

# LTE Release 11 Work and Study Items

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## Summary

3GPP TSG RAN meeting #53 was held in Fukuoka, Japan, from Sep. 13 - 16, 2011, and was hosted by ARIB & TTC. The meeting had 154 participants and 479 Technical Documents [1].

At last RAN plenary meeting RAN#52, operators were requested to provide a ranking of the Work and Study Items (WIs/SIs) for Release 11. 35 operators provided their view which now allows us to rank the work items according to the operator's priority. The tables of this report provide an excellent idea of the interest areas of different operators about the Release 11 work in 3GPP. A general observation is that there is less operator support for HSPA evolution in 3GPP than for LTE enhancements. Still work will also progress on some HSPA WI/SI. A lot of the WI/SIs anyway cover both technologies.

The WG chairmen provided their view for the next months until March 2012. At the next plenary Dec. 11 at RAN #54 they will review the situation and have a discussion about the future handling. Nevertheless there will not be any new WI/SI discussed anymore, so this report should provide the reader a full picture of LTE Release 11 activities.

## RAN1 – Physical Layer Working Group

Generally RAN1 has a very high work load. The RAN1 chairmen suggested that max 4 WIs/SIs are feasible to be completed in time. In the next 6 months, the work in RAN1 will continue on the top 6 WI/SIs as shown by the green parts in the table below.

Title	WI or SI	Status
WI/SI Coordinated Multi-Point Operation for LTE	WI	Approved
Core part: LTE Carrier Aggregation Enhancements	WI	Approved
Core part: Further Enhanced Non CA-based ICIC for LTE	WI	Approved
Study on further Downlink MIMO enhancements for LTE-Advanced	SI	Approved
Provision of low-cost MTC UEs based on LTE	SI	Approved

Proposed SI on LTE Coverage Enhancements	SI	Approved
Study on Enhanced Uplink Transmission for LTE	SI	on hold
Study on LTE Device to Device Discovery and Communication - Radio Aspects	SI	postponed
Study on Further Enhancements to LTE TDD for DL-UL Interference Management and Traffic Adaptation	SI	on hold
New WI: Improvements to LTE Relay Backhaul	WI	postponed

Highest priority of the operators lies with Coordinated Multi-Point (CoMP) transmission and reception [2]. Such techniques, including the use of large scale Remote Radio Heads, have been recognized as a tool to improve the coverage, to support high data rates, improve the cell-edge throughput, and also to increase the system capacity. CoMP will be the key feature of release 11. There are different flavors with varying complexity, involving more or less changes to the physical layer, the protocol and the X2 interface. After successful studies and the analysis of impact on specification, a Work Item is now created to prepare the Release 11 specification for this new feature. Samsung is leader of this work item.

Operator's second priority is the enhancement of Carrier Aggregation. As previously explained, we see Carrier Aggregation as the most important feature of Release 10, and operators confirm this understanding by expressing the wish to improve this feature. One of the key issue is to handle multiple timing advances in LTE-A. This would allow carriers of different sites to be scheduled dynamically by a single scheduler.

Similarly to Release 10, an Enhanced Inter-cell Interference Coordination will play also a role in Release 11 to enable Heterogeneous Networks (HetNets) in a backwards compatible manner. This is addressed in a Work Item that will be executed in RAN1 and is called "Further Enhanced Non CA-based ICIC for LTE". For this WI, it was decided that no work will be done on the so called second priority items for the next 6 months. There is still REL-10 work ongoing which has to be prioritized over REL-11 work. The same argument holds for other earlier R10 WIs, like CA, MIMO

and eICIC. NSN suggested postponing Rel-11 items in RAN4 while Rel-10 discussions are still ongoing. Main work load is in RAN4 and the RAN4 Chairman will prioritize the work accordingly.

Overall these three work items represent the core work that will be done as part of Release 11 in RAN1 on the Physical Layer. Furthermore, there are three supported Study Items, where depending on the outcome of the study, a Work Item might be created or not.

The scope of the downlink MIMO WI (Study on Downlink MIMO Enhancement for LTE-Advanced) was reduced. Open loop MIMO, including open loop MU-MIMO operation, will not be investigated anymore. Possible enhancements for demodulation Reference Symbols for MIMO, including considerations on improved orthogonality for MU-MIMO and possibilities for DMRS overhead reduction is also not part of the work item anymore.

Another study deals with Machine-Type Communications (MTC), a market that is likely to have some potential. Usually these type of devices and applications can be handled adequately by the use of GSM/GPRS. As LTE deployments evolve, operators would like to reduce the cost of overall network maintenance by minimizing the number of RATs and would like to promote a migration to LTE.

The LTE coverage enhancements SI will be discussed over email to reduce time spend in the meetings.

Qualcomm proposal on Device to Device communication was postponed due to lack of support by the operators. It can be assumed that Qualcomm will continue to push this work item that seems to be of high priority to them, since they already presented proprietary solutions for Device to Device communication on the market.

China Mobile made a lot of pressure on LTE TDD enhancements that were not supported by other operators not having any TDD spectrum. In particular, a study item for interference management and traffic adaptation was discussed. After lengthy discussion to grant a special status due to its high importance for that market, it was still concluded to put that Work Item on hold. It should also be noted that already many WI/SI like CoMP, CA aggregation enhancements cover FDD & TDD technologies at the same time. Supporting companies were CATT, CATR, Clearwire, CMCC, Ericsson, HiSilicon, Huawei, Intel, ITRI, NII Holdings, Potevio, Samsung, ST-Ericsson, UK Broadband, and ZTE. It is expected that the issues will be discussed again in the December meeting.

## RAN2 – Radio Access Protocol WG

Similarly to RAN1 the RAN2 Chairman recommended in the next 6 months to continue on the top 6 WI/SIs.

Title	WI or SI	Status
Core part: LTE RAN Enhancements for Diverse Data Applications	WI	Approved
Study on HetNet mobility enhancements for LTE	SI	Approved
Enhancement of Minimization of Drive Tests for E-UTRAN and UTRAN	WI	Approved
New WI: Signalling and procedure for interference avoidance for in-device coexistence	WI	Approved
New WI proposal: RAN overload control for Machine-Type Communications	WI	Approved
Core part: Service continuity and location information for MBMS for LTE	WI	Approved
Study Item on Further RAN Improvements for Machine-type Communications	SI	postponed
New Study Item Proposal for Radio Level Dynamic Flow Switching between 3GPP-LTE and WLAN	SI	postponed
New study item proposal for LTE and HSDPA Carrier Aggregation	SI	postponed
Core Part: Network-Based Positioning Support for LTE	WI	continue

Highest priority was given to the WI LTE RAN Enhancements for Diverse Data Applications [3]. The idea is to enhance current mobile networks to better support smartphones, laptops, netbooks, tablets and embedded modems running a wide variety of data applications, often in parallel. The diversity and unpredictable nature of application traffic profiles leads to challenges in optimising the network and in guaranteeing efficient operation under all use cases. RRC state control mechanisms and DRX configurations may be optimised with particular applications in mind, but these may not remain optimal as different applications are installed/started/stopped on the device, and as the consequent traffic profile of the device changes over time. RIM is leader of this work item.

The scope of the eMBMS WI (Service continuity improvements for MBMS for LTE) was reduced. In particular, the work on location-based services was removed. This basically concerns specific optimizations for services that may only be relevant for localized areas (smaller than the MBSFN area) e.g. location based services selection or energy savings.

Although, Trueposition did not get any support for its Network-based position WI, they were able to continue on this work item since only work in

RAN3 is required, a group which is not overloaded. The reader might be aware of the lawsuit of TruePosition against Ericsson, Alcatel-Lucent and Qualcomm that accuses the defendants of blocking the adoption of TruePosition's technologies into the new standards for LTE, which has been reported in the media.

### RAN3 – Radio Access Interfaces WG

As RAN3 in general is not overloaded, all WI/SI with RAN3 in the lead have been accepted to continue.

Title	WI or SI	Status
Further Self Optimizing Networks (SON) Enhancements	WI	Approved
Core part: Carrier based HetNet ICIC for LTE	WI	Approved
New WI: Network Energy Saving for E-UTRAN	WI	Approved
Proposed WID: LIPA Mobility and SIPTO at the Local Network RAN Completion	WI	Approved
Study on further enhancements for HNB and HeNB	SI	Approved
New SI: Mobile Relay for E-UTRA	SI	Approved

After extensive standardisation of SON already in Rel.8, 9 and 10, this work will further continue in Release 11 as part of the Work Item "Further Self Optimizing Networks (SON) Enhancements" [4]. Key issues are further improvements of Mobility Robustness Optimization and an extension of the Automatic Neighbor Relation function. New, complex scenarios will be investigated such as unnecessary short stays of UEs when moving across a network or the avoidance of Intra-RAT inter-layer or inter-RAT ping-pongs by information exchange between the RATs. These events may be especially relevant in case of HetNet deployments, where a macro cell overlaps with several low power nodes. Another aspect is the RAT selection based on QoS related information or coordination between Mobility Robustness Optimization and other traffic steering or load balancing algorithms.

Mobile relays will focus only on RAN3 aspects for the next 6 months, and is of lower priority in general. Since, some work of RAN1 and RAN2 is likely to be required it seems to be uncertain if a Rel.11 Work Item can be created later on.

A major impact on RAN3 can be expected on Coordinated Multipoint transmission in case RAN1 decides to standardize X2-based CoMP schemes.

### RAN4 – Radio Frequency and Performance Testing Working Group

RAN4 Chairman's initial recommendation was that all RAN4-led WI/SIs could be handled. Therefore most of the WI/SIs were approved. Nevertheless agreement could not be reached on three new proposed WI/SIs, which were postponed to the December 2011 plenary.

Title	WI or SI	Status
Enhanced performance requirement for LTE UE	SI	Approved
New SI: Study of RF and EMC Requirements for Active Antenna Array System (AAS) Base Station	SI	Approved
Study on Measurement of Radiated Performance for MIMO and multi-antenna reception for HSPA and LTE terminals	SI	Approved
New SI: Passive InterModulation (PIM) handling for Base Stations	SI	Postponed
E-UTRA medium range and MSR medium range/local area BS class requirements	WI	Approved
RF Requirements for Multi-band and Multi-standard Radio BTS	WI	Postponed
Core part: Relays for LTE (part 2)	WI	Approved
EMC Requirements for Multi-Standard Mobile Terminals and Ancillary Equipment	WI	Postponed
Study on Inclusion of RF Pattern Matching Technologies as a positioning method in the E-UTRAN	SI	Approved

By far the biggest operator's interest was seen for the Study Item "Enhanced performance requirement for LTE UEs". This SI will evaluate feasibility and potential gain by advanced receiver at link and system levels to cope with growing data traffic to support smart phones with various applications and to improvement of system capacity for the LTE systems. Particularly, mitigating inter-cell interference at the UE receiver would be desired to improve cell edge user throughput. This might be of particular interest for HetNets with low power nodes within the macro cell coverage which might even apply range expansion. Spatial domain interference mitigation such as Interference Rejection Combining might be the candidate technologies.

### LTE-Advanced Carrier Aggregation band combinations

The work items related to the different bands for LTE-A CA have not been part of the prioritisation process. This work is of highest priority to introduce Carrier Aggregation in different markets.

In the next table we provide an overview of band combinations for which Release 11 Work Items have already been approved to support Carrier Aggregation. Since there is a large number of WIs, a high work load can be assumed until all of them can be completed for Release 11.

Combination	WI or SI	Status
Band 3 + Band 7	WI	Approved
Band 4 + Band 13	WI	Approved
Band 4 + Band 17	WI	Approved
Band 20 + Band 7	WI	Approved
Band 5 + Band 12	WI	Approved
Band 4 + Band 12	WI	Approved
FLO + Band 2	WI	Approved
Band 2 + Band 17	WI	Approved
Band 4 + Band 5	WI	Approved
Band 5 + Band 17	WI	Approved
Band 20 + Band 3	WI	Approved
Band 20 + Band 8	WI	Approved
Band 1 + Band 3	WI	Approved
Band 4 + Band 7	WI	Approved
Band 1 + Band 7	WI	Approved
Band 41 (intra-band CA)	WI	Approved
Band 38 (intra-band CA)	WI	Approved
Band 7 (intra-band CA)	WI	Approved
Band 25 (intra-band CA, non contiguous)	WI	Approved

An overview of the detailed parameter for all different standardised LTE bands can be found in [5].

## References

- [1] RP-11xxxx, Draft Report of 3GPP TSG RAN meeting #53, Fukuoka, Japan, Sep. 13 – 16, 2011
- [2] RP-111117 Work Item Description, Coordinated Multi-Point Operation for LTE, Samsung, 3GPP TSG RAN meeting #53, Fukuoka, Japan, Sep. 13 – 16, 2011
- [3] RP-111123 Work Item Description, Proposed Update for LTE RAN Enhancements for Diverse Data Applications, RIM, 3GPP TSG RAN meeting #53, Fukuoka, Japan, Sep. 13 – 16, 2011
- [4] RP-111110 Work Item Description, Further Self Optimizing Networks (SON) enhancements, Nokia Siemens Networks 3GPP TS 36.104 V10.4.0 (2011-09) TSG RAN; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (Release 10)
- [5]

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