



## **GSM-R certification and authorization process**

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GSM-R in CCS TSI



## GSM-R in CCS TSI (I)

- In the section 1.1 of the CCS TSI (2012/88/EU), the scope of the TSI is defined for both Track-side and On-board Subsystems:

*This TSI concerns the Control-Command and Signalling On-board Subsystem and the Control-Command and Signalling Track-side Subsystems*

- In the section 2.1 of the CCS TSI (2012/88/EU), a definition of what is a subsystem can be found.

*The Control-Command and Signalling Subsystems are defined in Annex II to the Railway Interoperability Directive as 'all the equipment required to ensure safety and to command and control movements of trains authorised to travel on the network'.*

- In the section 2.2 of the CCS TSI (2012/88/EU), the different parts of each Subsystem are defined.

*The Control-Command and Signalling Subsystems include the following parts:*

- 1. train protection;*
- 2. radio communication;*
- 3. train detection.*



## GSM-R in CCS TSI (II)

- TSI defined parts of a subsystem can be assessed separately, according to the point 6.4.2 in the CCS TSI

### 6.4.2. Assessment of parts of Control-Command and Signalling Subsystems

*Assessing whether a Control-Command and Signalling Track-side or On-board Subsystem complies with the requirements of this TSI is a process that may be performed in successive steps – one for each of the three parts. At each step, the assessor checks only whether that particular part complies with the TSI requirements.*

*Regardless of which module is chosen, the Notified Body shall verify that:*

- 1. the TSI requirements for the part in question have been respected;*
- 2. the TSI requirements already assessed are not prejudiced.*

*Functions already assessed and unchanged and which are not affected by this step do not need to be checked again.*

- As a result of the assessment, the NoBo will issue a certificate of EC verification of the specific part or parts of the subsystem. (for GSM-R, the Radio Communication part)
- When no other parts of the Subsystem are present, and only the Radio Communication part is present, the Subsystem is composed of only 1 part.



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Notes on certification & authorisation



# Authorisation for placing in service of a subsystem

- Directive 2008/57/EC

## Art.15:

*Each Member State shall authorise the placing in service of those structural subsystems constituting the rail system which are located or operated in its territory.*

## Art 17:

- 1. Member States shall consider as being interoperable and meeting the essential requirements concerning them, those structural subsystems constituting the rail system which are covered by the 'EC' declaration of verification.*
- 2. Essential requirements, of a structural subsystem constituting the rail system shall be established by reference to TSIs, where they exist.*
- 3. Member States shall draw up, for each subsystem, **a list** of the technical rules in use for implementing the essential requirements and notify this list to the Commission **when**:*
  - **no relevant TSI exists**, or*
  - a **derogation** has been notified under Article 9, or*
  - a **specific case** requires the application of technical rules not included in the relevant TSI.*



# Procedure: Authorisation for placing in service

- Directive 2008/57/EC

## Art.18:

a) The applicant selects a NoBo

*[The applicant may be the contracting entity or the manufacturer, or their authorised representative within the Community]*

b) The NoBo runs the **EC verification** process

c) *The notified body shall be responsible for compiling the technical file that has to accompany the 'EC' declaration of verification.*

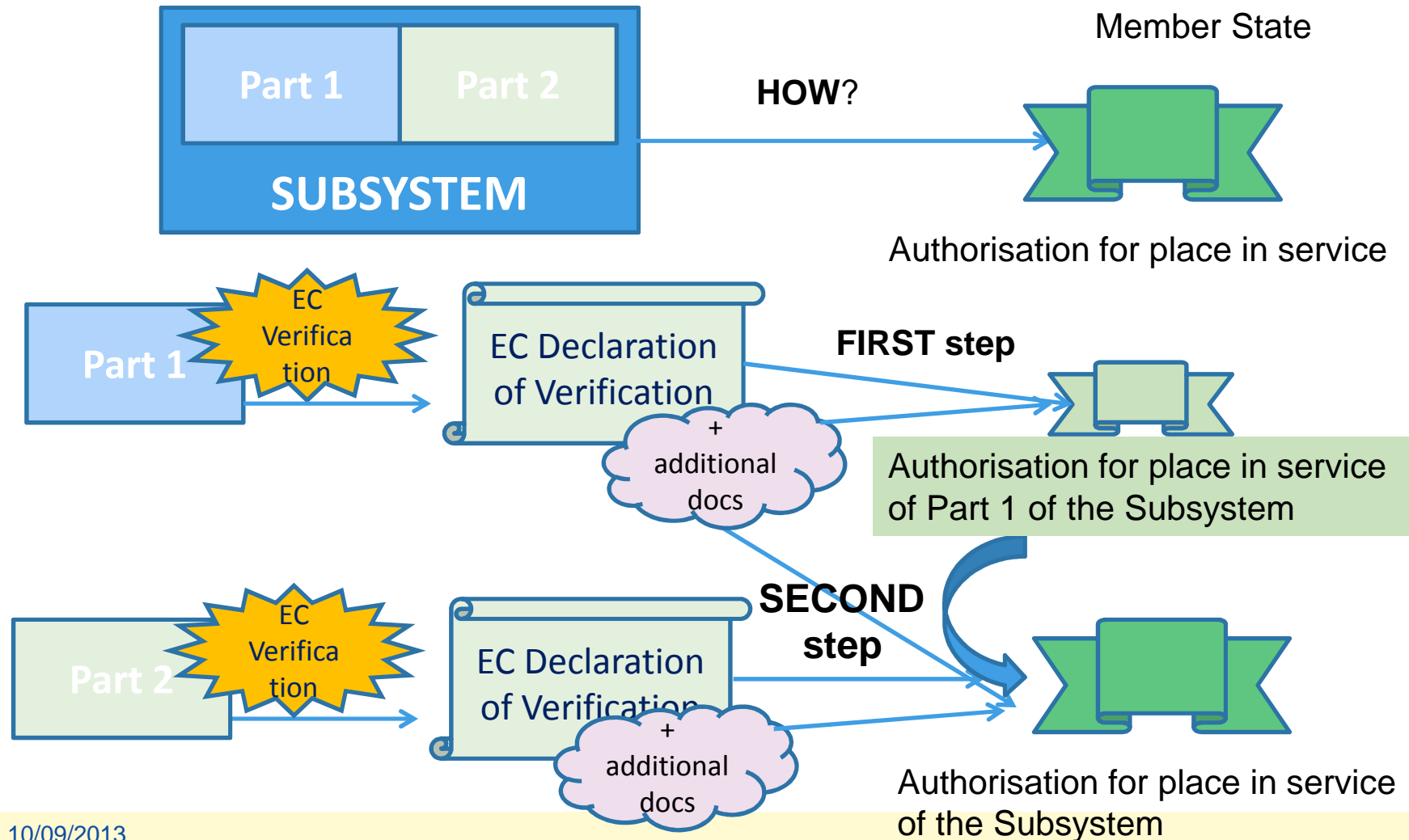
d) The applicant issues the **EC declaration of verification of the subsystem**

e) The EC declaration of verification is presented to get the authorisation for placing in service.



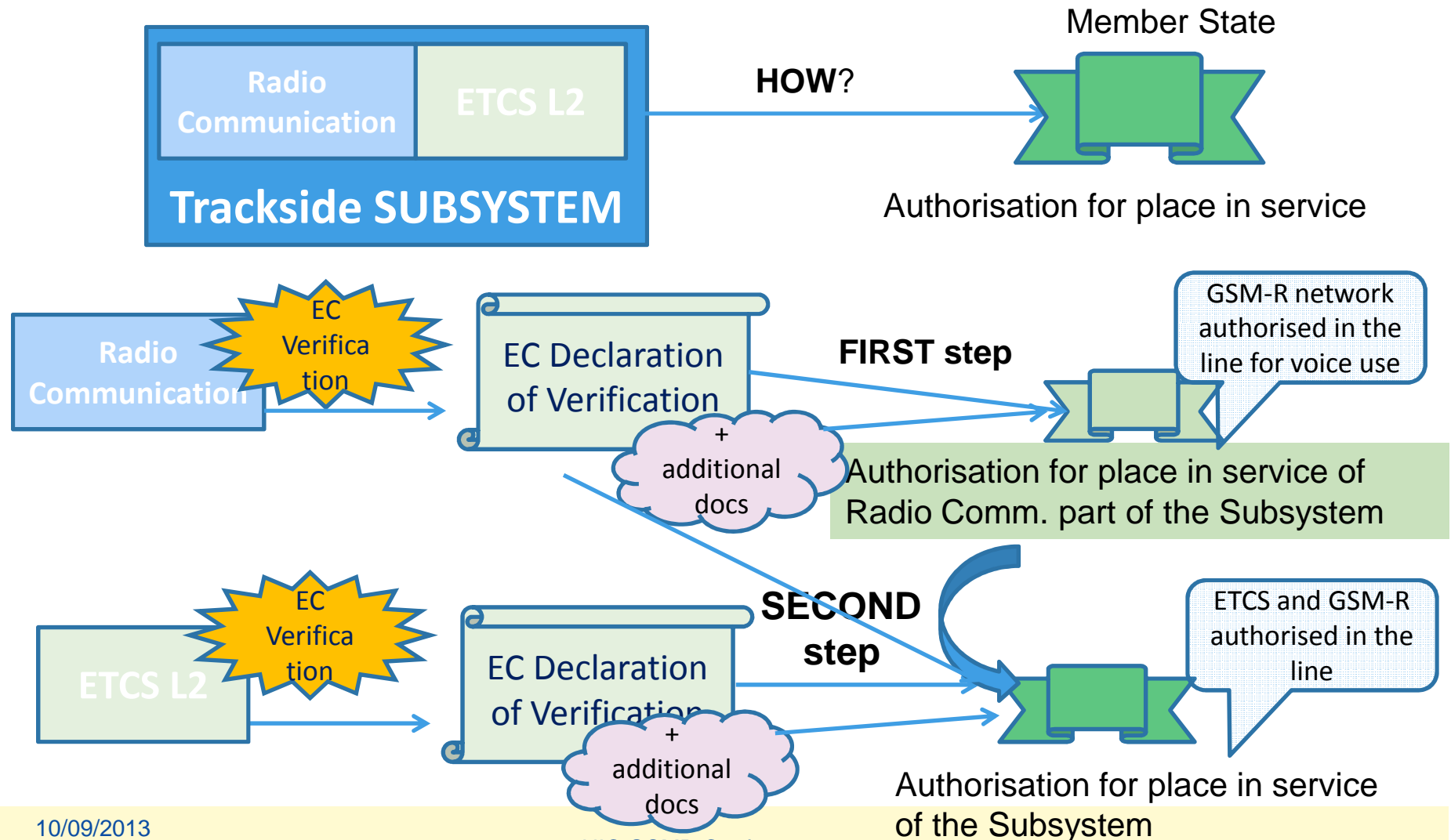


# One example





# Putting the names to the parts...





# Modules used for certificates

- FOR ICs : point 6.2.2 in 2011/88/EC

*For assessing interoperability constituents within the Control-Command and Signalling Subsystems, the manufacturer or his authorised representative established within the European Union, may choose:*

*1. either **the type-examination procedure (Module CB)** for the design and development phase **in combination with the production quality management system procedure (Module CD)** for the production phase; or*

*2. **the type-examination procedure (Module CB)** for the design and development phase **in combination with the product verification procedure (Module CF)**; or*

*3. the full **quality management** system with design examination procedure **(Module CH1)**.*

*In addition, for checking the **SIM card** Interoperability Constituent, the manufacturer or his representative may choose **module CA**.*



## Modules used for certificates (II)

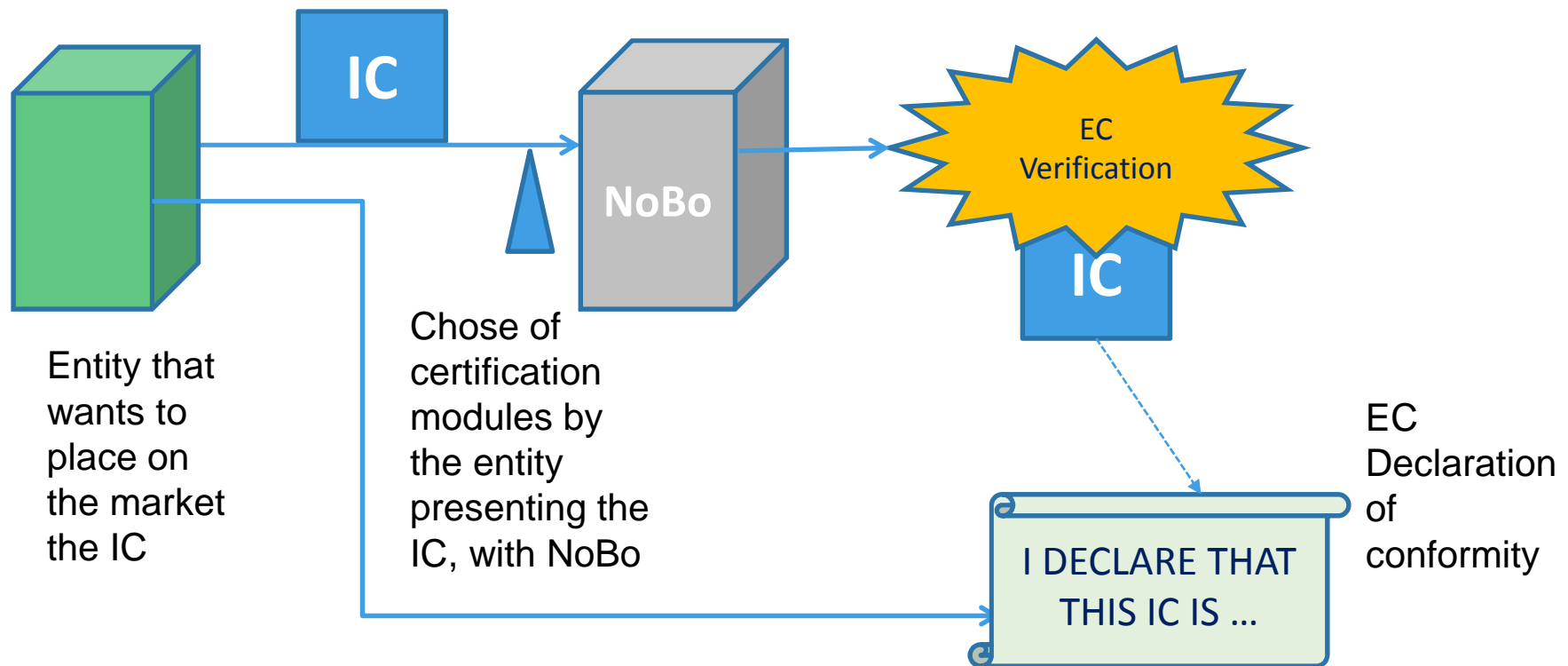
- FOR ICs : point 6.2.2 in 2011/88/EC

NOTE: Who is “the manufacturer or his authorised representative”?  
the entity that presents the IC in order to be able to issue the EC ` declaration of conformity, to allow to place on the market the IC.

- a) The IC is taken to a NoBo
- b) The modules to be used are chosen by the entity that presents the IC to the NoBo
- c) The NoBo carries out the EC verification of the IC
- d) The “manufacturer of his authorised representative” demonstrates the compliancy of the IC via the “EC Declaration of Conformity”



# Modules used for certificates (III)





## Modules used for certificates (IV)

- FOR SUBSYSTEMS: point 6.3 in 2011/88/EC

*6.3.1 At the request of the applicant the Notified Body shall carry an ‘EC’ verification of a Control-Command and Signalling On-board or Track-side Subsystem in accordance with Annex VI to the Railway Interoperability Directive.*

*The applicant shall draw up the ‘EC’ declaration of verification for the Control-Command and Signalling On-board or Track-side Subsystem in accordance with Article 18(1) and Annex V to the Railway Interoperability Directive*

NOTE: Who is “the applicant”?

the entity that presents the subsystem in order to be able to issue the EC declaration of verification, to allow to place in service of the subsystem



# Modules used for certificates (V)

- FOR SUBSYSTEMS: point 6.3 in 2011/88/EC

## **ONBOARD SUBSYSTEM: 6.3.2.1**

The applicant may choose either:

1. the type-examination procedure (**Module SB**) for the design and development phase **in combination with** the production quality management system procedure (**Module SD**) for the production phase; or
2. the type-examination procedure (**Module SB**) for the design and development phase **in combination with** the product verification procedure (**Module SF**); or
3. the **full quality management** system with design examination procedure (**Module SH1**).

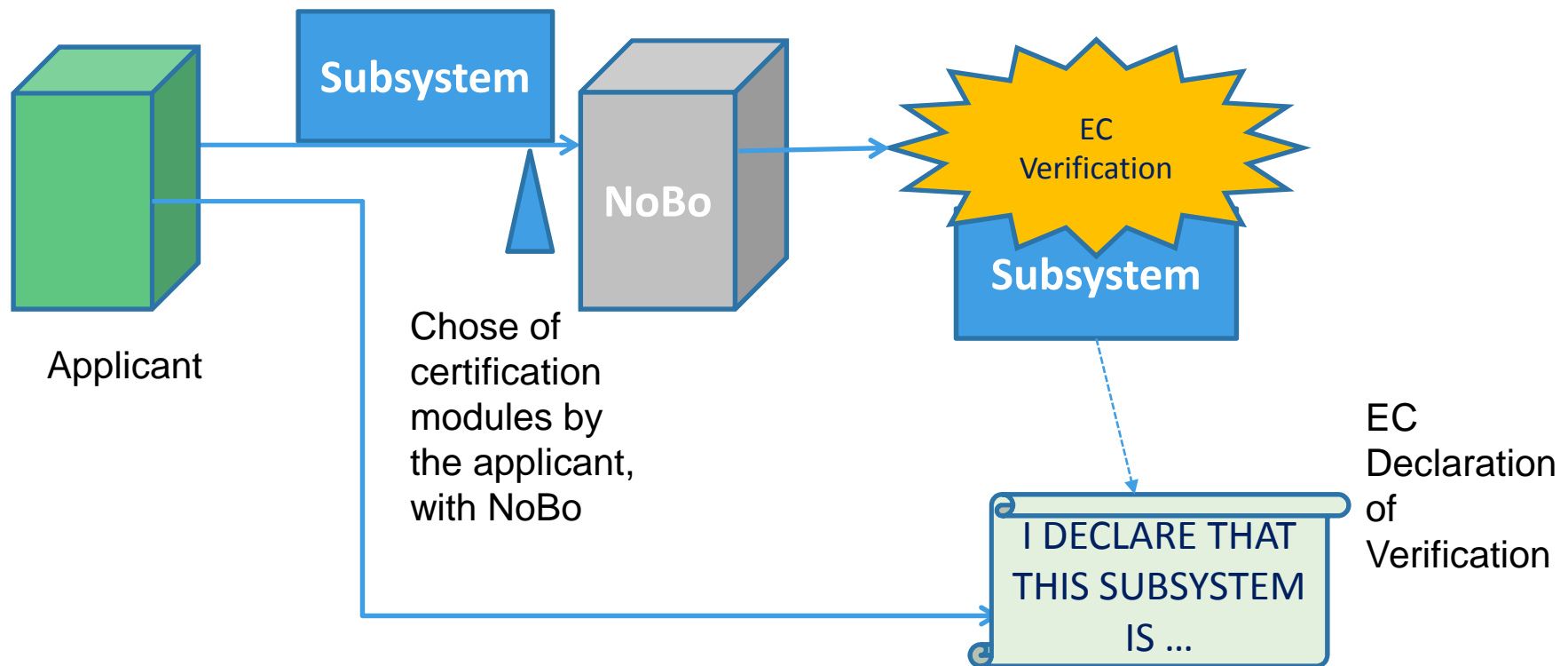
## **TRACKSIDE SUBSYSTEM: 6.3.2.2**

The applicant may choose either:

1. the unit verification procedure (**Module SG**); or
2. the type-examination procedure (**Module SB**) for the design and development phase in combination with the production quality management system procedure (**Module SD**) for the production phase; or
3. the type-examination procedure (**Module SB**) for the design and development phase in combination with the product verification procedure (**Module SF**); or
4. the **full quality management** system with design examination procedure (**Module SH1**).



# Modules used for certificates (VI)







# Description of Modules

- Decision 2010/713/EC

## **Some definitions:**

### **Art 3 :**

5. 'applicant' means contracting entity or manufacturer;

11. 'manufacturer' means any natural or legal person who manufactures a product or has a product designed or manufactured, and markets that product under his name or trademark;

12. 'authorised representative' means any natural or legal person established within the Union who has received a written mandate from a manufacturer or a contracting entity to act on their behalf in relation to specified tasks;



## Description of Modules (II)

- Decision 2010/713/EC

**Depending on the modules chosen, changes in the subsystem are treated in a different way.**

For example, for Module SD :

*3.5. The applicant shall keep the notified body that has approved the quality management system informed of any intended change to the quality management system having impact on the subsystem design, manufacture and final inspection, testing and operation, as well as of any changes of quality management system certificate.*

*The notified body shall evaluate any proposed changes and decide whether the modified quality management system will continue to satisfy the requirements referred to in point 3.2 or whether a reassessment is necessary.*

*It shall notify the applicant of its decision. The notification shall contain the conclusions of the examination and the reasoned assessment decision.*

*4. Each notified body shall inform its notifying authorities of quality management system approvals issued or withdrawn, and shall, periodically or upon request, make available to its notifying authorities the list of quality management system approvals refused, suspended or otherwise restricted.*



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Radio communication part of Trackside Subsystem



# Radio Communication part of Trackside Subsystem (I)

- The GSM-R network installed by an Infrastructure Manager to be operated in a Member State area is the radio communication part of the Control-Command and Signalling Track-side Subsystem.
- When the area covered by the GSM-R communications network falls under the geographical scope of the TSI, the article 5(2) of the Interoperability Directive (2008/57/EC) states that: “*subsystems shall comply with the TSIs in force at the time of their placing in service, upgrading or renewal*”.
- In all cases under the scope of the TSI, for the placing in service of the GSM-R communication network, its assessment in terms of compliancy to the TSI is needed.



# Radio Communication part of Trackside Subsystem (II)

- The same network is used for voice and data (ETCS data) transmission. Requirements for the network are common: documents in the Annex A
  - Index 32 and 33: EIRENE: Requirements classified as (MI) in GSM-R Baseline 0 (FRS 7.3.0/ SRS 15.3.0) should be fulfilled.
- Some notes for ETCS data:
- *FRS: 2.3.13 Where ERTMS/ETCS level 2 or 3 is implemented, the network shall be capable of supporting data communications for that train control system. (MI)*
  - SRS: 2.3 GSM-R bearer services/ 2.4 GSM-R supplementary services (eMLPP)



# Radio Communication part of Trackside Subsystem (III)

- In order to perform EC Verification of the GSM-R network, it is not necessary to have a train fitted with ETCS. Only the network functionality will be verified.
- However, the NoBo has to verify that the voice and data requirements are fulfilled. This includes the requirement in FRS:  
*3.2.4 The land-based part of the system shall provide communications for mobiles when stationary and when travelling at speeds up to the maximum allowable line speed or 500 km/h, whichever is the lower. (MI)*

This is for both data and voice communication, enough evidences have to be provided; the NoBo may decide that an onsite test is required, but it should not require a train with ETCS, just an EDOR/modem to be able to check the functionalities provided.



## GSM-R network assessment

- The GSM-R network is considered as a whole in the CCS TSI. This means: no separate concept of BSS and NSS.
  - The assessment of the network is NOT done separately for BSS and NSS
  - **All the elements installed in the network**( transmission system between BTS and BSC, backbone, BSCs, BTSs, MSCs, Authentication center...) should be present as they are part of the subsystem. The assessment of the essential requirements (in TSI) is done to the complete network.
  - The details of the specific engineering (single/dual coverage, redundancy of BSCs, redundancy of MSCs, etc) are assessed while verifying the essential requirement for Reliability/Availability, and the relevant points in the TSI.
  - There is no specific architecture required in order to fulfil the requirements. Also, there is specific consideration
  - The coverage and network availability are specified in GSM-R SRS mandatory for interoperability requirements.



## GSM-R network assessment (II)

- Coverage references in SRS : (ETCS data in red)

### 3.2.2 The following minimum values shall apply: (MI)

- coverage probability of 95% based on a coverage level of 38.5 dBmV/m (-98 dBm) for voice and non-safety critical data;
- coverage probability of 95% based on a coverage level of 41.5 dBmV/m (-95 dBm) on lines with ETCS levels 2/3 for speeds lower than or equal to 220km/h.

### 3.2.3 The following minimum values shall apply: (MI)

- coverage probability of 95% based on a coverage level of 44.5 dBmV/m (-92 dBm) on lines with ETCS levels 2/3 for speeds above 280km/h;
- coverage probability of 95% based on a coverage level between 41.5 dBmV/m and 44.5 dBmV/m (-95 dBm and -92 dBm) on lines with ETCS levels 2/3 for speeds above 220km/h and lower than or equal to 280km/h.





## GSM-R network assessment (III)

- **GSM-R Network with coverage for voice:**
  - All the MI requirements for the network to be tested
  - This includes the MI network requirements for data transmission
  - Coverage for voice according to the Baseline 0 r3 requirement
  - ⇒ EC Verification of the RADIO PART of the Trackside Subsystem for the use of voice
  
- **GSM-R Network with coverage for ETCS data:**
  - All the MI requirements for the network to be tested
  - This includes the MI network requirements for data transmission
  - Coverage for data according to the Baseline 0 r3 requirement
  - ⇒ EC Verification of the RADIO PART of the Trackside Subsystem for the use of voice and ETCS data



## GSM-R network assessment (IV)

- GSM-R Network already assessed for voice use, new coverage for ETCS data:
  - This is an upgrade of the radio part => UPDATE the certificate
  - Verification that the previously assessed parameters remain unchanged
  - Coverage for ETCS data according to the Baseline 0 r3 requirement⇒ UPDATE the EC Verification of the RADIO PART of the Trackside Subsystem for the use of voice and issue one for the use of voice and ETCS data
- GSM-R Network assessed in one line, new line built:
  - The applicant has flexibility to define the geographical scope of the Trackside Subsystem
  - If the scope of each Trackside subsystem is one line, then new certificate to be issued for the new line.
  - Other solutions possible (i.e. if the lines in a whole country are considered as one Trackside subsystem, then adding one line will be an upgrade, the certificate has to be updated ...)



## GSM-R network assessment (V)

- **SIM card assessment:**
  - Module CA can be used (“internal production control”)
  - The “manufacturer” (the entity that puts the product on the market: the IM or network operator) issues a “EC Declaration of conformity” for the IC: the relevant ETSI specifications are respected and in addition the requirements of the FFIS for SIM card (configuration of SIM).
  - The SIM card is distributed to the RU and inserted in the train
  - The applicant (RU or other) will issue a “EC Declaration of verification” for the OnBoard subsystem, that includes all the ICs (SIM card as well), as part of the authorisation process.
- **GSM-R Network options:**
  - NoBo: when the MI features are assessed, it is implied that nothing is affecting interoperability. NO specific checks for options.
  - DeBo: if there is an option relevant for the essential requirements, it has to be notified. If accepted by EC, then to be checked by DeBo (or NoBo acting as DeBo, if requested in the notification).



4

Radio communication part of Onboard subsystem



# Radio Communication part of On-board Subsystem

- Declared ICs in 2012/88/EU: Cab radio, EDOR (ETCS data only radio), SIM card (in the On-board if not in the Trackside Subsystem)
- Cab radio (voice) and EDOR (ETCS data) may be provided in the same physical equipment, but the functional requirements are different.

- Some notes for EDOR:

- SRS Chapter 4 includes different services for each mobile radio type
- SRS Chapter 16 collects specific requirements for EDOR:

*16.3.4 All GSM-MT of the ETCS data only radio shall be initialised and controlled, for example with regard to network selection and call handling, by the ETCS train-borne system according to FFFIS for EURORADIO specification [MORANE EURO FFFIS]. (MI)*

*16.3.5 The ETCS data only radio shall be capable to be used within the band 876-880 MHz (uplink) and 921-925 MHz (downlink). (MI)*

*16.3.6 The ETCS data only radio should be capable to be used within the band 880-915 MHz (uplink) and 925-960 MHz (downlink). (O)*

NOTE: 16.3.5 & 16.3.6 are different to the requirements for Cab radio.



# Radio Communication part of On-board Subsystem

- SIM card is a declared IC. Although they are provided by the GSM-R network operator, since they will be placed in the terminals, they are an IC of the Onboard Subsystem.



## GSM-R assessment in vehicle

- Vehicle without GSM-R voice that installs ETCS L2 signalling
  - UNLESS DEROGATION: the installation of ETCS L2 signalling modifies the radio part of the onboard subsystem : this is an upgrade or renewal
  - In case of upgrade or renewal, the radio part has to be fully upgraded => GSM-R voice has to be installed.
- Certificates for more than one part
  - If a certificate contains more than one part (i.e. radio part for use of voice, and train protection part for use of ETCS L1), and one of the parts is upgraded, the certificate will have to be UPDATED for the modified part.



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