ERICSSON

5+5 MHz Sector Carrier

Feature Description

129/221 04-LZA 701 6014/1 Uen N4B

Contents

1 5+5 MHz Sector Carrier Overview

The feature enables the carrier capacity licenses on the node. This feature is automatically activated during software upgrade.

Feature Identity:	FAJ 121 3071
Value Package Name:	LTE Base Package
Value Package Identity:	FAJ 801 0400
Node Type:	Baseband
Licensing:	Capacity

Summary

The 5+5 MHz Sector Carrier feature enables the operator to allocate 5+5 MHz sector carrier capacity units depending on the requirement of the operator. This provides a more flexible capacity licensing capability to the node with an increasing number of cells.

Note: The 5+5 MHz Sector Carrier license is needed on the node.

2 Dependencies of 5+5 MHz Sector Carrier

The feature has no dependencies to other features, but can limit the size of the node. This limitation can effect other features.

Feature Dependencies

There are no dependencies to other features.

Hardware

There are no special hardware requirements for this feature.

Limitations

The 5+5 MHz Sector Carrier feature is related to the overall node capacity and can limit the size of the node. The limitation on the node size can affect other features.

Network Requirements

There are no network requirements for this feature.

3 Feature Operation of 5+5 MHz Sector Carrier

The feature works through allocating 5+5 MHz sector carriers for units.

The 5+5 MHz Sector Carrier feature introduces a capacity license. The license restricts the number of 5+5 MHz Sector Carrier capacity units that can be activated on a node. This feature enables the operator to allocate features for each 5+5 MHz sector carrier and not for each node.

This feature checks the free 5+5 MHz sector carrier capacity units when a cell that refers to single or multiple sectors is unlocked or reconfigured. The operator can allocate more 5+5 MHz sector carrier capacity units, or undo the cell unlocking or reconfiguration if any of the following happens:

— The free units are insufficient.

— The cell unlocked or reconfiguration fails.

— A relevant alarm is triggered.

3.1 Calculating the Number of Required 5+5 MHz Sector Carrier Capacity Units, FDD

The 5+5 MHz sector carrier is the capacity granularity for every cell per Radio Access Technology (RAT) per node.

The operator can use the following formula to calculate the required number of 5+5 MHz sector carrier capacity units for one cell:

$$No.\ of\ Required\ \ Capacity\ \ Units = Ceiling\ \left[\frac{Configured\ \ Channel\ \ Bandwidth}{10\ MHz}\right] * No.\ of\ Sector\ \ Carriers\ \ of\ \ the\ \ Cell$$

In a non-PSI-Coverage cell, the Configured Channel Bandwidth is the sum of values of the `EUtranCellFDD.dlChannelBandwidth` and the `EUtranCellFDD.ulChannelBandwidth` attributes.

In a PSI-Coverage cell, the Configured Channel Bandwidth is the sum of values of the `EUtranCellFDD.dlChannelBandwidth` and the 3 × [UL channel bandwidth of each SectorCarrier].

Note: `EUtranCellFDD.ulChannelBandwidth` does not represent the actual uplink bandwidth provided by the PSI-Coverage FDD cell. Instead, a calculation that involves comparison of ifBandwidth and ulChannelBandwidth is performed by CRA, and the lower of the two values is used as uplink channel bandwidth per sector carrier.

The number of cell sector carriers is determined by the `EUtranCellFDD.sectorCarrierRef` attribute.

For example, a 1.4 MHz/3 MHz cell with single sector carrier requires one 5+5 MHz unit. A 5 MHz cell with two sector carriers requires two units, as shown in Figure 2.

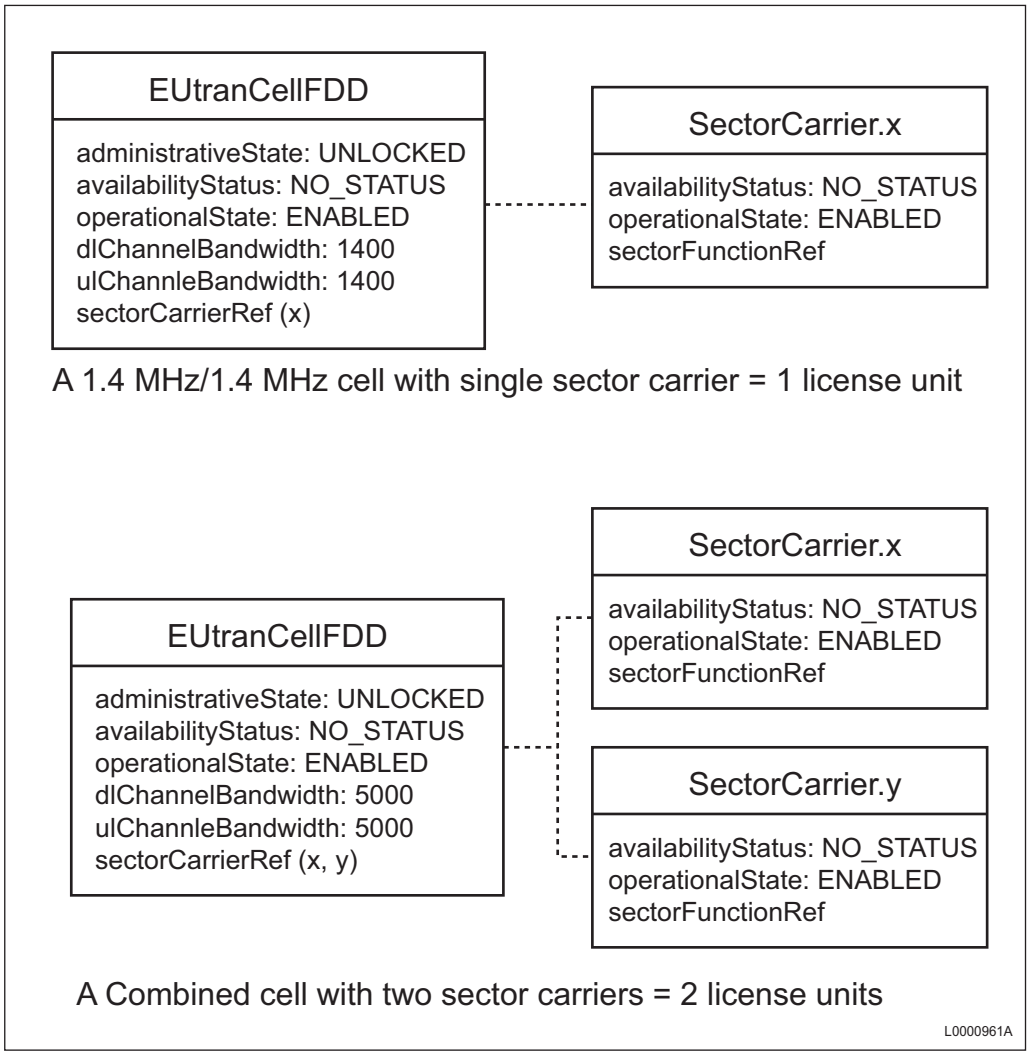

Figure 2 Examples of Required 5+5 MHz Sector Carrier Capacity Units Calculation, FDD

Example 1 Calculating the Number of Required Units, FDD

- `Required capacity units`
  `= Ceiling (<Configured channel BW> / 10 MHz) *`
  `<no. of SC of the cell>`

- `Configured channel BW =`
  `For PSI-Coverage FDD cell`

```
      : DL BW + 3 * <UL channel bandwidth of each SC>
   For DL only FDD cell
      : DL BW
   For FDD cell
      : DL BW + UL BW
   DL BW = EUtranCellFDD.dlChannelBandwidth
   UL BW = EUtranCellFDD.ulChannelBandwidth
   UL channel bandwidth of each SC = ulCarrierBandwidth
      from CAT(a lower value of ifBandwidth and
      ulChannelBandwidth)
```

- ```
  no. of SC of the cell =
  For PSI Coverage FDD : 1
  Others               : no. of SC of the cell
  ```

- ```
  1.4 MHz/3 MHz require at least 1 unit of
  5+5 MHz SectorCarrier license
  ```

3.2 Calculating the Number of Required 5+5 MHz Sector Carrier Capacity Units, TDD

The 5+5 MHz sector carrier is the capacity granularity for every cell per Radio Access Technology (RAT) per node.

The operator can use the following formula to calculate the required number of 5+5 MHz sector carrier capacity units for one cell:

$$No.\ of\ Required\ \ Capacity\ \ Units = Ceiling\left[\frac{Configured\ \ Channel\ \ Bandwidth}{10\ MHz}\right] * No.\ of\ Sector\ \ Carriers\ \ of\ \ the\ \ Cell$$

The Configured Channel Bandwidth is determined by the `EUtranCellTDD.channelBandwidth` attribute.

The number of sector carriers of a cell is determined by the `EUtranCellTDD.sectorCarrierRef` attribute.

For example, a 5 MHz cell with two sector carriers requires two units, as shown in Figure 4.

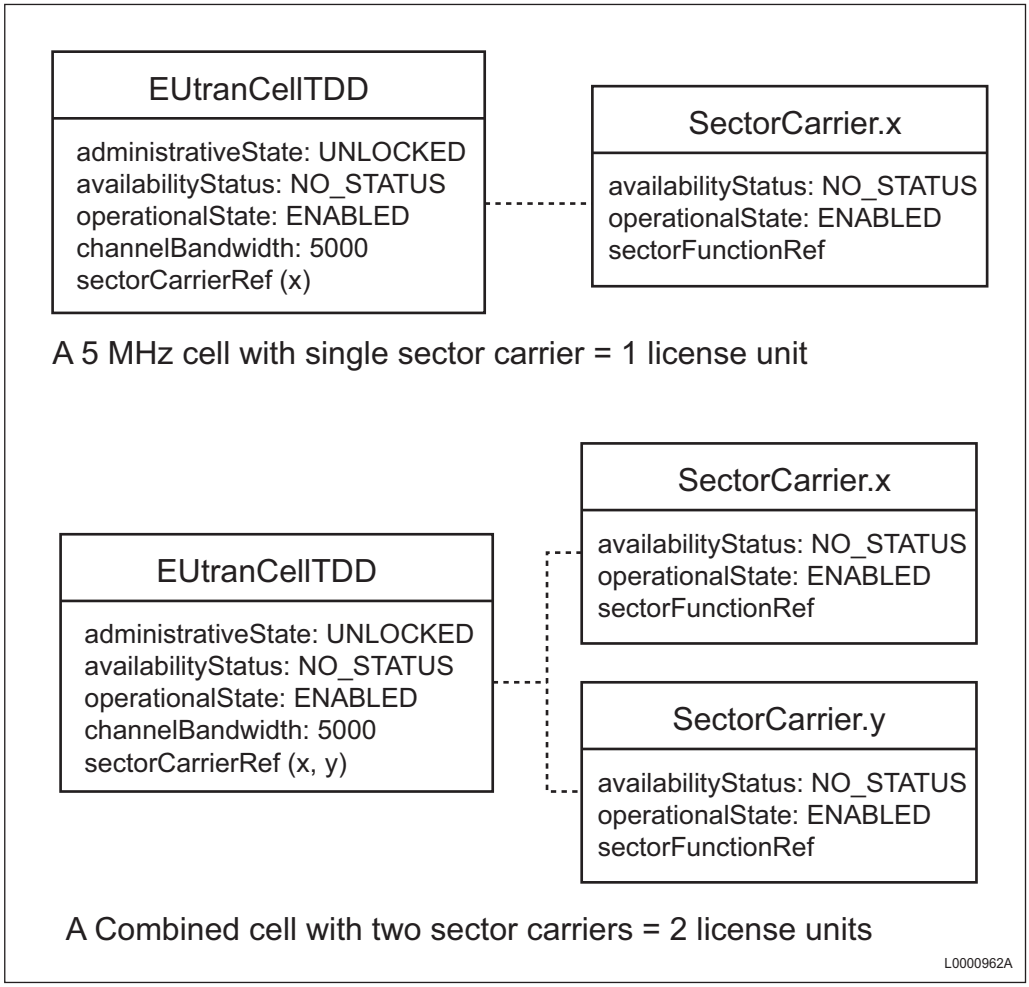

Figure 4 Examples of Required 5+5 MHz Sector Carrier Capacity Units Calculation, TDD

Example 2 Calculating the Number of Required Units, TDD Only

- Required capacity units
  = Ceiling (<Configured channel BW> / 10 MHz) *
    <no. of SC of the cell>

- Configured channel BW =
  For TDD cell
     : BW
  BW = EUtranCellTDD.channelBandwidth

- 1.4 MHz/3 MHz require at least 1 unit of
  5+5 MHz SectorCarrier license

3.3 Checking 5+5 MHz Sector Carrier Capacity

The `CapacityFeatureLicense.capacityUnit` attribute shows the value of the 5+5 MHz sector carrier capacity of a cell.

3.4 Allocating 5+5 MHz Sector Carrier Capacity Units

When unlocking or reconfiguring a cell, the eNodeB checks if there are sufficient free licensed 5+5 MHz sector carrier capacity units:

— If there are, the eNodeB allocates the 5+5 MHz sector carrier capacity units to the cell. The cell and all its `SectorCarrier` are successfully activated.

— If the free 5+5 MHz Sector Carrier capacity units are sufficient for at least one referenced `SectorCarrier` but not all, the eNodeB only partly licenses the cell. The cell is activated with setting `SectorCarrier.availabilityStatus` attribute to `DEGRADED`. `SectorCarrier` can be activated while others fail. If this occurs, alarm Resource Allocation Failure is triggered.

Note: The operator cannot configure the `SectorCarrier` in the activated cell, as it is dependent on the order in which `SectorCarrier` activation belongs to the cell.

— If the 5+5 MHz sector carrier capacity units are insufficient for all referenced `SectorCarrier`, the cell unlocking operation fails and the Resource Allocation Failure alarm is triggered.

— For FDD, degraded status is not allowed in a cell with the Psi-Coverage feature. If there is not enough 5+5 MHz sector carrier capacity units in a cell with the Psi-Coverage feature, the cell unlocking operation fails and the Resource Allocation Failure alarm is triggered.

3.5 Releasing 5+5 MHz Sector Carrier Capacity Units

When locking a cell, the 5+5 MHz sector carrier capacity units allocated to the cell are released and return to the unit pool. The Resource Allocation Failure alarm (if any) is ceased, along with any other alarms in the cell.

3.6 Changing 5+5 MHz Sector Carrier Capacity

The operator can change the number of 5+5 MHz sector carrier capacity units by installing a new LKF or activating the emergency state.

If the new license allows a lower number of 5+5 MHz sector carrier capacity units than the allocated license, the activated cells stay in service. However, new unlocking cells are rejected because of the license allocation failure. To release

some units to match the new license capacity, the operator can select cells to lock or reconfigure.

If a new license allows more 5+5 MHz Sector Carrier capacity units, the operator can unlock more cells. The operator can also reconfigure cells to utilize the recently applied license capacity.

4 Network Impact of 5+5 MHz Sector Carrier

The feature has no impact on capacity, performance and interfaces.

Capacity and Performance

This feature has no impact on capacity and performance.

Interfaces

This feature has no impact on the interfaces.

Other Network Elements

This feature has no impact on other network elements.

5 Parameters for 5+5 MHz Sector Carrier

There are no introduced or associated parameters.

Parameters

No parameters are introduced or associated with this feature.

6 Performance of 5+5 MHz Sector Carrier

This feature introduces counters to show the number of allocated capacity in the node, and the capacity units for FDD and TDD cells.

KPIs

This feature has no associated KPIs.

Counters

This feature introduces the following counters:

- `ENodeBFunction.pmLic5MHzSectorCarrierActual`
- `ENodeBFunction.pmLic5Plus5MHzScFddActual`
- `ENodeBFunction.pmLic5Plus5MHzScTddActual`

Events

This feature has no associated events.

7 Enable or Disable Capacity

While licensed features need to be individually activated, capacities are automatically enabled when the License Key File is installed on a node. Capacity cannot be deactivated once it is enabled on the node.

8 Engineering Guidelines for 5+5 MHz Sector Carrier

The feature enforces the 5+5 MHz sector carrier license rules with software upgrade.

Software Upgrade

The 5+5 MHz sector carrier license rules are instantly enforced during upgrade. This is because of the node restart that results in unlocked cells and sector carriers. To avoid network disturbance, operators need to have a clear upgrade strategy for all nodes. The following high-level process is recommended:

1. Add 5+5 MHz sector carrier licenses to each customer bulk in Ericsson License Information System.
2. Download new LKFs which contain the number of licensed 5+5 MHz sector carrier capacity units depending on the customer contract.
3. Deploy the new LKFs before downloading the software.
4. Ensure that all LKFs are updated before rolling out the software.

Before upgrading, it is suggested to verify the presence of 5+5 MHz Sector Carrier license key ID in `UpgradePackage.verifyUpgrade` MO. After the upgrade is triggered, the presence of 5+5 MHz Sector Carrier license key ID is also checked with `UpgradePackage.rebootNodeUpgrade` or `UpgradePackage.upgrade` actions. If the license key ID is found in the LKF, the verification or upgrade sequence continues. Otherwise, further execution of the sequence is rejected. This status is visible in `UpgradePackage.actionResult` attribute, without rollback.