

Email discussion summary for [RAN-R18-WS-non-eMBB-UIC] - Version 0.0.6

RAN

RWS-210601

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1 Introduction

The use of 5G NR is essential for the railways in Europe because it not only replaces GSM-R, but also paves an important step for the digitalization of rail operations. The frequency spectrum for operational purposes is limited and the allocated 2x5.6MHz in the 900MHz range need to be shared between FRMCS (Future Railway Communication System) and GSM-R for a transition period of at least 10 years. During this transition period, GSM-R forms the decisive factor for interoperability in cross-border rail traffic in Europe. Accordingly, there is a strong need for a channel bandwidth of less than 5 MHz in order to meet this requirement.

The vertical industry has met globally to identify intersections for this requirement and to jointly address the need for channel bandwidths > 5MHz at 3GPP.

Companies are invited to ask questions about railway needs in the context for channel bandwidth <5MHz. Please use for your reference RWS-210280.

2 Round 1 - Questions and comments

Please raise your questions or comments related to Tdoc RWS-210280 in the feedback form.

Feedback Form 1:

1 – Intel Corporation (UK) Ltd

Thanks for the contribution. We have a couple of questions:

Q1. What specific BW values (< 5 MHz) do you envision for "FRMCS" (NR)?

Q2. Could you comment on possible DL coverage requirements for the Railways use-case? Specifically, if degradations of up to X dB compared to Rel-15 NR (e.g., X < 3 to 5 dB) may be acceptable?

2.1 Round 1- Answers

Answer to Q1: Today, GSM-R uses the spectrum range 876-880/921-925MHz and will stay in this spectrum in accordance to ECC Decision 20(02). Therefore FRMCS will potentially utilize the range from 874.4-xxx(-880)MHz/919.4-xxx(-925)MHz. Current assumption is that GSM-R will potentially require 10 to 14 narrowband carriers (200kHz) for proper operation. Assuming guard band(s) narrowband 5G NR an GSM-R it will result to 2.4-3.x MHz CBW. Railways are interested to have certain flexibility. A study on this topic should outline potential limitations in this context.

Answer to Q2: For Europe ECC Decision 20(02) applies. Basically for railways, deterministic coverage with certain location probability (lowest segment 100m) is one of the key requirements. For FRMCS the existing

Inter Site Distance (ISD), determined by GSM-R, shall be reused. Potential DL power reductions then play a direct role in the reuse of the GSM-R ISD. Limitations when using narrowband NW should be identified accordingly on the basis of a study.

3 Round 2 - Questions and comments

Please raise your questions or comments related to Tdoc RWS-210280 in the feedback form.

Feedback Form 2:

1 – MediaTek Inc.

Q1: It is often the case that it is difficult to source RF components for bands that are not for mass market devices. We believe that Half Duplex support would help make this easier (Mediatek is making a similar proposal for NR NTN for a similar reason). Have you considered Half Duplex support for NR in Railways, and if not, do you think it would be feasible?

Q2: In the case where you have GSM-R and NR both deployed, would these generally be provided by the same operator and use collocated sites? If the answer is yes, there is no mobility and service continuity between NR and GSM defined today. What is the expected deployment and migration plan given this restriction?

Q3: Is this purely a standalone deployment, e.g. not aggregated with other frequency bands from MNOs for example?

Q4: We observe very limited LTE-R demand. What will be the key drivers for using NR when compared to LTE in this scenario, causing you to expect robust demand?

Q5: Is it foreseen that RedCap will be reused to address this market?

4 Round 2- Answers

Answers to Q1: For interoperability reasons railways are interested in harmonized solutions . Together with other partners, the potential way forward has been discussed. Half-duplex is another approach and requires further analysis.

Answer to Q2-1: It can be assumed that GSM-R and FRMCS (NR) are provided by the same infrastructure manager using the allocated Rail Mobile Radio spectrum portion of 900MHz FDD.

Answer to Q2-2+3: Railways are aware about mobility and service continuity restrictions between GSM-R and FRMCS (NR). That is why precautions are already being taken today to map the transition between GSM-R and FRMCS in external applications. A train onboard system will provide the corresponding mechanisms.

Answer to Q3: Rail Mobile Radio spectrum portions have been allocated in Europe by ECC Decision 20(02). Railways in Europe will use the allocated spectrum accross Europe to guarantee interoperability when crossing the borders. Due to complexity reasons, aggregation with MNO allocated spectrum portions are not foreseen at the moment. Control Command Signalling applications assuring that the train is in a safe movement require deterministic coverage approaches with 95% location probability. MNOs approaches in this context are different.

Answer to Q4: Railway infrastructure manager in Europe organised under the umbrella of UIC decided that FRMCS shall be based on 5G NR due to time constraints in the national FRMCS rollout plans and to reduce complexity with LTE as intermediate step.

Answer to Q5: The current assumption is that RedCap scope is different from narrowband NR scope, because railways operate under high mobility conditions, require UE power class 1 and 3 etc.

5 Summary of the E-mail discussion

Thank you for all the questions asked, which addressed various aspects within the email discussion. The major ones are summarized below:

- 1.) Minimum requirements regarding bandwidth for GSM-R and simultaneous use of narrowband NR. During the coexistence phase of both systems, GSM-R and FRMCS narrowband NR, GSM-R requires approx. 10-14 narrowband carriers for safe operation.
- 2.) A widespread use of narrowband NR is foreseeable by the railways in Europe.
- 3.) Similarities between half-duplex operation proposed by MediaTek and the narrowband NR approach require further analysis and discussion.
- 4.) Acceptable restrictions regarding DL Power requires further analysis because it impacts Inter Site Distance along railway tracks.

All questions were answered and there was no controversy.

Way forward:

Identify similarities with other Rel-18 proposal that address same needs.

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Identify potential objectives in the 3GPP RAN context.