

Rel-18 NR above 52.6 GHz

Agenda Item:

9.0.2

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Discussion

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- WI for enhancement of NR 52.6 ~ 71 GHz
- SI for NR extension up to 114.25 GHz

WI for enhancement of NR 52.6 ~ 71 GHz

Rel-17 NR extension up to 71GHz

- Baseline feature enablement for 60GHz (unlicensed) band
 - Targets general eMBB enhancements, and not optimized for various verticals.
 - Extension of FR2 design to support wider bandwidths and larger subcarrier spacing.
 - Rel-17 design is not complete, so difficult to estimate all the baseline features that will be available at the end of Rel-17.
 - Extremely likely that the following improvements will be not considered (or at the very least not optimized) in Rel-17:
 - Lower process latency (compared to FR2),
 - Lower power consumption and improved energy efficiency,
 - Enhancement to peak data throughput (such as 256QAM, etc)
 - Improved coverage

Rel-18 Potential Areas for Improvement (1/2)

▪ Higher Performance Features

- Optimized support for UEs not limited to handheld form factors and handheld device power constraints. – *depend on Rel-17 progress*
- More advanced UE capability (than what is available in Rel-17) – *depend on Rel-17 progress*
- Investigation on techniques that could lower implementation challenge barrier for even higher order modulation (for 64 QAM or 256 QAM). – *not part of Rel-17 scope*
 - e.g. non-uniform constellation, etc.

▪ Improved Coverage Features

- Potentially supporting of transmission techniques to combat coverage taking into account limited EIRP and PSD enforced by regulatory domains (coverage enhancement explicitly left out from Rel-17 WID). – *not part of Rel-17 scope*

Rel-18 Potential Areas for Improvement (2/2)

▪ Improved Energy Efficiency Features

- Multi-rank DFT-s-OFDM (that leverage low PAPR/CM) to improve power efficiency – *not part of Rel-17 scope*
- Power saving techniques adapted to scenarios with LBT enabled – *not part of Rel-17 scope*

▪ Other Feature Enhancements

- Channel access enhancements (possibly including support or enhancements for Rx-assisted LBT) – *depend on Rel-17 progress*
- Enhancements of multi-beam/panel/TRP operation – *depend on Rel-17 progress*
- Beam management enhancements – *depend on Rel-17 progress, but likely not completed in Rel-17*

Rel-18 Focus Areas for Expansion & Optimization



Positioning

Leveraging extremely wide BW for improved precision and accuracy.

Key feature in supporting various verticals.



Fixed Wireless & IAB

Optimizations to better support fixed wireless communication, and IAB.

Leveraging much higher EIRP regulatory limits (e.g. in UE mobile links are limited to 40dBm EIRP, while fixed wireless have 85dBm EIRP).



V2X & ITS

Harmonized ITS band located at 64 ~ 66 GHz.

Enablement of V2X/ITS operation in 60GHz band

Note: these enhancements should be part of each vertical WI scope

Suggested Prioritized Objective and Scope

- Among all potential areas for improvement, the following are the prioritized objectives in case of limited TU. We may consider other objectives from slide 4 and 5 if some objectives denoted as “if left out from Rel-17” can be complete in Rel-17.
- **Feature enhancements:**
 - [RAN1] Enhancements of channel access (if features are left out from Rel-17);
 - [RAN1] Enhancements of multi-beam/panel/TRP operation (if features are left out from Rel-17);
 - [RAN1] supporting coverage enhancements (feature was excluded from Rel-17 WID);
- **Performance enhancements:**
 - [RAN1] Enhancements to robustly sustain high peak rates (e.g DMRS/PTRS enhancements, non-uniform constellation, etc) (if feature(s) left out from Rel-17);
 - [RAN1] capability for supporting lower PDSCH/PUSCH/CSI latency (if low latency capabilities are left out from Rel-17);
 - [RAN4] enhancement to support faster transient times (if left out from Rel-17);
- **Any leftover RAN4 work:**
 - [RAN4] any core/performance requirements that might have been de-prioritized in Rel-17 and left incomplete (e.g. requirements for non-handheld UE power class, licensed band definition, etc)

SI for NR extension up to 114.25 GHz

SI for NR extension up to 114.25 GHz

FR1 (0.41 ~ 7.125 GHz)

FR2 (24.25 ~ 52.6 GHz)

E-BAND (60-90 GHz)

W BAND (75-110 GHz)

SI Target

Already Lightly Licensed around the Globe for fixed wireless

Unlicensed 60 GHz band

E-Band & W-Band

- Enabler for ultra-wide band spectrum usages for both licensed & unlicensed

Rel-17 WI

- While 52.6 GHz ~ 71 GHz has been identified a candidate for future licensed operation deployments, currently lack actual approved licensing.
- Primary to support unlicensed operation (in practice)
- Use cases are limited within 52.6 ~ 71 GHz.

Rel-18+ Goals

- Natural extension to investigate licensed bands that are already available in E or W-band.
- Focus on enablement of ultra-wideband spectrum for licensed operation.

SI Scope & Rel-18 Targets

- Likely need to be separate a SI from NR 52.6 ~ 71 GHz enhancement.
- Scope for Rel-18
 - Target study of NR support up to 100GHz (or even up to 114.25 GHz)
 - A general waveform study for 52.6 ~ 100 GHz
 - Investigation into whether existing channel model (TR38.901) that supports up to 100GHz need updates/tweaks.
 - Preparation for potential WI in Rel-19 timeframe.

Suggested Objective and Scope

- Among all potential areas for improvement, the following are the prioritized objectives.
- RAN1 study
 - use case and regulatory landscape study (that are not captured by TR38.807)
 - study of waveforms and numerologies for frequencies [52.6] GHz – 114.25 GHz
 - identify potential specification impact
 - any updates to channel mode (if needed)
- RAN4 study
 - RF impairment modeling (e.g. phase noise, PA modeling (if applicable))

Note: Frequency range applicable for the study may require some discussion.

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