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| Working Group FM | | | **FM(13)065** |
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| **Date issued:** | **9 April 2013** | | |
| **Source:** | **ECO** | | |
| **Subject:** | **ECO Summary of the Responses to the Questionnaire to CEPT Administrations on Interference into GSM-R caused by MFCN** | | |
| N  Group membership required to read? (Y/N) | | | |
|  | | | |
| **Summary:** | | | |
| This questionnaire was sent out from the Office on 12 February 2013. The official deadline was on the 28 March 2013.  **By 5 April 2013, a total of 34 countries have provided an answer to the questionnaire. In addition, two stakeholders (ProRail, NL and Trafikverket, SE) have provided a response.**  The responses are covered in the annex to this document. | | | |
| **Proposal:** | | | |
| WG FM is invited to consider the summary and decide on necessary actions to be taken on the matter.  The WGFM Correspondence Group on the review of the GSM-R situation is invited to provide an assessment based on the results of the questionnaire and make a proposal to WGFM. | | | |
| **Background:** | | | |
| In 2011 WG FM decided to include a new work item in the Work Programme to monitor and review the situation regarding GSM-R in 2013/2014, WGFM Work Item 23: “Part 2: Monitor and review situation in 2013/2014 when requested.” WG FM adopted the questionnaire on interference into GSM-R caused by MFCN during its 76th meeting in February 2013. | | | |

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| --- | --- |
| Albania  Andorra  **Austria**  Azerbaijan  **Belarus**  Belgium  **Bosnia Herzegovina**  Bulgaria  **Croatia**  **Cyprus**  **Czech Republic**  **Denmark**  **Estonia**  **Finland**  **France**  Georgia  **Germany**  **Greece**  **Hungary**  **Iceland**  **Ireland**  **Italy**  **Latvia**  Liechtenstein | **Lithuania**  Luxembourg  **Former Yugoslavian Republic of Macedonia (FYROM)**  **Malta**  Monaco  **Montenegro**  **Moldova**  **Norway**  **Polen**  **Portugal**  Romania  **Russian Federation**  San Marino  **Serbia**  **Slovak Republic**  **Slovenia**  **Spain**  **Sweden**  **Switzerland**  The Netherlands  **The United Kingdom**  **Turkey**  Ukraine  Vatican City |

In addition, 2 answers from stakeholders have been received by the ECO from the railway side: 1) ProRail (NL) and Trafikverket (Sweden).

**Categories of country situation regarding GSM-R**

**34 answers**

**Question 1: What is the deployment of GSM-R in your country (railway tracks in km)?**

**Table 1: Country situation**

| **Situation** | **Country** |
| --- | --- |
| GSM-R network implemented and in operation and interference cases officially reported to the national regulatory authority | Austria, Finland, France, Germany, Norway, United Kingdom |
| GSM-R network implemented and in operation and no interference cases officially reported to the national regulatory authority | Czech Republic, Greece, Italy, Lithuania, Portugal, Russian Federation, Slovak Republic, Spain, Sweden, Switzerland, Turkey |
|  | |
| GSM-R network in process of being implemented / tests / trial phase | Belarus, Denmark, Hungary, Ireland, Macedonia, Poland |
| GSM-R implemented in the national frequency plan but no network implementation yet. | Bosnia Herzegovina, Croatia, Estonia, Latvia, Moldova, Montenegro, Serbia, Slovenia |
| No railways | Cyprus, Iceland, Malta |

Comparing with document RSC 13-10, two countries did not provide an answer for which some interference cases into GSM-R from MFCN were reported in RSC 13-10. This is The Netherlands and Belgium. From The Netherlands, a response was received from the stakeholder Prorail and concerning Belgium, information is given in this summary referring to the UIC interference database and some information on how interference cases are handled in Belgium later on in this summary.

According to latest information in 03/2013, collected in ETSI TC RT in ETSI TR 103 134, GSM-R (voice and data bearer) is deployed and covers around 68 000 km of tracks in Europe and this approximate figure is confirmed by the answers received in response to this questionnaire. In Europe, where the total railway network taken into account is 221 025 km, GSM-R coverage was planned for 149 673 km according to ETSI TR 102 627, published in 11/2008, also explaining that in September 2007 the network comprised 60 507 km equipped with GSM-R infrastructure, of which 40 918 were in operation by that date. This means that GSM-R network implementation has to some extent slowed down in recent years below the figures which have been forecasted about 5 years ago.

**Figure 1: Country related implementation information**

Figure 1 includes the equipped distances of the railway tracks in the respective year with GSM-R technology. Portugal has up to now only 8 BS covering 40 km railways, Slovak Republic has only 17 BS covering 100 km and the Russian Federation is deploying GSM-R systems in the Krasnodar Territory and Kaliningrad Region.

Spain, UK: estimates from ETSI TR 102 627 (11/2008) are included in figure 1.

**Question 2:**

**How much interference into GSM-R caused by MFCN was reported by CEPT administrations?**

Germany provided the following overview:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Interferences – new cases in a year) (reasons – multiple reasons also possible) | 2009 | 2010 | 2011 | 2012 |
| Blocking caused by GSM | 24 | 15 | 3 | 3 |
| Blocking caused by GSM, low GSM-R field strength | 7 | 2 | 0 | 0 |
| Blocking caused by GSM, IM3 | 24 | 19 | 10 | 5 |
| Blocking caused by GSM, IM3, low GSM-R field strength | 13 | 7 | 1 | 2 |
| IM3 | 14 | 17 | 15 | 5 |
| IM3, low GSM-R field strength | 13 | 7 | 1 | 0 |
| Internal GSM-R interference | 3 | 1 | 2 | 0 |
| No interference detected at the time of BNetzA measurement | 19 | 14 | 5 | 2 |
| Summary | 117 | 82 | 37 | 17 |

Finland, in total until now, reported 5 interference cases.

In the UK, there are no cases of interference being notified to OFCOM. However, it is understood that there have been tens of locations where train drivers have reported a loss in GSM-R signal. These losses have however not been formally validated. In the UK there is a coordination system between UMTS 900 network operators and GSM-R operators that is believed to cover all of these reported scenarios. There is however no restriction on GSM operators installing apparatus close to a rail line.

Norway: Until now a total of 9 interference situations have been reported that possibly are caused by signals from public mobile operators. The reasons for the reported situations have not been completely clarified. Many of the situations may come from low field strength for the GSM-R signal compared to the GSM signal. NPT has not been involved and the situations are being handled by the GSM-R operator in cooperation with the public mobile operators.

France:

|  |  |  |  |
| --- | --- | --- | --- |
| **2010** | **2011** | **2012** | **Summary** |
| 1 case | 3 cases (on the same railway line) | 0 | 17 cases in between 2006 and 2012.  1 case declared in March 2013 is under investigation |

Austria: No official reporting from the railway operator to the regulator. The Austrian administration refers however to the interference cases documented by this GSM-R operator. These are up to 25 cases in the time frame 2011-2012, presumable around 20 caused by/ in relation to MFCN.

**There are several databases in use to provide statistics on interference into GSM-R. The GSM-R operator and, partly, the GSM operators use own data base systems. The numbers of interferences according to these data base systems are different compared to the administration’s numbers. The processes for reporting interference sites are not the same for all administrations. It seems to be that some interference problems have been solved among the relevant parties (GSM-R operator and relevant MFCN operator) without a notification to the regulatory authority.**

A snapshot of the number of interference cases counted in the UIC interference database (reported by the railway operators) on 31 January 2013, including the interference cases of the years before, is provided as follows:

|  |  |
| --- | --- |
| **Railway operator** | **Cases** |
| RFF (France) | 17 |
| DB (Germany) | 267 |
| OEBB (Austria) | 19 |
| FTA (Finland) | 9 |
| JBV (Norway) | 11 |
| TV | 0 |
| PRORAIL | 0 |
| NR (UK) | 9 |
| INFRABEL (Belgium) | 43 |
| SBB (Switzerland) | 4 |
| ADIF (Spain) | 3 |
| Total | 382 |

This includes interference cases in Spain (3), Switzerland (4), Belgium (43) not included in answers to this questionnaire.

Other reporting includes:

Italy (Source: RFI) reported a total of 13 interference cases, 3 of them in 2012. 1 case was obviously not caused by MFCN (unwanted emissions from FM broadcast transmitter).

Greece reported interference problems from illegal transmissions not related to MFCN.

ProRail (NL):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Application* | *2010* | *2011* | *2012* | *Summary* |
| *Infoplus* |  | *83* | *119* | *202* |
| *Trainradio* | *2* | *9* | *1* | *12* |
| *ETCS L2* |  |  | *1* | *1* |

*Note: Infoplus is a train departure information display system, located at all Dutch railway stations, using GSM-R GPRS. This seems to be a specific problem with a specific data modem used as GSM-R UE.*

**Question 3: What were the reasons for the interferences into GSM-R?**

**Blocking and intermodulation products were reported as the main reasons for the interferences. I.e. interference was in most of the cases due to high MFCN signal levels in the 925 – 960 MHz band, causing blocking and/or intermodulation in the GSM-R receivers. There is no evidence that the GSM-R field strength level was often too low (i.e. below the design level specified in the TSI) at the railway tracks or too high unwanted emissions from MFCN caused problems in a significant number of cases. In most of the cases reported, it seems like that both networks (MFCN and GSM-R) are compliant with their allowed emission limits and minimum coverage requirements (i.e. minimum GSM-R field strength at railway tracks).**

**In quantitative terms, the number of interference cases into GSM-R from MFCN should not exceed more than 300-400 locations in Europe with no evidence/tendency of increasing further if proper coordination processes are established. It is rather likely that the number of unresolved cases will drop down in the future since more cases get resolved than added to the statistics. This seems to be an important aspect regarding a sustainable solution’s related cost-benefit consideration since changes at the GSM-R MS such as incorporation of filters at locomotives (in front of cab radios) or exchange of cab radios may be prohibitively expensive, adding uncertainty for those who invest in GSM-R and therefore may cause further slowdown of the investment in GSM-R in Europe. According to ERA and UIC information, incorporation of a switchable external filter is estimated with 4 000 - 5 000 Euro (not including costs for engineering and installation), a complete exchange of the cab-radio and related installation in the train engine is considerably more expensive. The number of trains in Europe equipped with GSM-R technology is estimated in the rough order of magnitude of at least about 50 000 trains.**

GSM-R receivers as specified in ETSI TS 102 933-1 and TS 102 933-2 on improved GSM-R receiver parameters with improved linearity, blocking capabilities and IM product resistance can help to significantly reduce the number of interference cases. The minimum improvement according to the official specification in the ETSI documents is about 5 dB. Potential improvements can provide amendments up to 15 dB. The Rx-frontend reference sensitivity is unchanged in the specifications. The improvements in the receiver chipsets/ Rx-front-end are basically realised by using a specific, fast switchable (per time slot) SAW-filter splitting into the GSM-R and MFCN receiver bandwidth and improved gain control/linearisation. If theoretically applied in all trains, the majority of interference cases would not exist. The estimated cost per radio module (i.e. no complete exchange of train cab radio necessary) is about 1 500 Euro. National roaming (e.g. for emergency calls from the locomotive or at locations without GSM-R coverage) is still possible with such an Rx-frontend. A revision of the ERA TSI specifications may not be needed for such improved radio modules. Limitations of this improved Rx module concept are seen because of the limited filter roll-off (i.e. limited effect on emissions from 925-930 MHz where other solutions such as coordination or change of technical operational parameters still must be found).

**Question 4: Were the interferences into GSM-R caused by GSM, UMTS or LTE?**

Most of the interferences found up to today are still caused by GSM or E-GSM emissions. The individual situation varies from country to country from GSM-900, UMTS-900 and LTE-900 and no clear picture can be drawn with regard to increase or decrease of interference dependent on the technology in use in the 900 MHz MFCN band. Legacy GSM mobile networks exist without obligations on special coordination or protection requirements with regard to GSM-R. An analysis commissioned by OFCOM showed that UMTS-900 may have a higher interference potential than GSM-900: Red-M Report -> section 4.8 <http://stakeholders.ofcom.org.uk/binaries/consultations/900-1800mhz-wireless-telegraphy/statement/UMTS900.pdf> ). This is also indicated in the UIC O-8700 Report as well as JRC / ISPRA measurement report UIC O-8725.

Sweden reported that the license conditions for protection of GSM-R in the public 900 MHz operators´ licenses seem to be working fine. This was however currently achieved at the cost of substantial impairment on coverage for the public 900 MHz band operators.

France reported that the reasons for interferences into GSM-R in their case are mainly intermodulation products (IM3) due to combination of two carriers (GSM and sometimes UMTS+GSM) in the adjacent frequency band of GSM-R. This observation is also backed by measurements in the UK and the experience that the number of interference cases increased after switching from GSM to UMTS in the UK before the Olympic Games in 2012. I.e. a new situation can always appear when an operator switches to UMTS or LTE in the 900 MHz band which can lead to creation of new IM-products falling into the GSM-R operating channel. In addition, the levels of such IM product may vary due to the varying power of the BS transmit station depending on the momentary network traffic situation.

**Question 5:  
Which technical measures have been carried out to overcome the interferences?**

Discussions/ coordination between the GSM-R operator and the MFCN operators have been established in most of the countries with GSM-R implementations to discuss and solve interference scenarios. Quite often, the administration does not have a legal basis to impose any action on any of the participants, and they issue recommendations for modifications. In addition, power limitation to public operators cannot be forced due to the service impact, unless this is included in the licensing conditions. In most of the cases resolved, the action has been clearly taken by the railways operator (modifying parameters, antennas, improving sensitivity of the receiver by the use of filters, adding new BTSs…).

Germany and UK: A coordination process has been established. The emissions of UMTS-900 must not exceed a defined field-strength limit at the railway lines in the GSM-R bands. In the UK, the coordination procedure can be found at <http://stakeholders.ofcom.org.uk/binaries/consultations/900-1800mhz-wireless-telegraphy/statement/GSMR_operators.pdf> )

Sweden deviates from pure coordination procedures and has fixed levels for both GSM-R and the MFCN networks.

Sweden: Both the unwanted emission into the GSM-R band from wideband systems in the 900 MHz band and the field strength that wideband systems are allowed to generate in-band over the train tracks are regulated in the 900 MHz operator’s license conditions. Sweden highlights that actions are required on both sides, with the regulation implemented in Sweden the involved parties will all take costs to ensure a good coexistence situation. The two coexistence issues addressed are unwanted emissions from public mobile network systems into the GSM-R band and that the GSM-R receiver can be blocked by the public operator signals. The distribution of the burden between the parties can conceptually be described as follows:

1) The public operators will, in areas with GSM-R enabled railway tracks, take measures to limit the out of band noise (unwanted emission) that is generated into the GSM-R band. To achieve this there are several options, for example install improved out-of-band filters on 3G and 4G base stations and thereby limit the noise that is generated into the GSM-R band or reduce the signal strength so that the noise that falls into the GSM-R band is limited. The later solution would results in a loss of coverage in the vicinity of the railway tracks. Consequently, as a public operator you can choose to take your burden either as extra costs or loss of coverage.

2) The GSM-R operator will on request locally strengthen the signal levels in the GSM-R network. This will allow secure GSM-R operation even if the noise that is generated from the public operator in the adjacent 900 MHz bands in the GSM-R band is increased. This way the public operators and the GSM-R operator are sharing the burden for mitigating the out of band noise problem.

3) Until 30 June 2015 the public operators must limit the signal strength (wanted emission) inside its own licensed spectrum in areas with GSM-R enabled railway tracks. This will protect legacy GSM-R terminals from blocking. This limitation of the use the public operators own licensed spectrum is a result of the performance of the GSM-R terminal and will lead to a degradation of coverage.

4) After 30 June 2015 the public operators will be allowed to increase the signal strength inside its own licensed spectrum in areas with GSM-R enabled railway tracks. So at that time legacy GSM-R will no longer have full protection from blocking. To handle this new situation it is envisioned that the train operators implement either extra filtering of the 900 MHz band or better GSM-R radio modules in their trains. In this way the GSM-R receivers will be able to handle the increased signal levels in the adjacent 900 MHz band.

It is envisioned that after 30 June 2015 all parties will have implemented and taken their part of the total burden. With the chosen solution PTS is confident that a balance has been achieved between the need for protection of GSM-R and the ability to roll out mobile broadband in the 900 MHz band. It should also be noted that currently the mobile operators in the 900 MHz band is taking double burden, both for reducing the out-of-band noise and to protect the GSM-R terminals from blocking.

Germany outlined that all possibilities set out in the conclusions of ECC Report 162 have been carried out to solve problems:

• Change of frequencies or power reduction (may have an impact on the coverage) in the relevant GSM base station. That reduces the field strength level along the railway tracks.

• In some cases a possible cost sharing of such measures has to be negotiated between the GSM and the GSM-R operators.

• An implementation of different band-path filters in the GSM base stations can mitigate the problem of Out-Of-Band interference cases, but not the problem due to intermodulation products.

• Case-by-case treatment (with cooperation / coordination between GSM-R and GSM operators).

• Additional GSM-R base stations have been put in operation (handover problems may occur because of that):

Year 2009 2010 2011 2012 2013

Number of additional installed  
GSM-R base stations:

3 11 10 9 8 (planned)

Finland: Reduction of UMTS power and change of GSM frequencies.

Norway indicated that in each of the licences in the 900 MHz band and for the GSM-R licence, special conditions have been laid down to provide protection to the GSM-R service as well as to the public mobile service:

* When transmission technology other than GSM is introduced in the commercial mobile networks, GSM-R operating in the frequency band 876-880 / 921-925 MHz shall be protected at the same level as when GSM is the technology used (in the commercial networks).
* The licensee is obliged to cooperate with Jernbaneverket in the planning phase and before a base station with other technologies than GSM is put into operation. This applies both for new base stations (new sites) and where the licensee changes technology from GSM to another technology on existing base stations.
* When a new base station is planned, a notification shall be sent before site acquisition. When a change is made to an existing base station, a notification shall be sent before the base station is put into operation.
* The basic principle in the coordination procedure is that all parties are responsible for their own networks. The party experiencing interference is obliged to undertake necessary and possible measures to improve the network quality in their own network in order to ensure a reasonable quality of service before any measures should be undertaken by the counterpart.
* Costs for making changes in a network shall be paid by the owner of the network in which changes are made.

The licensee shall notify Jernbaneverket when the distance from the base station to a railway line is less than or equal to 700 meters. For base stations without line of sight to the railway line, or which are mounted indoors, there is no notification requirement.

Procedures and time frames for cooperation and coordination are given in an annexed document in the Norwegian answer. The licensee and Jernbaneverket can agree on other procedures and details than those given in the annexed document. Such an agreement should be made in writing. Notification shall follow the criteria in this licence, and as long as the licensee follows these conditions for cooperation with Jernbaneverket, the licensee is not responsible for the quality in the GSM-R network or for any damages following a reduction in quality. If, despite successful coordination, interferences still occur, the licensee is obliged to cooperate with Jernbaneverket in order to try to solve the problem by implementing necessary measures. If the licensee chooses to start operating a base station with a technology other than GSM in cases where coordination has not been achieved, Jernbaneverket must be informed about the specific point in time when the station will be put into operation. If Jernbaneverket can prove that the use of the base stations will cause significant disturbances for GSM-R, the licensee shall make necessary measures on the base stations to cease the disturbances. If a conflict arises from the coordination activities, the Norwegian Post and Telecommunications Authority (NPT) may, after request from one of the parties involved, be involved as an arbitrator. The arbitration is a voluntary, non-binding process with a neutral third party (NPT). NPT shall seek to contribute to an agreement between the parties involved. The main responsibility for reaching an agreement lies with the parties involved. The task of the NPT is first and foremost to help the parties to reach an agreement. If arbitration ends without reaching an agreement, NPT might take a decision, including setting conditions necessary to reach an agreement between the parties. In the coordination process the radio planners shall have the possibility to assess several possible measures to find a satisfactory solution. In the following a non-exhaustive list of such measures is presented:

* + - Location of a notified base station
    - Choice of location and co-location
    - Antenna configuration
    - Changing of antenna sectors, placement, distance between antennas, changing of the antenna type, adjustment of the antenna height, tilt or direction
    - Technology/parameters
    - Consider to change carrier frequency/frequency band/technology, reduce output power (EIRP)
* Establish a new site or in other ways improve the coverage for the GSM-R system or the public mobile system respectively

To make it possible for Jernbaneverket and the mobile operators to evaluate each base station's influence on their own radio networks, necessary data on coverage and/or base station parameters should be exchanged: Geographical position, height, antenna model, antenna direction, antenna tilt, EIRP and carrier frequency.

The experience so far in Norway:

The licences were amended in June 2011 and the mobile operators have had the possibility to use other technologies than GSM since then. To date approximately 2150 sectors have been put into operation with UMTS900. This corresponds to approximately 1030 base stations. NPT has no detailed information on the number of base stations located within a distance of 700 meters from the railway line, but considering the cities in which these base stations are placed, this number must be considerable.

The NPT has so far not received any reports of harmful interference. Furthermore, no requests to take part as an arbitrator between an operator and Jernbaneverket have been received by the NPT. This indicates that the cooperation and coordination process is handled by the involved parties without major difficulties.

France:

The cases were solved on a case by case basis. The main technical measures were frequency planning adjustment, Antenna optimisations (on both sides: GSM-R and public operator), Power control on public operator side, Installation of a GSM-R repeater.

Austria: Some of the cases were solved by introduction of intra-cell-handover or increase of the GSM-R field-strength level.

Netherlands: Until now all interference cases have been solved locally by changing GSM-R channels, improving the GSM-Rail network or by extra filtering (only applied for a local train line). In addition to that it was experienced that some brands of radios are more sensitive to interference due to blocking or intermodulation than other brands of radios.

The Dutch railway companies are “expecting a lot of new interference incidents from the upcoming use of UMTS or LTE in the 900 MHz spectrum in the Netherlands”. Interference is expected mainly due to blocking and intermodulation occurring in the receivers of the train radios. Also interference from out of band emissions is expected but the operators are obliged (by a licence condition) to take all appropriate measures to prevent such interference.

**Question 6: Was the solution based on cooperation among MFCN and GSM-R operators?**

8 administrations provided an answer.

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| Finland | Change of GSM frequencies was done in cooperation but not the reduction of UMTS power |
| Belgium (source: RSC13-10) | In December 2012 there was a first meeting concerning GSM-R interference between BIPT, DVIS, Infrabel and the public mobile operators.  BIPT performed measurements on 4 locations with GSM-R interference (out of the list of sites reported to them) and found no violation of technical rules by the public operators, nor by Infrabel. Nonetheless, BIPT asked for coordination between Infrabel and the public mobile operators to prevent new interference locations, and a case by case solution for the present interference locations. |
| France | One case was solved by cooperation between MFCN and GSM-R operator. The remaining cases were solved by solutions applied to GSM-R network. |
| Germany | The solution requires cooperation among the relevant parties (GSM-R operator and relevant GSM operator), both systems are operated in line with the usage conditions according to the licences. |
| Italy | In 2012, the railway operator asked and obtained the cooperation of mobile operator. |
| Netherlands | In close cooperation with the national rail network operator ProRail and the involved mobile operators, the Dutch Ministry of Economic Affairs has tasked the independent research organisation TNO to develop a parameterized analysis model. This model, implemented as a software tool, allows all stakeholders insight in coexistence criteria, system parameters and the different factors that determine the extent of coordination that would be required to prevent interference due to out of band emissions, blocking and intermodulation. Also the influence of, for example, external filters in train radios to improve their selectivity can be entered in the model to see how these filters can contribute to prevent or solve interference. The analysis model is expected to be ready by February 2013. On request we are willing to make this model available for other EU member administrations other stakeholders like train and mobile operators. |
| Norway | NPT has not been involved and the situations are being handled by the GSM-R operator in cooperation with the public mobile operators. |
| Sweden | Yes and no, the final license conditions include requirements on all involved parties so that they in reality cooperate to solve the problem. However, this is cooperation by regulation. PTS first tried to set up a voluntary coordination solution between the involved license holders. To achieve this goal the public 900 MHz operators and the GSM-R operator were invited to PTS for informal meetings about implementation of the voluntary coordination solution. These meetings went on for a year without the involved parties reaching an agreement. The concept of coordination could be accepted by all parties, but the big “stumbling block” was the definition of rights and obligations in a coordination situation. These rights and obligations in principle decide how to share the costs for implementing the extra protection measures that would be a result of the coordination and this became a contentious issue.  When it became evident that an agreement covering a voluntary coordination solution could not be reached, PTS instead had to implement a fallback solution of implementing GSM-R protection conditions in the 900 MHz licenses held by public operators. The objective for PTS was to find a solution that was proportionate and achieved a fair distribution of burdens and costs between all the involved parties. |
| UK | The coordination process was imposed on the UMTS900 operators after a period of consultation. It is understood that there is regular dialogue between the respective operators. |

**Question 7: Any further information which may be relevant from your point of view?**

5 administrations provided an answer.

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| Czech Republic | There was no interference report to the Office on interference GSM-R by MFCN networks within time frame required in the Czech Republic. However, based on some experiences of responsible body on GSM-R operation, there are some fears on compatibility and possible interference of GSM-R by operation of new 4G networks specifically in cases of necessity to share sites along railways lines. |
| France | A new case was raised in March 2013 and is currently under investigation.  It may be worth:  o investigating the benefits of using the GSM-R extended band where interference cases are identified and no other solution can be identified noting that it may be a costly fix;  o exploring the option to produce a guidance document on how GSM-R and mobile operators could document their cases in a uniform, complete and transparent approach and explore options together in a timely manner and track progress;  o Ensure that site surveys carried out by mobile and GSM-R operators during the planning phase are taking into account the existing radio transmitters |
| Germany | Measurements have been carried out in order to verify the possible impact from UMTS-900 into GSM-R. The report on the results is still under development. |
| Sweden | The current implementation in Sweden where the public 900 MHz operators is taking a dual burden both limiting the out of band signal levels and their own in-band signal levels over the GSM-R enabled railway track is not seen as proportionate.  Due to this the license conditions will change at 30 June 2015, after that date the public operators in the 900 MHz band will be allowed to increase their in-band signal levels in their own frequency space above the GSM-R enabled train tracks.  This change is expected to give rise to disturbances in the GSM-R operation unless improvements are implemented in the GSM-R terminal receivers so that they can handle the increased signal levels. Measurements and field tests done by Trafikverket and the public operators in Sweden confirm that current GSM-R receivers will have problems handling these higher signal levels.  Measurements also confirm that there are relatively straightforward solutions that can be implemented so that the behaviour of the GSM-R terminals is improved to a point where the signal strength in the public 900 MHz band becomes a non-issue. Technical realizations that would achieve this goal would be installation of Improved/modified radio modules or installation of Switchable protective filter.  However, to implement this last part of the agreed solutions package, where the GSM-R operator and the public 900 MHz operators have already implemented their part of the solution, it would be extremely beneficial if a clear statement was included in TSI CCS (EIRENE) that switchable filters or other solution which meet the harmonized levels of wanted emissions is accepted. To put focus on this issue all involved parties in Sweden, regulators, the GSM-R operator, the public 900 MHz operators and the train operators have agreed on a common information memorandum describing the situation in Sweden and the solution that we would like to implement.  Link to the document: http://www.trafikverket.se/PageFiles/117321/coexistence.pdf (on pages 13-15 an unofficial translation of the license condition to protect GSM-R that are included in the public 900 MHz licenses can be found) |
| Switzerland | MFCN and GSM-R operators work closely together. |

Concerning external switchable filters, a revision of the TSI CCS specification may be necessary since the incorporation of a filter may not be compliant to the existing specification (e.g. insertion of losses between antenna and cab radio). Secondly, due to international train traffic, this can be perceived as a problem for the pan-European railway traffic and limiting competition on the market. The agreements in place in Sweden to modify equipment on board of trains only cover the local companies, and not the trains from companies abroad which may request to access the country’s railway network.