

LTE-A – Requirements

Agenda Item: 6.1

Source: Nokia, Nokia Siemens Networks

LTE-A Workshop Outcome

- REV-080058 contains a chairman summary of the LTE-A workshop discussion
 - A first outline was given for the requirement discussion
 - A good starting point for the requirement developments as the main issue are covered
- In this contribution we address the requirements needing further development

Peak Data Rate Requirements

- Workshop identified targets for peak data rate
 - Peak data rate in DL: [up to] 1 Gbps
 - Peak data rate in UL: [Greater than 500 Mbps]
- Peak data rates requirements are mainly UE capability related
- Requirements are met as long as the peak spectrum efficiency x 100 MHz allows this
- L1 designed to meet peak data rates
 - Actual peak data rate varies according to duplexing modes and frequency bands etc.

Peak Spectrum Efficiency

- Workshop indentified targets for peak spectrum efficiency
 - Uplink: [15] b/Hz/s
 - Downlink: [30] b/Hz/s
- Peak spectral efficiency of LTE Release 8
 - Uplink: 3.75 b/Hz/s (with 64QAM)
 - Downlink: 15 b/Hz/s
- The main way of increasing the peak spectrum efficiency is increasing the number of antennas, however
 - More antennas in the UE
 - Having more than two antennas are difficult in handheld devices
 - Four might be possible in laptop type devices, but still difficult
 - More antennas comes at the expense of terminal cost and form factor
 - Practical performance improvements from multiple antennas are much less than theoretical ones due to non-ideal correlation and power properties
 - Large differences between frequency variants
 - More antennas in the base station
 - Four antennas is already a large step

Peak Spectrum Efficiency (cont.)

- Our recommendation for LTE-A peak spectrum efficiency
 - UL: 7.5 b/Hz/s
 - Assuming 2x2 or 2x4
 - DL: 15 b/Hz/s
 - LTE is long term competitive with 4x4 supported
- 2x2 will in long term be the most important case
- Practical achievable improvements and real competitiveness should be prioritized

Target for spectrum efficiency (Average)

- Workshop identified targets for average cell throughput
 - Uplink: [2] b/Hz/s
 - Downlink: [3.2] b/Hz/s
- Average cell throughput performance for LTE Release 8 for simulation case 1
 - Uplink: 0.8-0.9 b/Hz/s for 1x2
 - Downlink: 2.7 b/Hz/s for 4x4
- The only way to get close to these targets is to increase the number of antennas in the UE and base station
 - Uplink: Reference case is 2x4
 - Downlink: Reference case is 4x4
- Workshop indicated the following assumptions for the evaluation scenarios:
 - Deployment scenario considered for absolute values is case 1 in TR25.814
 - Similar relative gains are targeted for other system scenario in TR25.814
 - Additional indoor scenarios [TBD] should be considered ⇒ This indoor scenario needs to be developed in the beginning of the SI so that performance evaluation can also be done in the new indoor scenario.
- Workshop indicated that primary focus of LTE-Advanced is low mobility users ⇒ This should be taken into account in the LTE-A evaluation assumptions
- The figures should be understood as targets
 - IMT-A requirements shall be met
 - LTE-A targets can be more aggressive

Target for spectrum efficiency (Cell edge)

- Workshop identified targets for cell edge throughput
 - Uplink: [0.05] b/Hz/s
 - Downlink: [0.1] b/Hz/s
- Cell edge throughput performance for LTE Release 8 for simulation case 1
 - Uplink: 0.03-0.04
 - For 1x2 when maintaining an average cell throughput of 0.8-0.9 b/Hz/s
 - Downlink: 0.1 b/Hz/s
 - For 4x4 and with average cell throughput of 2.7 b/Hz/s
- Workshop targets are OK
 - Are cell edge and average spectral efficiency to be achieved at the same time?

VoIP Requirements

- Workshop suggestion: [300] concurrent VoIP users @5MHz
 - Absolute limits on the maximum number of VoIP users in different bandwidths should be considered
- LTE VoIP system simulations for Case 1
 - ~250 users (UL limited)
- Increasing the number of antennas in the base station would benefit UL
- Increasing the number of antennas for voice centric terminals is not
- Significant increase in the VoIP capacity for LTE-A is challenging
 - Is increasing the VoIP capacity beyond LTE the prime target of LTE-A?