Interferences into GSM-R due to Public Mobile networks
**GSM-R highlights**

- An indispensable constituent for the present and future railway operations.

- Specified in TSI as part of ERTMS.

- Railways implementing GSM-R with ETCS on TEN high speed and conventional lines with a specific consideration to corridors; scope extension for the TSI is currently under discussion.
GSM-R implementations status

> More than 160,000 km of rail shall be covered with GSM-R by end 2016

> Today only 60,000 km are in operation.

> 40,000 Cab Radios and 1200 EDORs are activated; more to come.
Development of broadband technologies pushed forward by the EC and EU Member States.

Increasing numbers of interferences to the GSM-R systems identified.

Number of cases will significantly increase:
- GSM-R implementation is not completed
- ETCS L2 implementation at its beginning
- Broadband technologies are now emerging in 900 MHz band

This is just the beginning.
Unwanted emission coming from the public base stations. Signals from UMTS, LTE etc. leaks into GSM-R band.

Cumulated interferences signal level due to high transmitting levels from public transmitters.

Installations close to railways lines without coordination will cause interference to the communication for ERTMS (ETCS + GSM-R).
Possible technical measures considered by Railways

- Additional GSM-R base stations.
- On-board radio filters.
- Improved radio modules in trains.
- Measures are not always successful
- Cost for rail is very high – not acceptable.
- Both sides (Railways and Public Operators) combined solutions must be considered.
- Solutions – today considered at national level - need urgent EU harmonisation
Operational and commercial consequences

> Movement orders and train position needed for ETCS operations are exchanged via GSM-R.

> Jammed traffic:
  - major delays; performances of line and rail network is badly affected; bad economic and commercial effects.
  - Impossible to make voice communication – especially Railway Emergency Calls - can lead to dangerous situations.

> Whereas 12 of 2012/88/EU: “the availability of the GSM-R frequencies is essential for safe and interoperable operations”
In total more than 360 000 million passenger-kilometers per day travelled on railway networks within Europe.

One GSM-R connection loss for ERTMS can cause train delays for 15-30 minutes, affecting about 1000 passengers.

*Source: Eurostat & UIC*
Conclusions 1/2

> Co-existence between GSM-R and Public Networks can only be guaranteed by regulatory measures, followed by appropriate technical mitigation techniques, for both unwanted emissions and blocking cases.

> As GSM-R is an European solution - where free movement of trains between countries must be assured - the regulatory measures must be defined in the form of European harmonized protection values for GSM-R.

> Member States have an existing legal obligation to ensure appropriate protection of GSM-R.

> Railways shall not have to adapt every time a new broadband system is appearing, and GSM-R will be in place until at minimum 2025; the solutions adopted must be future proof!
Conclusions 2/2

> Uninterrupted functioning of the GSM-R system is the **basis for communication in a modern safe and interoperable European railway.**

> Railways have considered, and in some cases already implemented, the technical solutions they are able to do. These **national solution will jeopardise interoperability.**

> The growing implementation of next generation systems are expected to create interferences that railways are unable to overcome without support from EU.
Thank You For Your Attention!