

Supplemental Downlink for Carrier Aggregation

FDD

Feature Description

Copyright

© Ericsson AB 2016-2018. All rights reserved. No part of this document may be reproduced in any form without the written permission of the copyright owner.

Disclaimer

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

Trademark List

All trademarks mentioned herein are the property of their respective owners. These are shown in the document [Trademark Information](#).



Contents

1	Supplemental Downlink for Carrier Aggregation Overview	1
2	Dependencies	3
3	Feature Operation	4
4	Parameters	5
4.1	Feature Configuration Parameters	5
4.2	Affected Parameters	5
4.3	Parameters Affecting the Feature	5
5	Network Impact	7
5.1	Mobility	7
6	Performance	8
6.1	KPIs	8
6.2	Counters	8
6.3	Events	8
7	Activate Supplemental Downlink for Carrier Aggregation	9
8	Deactivate Supplemental Downlink for Carrier Aggregation	10





1 Supplemental Downlink for Carrier Aggregation Overview

Access Type:	LTE
Feature Identity:	FAJ 121 3068
Value Package Name:	Carrier Aggregation
Value Package Identity:	FAJ 801 0405
Node Type:	Baseband Radio Node DU Radio Node
Licensing:	Licensed feature. Once license per radio.

Summary

A cell typically consists of two component carriers: uplink and downlink. Supplemental downlink only cells are an exception where there is only a downlink component carrier.

For FDD, this feature allows a carrier aggregation capable UE to use the supplemental downlink only cell as a secondary component carrier. The Supplemental Downlink for Carrier Aggregation feature makes it possible to add and unlock a `EUtranCellFDD` with only a downlink carrier, for example Band 29. This means that no uplink carrier is needed. The downlink only cell is utilized as a downlink secondary cell by the Carrier Aggregation feature.

Additionally, an FDD or TDD cell which has been configured as barred through setting parameter `cellBarred` (`EUtranCellFdd.cellBarred` or `EUtranCellTdd.cellBarred`) = 1 (BARRED), can also be used as an SCell when the Supplemental Downlink for Carrier Aggregation feature is active and the cell is configured as an SCell candidate.

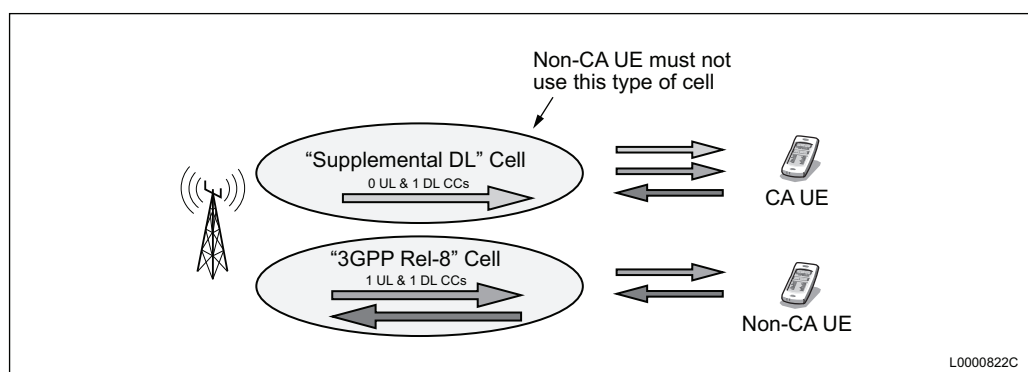


Figure 1 The Carrier Aggregation Function



The Dynamic SCell Selection for Carrier Aggregation and Supplemental Downlink for Carrier Aggregation features can operate together.

The main benefits of Supplemental Downlink for Carrier Aggregation are the following:

- Spectrum utilization on bands defined as downlink only, for example: Band 29 using Carrier Aggregation
- Increased downlink User Equipment (UE) peak throughput
- Increased aggregated downlink throughput and capacity

Additional Information

More information about this feature and related topics can be found in the following documentation:

- *3GPP 36.104 V11.4.0, Band 29*



2 Dependencies of Supplemental Downlink for Carrier Aggregation

Table 1 Feature Dependencies

Feature	Relationship	Description
Carrier Aggregation(FAJ 121 3046)	Prerequisite	The Carrier Aggregation license is activated.
Combined Cell(FAJ 121 3025)	Related	Combined cells cannot be configured as downlink only SCells.
Dynamic SCell Selection for Carrier Aggregation(FAJ 121 3063)	Related	The features Dynamic SCell Selection for Carrier Aggregation and Supplemental Downlink for Carrier Aggregation can operate together. When the eNodeB is configured with downlink only cells, these cells can be candidates when performing dynamic SCell selection.

Hardware

No special hardware requirement is expected for this feature

Limitations

No limitations for this feature.

Network Requirements

This is a licensed feature. This means that for the feature to be operational, a valid license key must be installed and the feature must be explicitly activated by setting a MOM attribute.

The following must be fulfilled at feature activation:

- The Carrier Aggregation license is activated.
- The Supplemental Downlink for Carrier Aggregation license is activated.
- The User Equipment (UE) supports Carrier Aggregation and the aggregated bands.



3 Feature Operation

This section describes the Supplemental Downlink for Carrier Aggregation feature in more detail, including network configuration requirements and operation flows.



4 Parameters

This section describes parameters introduced by the Supplemental Downlink for Carrier Aggregation feature and parameters affected by activating the feature.

4.1 Feature Configuration Parameters

[Table 2](#) Describes the parameters introduced by the feature.

Table 2 Feature Parameters

Parameter	Description
isDlOnly	Indicates if the cell is operated with downlink only and with no uplink. The cell must be locked when changing this attribute and it takes effect at cell unlock.
anrMeasOn	Automated Neighbor Relations (ANR) performs measurements on the referenced frequency if this parameter is set to true. Otherwise, ANR does not perform measurements on this frequency.

4.2 Affected Parameters

[Table 3](#) describes the parameters affected by the feature.

Table 3 Affected Parameters

Parameter	Description
cellBarred	Indicates if the cell is barred and must not be accessible to random UEs.

4.3 Parameters Affecting the Feature

[Table 4](#) describes parameters that affect the feature.

Table 4 Parameters Affecting the Feature

Parameter	Description
sCellCandidate	The value indicates whether the cell that is indicated by the parameter cell relation can be used as the Secondary component carrier (SCell). This is for the UE using this cell as the Primary component carrier (PCell).
isRemoveAllowed	Indicates if the Automated Neighbor Relations (ANR) function is allowed to remove this object. The ANR function does not restrict operator removal of the object.
isHoAllowed	Specifies whether handover between the cells in this relation is allowed.
connectedModeMobilityPrio	Prioritizes E-UTRAN frequencies among all frequencies related to the cell for UEs in connected mode. For information about mobility, see Mobility on page 7.
voicePrio	Prioritizes EUTRAN frequencies among all frequencies related to the cell for UEs in connected mode. Sets the priority to which frequency



Parameter	Description
	to perform mobility to for a voice session. For information about mobility, see Mobility on page 7.
loadBalancing	This attribute indicates whether Inter-Frequency Load Balancing is ALLOWED or NOT_ALLOWED or if Inter-Frequency Offload shall be applied from the current cell to the cell indicated by the cell relation.
earfcnul	The channel number for the central uplink frequency. The mapping from channel number to physical frequency for specified E-UTRA bands is described in 3GPP TS 36.104. The values that can be used depend on national, operator-specific frequency allocation as well as on the supported frequency bands of the RBS. Note: This attribute is dependent on and set together with earfcndl. The earfcnul and earfcndl values are dependent and relate according to the default E-UTRA TX channel to RX channel separation as specified in 3GPP TS 36.101 for the E-UTRA operating band and channel bandwidth of the cell. Note: For DL-only bands, the value of earfcnul is set to N/A.
ulChannelBandwidth	The uplink channel bandwidth in the cell.
noOfRxAntennas	The number of antennas that can be used for uplink reception in a sector.
ulAttenuation	Uplink attenuation between the connector on the radio unit and the connector on the antenna unit.
ulTrafficDelay	Uplink traffic delay in the low noise amplifier branch associated with this connector.



5 Network Impact

This section describes how the Supplemental Downlink for Carrier Aggregation feature impacts the network functions and capabilities.

5.1 Mobility

This section provides information on the impact of the feature on mobility.

Cells that are configured as downlink (DL) only cannot be used as Primary Cells (PCells) and must therefore never be the target of any handover. The eNodeB will not do any handover using a cell relation where the attribute `isHoAllowed` is set to false. Also, the eNodeB will not use frequency relations where the attributes `connectedModeMobilityPrio`, `voicePrio`, and `arpPrio` are set to the value -1. Making these settings on the frequency relations where DL only configured cells exist will ensure that no release with redirect or handover will happen to these frequencies triggered by mobility.

When a cell is configured as DL only, all incoming X2 and S1 handover preparations are rejected, even if the relation exists.



6 Performance

This section describes performance indicators, counters, and events associated with the Supplemental Downlink for Carrier Aggregation feature.

6.1 KPIs

The same KPIs associated with the Carrier Aggregation feature are valid for Supplemental Downlink for Carrier Aggregation.

6.2 Counters

[Table 5](#) lists the counters associated with the Supplemental Downlink for Carrier Aggregation feature.

Table 5 Counters

Counter	Description
pmHoPrepRejInDlOnlyCell	Handover is not supported for downlink only cells. This performance manager counter pegs if the incoming handover preparation rejection cause is owing to the downlink only target cell.

More information about counters can be found in [Managed Object Model \(MOM\)](#).

6.3 Events

[Table 6](#) lists the events associated with the Supplemental Downlink for Carrier Aggregation feature.

Table 6 Events

Event	Event Parameter	Description
INTERNAL_PROC_HO_PREP_X2_IN	EVENT_PARAM_HO_REJECT_CAUSE	Updated with new failure cause REJECT_DUE_TO_DL_ONLY_CELL
INTERNAL_PROC_HO_PREP_S1_IN	EVENT_PARAM_HO_REJECT_CAUSE	Updated with new failure cause REJECT_DUE_TO_DL_ONLY_CELL

More information about events can be found in [Manage Lists](#).



7 Activate Supplemental Downlink for Carrier Aggregation

Prerequisites

- The license key is installed in the node.
- Continuous Cell Trace Recording (CCTR) is activated since at least one week. This ensures there is troubleshooting data available if something goes wrong.

Steps

1. Set the attribute `featureState` to `ACTIVATED` in the applicable MO instance, depending on node type:

Node Type	License Control MO
DU Radio Node	<code>OptionalFeatureLicense=SupplementaryD1OnlyCell</code>
Baseband-based Node	<code>FeatureState=CXC4011567</code>

After This Task

Let the CCTR be active for one week, for continued collection of troubleshooting data.



8 Deactivate Supplemental Downlink for Carrier Aggregation

Prerequisites

Continuous Cell Trace Recording (CCTR) is activated since at least one week. This ensures there is troubleshooting data available if something goes wrong.

Steps

1. Set the attribute `featureState` to DEACTIVATED in the applicable MO instance, depending on node type:

Node Type	License Control MO
DU Radio Node	<code>OptionalFeatureLicense=SupplementaryD1OnlyCell</code>
Baseband-based	<code>FeatureState=CXC4011567</code>

After This Task

Let the CCTR be active for one week, for continued collection of troubleshooting data.