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# ORI

## **The co-ordination of GSM-R systems and radio planning at borders**

*Coordination des systèmes GSM-R et de la planification radio aux frontières  
Die Koodinierung der GSM-R-Systeme und der Funkplanung an den Grenzen*



UNION INTERNATIONALE DES CHEMINS DE FER  
INTERNATIONALER EISENBAHNVERBAND  
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# Contents

|                                                                       |           |
|-----------------------------------------------------------------------|-----------|
| <b>Summary .....</b>                                                  | <b>1</b>  |
| <b>1 - General.....</b>                                               | <b>2</b>  |
| <b>2 - Frequencies for GSM-R .....</b>                                | <b>3</b>  |
| <b>3 - Frequencies for Direct Mode.....</b>                           | <b>5</b>  |
| 3.1 - Definition.....                                                 | 5         |
| 3.2 - Frequency issues.....                                           | 5         |
| <b>4 - Frequency co-ordination at borders .....</b>                   | <b>6</b>  |
| 4.1 - Allocation of preferred frequencies .....                       | 7         |
| 4.2 - Identification of interference potential .....                  | 8         |
| 4.3 - Advice to neighbouring railways .....                           | 8         |
| 4.4 - Neighbouring railways' response.....                            | 9         |
| 4.5 - Formal approval.....                                            | 9         |
| <b>5 - Use of Network Colour Codes (NCC) .....</b>                    | <b>10</b> |
| <b>6 - Implementation of new features and software upgrades .....</b> | <b>12</b> |
| <b>7 - Algorithms .....</b>                                           | <b>13</b> |
| <b>8 - Network names.....</b>                                         | <b>14</b> |
| <b>9 - The management of network parameters .....</b>                 | <b>15</b> |
| <b>List of abbreviations .....</b>                                    | <b>16</b> |
| <b>Bibliography .....</b>                                             | <b>18</b> |

## Summary

The purpose of this leaflet is to give the background of the radio frequency aspects and to enable railways to co-ordinate the introduction and operation of GSM-R networks in the most efficient manner. The leaflet describes:

- the frequencies allocated to GSM-R and Direct Mode,
- the method to be used in co-ordinating these frequencies at borders,
- the use of network colour codes,
- the implementation of new features and software upgrades,
- the use of algorithms,
- the use of network names,
- the management of network parameters.

# 1 - General

The signatories to the *EIRENE Memorandum of Understanding* (see Bibliography - [page 18](#) and List of abbreviations - [page 16](#)) agreed that in the development and introduction of new radio communications systems for railway operations in Europe and throughout the world, it is important that a common standard is adopted and that in their individual implementations they would ensure that full interoperability as defined by the mandatory requirements of the EIRENE specification is contained within the systems of their individual railways.

To enable this goal to be achieved, the signatories of the MoU agreed the following:

1. To adopt those aspects of the ETSI GSM ([see List of abbreviations - page 16](#)) standard adapted for railway operations essential to interoperability as the basis for their new train radio systems from 2005 at the latest.
2. To implement the mandatory requirements of the EIRENE specification when it is - overall - economically advantageous on a particular route to do so to enable interoperability of rolling stock across international boundaries.
3. To co-operate with neighbouring railways on the introduction of new systems to enable as rapid an introduction as possible.
4. To co-ordinate with neighbouring railways or other radio spectrum licence holders where applicable, on the allocation of frequencies from *CEPT/ERC Recommendation TR 25-09* ([see Bibliography - page 18](#)), using the procedure laid down in point 4 - [page 6](#).
5. To exchange information on the practical experience gained in the implementation of systems.

The purpose of this leaflet is to enable railways to co-ordinate the introduction and operation of their GSM-R networks ([see List of abbreviations - page 16](#)) in the most efficient manner. In the following sections this leaflet describes

- the frequencies allocated to GSM-R and Direct Mode ([see List of abbreviations - page 16](#)),
- the method to be used in co-ordinating these frequencies at borders,
- the use of network colour codes,
- the implementation of new features and software upgrades,
- the use of algorithms,
- the use of network names,
- the management of network parameters.

## 2 - Frequencies for GSM-R

The frequencies for GSM-R as designated in the EIRENE Specification were negotiated with the European Communications Committee (formerly the CEPT) (see [List of abbreviations - page 16](#)) to ensure that interoperability was achievable between countries.

These are set out in the *ECC Decision ECC (02) 05 of 5 July 2002*. This superseded *ERC Recommendation T/R 25-09 E* (see [Bibliography - page 18](#)).

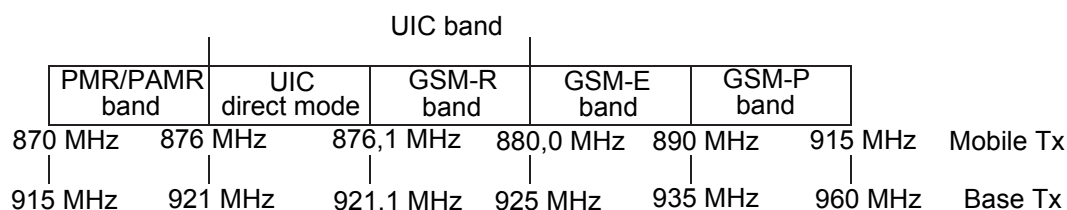


*Fig. 1 - The 900 MHz Band*

Fig. 1 shows the UIC band in relation to the adjacent allocations to other services in Europe. Each GSM-R channel (like those allocated to GSM) is 200 kHz wide. The ECC recommends guard bands to protect adjacent services, which can be found in the appropriate ECC reports. In the case of GSM-R a 400 to 600 kHz guard band is recommended to PMR/PAMR services below the UIC GSM-R allocation of which 100 kHz is taken from the UIC band (and is now reserved for UIC Direct mode). The recommended guard band between the GSM-R band and the GSM-E band is one channel if services are co-ordinated and two channels if they are uncoordinated. One channel of the GSM-R allocation is allocated to this guard band leaving 19 channels for GSM-R use out of the twenty possible channels (see [List of abbreviations - page 16](#)).

*ECC decision (02)05* specifies the frequencies for GSM-R as shown in [Table 1 - page 4](#).

Table 1 : GSM-R Channels

| Centre frequency<br>Mobile TX<br>(MHz) | Centre frequency<br>Base TX<br>(MHz) |
|----------------------------------------|--------------------------------------|
| 876,2000                               | 921,2000                             |
| 876,4000                               | 921,4000                             |
| 876,6000                               | 921,6000                             |
| 876,8000                               | 921,8000                             |
| 877,0000                               | 922,0000                             |
| 877,2000                               | 922,2000                             |
| 877,4000                               | 922,4000                             |
| 877,6000                               | 922,6000                             |
| 877,8000                               | 922,8000                             |
| 878,0000                               | 923,0000                             |
| 878,2000                               | 923,2000                             |
| 878,4000                               | 923,4000                             |
| 878,6000                               | 923,6000                             |
| 878,8000                               | 923,8000                             |
| 879,0000                               | 924,0000                             |
| 879,2000                               | 924,2000                             |
| 879,4000                               | 924,4000                             |
| 879,6000                               | 924,6000                             |
| 879,8000                               | 924,8000                             |
| 880,0000 <sup>a</sup>                  | 925,0000 <sup>a</sup>                |

a. The frequency 880,0000 MHz paired with 925,0000 MHz may be considered as guard channel to other services in adjacent bands.

It is a condition of the ECC Decision that the original recommendation on frequencies in the 450-470 MHz band (*Recommendation CEPT/ERC T/R 22-01* - see Bibliography - [page 18](#)) will be withdrawn.

The GSM-R frequencies are also designated in the *modified Annex A of 29 April 2004 of the European Community Decision 2002/731/EC of 30 May 2002* (see Bibliography - [page 18](#)) establishing the main characteristics of Class A system (ERTMS - see List of abbreviations - [page 16](#)) of the control-command and signalling subsystem relating to the trans-European conventional rail system (notified under document number C(2004) 1559) .

GSM Channel numbers for the GSM-R frequencies are designated in the *ETSI specification EN 300 910* (see Bibliography - [page 18](#)), available from the ETSI website, <http://www.etsi.org>.