct Forward RF Sharing

Transfer of phase/time synchronization between system modules sharing a RF module is done with the use of 1PPS & ToD signals and interfaces. The ability to serve as head element of a Sync Hub Direct The used synchronization feature LTE1710 Sync Hub Direct Forward also allows to serve as head element of a Sync Hub Direct Forward chain or as intermediate element shall be independent of the RAT of a BTS. However, with LTE-LTE & LTE-GSM RF sharing feature, LTE must be the head element of a Sync Hub Direct Forward chain. The RP3-01 connection between system modules involved in RF sharing is still required to perform RF sharing topology scan to build a communication among RF sharing elements.

9.7.3 LTE2387 system impact

LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature impacts the following features:

- *LTE1829: Inter eNB RF Sharing*
  Requirement is to make this feature RF HW agnostic but HW has to be part of LTE1829 or related CRL adding HW variants.

Impact on interfaces

The *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature has no impact on interfaces.

Impact on network management tools

The *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature has no impact on network management tools.

Impact on system performance and capacity

New multi-operator configurations are available.

9.7.4 LTE2387 reference data

LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 290 LTE2387 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

Alarms

There are no alarms related to the *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature.

Parameters

There are no parameters related to the *LTE2387: Classical LTE(MORAN)-GSM(MOBSS) RF sharing with one SM per operator* feature.

Sales information

Table 291 LTE2387 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	No

9.8 LTE2516: FRIJ AirScale RRH 4T4R B66 160 W

Benefits, functionality, system impact, reference data of the LTE2516 feature

The *LTE2516: FRIJ AirScale RRH 4T4R B66 160 W* feature introduces the FRIJ AirScale RRH 4T4R B66 160 W (uplink: 2110-2200 MHz, downlink: 1710-1780 MHz).

9.8.1 LTE2516 benefits

The *LTE2516: FRIJ AirScale RRH 4T4R B66 160 W* feature provides the following benefits:

- Four Power Amplifiers that enable supporting one sector with up to 4x40 W 4TX MIMO output power at the BTS antenna connectors.
- FRIJ RRH supports 1 or 2 sector operation
- It supports 2x2x40 W that allows using the entire spectrum split over 4-pipes, each 2T2R segment to allow wider Occupied Bandwidth use.
- Smaller size and weight compared to prior generation.
- New, industrial designed outer shell and book mount design.
- IP65 environmental protection class.
- Its bandwidth filter supports the whole 3GPP band 66 (70/90 MHz).
- Optional fan module for additional mounting schemes are available.

9.8.2 LTE2516 functional description

Main properties

FRIJ is a 4-pipe RRH optimized for distributed macro BTS installations.

FRIJ AirScale RRH 4T4R B66 160 W main properties:

- It supports 3GPP FDD bands 4, 10 and Band 66, with 10 W, 15 W, 20 W, 30 W, 40 W output power per Tx
- Support of modulation schemes up to QAM64 (UL)
  Support of modulation schemes up to QAM256 (DL)
- RF Sharing Bandwidth FDD-LTE: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 2 x 20 MHz
- RF Sharing Bandwidth: WCDMA 3.8 MHz, 4.2 MHz, 5 MHz
- Supported RF frequency FDD: downlink: 2110-2200 MHz, uplink: 1710-1780 MHz
- External interfaces on band A:
  - 4 TX/RX ports with 4.3-10 connector
  - EAC with USB3 connector (MDR 36 requires an adapter cable)
  - 3 optical RF ports (SFP slots)
  - OBSAI 6Gbps links
  - One DC IN connector
  - RET with 8-pin circular
- -40°C to +40°C with convection cooling
- Weight: 22 kg
- Volume: 25 l
- To enable full output power, one power license per TX pipe is required
- Supported mounting options: pole, wall
- Compatible with RAS mounting: book, horizontal (with optional fan module)

Filter BW is 90 MHz downlink, 70 MHz uplink. 5% of sites would require the external filter to be compliant with FCC rules to protect federal spectrum from AWS emissions.

Dimensions and weight

Table 292 FRIJ dimensions and weight

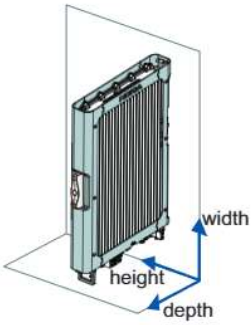
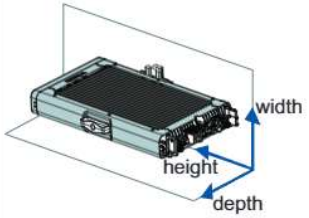
Property	Value	Dimensions orientation
Height	With cover: 600 mm (23.6 in.) With cover and fan: 630.2 mm (24.8 in.)	Dimensions orientation in vertical mount with cover 
Depth	With cover and handle: 409.5: mm (16.1 in.) With cover, fan and handle: 409.5 mm (16.1 in.)	
Width	With cover: 126 mm (5.0 in.) With cover and fan: 126 mm (5.0 in.)	
Weight	21 kg (46.3 lbs)	
Volume	With cover: 28 l Without cover: 20.4 l	

Table 292 FRIJ dimensions and weight (Cont.)

Property	Value	Dimensions orientation
		Dimensions orientation in horizontal mount with cover and fan 

For more information, see *Nokia AirScale Radio Description*.

RF Sharing Configurations

For implementation and configurations for RF sharing on the system level, refer to SW release feature roadmap and release documentation. FRIJ HW is prepared for LTE-WCDMA RF sharing.

Supported BTS configurations

Supported BTS configurations:

- For the single carrier LTE: all released BTS configurations valid for RRH 4Tx RF units
- For multi-carrier LTE: released LTE BTS configurations supporting dual carrier and multi-carrier configurations as well as inter eNB RF sharing configurations

The same band combines:

- Four ports of the RRH to two ports
- AWS-1 frequency and AWS-3 frequency to double the power (~75 W) in a 2-pipe configuration
- Max instantaneous BW is: downlink: 90 MHz, uplink: 70 MHz
- Max four carriers per pipe, the maximum occupied bandwidth is 40 MHz

9.8.3 LTE2516 system impact

LTE2516: FRIJ AirScale RRH 4T4R B66 160 W impact on features and system performance and capacity

Interdependencies between features

The *LTE2516: FRIJ AirScale RRH 4T4R B66 160 W* feature is impacted by the following features:

- *LTE115: Cell Bandwidth - 5 MHz*
  It enables LTE 5 MHz carriers.
- *LTE114: Cell Bandwidth - 10 MHz*
  It enables LTE 10 MHz carriers.
- *LTE113: Cell Bandwidth - 15 MHz*
  It enables LTE 15 MHz carriers.

- *LTE112: Cell Bandwidth - 20 MHz*
  It enables LTE 20 MHz carriers.
- *LTE614: Distributed Site*
  With LTE614 FRIJ, it might be used in distributed sites with up to 23 km fiber length to the system module.
- *LTE977: RF chaining*
  With LTE977 FRIJ, it supports chains of up to 4 radio units.
- *LTE1891: eNode B power saving - Micro DTX*
  It enables using the Micro DTX feature.
- *LT2508: BTS Embedded Power Meter for Energy Efficiency Monitoring*
  It enables using the energy metering feature.
- *LTE1103: Load based Power Saving for multi-layer networks* or *LTE1203: Load based Power Saving with Tx path switching off*
  It enables using the PA shutdown feature.
- *LTE2149: Supplemental downlink carrier*
  It enables using an extra 20 MHz in downlink spectrum.
- *LTE2824: Extended frequency band range*
  It supports extended parameter range for band 66.
- *LTE3096: Supported RAS Installation options in FL16A Release*
  With LTE3096 RAS installation options are defined.

Impact on interfaces

The *LTE2516: FRIJ AirScale RRH 4T4R B66 160 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE2516: FRIJ AirScale RRH 4T4R B66 160 W* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2516: FRIJ AirScale RRH 4T4R B66 160 W* feature impacts system performance and capacity as follows:

- New configurations are available.

9.8.4 LTE2516 reference data

LTE2516: FRIJ AirScale RRH 4T4R B66 160 W requirements and sales information

Requirements

Table 293 LTE2516 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	FL16A	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not Applicable	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

Impact on system performance and capacity

The *LTE2517: AirScale HW capacity activation licence* feature provides the possibility to utilize baseband cost according to required cell capacity.

9.9.4 LTE2517 reference data

LTE2517: AirScale HW capacity activation licence requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 295 LTE2517 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

9.10 LTE2605: 4RX Diversity 20MHz Optimized Configurations

Benefits, functionality, system impact, reference data, instructions of the feature

The *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature introduces BTS configurations which support three cells with 4 Rx diversity on 15 or 20MHz within a single basic cell set.

9.10.1 LTE2605 benefits

The *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature enables for buiding dual band or triple band configurations with 3-sector 15/20MHz on single Flexi System Module 10.

9.10.2 LTE2605 functional description

The existing BTS configuration features for support of 4Rx diversity require at least one FBBA or FBBC extension module (extended cell set) for 15 or 20MHz LTE carriers in 3 sectors.

With the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature it is possible to create configurations for 2x2 MIMO with 4Rx diversity for up to 3 cells of 15 or 20 MHz in one basic cell set. No additional baseband extension modules FBBA or FBBC are needed.

This feature is an optional feature which is activated/deactivated via an O&M parameter per eNB. For each cell using this new optimized 4Rx implementation, one license key is required.

9.10.3 LTE2605 system impact

LTE2605: 4RX Diversity 20MHz Optimized Configurations impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature:

- *LTE72: 4-way RX Diversity*
- *LTE980: IRC for 4 RX paths*

The following features must be deactivated before activating the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature:

- *LTE568: DL adaptive closed loop MIMO (4x2)*
- *LTE1691: Uplink Intra-eNB CoMP (4Rx)*
- *LTE1987: Downlink Adaptive Closed Loop SU MIMO (4x4)*

For more information on BTS configurations supported with LTE2605, see the Creating LTE Configurations document.

Impact on interfaces

The *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature has no impact on interfaces.

Impact on network management tools

The *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature has no impact on system performance or capacity.

9.10.4 LTE2605 reference data

LTE2605: 4RX Diversity 20MHz Optimized Configurations requirements and sales information

Requirements

Table 299 LTE2605 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not supported	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not applicable	LTE OMS16A	not supported	NetAct 16.8	not supported	not supported

The *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature requires BTS configurations with 4Rx support.

Alarms

There are no alarms related to the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature.

BTS faults and reported alarms

There are no faults related to the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature.

Commands

There are no commands related to the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature.

Measurements and counters

There are no measurements or counters related to the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature.

Key performance indicators

There are no key performance indicators related to the *LTE2605: 4RX Diversity 20MHz Optimized Configurations* feature.

Parameters

The feature must be activated by parameter *actOptimizedBbUsage*.

Additionally *cellsWithOptBbCalcApplied* is read only parameter that shows how many cells are actually using this feature

Sales information

Table 300 LTE2605 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	No

9.11 LTE2609: Dual Carrier Support LTE1.4 and LTE3

Benefits, functionality, system impact, reference data of the feature

The *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature introduces two LTE carriers - of which one has 1.4MHz or 3MHz BW - on a single radio unit.

9.11.1 LTE2609 benefits

The *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature provides the following benefits:

- Efficient usage of narrow LTE spectrum chunks becomes possible.
- Minimum carrier spacing allows to reduce the guard band in case of adjacent dual carriers.

9.11.2 LTE2609 functional description

This feature extends the existing feature *LTE2019: Advanced Dual Carrier Operation within same RF Unit* with support of narrow LTE carriers with 1.4 MHz or 3 MHz carrier bandwidth. In all dual carrier configurations defined by LTE2019 for 2Tx/2Rx with shared antenna, one 5MHz carrier can be replaced with a 1.4 MHz or a 3 MHz carrier. Additionally the combination of 1.4 MHz + 3 MHz is supported as well.

For carriers adjacent to each other, the minimum carrier spacing allows for fit two carriers into slightly less spectrum as given by the sum of the nominal bandwidth of both carriers.

Minimum spacing supported (distance between center frequency of both carriers):

- 10.5 MHz for 3 + 20 MHz
- 8.4 MHz for 3 + 15 MHz
- 6.0 MHz for 3 + 10 MHz
- 3.9 MHz for 3 + 5 MHz
- 3.0 MHZ for 1.4 + 5 MHz
- 9.6 MHz for 1.4 + 20MHz
- 7.5 MHz for 1.4 + 15MHz
- 5.1 MHz for 1.4 + 10MHz
- 2.1 MHz for 1.4 + 3 MHz

For non adjacent carrier configurations, the max carrier spacing is limited by the instantaneous bandwidth that is supported by the used radio units.

9.11.3 LTE2609 system impact

LTE2609: Dual Carrier Support LTE1.4 and LTE3 impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature:

- *LTE116: Cell Bandwidth - 3 MHz*
- *LTE117: Cell Bandwidth - 1.4 MHz*

For more information on BTS configurations supported with LTE2609, see the Creating LTE Configurations document.

Impact on interfaces

The *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature has no impact on interfaces.

Impact on network management tools

The *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature has no impact on system performance or capacity.

9.11.4 LTE2609 reference data

LTE2609: Dual Carrier Support LTE1.4 and LTE3 requirements and sales information

Requirements

Table 301 LTE2609: Dual Carrier Support LTE1.4 and LTE3 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	not supported	FL16A	not applicable	not supported	not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
not supported	LTE OMS16A	not supported	NetAct 16.8	not supported	not supported

The *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature requires FSMF module and any radio unit that supports 3MHz respecively 1.4MHz LTE carriers and allowes dual carrier operation.

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2609: Dual Carrier Support LTE1.4 and LTE3* feature.

Sales information

Table 302 LTE2609 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	Yes

9.12 LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB

Benefits, functionality, system impact, reference data of the feature

The *LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB* feature introduces new WCDMA-LTE RF sharing configurations with 2Tx/2Rx Remote Radio Head (RRH) FHDB.

9.12.1 LTE2610 benefits

The *LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB* feature provides the following benefit: the option of using FHDB in WCDMA-LTE RF sharing can make more flexible configurations available.

9.12.2 LTE2610 functional description

This feature extends the existing WCDMA-LTE RF sharing functionality to configurations with 2Tx/Rx FHDB.

Table 303 Configurations introduced by the feature

Cells/Sectors	Configurations type	LTE BW	System Module	RF Modules (shared)
WCDMA: up to 3+3+3 LTE: 1+1+1	WCDMA: 1Tx/2Tx or 2Tx/2Rx, SIMO/VAM (A/I-type) LTE: 2Tx/2Rx, MIMO (I-type)	Up to 5 MHz	WCDMA: FSME or FSMF LTE: FSMF	FHDB (1-3 sectors)
WCDMA: up to 2+2+2 LTE: 1+1+1	WCDMA: 1Tx/2Tx or 2Tx/2Rx, SIMO/VAM (A/I-type) LTE: 2Tx/2Rx, MIMO (I-type)	Up to 10 MHz	WCDMA: FSME or FSMF LTE: FSMF	FHDB (1-3 sectors)

Additional dedicated LTE bands are supported as defined in *LTE2080: LTE-WCDMA RF sharing with full FBBC support*.

For more information, see the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.12.3 LTE2610 system impact

LTE2610 impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB* feature:

- *RAN2126: RF Sharing WCDMA - LTE*
- *LTE435: RF Sharing WCDMA - LTE*

Impact on interfaces

The *LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB* feature has no impact on interfaces.

Impact on network management tools

The *LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB* feature has no impact on network management tools.

Impact on system performance and capacity

New configurations are available. For more information, see the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.12.4 LTE2610 reference data

LTE2610 requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 304 LTE2610 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	Not supported	FL16A	Planned for later releases	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Support not required	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

There are no alarms, measurements and counters, key performance indicators, parameters related to the *LTE2610: Support for classical WCDMA/LTE RF-sharing on 2Tx/2Rx RRH FHDB* feature.

Sales information

Table 305 LTE2610 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.13 LTE2637: Quad Carrier on Single RF Unit

Benefits, functionality, system impact, reference data of the feature

The *LTE2637: Quad Carrier on Single RF Unit* feature introduces 3 or 4 LTE carriers in the same band supported on a single RF unit. The total possible LTE carrier bandwidth is up to 40MHz. A 2 x 2 MIMO, some configurations also with 4 RX diversity are supported..

9.13.1 LTE2637 benefits

The *LTE2637: Quad Carrier on Single RF Unit* feature allows the operators to use scattered chunks of spectrum with minimum investment in radio units and antennas. The following benefits are provided:

- 3 or 4 LTE carriers in the same band are supported on a single RF unit.
- A total LTE carrier bandwidth of up to 40MHz is possible.

9.13.2 LTE2637 functional description

This feature allows for configuring up to 4 LTE carriers on a single RF unit per sector.

Additionally, a special configuration for two sectors with two carriers on each sector is supported.

Either of the Remote Radio Head units with 4 Tx pipes or RF Modules with 6Tx pipes can be used. One unit is required per sector. Four pipes are in use on/in both RF types. The Tx carriers are distributed to the 4 pipes, thus a single pipe can support up to:

- one 15 or 20MHz Tx carrier.
- one 5/10/15/20 MHz Tx carrier plus one 5/10 MHz Tx carrier.
- one 5/10MHz Tx carrier plus two 5MHz Tx carriers.

The maximum available power per pipe is shared by up to 3 carriers assigned to the same pipe. Power levels for each carrier can differ by up to 6dB based on power spectral density.

The following carrier bandwidth combinations are supported in a 3-sector configuration on a Flexi Multirado 10 System Module:

- Max. 4 carriers: 5/10MHz + 5/10MHz + 5/10MHz + 5/10MHz in 2Tx/2Rx
  This configuration is served by one extended cell set.
- Max. 3 carriers: 15/20MHz + 5/10MHz + 5/10MHz:
  - in 2Tx/4Rx: served by one XL cell set
  - in 2Tx/2Rx: served by one extended cell set
- Max. 4 carriers: 15/20MHz + 5/10MHz + 5MHz + 5MHz in 2Tx/2Rx
  This configuration is served by one XL cell set.

9.13.3 LTE2637 system impact

LTE2637: Quad Carrier on Single RF Unit impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The *LTE2605: 4Rx Diversity 20MHz Optimized Configurations* feature must be enabled for using the 2Tx/4Rx configurations before activating the *LTE2637: Quad Carrier on Single RF Unit* feature.

UL CoMP for 4 Rx cannot be used with these configurations.

No concurrent RF sharing is possible with the *LTE2637: Quad Carrier on Single RF Unit* feature.

For more information on BTS configurations supported with LTE2637, see the Creating LTE Configurations document.

Impact on interfaces

The *LTE2637: Quad Carrier on Single RF Unit* feature has no impact on interfaces.

Impact on network management tools

The *LTE2637: Quad Carrier on Single RF Unit* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2637: Quad Carrier on Single RF Unit* feature has no impact on system performance or capacity.

9.13.4 LTE2637 reference data

LTE2637: Quad Carrier on Single RF Unit requirements and sales information

Requirements

Table 306 LTE2637 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

The feature needs to be activated by setting *LNBTS:actMultipleCarrier* to the appropriate value.

There are no alarms, measurements and counters, key performance indicators, parameters related to the *LTE2637: Quad Carrier on Single RF Unit* feature.

Sales information

Table 307 LTE2637 sales information

Product structure class	License control	Activated by default
Application software (ASW)	Pool license	No

9.14 LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W

Benefits, functionality, system impact, reference data of the feature

The *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature introduces the Flexi Multiradio RF Module (FRSA) for 3GPP band 32 at 1450 MHz in TX and 3GPP band 20 at 800 MHz in RX (uplink: 832 - 862 MHz, downlink: 1452 - 1492 MHz). FRSA has six power amplifiers enabling it to support one, two or three sectors with an output power of up to 60+60 Watts 2TX MIMO at the BTS antenna connectors.

9.14.1 LTE2650 benefits

The *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature provides the following benefits:

- The most cost-efficient and compact 3-sector BTS Site
- Industry leading RF integration level
- 3-sector RF in one outdoor IP65 box
- Low power consumption and OPEX
- Can be used as a feederless site with one DC and 1...2 optical cables
- A 2TX div or 2TX MIMO for three sectors can be built with a single RF Module
- One 3-sector module providing a more cost effective solution than three RRHs in feederless installations
- HW prepared to support one powerful sector RRH with 4x60 W 4TX MIMO with 4RX
- Reduced weight
- Reduced wind load
- Wide operating temperature range: -35°C - +55°C (-31°F - +131°F) without solar load
- 1/3 of DC and 2/3 of optical cabling compared to a site with an RRH

9.14.2 LTE2650 functional description

The FRSA module supports 3GPP band 32 at 1450 MHz in TX and 3GPP band 20 at 800 MHz in RX. It provides an output of 6x60 W at the antenna connector. TX bandwidth is 40 MHz and RX bandwidth is 30 MHz.

The main features of the FRSA are as follows:

- 3U high with Flexi platform mechanics
- EAC port
- Optical chaining supported by HW, three optical connectors with up to 6 Gbit/s interfaces
- AISG2.0 antenna tilt support with external connector (RS485)
- Ability to be used in feederless BTS sites (optical and DC cable up to 200 m)
- TX typical output power tolerance ≤ +-0.8dB over full TX RF bandwidth with ambient temperature -35°C (-31°F) to +55°C (+131°F)

The following are some basic LTE configurations:

- 1, 1+1 or 1+1+1 LTE cells @ max 20 MHz LTE bandwidth and 2TX MIMO/2RX
- 8, 20, 40 or 60 W 1TX mode per sector (by branch activation SW licenses)
- 8+8, 20+20, 40+40 or 60+60 W 2TX mode per sector (by branch activation and MIMO SW licenses)

For more information, see *Flexi Multiradio BTS RF Module and Remote Radio Head Description*.

9.14.3 LTE2650 system impact

The LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W feature has no impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

There are no interdependencies between the *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature and any other feature.

Impact on interfaces

The *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature has no impact on system performance or capacity.

9.14.4 LTE2650 reference data

LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W requirements and sales information

Requirements

Table 308 LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL17	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not applicable	LTE OMS16A	Not applicable	NetAct 16.8	Not applicable	Not applicable

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W* feature.

Sales information

Table 309 LTE2650: FRSA Flexi RFM 6-pipe 1450 360 W sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.15 LTE2679: FRCJ Flexi RRH 2T4R 873 120 W

Benefits, functionality, system impact, reference data of the feature

The *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature introduces the Flexi Multiradio Remote Radio Head 2TX/4RX (FRCJ) for 3GPP 873 MHz band 26b (uplink: 824 - 835 MHz, downlink: 869 - 880 MHz). FRCJ provides up to 2x60 Watts high output power at the antenna connector with 2TX MIMO.

9.15.1 LTE2679 benefits

The *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature provides the following benefits:

- One sector RRH is able to support 2TX MIMO with high output power.
- Flexible installation options. FRCJ is designed to support book mount. It can be mounted onto a wall or pole and can be integrated into the Radio Antenna System.
- IP65 environmental protection class.

9.15.2 LTE2679 functional description

The FRCJ module can support up to two sectors with a maximum output power of 60 W per TX at the BTS antenna connectors.

The main features of the FRCJ are as follows:

- 873 MHz 3GPP band 26b (sub-band of 850 MHz 3GPP band 26) and band 5 support
- 11 MHz instantaneous bandwidth per RRH in 2T4R mode
- 8 W, 10 W, 15 W, 20 W, 30 W, 40 W and 60 W power level support
- 1.4 MHz, 3 MHz, 5 MHz and 10 MHz LTE bandwidths support
- Up to 4 external alarms with RJ45 connector
- AISG2.0 antenna tilt support with external connector (RS485)
- Compatibility with optional Flexi Power Submodules (FPAD or FPAE) when AC power supply is needed
- 12.7 l volume (without solar cover and brackets)
- 12.8 kg weight (without solar cover and brackets)

The FRCJ supports the following modulation schemes:

- up to QAM64 (DL/UL)
- up to QAM256 (DL)

The FRCJ module can be installed:

- on a pole.
- on a wall.
- with book mount option.
- inside the Radio Antenna System (RAS).

For more information, see *Flexi Multiradio BTS RF Module and Remote Radio Head Description*.

9.15.3 LTE2679 system impact

LTE2679: FRCJ Flexi RRH 2T4R 873 120 W impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature:

- *LTE117: Cell Bandwidth - 1.4 MHz* for the support of the 1.4 MHz LTE carriers
- *LTE116: Cell Bandwidth - 3 MHz* for the support of the 3 MHz LTE carriers
- *LTE115: Cell Bandwidth - 5 MHz* for the support of the 5 MHz carriers

The *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature is impacted by the following features:

- *LTE614: Distributed Site*
  With this feature FRCJ can be used in distributed sites with up to 23 km fiber length to the system module.
- *LTE977: RF chaining*
  With this feature FRCJ supports chains of up to 4 radio units.
- *LTE1103: Load based Power Saving for multi-layer networks* or *LTE1203: Load based Power Saving mode with Tx power reduction or path switching off*
  One of these features need to be enabled to use the PA shutdown feature.
- *LTE2508: BTS Embedded Power Meter for Energy Efficiency Monitoring*
  With this feature FRCJ can use Embedded Power Meter for Energy Efficiency Monitoring.
- *LTE1891: eNode B power saving - Micro DTX*
  This feature needs to be enabled to use Micro DTX extension.
- *LTE1443: UpPTS blanking*
  This feature can be used with FRCJ.
- *LTE2556: Flexi Multiradio BTS Rx-sniffing Enhancements*
  This feature can be used with FRCJ.
- *LTE2902: Rx-Sniffing - PIM Sweep Test*
  This feature can be used with FRCJ.

Impact on interfaces

The *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature has no impact on system performance or capacity.

9.15.4 LTE2679 reference data

LTE2679: FRCJ Flexi RRH 2T4R 873 120 W requirements and sales information

Requirements

Table 310 LTE2679: FRCJ Flexi RRH 2T4R 873 120 W hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not applicable	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2679: FRCJ Flexi RRH 2T4R 873 120 W* feature.

Sales information

Table 311 LTE2679: FRCJ Flexi RRH 2T4R 873 120 W sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.16 LTE2680: FHEL AirScale RRH 2T2R B3 120 W

Benefits, functionality, system impact, reference data of the LTE2680 feature.

The *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature introduces Remote Radio Head (RRH) FHEL with 2TX downlink MIMO and 2RX uplink diversity for world market LTE operation on 3GPP band 3.

9.16.1 LTE2680 benefits

The *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature provides the following benefits:

- Smaller size and lower weight
- Vertically stackable
- RAS compatible 2-pipe RRH
- Improved power consumption
- Improved reliability
- Full Band IBW (75MHz)
- Horizontal Mounting Option (with Fans)

9.16.2 LTE2680 functional description

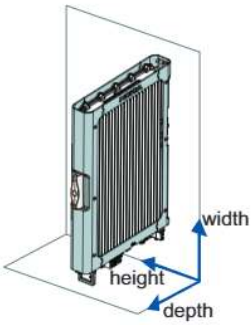
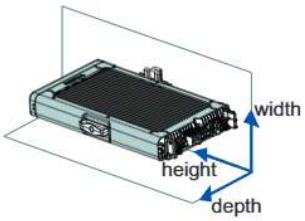
Main properties
LTE2680: FHEL AirScale RRH 2T2R B3 120 W main properties:

- 3GPP Band 3 1800 MHz, with 2x60 W output power

- Single RAT Bandwidth: 75 MHz IBW, 40 MHz OBW
- RF Sharing Bandwidth: GSM IBW 37.5 MHz, LTE 75 MHz, 40 MHz OBW
- Weight: 15 kg
- Volume: 14 l
- RF Connector : 4.3-10 Connector
- IP65 with -40 to +55 °C with convection cooling
- Up to 4 external alarms and outputs
- AISG2.0 Antenna tilt support with external connector (RS485)
- Compatible with optional FPAE power supply when needed for AC solutions
- Optical chaining supported by hardware
- To enable full output power, two power licenses per TX pipe are required

Dimensions and weight

Table 312 FHEL dimensions and weight

Property	Value	Dimensions orientation
Height	With cover: 600 mm (23.6 in.) With cover and fan: 630.2 mm (24.8 in.)	Dimensions orientation in vertical mount with cover  Dimensions orientation in horizontal mount with cover and fan 
Depth	With cover and handle: 409.5: mm (16.1 in.) With cover, fan and handle: 409.5 mm (16.1 in.)	
Width	With cover: 80 mm (3.1 in.) With cover and fan: 80 mm (3.1 in.)	
Weight	12.5 kg (27.5 lbs)	
Volume	With cover: 18 l Without cover: 12.5 l	

For more information, see *Nokia AirScale Radio Description*.

RF Sharing Configurations

LTE + GSM RF Sharing Configurations:

- up to 20MHz LTE + 4xGSM per pipe

Supported BTS configurations

Supported BTS configurations:

- For single carrier LTE: all released BTS configurations valid for RRH 2Tx/2Rx RF units

- For dual carrier *LTE2019: Advanced Dual Carrier Operation within same RF Unit*

9.16.3 LTE2680 system impact

LTE2680: FHEL AirScale RRH 2T2R B3 120 W impact on features, system performance and capacity.

Interdependencies between features

The *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature is impacted by the following features:

- *LTE112: Cell Bandwidth - 20 MHz*
  It enables LTE 20 MHz carriers.
- *LTE113: Cell Bandwidth - 15 MHz*
  It enables LTE 15 MHz carriers.
- *LTE114: Cell Bandwidth - 10 MHz*
  It enables LTE 10 MHz carriers.
- *LTE115: Cell Bandwidth - 5 MHz*
  It enables LTE 5 MHz carriers.
- *LTE116: Cell Bandwidth - 3 MHz*
  It enables LTE 3 MHz carriers.
- *LTE117: Cell Bandwidth - 1.4 MHz*
  It enables LTE 1.4 MHz carriers.
- *LTE614: Distributed Site*
  With LTE614 FHEL can be used in distributed sites with up to 23km fiber length to the system module.
- *LTE977: RF chaining*
  With LTE977 FHEL supports chains of up to 4 radio units.
- *LTE2437: Supported RAS Installation options in FL16 Release*
  With LTE2437 RAS installation options are defined

Impact on interfaces

The *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature has no impact on system performance and capacity.

9.16.4 LTE2680 reference data

LTE2680: FHEL AirScale RRH 2T2R B3 120 W requirements and sales information.

Requirements

Table 313 LTE2680 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not Applicable	LTE OMS16	Support not required	NetAct 16.8	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2680: FHEL AirScale RRH 2T2R B3 120 W* feature.

Sales information

Table 314 LTE2680 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.17 LTE2722: Basic FDD Configurations for AirScale

Benefits, functionality, system impact, reference data of the feature

The *LTE2722: Basic FDD Configurations for AirScale* feature introduces a comprehensive set of BTS configurations for single carrier deployments with AirScale System Module (one LTE carrier per antenna connector).

9.17.1 LTE2722 benefits

The *LTE2722: Basic FDD Configurations for AirScale* feature provides a comprehensive set of BTS configurations for single carrier deployments with AirScale System Module.

9.17.2 LTE2722 functional description

This feature provides BTS configurations for one FDD eNB built with the AirScale System Module Indoor. A complete eNB configuration is composed by a number of the following independent sub-configurations called *cell sets*:

- Sub-configurations can be flexibly combined, the maxium number of supported cells depends on the number of installed ABIA modules.
- Basic cell set sub-configurations are defined on level of ½ ABIA module.
- Extended cell set sub-configurations require one whole ABIA.

The possible cell mappings into the cell sets:

- Basic cell set:
  - up to 4 cells 5/10MHz in 2Tx/2Rx

  - up to 3 cells 15/20MHz in 2Tx/2Rx
  - up to 2 cells 15/20MHz plus 2 cells 5/10MHz in 2Tx/2Rx
  - up to 2 cells 5/10/15/20MHz with 4Tx/4Rx
- Extended cell set:
  - up to 6 cells 5/10/15/20MHz in 2Tx/2Rx
  - up to 3 cells 15/20MHz with 4Tx/4Rx

The difference in call capacity of two basic cell sets in comparison to one extended cell set is related to advanced LTE features.

Each capacity module ABIA provides 6 optical RF ports. Following optical interface options are supported (interface technology can be selected per ABIA module, speed can be selected on port base):

- OBSAI 3 Gbps or OBSAI 6 Gbps
- CPRI 2.4 Gbps or CPRI 4.9

The cell configurations listed above are supported by many different site deployment solutions using centralized Radio Modules, distributed Radio Modules or Remote Radio Heads. Intra Sector chaining is supported for distributed installations.

Most of the BTS topologies known from former releases can be re-used. However, the configuration of a Multiradio 10 base station cannot be used as it is with AirScale System Module. For the replacement of Multiradio 10 system modules with AirScale a manual conversion from Multiradio 10 base station plan file to AirScale plan file is needed.

Note: For details regarding supported configurations with different Radio Unit types please check release documentation.

Note: By default, both AirScale sub-rack halfs, each one equipped with one ASIA and up to three ABIA modules are operated as separate logical eNBs.

9.17.3 LTE2722 system impact

LTE2722: Basic FDD Configurations for AirScale impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

- LTE2517 AirScale HW capacity activation licenses are needed to use ABIA base band capacity. One license for each basic cell set and two licenses for each extended cell set.
- LTE1402 Uplink Intra-eNB CoMP: any 3 cells of same band belonging to the same cell set (basic one or extended one) can be selected for UL CoMP.
- LTE1691 Uplink intra eNode B CoMP 4RX: any 3 cells of same band belonging to the same cell set can be selected for the UL CoMP candidate set.
- Carrier aggregation is supported between cells assigned to same sector processed on any ASIA capacity module. Supported band and carrier bandwidth combinations are defined by the specific carrier aggregation features.
- Combined SuperCells according to LTE2445 can be configured between sub-cells served by radio units belonging to the same cell set.

Impact on interfaces

The *LTE2722: Basic FDD Configurations for AirScale* feature has no impact on interfaces.

Impact on network management tools

The *LTE2722: Basic FDD Configurations for AirScale* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2722: Basic FDD Configurations for AirScale* feature has no impact on system performance or capacity.

9.17.4 LTE2722 reference data

LTE2722: Basic FDD Configurations for AirScale requirements and sales information

Requirements

Table 315 LTE2722 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not supported	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

The *LTE2722: Basic FDD Configurations* feature requaires AirScale System Module.

Mimimum HW configuration:

- one AirScale Subrack AMIA
- one AirScale Common unit ASIA
- one AirScale Capacity unit ABIA

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2722: Basic FDD Configurations for AirScale* feature.

Sales information

Table 316 LTE2722 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.18 LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W

Benefits, functionality, system impact, reference data of the feature

The *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature introduces the Flexi Multiradio RF Module (FXEF) for 3GPP 1800 MHz band 3 (uplink: 1710 - 1785 MHz, downlink: 1805 - 1880 MHz). FXEF has three power amplifiers enabling it to support one, two or three sectors with an output power of up to 80 Watts xTX MIMO at the BTS antenna connectors.

9.18.1 LTE2767 benefits

The *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature provides the following benefits:

- Two RF Modules are able to support three sector 2TX MIMO.
- Flexible installation options. FXEF is designed to be mounted onto a wall or a pole.
- IP65 environmental protection class.

9.18.2 LTE2767 functional description

The main features of the FXEF are as follows:

- 1800 MHz 3GPP band 3 support
- 75 MHz instantaneous bandwidth
- 8 W, 10 W, 15 W, 20 W, 30 W, 40 W, 60 W and 80 W power level support
- 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz carrier bandwidth support
- Maximum eight GSM carriers or four WCDMA/LTE carriers per antenna connector with a maximum occupied bandwidth of 40 MHz multiple carriers with a maximum instantaneous bandwidth of 75 MHz in uplink and downlink
- LTE/LTE and LTE/GSM RF sharing support
- AISG2.0 antenna tilt support with external connector (RS485)
- Forced cooling by the integrated fans
- 25 l volume
- 25 kg weight

The FXEF supports the following modulation schemes:

- QAM64 (DL/UL)
- QAM256 (DL/UL)

The FXEF can be installed:

- on a pole.
- on a wall.

The following are some basic LTE configurations with one FXEF for one sector:

- 1 LTE cell @ max 20 MHz LTE bandwidth and 2TX MIMO/2RX
- 2 LTE cells @ max 20 MHz LTE bandwidth and 2TX MIMO/2RX
- 8+8, 20+20, 40+40, 60+60 or 80+80 W 2TX mode per sector (by branch activation and MIMO SW licenses)
- 8, 20, 40, 60 or 80 W 1TX 2RX mode per one, two or three sectors (by branch activation SW licenses)
- 4RX mode per sector (by activation 4RX SW license)

The following are some basic LTE configurations with two FXEF for two or three sectors:

- 1+1 or 1+1+1 LTE cells @ max 20 MHz LTE bandwidth and 2TX MIMO/2RX
- 2+2 or 2+2+2 LTE cells @ max 20 MHz LTE bandwidth and 2TX MIMO/2RX
- 8+8, 20+20, 40+40, 60+60 or 80+80 W 2TX mode per sector (by branch activation and MIMO SW licenses)
- 4RX mode per sector (by activation 4RX SW license)

The following are some basic GSM configurations:

- 4/4/4 cells @ 20 W with 40 MHz instantaneous bandwidth
- Up to eight GSM TRX carriers (4+4) per sector from 2TX PA paths

The following are the LTE/GSM configurations example:

- Up to 20 MHz LTE bandwidth (40 W) and four GSM 4TRX carriers per TX PA path
- 5 MHz bandwidth and 2TX MIMO + six GSM TRX carriers (3+3) per sector from 2 TX PA paths

For more information, see *Flexi Multiradio BTS RF Module and Remote Radio Head Description*.

9.18.3 LTE2767 system impact

LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature:

- *LTE117: Cell Bandwidth - 1.4 MHz* for the support of the 1.4 MHz LTE carriers
- *LTE116: Cell Bandwidth - 3 MHz* for the support of the 3 MHz LTE carriers
- *LTE115: Cell Bandwidth - 5 MHz* for the support of the 5 MHz LTE carriers
- *LTE114: Cell Bandwidth - 10 MHz* for the support of the 10 MHz LTE carriers
- *LTE113: Cell Bandwidth - 15 MHz* for the support of the 15 MHz LTE carriers
- *LTE112: Cell Bandwidth - 20 MHz* for the support of the 20 MHz LTE carriers

The *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature is impacted by the following features:

- *LTE614: Distributed Site*
  With this feature FXEF can be used in distributed sites with up to 23 km fiber length to the system module.
- *LTE977: RF chaining*
  With this feature FXEF supports chains of up to 4 radio units.
- *LTE1103: Load based Power Saving for multi-layer networks* or *LTE1203: Load based Power Saving mode with Tx power reduction or path switching off*
  One of these features need to be enabled to use the PA shutdown feature.
- *LTE1891: eNode B power saving - Micro DTX*
  This feature needs to be enabled to use Micro DTX extension.

Impact on interfaces

The *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature has no impact on system performance or capacity.

9.18.4 LTE2767 reference data

LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W requirements and sales information

Requirements

Table 317 LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL16A	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not applicable	LTE OMS16	Not applicable	NetAct 16.8	Not applicable	Not applicable

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature.

Sales information

Table 318 LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.19 LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)

Benefits, functionality, system impact, reference data of the feature

The *LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)* feature introduces the configurations of 4Tx/4Rx Remote Radio Heads (RRHs) from Flexi HW 4.3 in WCDMA-LTE RF sharing.

The list of RRHs belonging to Flexi HW 4.3 is available in the *LTE Base Stations Supported Configurations* document.

9.19.1 LTE2880 benefits

The *LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)* feature provides the following benefit: the option of using Flexi HW 4.3 based on 4Tx/4Rx RRHs in WCDMA-LTE RF sharing can make more flexible configurations available.

9.19.2 LTE2880 functional description

This feature extends the existing WCDMA-LTE RF sharing functionality to configurations with 4Tx/4Rx RRHs belonging to Flexi HW 4.3.

For the list of RRHs from Flexi HW 4.3, see the *LTE Base Stations Supported Configurations* document.

Table 319 Configurations introduced by the feature

Cells/Sectors	Configurations type	LTE BW	System Module	RF Modules (shared)	Carriers assignment
WCDMA up to 4+4+4 LTE: 1+1+1	WCDMA: 2Tx/4Rx (J-type) LTE: 2Tx/4Rx, MIMO (J-type)	5, 10, 15, 20 MHz	WCDMA: FSMF LTE: FSMF, FBBC	Up to 3x FRIJ or other RRHs from Flexi HW 4.3 (1-3 sectors)	Both WCDMA and LTE carriers mapped on dedicated Tx-pipes
WCDMA up to 4+4+4 LTE: 1+1+1	WCDMA: 2Tx/4Rx (J-type) LTE: 4Tx/4Rx, MIMO (M-type)	5, 10, 15, 20 MHz	WCDMA: FSMF LTE: FSMF, FBBC	Up to 3x FRIJ or other RRHs from Flexi HW 4.3 (1-3 sectors)	Both WCDMA and LTE carriers on shared PAs

Additional information on the configuration:

- WCDMA-LTE RF sharing is limited to the AWS1 frequency block of AWS-spectrum. The full frequency range support (AWS3) will come in the future release.
- Additional dedicated LTE bands are supported as defined in *LTE2080: LTE-WCDMA RF sharing with full FBBC support*.
- For this purpose, additional FBBC expansion modules might be needed.
- If LTE UL CoMP is used, an extended FSP cell set is required.
- An extended FSP cell set is also required if LTE 4Tx/4Rx-mode with 15/20 MHz is running.

For more information, see the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.19.3 LTE2880 system impact

LTE2880 impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)* feature:

- *RAN2126: RF Sharing WCDMA - LTE*
- *LTE435: RF Sharing WCDMA - LTE*

Impact on interfaces

The *LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)* feature has no impact on interfaces.

Impact on network management tools

The *LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)* feature has no impact on network management tools.

Impact on system performance and capacity

New configurations are available. For more information, see the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.19.4 LTE2880 reference data

LTE2880 requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 320 LTE2880 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	Not supported	FL16A	Planned for later releases	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Support not required	LTE OMS16A	Support not required	NetAct 16.8	Support not required	Support not required

There are no alarms, measurements and counters, key performance indicators, parameters related to the *LTE2880: Support of classical WCDMA/LTE RF-sharing on 4Tx/4Rx Remote Radio Head (RRH Rel. 4.3-family)* feature.

Sales information

Table 321 LTE2880 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.20 LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W

Benefits, functionality, system impact, reference data of the feature

The *LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W* feature introduces classical LTE-GSM RF sharing based on FXEF with both GSM and LTE running on FSMF System Modules.

9.20.1 LTE2911 benefits

The *LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W* feature provides the following benefit: the option of using FXEF in LTE-GSM RF sharing can make more flexible configurations available.

9.20.2 LTE2911 functional description

This feature extends the existing LTE-GSM RF sharing functionality to configurations with FXEF RF Module.

For information on FXEF, see the *LTE2767: FXEF Flexi RFM 3-pipe 1800 240 W* feature and the *Flexi Multiradio BTS RF Module and Remote Radio Head Description* document.

LTE-GSM RF sharing using FXEF is supported only on FSMF System Modules (both GSM and LTE).

FXEF is a replacement for FXEB and FXEE products. All FXEB configurations are supported. The configurations specific to FXEE are not introduced with this feature.

Any valid LTE cell set is allowed for a dedicated LTE radio that coexists with FXEF shared radio.

There is no power back-off in shared configurations.

In case of configurations where GSM uses a dedicated pipe, there are no antenna line management features available for that pipe.

RF sharing configurations with FXEF introduced by the feature:

- 1 x RFM indoor / Distributed Antenna System (DAS) solution
  - LTE (A) + 4 GSM TRX (A)
    LTE bandwidths: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz
- 2 x RFM centralized configuration
  - LTE 1.4 MHz (H) + 10 GSM TRX (C) or 5 GSM TRX (H)
  - LTE 3 MHz (H) + 10 GSM TRX (C) or 5 GSM TRX (H)
  - LTE 5 MHz (H) + 10 GSM TRX (C) or 5 GSM TRX (H)
  - LTE 10 MHz (H) + 8 GSM TRX (C) or 4 GSM TRX (H)
  - LTE 15 MHz (H) + 6 GSM TRX (C) or 3 GSM TRX (H)
  - LTE 20 MHz (H) + 4 GSM TRX (C) or 2 GSM TRX (H)
  - LTE 5 MHz (K) + 4 GSM TRX (K)
  - LTE 10 MHz (K) + 4 GSM TRX (K)
  - LTE 15 MHz (K) + 2 GSM TRX (K)
  - LTE 20 MHz (K) + 2 GSM TRX (K)
- 1-3 x RFM distributed site (shared PA, configuration G requires 2 port antenna, configuration J requires 4 port antenna), antenna ports which are not used can be allocated for a dedicated GSM (within the allowed capacity)
  - LTE 1.4 MHz (G) + 10 GSM TRX (B) or 5 GSM TRX (G)

  - LTE 3 MHz (G) + 10 GSM TRX (B) or 5 GSM TRX (G)
  - LTE 5 MHz (G) + 10 GSM TRX (B) or 5 GSM TRX (G)
  - LTE 10 MHz (G) + 8 GSM TRX (B) or 4 GSM TRX (G)
  - LTE 15 MHz (G) + 6 GSM TRX (B) or 3 GSM TRX (G)
  - LTE 20 MHz (G) + 4 GSM TRX (B) or 2 GSM TRX (G)
  - LTE 5 MHz (J) + 4 GSM TRX (J)
  - LTE 10 MHz (J) + 4 GSM TRX (J)
  - LTE 15 MHz (J) + 2 GSM TRX (J)
  - LTE 20 MHz (J) + 2 GSM TRX (J)
- 1-3 x RFM distributed site, dedicated pipes (either 4 port antenna or 2 x 2 port antennas needed)
  - LTE 1.4 MHz (G) + 6 GSM TRX (A)
  - LTE 3 MHz (G) + 6 GSM TRX (A)
  - LTE 5 MHz (G) + 6 GSM TRX (A)
  - LTE 10 MHz (G) + 6 GSM TRX (A)
  - LTE 15 MHz (G) + 6 GSM TRX (A)
  - LTE 20 MHz (G) + 6 GSM TRX (A)

All current RF sharing configurations are specified in the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.20.3 LTE2911 system impact

LTE2911 impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W* feature:

- *LTE447: SW support for RF sharing GSM-LTE*
- *BSS21520: SW support for RF sharing GSM-LTE*

Impact on interfaces

The *LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W* feature has no impact on network management tools.

Impact on system performance and capacity

New configurations are available. For more information, see the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.20.4 LTE2911 reference data

LTE2911 requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 322 LTE2911 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	Not supported	FL16A	Not supported	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Support not required	Support not required	Support not required	NetAct 16.8	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2911: Classical LTE-GSM RF-sharing with FXEF Flexi RFM 3-pipe 1800 240 W* feature.

Sales information

Table 323 LTE2911 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.21 LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)

Benefits, functionality, system impact, reference data of the feature

The *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature introduces the high power Flexi Zone Micro BTS (FW2CA) for 3GPP band 26 (uplink: 817.6 - 824 MHz, downlink: 862.6 - 869 MHz). FW2CA provides up to 2x20 Watts high output power at the antenna connector with 2TX MIMO.

9.21.1 LTE2914 benefits

The *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature provides the following benefits:

- One sector Flexi Zone Micro is able to support 2TX MIMO with high output power
- Seamless mobility and enhanced user experience in enterprise and public indoor locations by cost effectively improving the coverage and capacity of the network
- Small size and weight

9.21.2 LTE2914 functional description

The main features of the FW2CA are as follows:

- Frequency: 3GPP 850 MHz (band 26)
- RF output power: 1 W to 20 W per Tx path
- Carriers: 1

- Bandwidth support: 1x5 MHz per carrier
- Connected users: up to 480 simultaneous users
- Weight: 17 kg (37.5 lbs)
- Volume: 17 l
- Synchronization: RF GPS, IEEE 1588v2
- 2 x RJ45 and 1 x SFP for backhaul or management
- Antenna configuration: 2Tx/2Rx MIMO
- Antenna type: remote, customer provided
- Connector: 4.1/9.5 Mini-DIN
- Local Maintenance Ports: Bluetooth or unused RJ45 port
- Power Consumption: max: 360 W; typical: 290 W
- Emission: TS36.104 Rev-11 wide area
- No AISG 2.0 support

The FW2CA dimensions are:

- Height: 345 mm (13.6 in.)
- Width: 380 mm (15.0 in.)
- Depth: 169 mm (6.6 in.)

9.21.3 LTE2914 system impact

LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz) has no impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

There are no interdependencies between the *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature and any other feature.

Impact on interfaces

The *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature has no impact on interfaces.

Impact on network management tools

The *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature has no impact on system performance or capacity.

9.21.4 LTE2914 reference data

LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz) requirements and sales information

Requirements

Table 324 LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz) hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	Not supported	FL16A	FL16A

Table 324 LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz) hardware and software requirements (Cont.)

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz)* feature.

Sales information

Table 325 LTE2914: FW2CA Flexi Zone Micro High Power B26 (850 MHz) sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.22 LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)

Benefits, functionality, system impact, reference data of the feature

The *LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)* feature introduces classical WCDMA-LTE RF sharing support for narrowband LTE-carriers (1.4 and 3 MHz bandwidth) on all existing RF sharing configurations.

9.22.1 LTE2920 benefits

The *LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)* feature provides the following benefit: the option of using narrowband LTE-deployments in WCDMA-LTE RF sharing can make more flexible configurations available.

9.22.2 LTE2920 functional description

This feature extends the existing WCDMA-LTE RF sharing functionality to narrowband LTE support.

Narrowband LTE carrier support (LTE 1.4 MHz and LTE 3 MHz) for classical WCDMA-LTE RF sharing is released for the following RF variants:

- 1.4 MHz BW
  - 2-pipe RRHs: FRCG, FHDB
  - 4-pipe RRH: FHFB
  - 3-pipe RFMs: FXFA, FXCA, FXDA, FXFC, FXCB, FXDA, FXDB
- 3 MHz BW

- 2-pipe RRHs: FRCG, FHDB
- 3-pipe RFMs: FXFA, FXCA, FXDA, FXFC, FXCB, FXDA, FXDB

Narrowband LTE carrier support will be released on all existing WCDMA-LTE RF sharing configurations, that had been already released for 5 MHz LTE carrier on the listed RF units.

Note: There are some functional limitations while using LTE 1.4 MHz or 3 MHz, for example, 1.4 MHz and 3 MHz BW with 4RX diversity is not supported.

Further limitations are described in the *LTE2429: Inheritance of SIMO, RIU and 1.4/3MHz configurations* feature.

Those limitations are planned to be removed in further LTE releases.

All current RF sharing configurations are specified in the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.22.3 LTE2920 system impact

LTE2920 impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)* feature:

- *RAN2126: RF Sharing WCDMA - LTE*
- *LTE435: RF Sharing WCDMA - LTE*

The *LTE2429: Inheritance of SIMO, RIU and 1.4/3MHz configurations* feature describes functional limitations when using LTE bandwidth 1.4 or 3 MHz.

Impact on interfaces

The *LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)* feature has no impact on interfaces.

Impact on network management tools

The *LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)* feature has no impact on network management tools.

Impact on system performance and capacity

New configurations are available. For more information, see the *Flexi Multiradio BTS RF Sharing Released Configurations* document.

9.22.4 LTE2920 reference data

LTE2920 requirements, alarms and faults, measurements and counters, KPIs, parameters, and sales information

Requirements

Table 326 LTE2920 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE16A	Not supported	FL16A	Planned for later releases	Not supported	Not supported

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Support not required	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, measurements and counters, key performance indicators, parameters related to the *LTE2920: Classical WCDMA/LTE-RF sharing support for narrowband LTE (LTE 1.4 and 3 MHz)* feature.

Sales information

Table 327 LTE2920 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.23 LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA)

Benefits, functionality, system impact, reference data of the feature

The *LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA)* feature introduces dual-band Flexi Zone Indoor Pico BTS platform in two 3GPP licensed bands. There are two hardware variants introduced under this feature:

1. FW2EHA: Band-3 + Band-7
2. FW2EHWA: Band-3 + Band-7 + World Wide Compliant Wi-Fi

9.23.1 LTE2950 benefits

The *LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA)* feature provides the following benefits:

- Seamless mobility and enhanced user experience in enterprise and public indoor locations
- Cost-effective solution for improving the coverage and capacity of the network, delivering the best broadband experience to mobile users
- The hardware can be deployed as a stand-alone eNodeB, or in a Nokia's Zone-based architecture as a Flexi Zone Indoor Access Point via software upgrade
- The most compact dual-band Flexi Zone Indoor Pico BTS with macro parity in the industry
- Advanced features such as Carrier Aggregation across two bands

- Fully 3GPP compliant S1, X2 and Uu interfaces
- Seamless integration into legacy Nokia architecture and HetNets
- Software upgradeable to Nokia Zone solution
- Optional dual-band Wi-Fi including 802.11ac
- Fully automated Plug & Play

9.23.2 LTE2950 functional description

This hardware is the second generation of the Flexi Zone Indoor Pico BTS Platform. Key features include:

- Technology: LTE / LTE-A
- Frequency: FDD Band-3 (uplink: 1710 - 1785 MHz, downlink: 1805 - 1880 MHz) + Band-7 (uplink: 2500 - 2570 MHz; downlink: 2620 - 2690 MHz)
- Output Power: 2x250 mW max. per band (configurable in steps of 50 mW)
  Total output power of the Pico: 1 W
- Base Station Class: Local
- Weight and volume: < 3.0 kg / < 3.4 L (not including the mounting brackets) for both LTE and Wi-Fi
- Carrier bandwidth support: up to 20 MHz per band for the 3GPP licensed LTE
- Antenna Configuration: Integrated 2Tx / 2Rx (2X2 MIMO)
- Capacity: 400 users
- Wi-Fi: Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz, 802.11 b/g/n/ac
- Backhaul: Two RJ45 Copper Gigabit Ethernet ports
  Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2
  Port 2: Used for management, factory testing and also for daisy chaining of additional Indoor Pico
  Notes on backhaul ports:
  1. Only Port 1 is PoE capable. Thus, in daisy chained Picos, only the primary (main) Pico might be powered via PoE. The subsequent Picos will have to be powered via AC adapter.
  2. SynchE-based timing cannot be passed to the downstream Picos from the first Pico.
- Power: Two Options:
  - PoE++ capable
  - AC Power Adapter
- Mounting Options: Wall / Ceiling
- Regulatory Approvals: Market Specific

9.23.3 LTE2950 system impact

LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA) impact on features, system performance, and capacity

Interdependencies between features

LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA) feature has interdependencies between the following features:

- *FDD-LTE Dual Carrier (2x10MHz) Operation Support on a Single Flexi Zone Micro BTS*
  FDD-LTE Dual Carrier Operation Supports on a Single Kepler2 SoC
- *FDD Inter-band Dual Carrier Aggregation for Dual-Carrier Flexi Zone Micro BTS*
  FDD Inter-band Dual Carrier Aggregation for two-board Flexi Zone Micro BTS
- *Flexi Zone Controller Application support for multi-carrier Flexi Zone AP*
  Flexi Zone Controller Multi-Carrier AP Support

Impact on interfaces

The *LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA)* feature has no impact on interfaces.

Impact on network management tools

The *LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA)* feature has no impact on network management tools. This feature is not managed using NetAct.

Impact on system performance and capacity

The *LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA)* feature impacts system performance and capacity as follows:

- It supports up to 400 users.

9.23.4 LTE2950 reference data

LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA) requirements and sales information

Requirements

Table 328 LTE2950 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	Support not required	3GPP R10 mandatory 3GPP R11 mandatory 3GPP R11 UE capabilities 3GPP R12 UE capabilities	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the LTE2950: B3+B7 FZ G2 Indoor Multi-Band Pico (FW2EHA, FW2EHWA) feature.

Sales information

Table 329 LTE2950 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.24 LTE3027: FRPD Flexi RFM 6-pipe 700 240 W

Benefits, functionality, system impact, reference data of the feature

The *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature introduces the Flexi Multiradio RF Module (FRPD) for 3GPP EU700 MHz band 28 (uplink: 703 - 733 MHz, downlink: 758 - 788 MHz). FRPD has six power amplifiers enabling it to support one, two or three sectors with an output power of up to 40+40 Watts 2TX MIMO at the BTS antenna connectors.

9.24.1 LTE3027 benefits

The *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature provides the following benefits:

- One RF Module is able to support three sector 2TX MIMO.
- Flexible installation options. FRPD is designed to be mounted onto a wall or a pole.
- IP65 environmental protection class.

9.24.2 LTE3027 functional description

The main features of the FRPD are as follows:

- EU700 MHz 3GPP band 28 support
- 30 MHz instantaneous bandwidth
- 8 W, 10 W, 15 W, 20 W, 30 W and 40 W power level support
- 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz carrier bandwidth support
- Maximum six carriers per antenna connector with a maximum occupied bandwidth of 30 MHz multiple carriers with a maximum instantaneous bandwidth of 30 MHz in uplink and downlink in LTE mode
- AISG2.0 antenna tilt support with external connector (RS485)
- Forced cooling by the integrated fans
- 19.3 l volume
- 24 kg weight

The FRPD supports the following modulation schemes:

- QAM64 (DL/UL)
- QAM256 (DL/UL)

The FRPD module can be installed

- on a pole.
- on a wall.

For more information, see *Flexi Multiradio BTS RF Module and Remote Radio Head Description*.

9.24.3 LTE3027 system impact

LTE3027: FRPD Flexi RFM 6-pipe 700 240 W impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

The following features must be activated before activating the *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature:

- *LTE115: Cell Bandwidth - 5 MHz* for the support of the 5 MHz carriers
- *LTE114: Cell Bandwidth - 10 MHz* for the support of the 10 MHz carriers
- *LTE113: Cell Bandwidth - 15 MHz* for the support of the 15 MHz carriers
- *LTE112: Cell Bandwidth - 20 MHz* for the support of the 20 MHz carriers

The *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature is impacted by the following features:

- *LTE614: Distributed Site*
  With this feature FRPD can be used in distributed sites with up to 23 km fiber length to the system module.
- *LTE977: RF chaining*
  With this feature FRPD supports chains of up to 4 radio units.
- *LTE1103: Load based Power Saving for multi-layer networks* or *LTE1203: Load based Power Saving mode with Tx power reduction or path switching off*
  One of these features must be enabled to use the PA shutdown feature.
- *LTE1891: eNode B power saving - Micro DTX*
  This feature must be enabled to use Micro DTX extension.

Impact on interfaces

The *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature has no impact on interfaces.

Impact on network management tools

The *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature has no impact on system performance or capacity.

9.24.4 LTE3027 reference data

LTE3027: FRPD Flexi RFM 6-pipe 700 240 W requirements and sales information

Requirements

Table 330 LTE3027: FRPD Flexi RFM 6-pipe 700 240 W hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	FL16A	FL17	Not supported	Not supported

Table 330 LTE3027: FRPD Flexi RFM 6-pipe 700 240 W hardware and software requirements (Cont.)

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
Not applicable	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the *LTE3027: FRPD Flexi RFM 6-pipe 700 240 W* feature.

Sales information

Table 331 LTE3027: FRPD Flexi RFM 6-pipe 700 240 W sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes

9.25 LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)

Benefits, functionality, system impact, reference data of the feature

The *LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)* feature introduces a dual-band Flexi Zone Indoor Pico BTS platform in 3GPP licensed bands. There will be two hardware variants introduced under this feature:

1. FW2HHA: Band-7 + Band-7
2. FW2HHWA: Band-7 + Band-7 + World Wide Compliant Wi-Fi

9.25.1 LTE3177 benefits

The *LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)* feature provides the following benefits:

- Seamless mobility and enhanced user experience in enterprise and public indoor locations
- Cost-effective solution for improving the coverage and capacity of the network, delivering the best broadband experience to mobile users
- The hardware can be deployed as a stand-alone eNodeB, or in a Nokia's Zone-based architecture as a Flexi Zone Indoor Access Point via software upgrade
- The most compact dual-band Flexi Zone Indoor Pico BTS with macro parity in the industry
- Advanced features such as Carrier Aggregation across two bands
- Fully 3GPP compliant S1, X2 and Uu interfaces
- Seamless integration into legacy Nokia architecture and HetNets
- Software upgradeable to Nokia Zone solution
- Optional dual-band Wi-Fi including 802.11ac

- Fully automated Plug & Play

9.25.2 LTE3177 functional description

This hardware is the second generation of the Flexi Zone Indoor Pico BTS Platform. Key features include:

- Technology: LTE / LTE-A
- Frequency: FDD Band-7 (uplink: 2510-2550 MHz, downlink: 2630-2670 MHz) + Band-7 (uplink: 2510-2550 MHz; downlink: 2630-2670 MHz)
- Output Power: 2x250 mW max. per band (configurable in steps of 50 mW)
  Total output power of the Pico: 1 W
- Base Station Class: Local
- Weight and volume: < 3.0 kg / < 3.4 L (not including the mounting bracket) for both LTE and Wi-Fi
- Carrier bandwidth support: up to 20 MHz per band for the 3GPP licensed LTE
- Antenna Configuration: Integrated 2Tx / 2Rx (2X2 MIMO)
- Capacity: 400 users
- Wi-Fi: Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz, 802.11 b/g/n/ac
- Backhaul: Two RJ45 Copper Gigabit Ethernet ports
  Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2
  Port 2: Used for management, factory testing and also for daisy chaining of additional Indoor Pico
  Notes on backhaul ports:

  1. Only Port 1 is PoE capable. Thus, in daisy chained Picos, only the primary (main) Pico might be powered via PoE. The subsequent Picos will have to be powered via AC adapter.
  2. SynchE-based timing cannot be passed to the downstream Picos from the first Pico.

- Power: Two Options:
  - PoE++ capable
  - AC Power Adapter
- Mounting Options: Wall / Ceiling
- Regulatory Approvals: Market Specific

9.25.3 LTE3177 system impact

LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA) impact on features, interfaces, network management tools, and system performance and capacity

Interdependencies between features

There are no interdependencies between the *LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)* feature and any other feature.

Impact on interfaces

The *LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)* feature has no impact on interfaces.

Impact on network management tools

The *LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)* feature has no impact on network management tools.

Impact on system performance and capacity

The *LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA)* feature impacts system performance and capacity as follows:

- It supports up to 400 users.

9.25.4 LTE3177 reference data

LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA) requirements and sales information

Requirements

Table 332 LTE3177 hardware and software requirements

System release	Flexi Multiradio BTS	Flexi Multiradio 10 BTS	Nokia AirScale BTS	Flexi Zone Micro BTS	Flexi Zone Access Point
FDD-LTE 16A	Not supported	Not supported	Not supported	FL16A	FL16A

Flexi Zone Controller	OMS	UE	NetAct	MME	SAE GW
FL16A	Support not required	Support not required	Support not required	Support not required	Support not required

There are no alarms, commands, measurements and counters, key performance indicators, parameters related to the LTE3177: B7+B7 FZ G2 Indoor Multi-Band Pico (FW2HHA, FW2HHWA) feature.

Sales information

Table 333 LTE3177 sales information

Product structure class	License control	Activated by default
Basic Software (BSW)	-	Yes