
CER and EIM Position Paper

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With spectrum, boosting a Single European digital railway area

WITH SPECTRUM, BOOSTING A SINGLE EUROPEAN DIGITAL RAILWAY AREA

Summary of CER and EIM position

- Current harmonized spectrum is an essential asset for railways today and harmonized spectrum will also be needed for tomorrow to ensure safe and uninterrupted train operation.
- The 873 - 876 MHz / 918 – 921 MHz band, in addition to the current GSM-R band, is the most favorable option to reuse infrastructure investment and allow a smoother migration.
- CER and EIM strongly support the efforts for the harmonization within the 873 - 880 MHz / 918 – 925 MHz band for FRMCS. It is imperative to provide on the long run sufficient capabilities in terms of enhanced interoperable services and applications to manage the future of railway operations.
- It is, in the view of CER and EIM, essential to provide an acceptable migration path for those EU countries that have invested in GSM-R infrastructure.

The purpose of this document is to give to European and National Administrations the views of the railway operators (Infrastructure Managers and Railway Undertakings) on their needs for spectrum and the rationales of their request.

Background of rail request for spectrum

- Mobile communications play a key role in the railway sector and are used by safety critical (e.g. ETCS) and railway business applications. More specifically, the European railways rely on GSM-R as their mobile communication system, which nowadays utilises a uniform frequency band across Europe. This is laid down in EU railway regulations for interoperability (i.e. the TSIs).
- Dedicated railway communication radio networks are used throughout Europe to carry voice, data and signaling services, thus contributing to the transportation of about 400 billion passenger-kilometers¹ and 405 billion tonne-kilometers in Europe in a secure and safe way in a highly mobile environment.
- As the current standardized GSM-R system is to be phased out by suppliers by 2030, the migration towards the successor system will build a backbone for a digital Single European Railway Area. This will support the introduction of further innovations such as automatic train operation (ATO), saving energy and costs for the society and increasing punctuality.
- The coexistence between GSM-R and its successor must be guaranteed until the migration is completed in order to ensure the railway interoperability. Both GSM-R and its successor (FRMCS) need to be operated in parallel for a long period of time to ensure a seamless operational transition. Access to additional harmonized radio spectrum is therefore a key factor for the success of FRMCS.
- The roll-out of FRMCS is expected to be possible at latest in 2023.

CER and EIM have taken note of the recent recommendations of the Radio Spectrum Policy Group on spectrum for the next generation of railway communication systems, stating in particular that there is a wide range of options for the future of railway communications whose suitability may vary across Member States, while emphasizing that it will be important to ensure interoperability, and that a common solution would ease implementation. Based on this opinion, CER and EIM understand that this will be a challenge especially in view of defining a common European solution.

Railway needs for spectrum

1. Interoperability all over the EU

Interoperability is needed to support international train services. Until now, the interoperability of communication has been guaranteed by having a common system (GSM-R) that uses a harmonized frequency band.

Recalling that it is essential to ensure interoperability across member states and that a single solution would ease the implementation of the future radio communication system for railway, CER and EIM strongly support the efforts for **additional** harmonization of a uniform spectrum solution. Uniform frequency bands will allow easier spectrum management governance across Europe, but also more efficient issue resolution between countries by supporting best practice sharing and cooperation as the railway system is aimed to work in a common way across Europe.

¹ [The economic footprint of railway transport in Europe](#), CER, 2014

2. High performance for safety-critical applications

Railway mobile communication systems are used for safety critical applications, and require therefore a very high Quality of Service combined with a very high availability and reliability. For GSM-R, such a high Quality of Service has been achieved by operating a dedicated network, providing integral coverage of tracks with high availability/reliability (even in congested situations) including rural areas.

CER and EIM expect that for the future system (FRMCS), dedicated frequency bands along rail tracks will also be needed to guarantee this high Quality of Service for safety critical application along all the railway lines.

3. Seamless transition from GSM-R to FRMCS

The current GSM-R band will remain essential for the railway mission and must be maintained on the long term, as the GSM-R system will remain in service beyond 2030 and possibly remain active in some areas even further.

Ensuring a proper migration from GSM-R to FRMCS is an essential need for the railway sector since the business must continue during the migration. The roll-out of the new technology is expected to take several years and the start for the migration from GSM-R towards the new technology will vary from country to country.

4. Economies of scale

It is essential to make the best re-use of the site infrastructure of GSM-R when rolling out FRMCS. Using similar frequency bands for FRMCS and GSM-R (current GSM-R band and the extended GSM-R band) will save existing site infrastructure and also train borne equipment, and therefore limit the roll-out costs of FRMCS for member states.

It is also important to ensure that frequency bands used by FRMCS are supported by the 3GPP specifications to enhance the possibilities to use standardized products and open the market.

ANNEX: CER AND EIM VIEWS ON THE SPECTRUM OPTIONS IDENTIFIED BY RSPG FOR THE RAILWAY INDUSTRY

The views of CER and EIM on the different envisaged options for next-generation of railway communications systems is based on more than 15 years of experience of operation with GSM-R on about 114 000 km of railway tracks and about 64 000 GSM-R on-board in trains².

The different spectrum options for GSM-R are:

- Option 1: Leveraging the use of extension bands E-GSM-R (or part of it) to railway use in addition to the GSM-R band
- Option 2: Use of other dedicated bands for the railway industry
- Option 3: Use of public mobile networks for certain services
- Option 4: Sharing networks with other users (e.g. PPDR in the 700 MHz or 400 MHz band)

Recalling that it is essential to ensure interoperability across member states and that a single solution would ease this implementation, the railway sector strongly support the efforts for harmonization of a spectrum solution.

Option 1: using the GSM-R band and the extension (E-GSM-R) band (or a part thereof):

The railway sector supports the efforts for harmonization of a part or all of the extension-band in addition to the GSM-R band

- Availability of harmonized spectrum for current and future railway applications is essential for uninterrupted and safe train journeys. It is not possible to accommodate GSM-R and its replacement in the current frequency band (R-GSM band) simultaneously³.
- The current GSM-R band will remain essential for the railway mission and must be maintained on the long term, as GSM-R is likely remain in service beyond 2030 in some countries, and the band will host FRMCS-system after cessation of GSM-R.
- The band 873-876 MHz paired with 918-921 MHz has great advantages for the rail sector to enable the migration towards the new technology replacing GSM-R. It allows the re-use of existing site infrastructure and parts of train equipment, thus leading to significant cost reduction for the next generation communication system and thus for the society. Additionally, being adjacent to the R-GSM band, it opens up the possibility of a larger channel width for the future system once the GSM-R is phased out, supporting higher traffic requirements and innovative applications. The regulatory possibility in CEPT to allocate this band for rail already exists on a national basis, and is already implemented or considered in several countries. Harmonization of this band for rail, or part thereof, is the best option from European Railways.

² [Study on migration of railway radio communication system from GSM-R to other solutions, SYSTRA for ERA, 2016](#)

³ [Coexistence of GSM-R with other communication systems, LS Telecom for ERA, 2016](#)

Option 2: Use of other dedicated bands:

- Until now, the most suitable and economically-viable spectrum scenario for the seamless transition of GSM-R towards its successor in the EU is to use the 873-876 MHz (Uplink) and 918-921 MHz (Downlink) in addition to current GSM-R bands.
- The railway sector is open to discussion about different spectrum options and would like to recall its conclusions on this matter:
 - Using spectrum below 1GHz has great benefit for railways as more than 160 000 km of lines for its mission-critical applications need to be covered;
 - Several dedicated bands that vary between countries would be too complex and costly for the railway sector, given the interoperable nature of rolling stock units;
- The most favorable option for the European railway sector is a coordinated transition towards the next-generation railway communications system using a single harmonized-frequency solution.

Option 3: Current Public mobile networks and even 5G alone cannot be the unique answer for railways:

- The successor of GSM-R must combine integral coverage of tracks and high availability/reliability (even in congested situations), including in rural areas.
- Coverage of tracks by public networks will improve, but remain insufficient in the foreseeable future to cover railway essential and operational requirements especially in rural areas.
- There are currently no legal options that would allow MNO's to favor railway users and to preempt other users in case of congested situations, so as to ensure the availability needs of the railways especially in emergency situations.
- Nonetheless, public mobile networks are envisaged to support less-stringent railway applications, or act as a backup solution (however with a lower quality) in case of unavailability of railway radio network.
- The Public Mobile Operator Networks are therefore foreseen as a complementary option under certain circumstances (i.e. low-traffic regional lines, back-up solution), but are unlikely to cover the entire needs (specifically the mission critical needs) of the railways.

Option 4: Sharing with other Critical Communication Operators may be an option to consider on a national basis when interoperability is not concerned, but might be too complex to extend at a European scale:

- Sharing spectrum with PPDR or other Critical Communication Operators may be an option in some Member States where exclusive spectrum has been identified. It is complex, from an operational, organizational and legal standpoint, and no single solution exists for PPDR networks in Europe.
- Moreover, there exists no regulatory mechanism to enforce the sharing especially once spectrum has already been assigned to PPDR, nor to provide the legal assurance that rail mission critical operational requirements can be fulfilled.