LTE Key Performance Indicators for LTE RF Design

LTE is still a developing technology, and it is important to note that as more field trials are carried out and results validated against the deployed LTE network performance goals, the design targets outlined in this section are subject to change. The quality of the LTE RF design will be evaluated using planning Tool. This will be based on a combination of area predictions and Monte Carlo simulations. It is important to note that the emphasis of the design evaluation will be on focusing where demand is and where potential LTE users are located. The following are a non comprehensive list of key performance indicators that will be used to validate the quality of the LTE RF network design.

Reference Signal Received Power (RSRP)

Reference signal received power (RSRP) identifies the signal level of the Reference Signal. It is defined as the linear average over the power contributions of the resource elements that carry cell-specific reference signals within the considered measurement frequency bandwidth.

Design KPI for RSRP:

10MHz Channel Bandwidth (700MHz & AWS): -98 dBm /-103 dBm
5MHz Channel Bandwidth (700MHz & AWS): -98 dBm /-103 dBm

A minimum of 95% of the weighted average of the LTE design service area (Cluster or Polygon) must meet the RSRP targets specified above. The criterion of 95% is based on a weighting using the same clutter weights used for traffic spreading. The target specified above is after taking into consideration the indoor loss values assigned per clutter type (In-building losses enabled).

Note: The targets for AWS are only applicable in cases where the AWS design is being carried out as a standalone design and not be used as a capacity layer over an existing 700 MHz layer LTE network.

Reference Signal Received Quality (RSRQ)

Reference Signal Received Quality (RSRQ) identifies the quality of the Reference Signal. It is defined as the ratio N×RSRP/(E-UTRA carrier RSSI), where N is the number of RB"s of the E-UTRA carrier RSSI measurement bandwidth. The measurements in the numerator and denominator shall be made over the same set of resource blocks.

E-UTRA Carrier Received Signal Strength Indicator (RSSI), comprises the linear average of the total received power observed only in OFDM symbols containing reference symbols for antenna port 0, in the measurement bandwidth, over N number of resource blocks by the UE from all sources, including co-channel serving and non-serving cells,adjacent channel interference, thermal noise etc. The Design KPI is based on traffic load—traffic load is discussed later in Sections 3.5 and 5.5.

Design KPI for RSRQ:

2 Transmit Paths:
50% Load: -15 dB
100% Load: - 18 dB

A minimum of 95% of the weighted average of the LTE design service area (Cluster or Polygon) must meet the RSRQ targets specified above. The criterion of 95% is based on a weighting using the same clutter weights used for traffic spreading.

Overlapping Zones (Number of Servers)

The overlapping zones (number of servers) criteria are used to establish the quality of the RF propagation environment from an interference point of view. The goal of the number of servers‘ criteria is to establish dominance and reduce the waste of network resources and degraded network performance that may

occur when multiple servers exist in the same geographic area. The calculation is based on the reference Signal (RS) signal levels of the servers.

Design KPI for Overlapping Zones (Number of Servers):

Within 5 dB of the best server

- % area with 4 or more servers should be < 2%.
- % of area with 2 or more servers should be < 30%.

Within 10dB of the best server

- % of area with 7 or more servers should be < 2%.
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The calculation is based on area importance. The clutter weights used for traffic spreading establishes the importance of the geographic area. The idea here is to focus the LTE design where LTE users are located (for example, core urban areas, convention centers, major stadiums, etc.) instead of areas within the LTE polygon with no users (for example, scrublands, forests, etc.)

DL Cell Aggregate Throughput

The DL Cell Aggregate throughput is the sum of the throughputs to all the users in the cell at an instant in time. This is to be measured following Monte Carlo simulations only.

Design KPI for DL Cell Aggregate Throughput:

- 10MHz Channel Bandwidth: 13.4 Mbps per cell
- 5MHz Channel Bandwidth: 6.7 Mbps per cell

A minimum of 90% of the cells in the LTE design reference area (Cluster or Polygon) should have the DL Cell Aggregate Throughput exceeding the minimum design KPI values specified above. No cells should have Aggregate DL Throughput less than 50% of this KPI target.

DL Cell Edge User Throughput

The DL Cell Edge User Throughput is established as the minimum throughput for users at the cell edge of the network at 50% loading. This is to be measured following Monte Carlo simulations only.

Design KPI for DL Cell Edge User Throughput:

- 10MHz Channel Bandwidth: 1000 kbps per user
- 5MHz Channel Bandwidth: 500 kbps per user

A minimum of 90% of all users in the LTE design reference area should have the DL Cell Edge User Throughput exceeding the minimum design KPI values specified above. No more than 2% of the users should have a DL Cell Edge User Throughput less than 50% of this KPI target.

All the statistics for the LTE designs must be generated on a cluster by cluster or super cluster basis following the criteria defined later in the document. In addition to the quantitative evaluation of the LTE design using the KPIs stated above, a qualitative evaluation of the design will also be carried out as outlined in the design evaluation. The exit criteria of a design are met when both the quantitative (KPIs) and qualitative evaluation of the designs are successfully completed.