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Operator views on LTE advanced

Orange

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Scope and overall objective

- Continued evolution of mobile services and growth of radio traffic for mobile systems is expected for the coming decade.
- We support a further evolution of LTE with the double objective:
  - LTE advanced should be a competitive candidate for the IMT advanced family defined by ITU-R.
  - LTE advanced should meet operator needs for future mobile broadband systems beyond LTE capabilities.
- Requirements to be considered:
  - ITU-R requirements will mainly focus on physical layer performance and spectrum related aspects.
    LTE advanced should meet or exceed these requirements.
  - Operator needs and expectations also include areas such as QoS handling, deployment and operational aspects, reduced CAPEX/OPEX cost per bit.
    LTE advanced should bring further improvements compared to LTE.

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Backwards compatibility

- Operators are preparing a big migration step towards LTE/SAE.
- Operators are not prepared for another big step in the timeframe foreseen for LTE advanced.
- Backwards compatibility mentioned in the SID (RP-080137) is a strong requirement and should be further refined:
  - an LTE terminal should be able to operate in LTE advanced …without noticeable performance impact.
  - an LTE advanced terminal should be able to operate in LTE …with the same performance as an LTE terminal.
- Any disruptive features or versions of LTE advanced should be carefully assessed and introduced only if there is a strong request from operators in specific scenarios.

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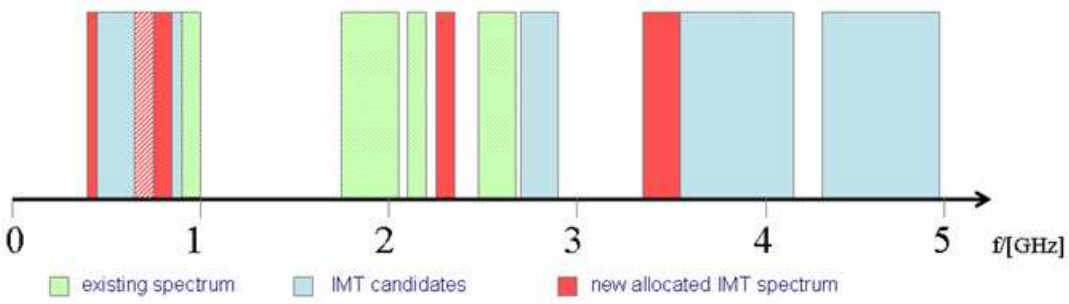
Spectrum related requirements

- LTE advanced is expected to operate in the bands identified by ITU-R for IMT systems.
- All existing and new IMT bands are potential candidates.



- Flexibility in terms of spectrum allocations was already introduced in LTE but should be extended to
  - Larger spectrum allocations above 20 MHz, e.g. 40 MHz.
  - Possibility to support discontinuous spectrum allocations (spectrum aggregation).

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Performance requirements

- LTE fulfills requirements from TR25.913 but stays close to the lower end in some areas [RP-070458]
- ITU-R requirements are still under discussion but can be expected to be somewhat above current LTE capabilities.
- Operator expectations for the performance of future mobile systems can be found e.g. in [NGMN].
- Orange's view on performance requirements for improving LTE:
  - Peak spectrum eff. expectations are mainly fulfilled by LTE (2x2 and 4x4).
  - Main improvements expected in the following areas:
    - Downlink cell average spectrum efficiency *[>2.65 b/s/Hz/sector]**
    - Downlink cell edge spectrum efficiency *[>0.1 b/s/Hz/user]**
    - Uplink cell average spectrum efficiency *[>1.65 b/s/Hz/sector]**
    - Uplink cell edge spectrum efficiency *[>0.05 b/s/Hz/user]**
    - VoIP capacity: >60 users/MHz*
    - One way air interface latency < 5ms*
- Main goal is to improve cell average and cell edge performance

*(2x2 system, case 1 of TR25.814, 10 users, cf. R1-070674)

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Candidate technologies

- Improved interference management
  - Key technology to improve cell average and cell edge performance.
  - Advanced receivers (including interference cancellation) should be considered and related performance requirements should be specified.
  - Improved multi-cell interference management
  - Benefits of synchronous networks should be assessed

- Enhanced MIMO operation
  - Further enhancements of downlink schemes
  - Introduction of uplink SU-MIMO for specific scenarios (indoor, small cells)
  - Multi-user MIMO and beamforming

- Coverage and cell edge improvements
  - Relaying

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Operational requirements

- LTE will include a limited set of features to enable operational requirements such as:
  - Facilitate operation and maintenance
  - Self configuration and optimization
  - True multi-vendor interoperability via open interfaces
- LTE advanced should be able to provide further improvements and reduce CAPEX/OPEX per bit.

- LTE advanced should provide further enhancements for specific operation modes such as
  - Small cells (femto cells)
  - Broadcast mode

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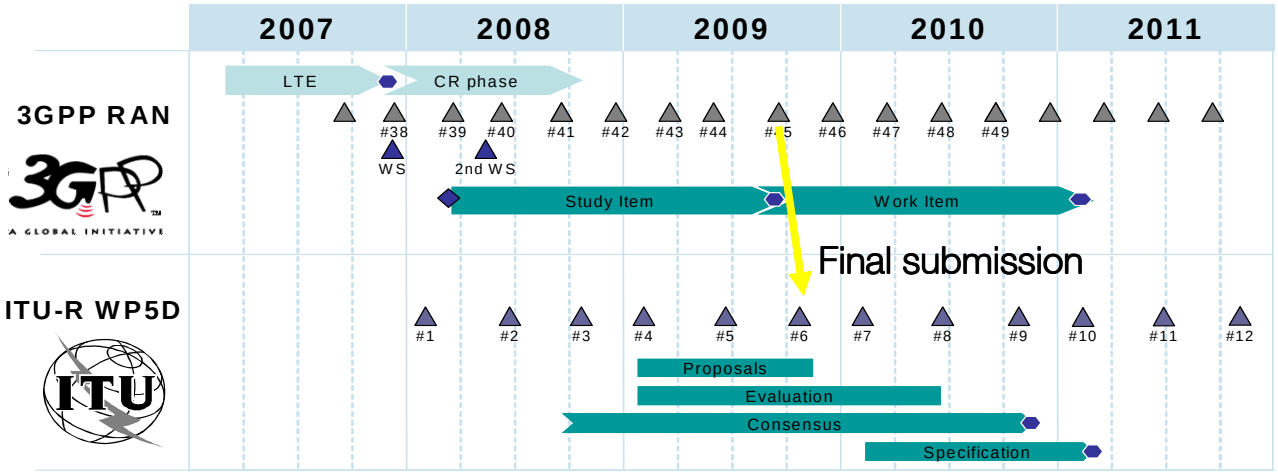
Timeplan and relation to ITU-R



- LTE should be improved based on operator requests for specific features and workload at 3GPP-RAN.
- Planning of WIDs related to LTE advanced features should be discussed taking into account updated schedules at ITU-R and outcomes of the study item.
- We should allow an early introduction of specific enhancements identified during the LTE advanced study item in LTE prior to the release that fully addresses the design submitted to ITU-R.

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References

- RP-080137 Further advancements for E-UTRA (LTE-Advanced), RAN#39, Puerto Vallarta, March 2008.
- [NGMN] NGMN, 'Next Generation Mobile Networks Beyond HSPA & EVDO – A white paper', V3.0, December 2006, available at http://www.ngmn.org.
- RP-070458 LTE Performance – Review and Way Forward, RAN#36, Busan, May 2007.
- R1-070674 LTE physical layer framework for performance verification, RAN1#48, St. Louis, February 2007.

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thank you

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