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Report

On the implementation of ETCS system compatibility (ESC) and radio system compatibility (RSC)

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1.0	29/05/2020	Version to be sent to EC
1.1	22/03/2021	Editorial update for clarification of header in tables 1, 3 and 5 and section 6.5. No update of the data of the report, so the report date is kept in 29/05/2020.

Contents

1. Scope of the report

The scope of this report is to fulfil the CCS TSI [1] Art 11.1a requirement "*By 1 June 2020, the Agency shall send a report to the Commission on the implementation of ETCS system compatibility (ESC) and radio system compatibility (RSC). The report shall include an assessment of the differing types of ESC and RSC, and the potential for reducing the underlying technical divergences of ESC and RSC types. Member States shall provide the Agency with the necessary information to complete the analysis".*

2. Abbreviations and acronyms

ABBREVIATION/ACRONYM	*FULL TEXT*
BDC	Basic Design Characteristics
CR	Change Request
EDOR	ETCS Data Only Radio
ERATV	European Register of Authorised Types of Vehicles
ESC check	ETCS System Compatibility check
IC	Interoperable Constituent
IM	Infrastructure Manager
MS	Member State
NNTR	Notified National Technical Rule
NoBo	Notified Body
RCC	Route Compatibility Check
RFC	Rail Freight Corridors
RINF	Register of Infrastructure
RSC check	Radio (GSM-R) System Compatibility check
RU	Railway Undertaking
RBC	Radio blocking center
TRK	Trackside
VA	Vehicle Authorization

3. Document references

DOCUMENT REFERENCE	*TITLE*	*LAST ISSUE*
[1] (EU) 2016/919	Commission Regulation of 27 May 2016 on the technical specification for interoperability relating to the control-command and signalling subsystems of the rail system in the European Union	*L 158 15.6.2016 p. 1*
	COMMISSION IMPLEMENTING REGULATION (EU) 2019/776 of 16 May 2019 amending Commission Regulations (EU) No 321/2013, (EU) No 1299/2014, (EU) No 1301/2014, (EU) No 1302/2014, (EU) No 1303/2014 and (EU) 2016/919 and Commission Implementing Decision 2011/665/EU as regards the alignment with Directive (EU) 2016/797 of the European Parliament and of the Council and the implementation of specific objectives set out in Commission Delegated Decision (EU) 2017/1474	*L 139-I 27.5.2019 p.108*
	Commission implementing Regulation (EU) 2020/387 of 9 March 2020 amending Regulations (EU) No 321/2013, (EU) No 1302/2014 and (EU) 2016/919 as regards the extension of the area of use and transition phases	*L 73, 10.3.2020, p. 6*
[2] CCS TSI Application Guide	Guide for the application of the CCS TSI	*V6.1 05/02/2020*
[3] ESC/RSC Technical Document	TD/011REC1028 ESC/RSC Technical Document. Link to the Agency web page: https://www.era.europa.eu/sites/default/files/activities/docs/era_td-011rec1028_esc-rsc_technical_document_en.pdf	*V4.0 29/05/2020*

4. Introduction

In the amended CCS TSI Regulation (EU) 2019/776 [1] it was introduced the concept of ESC/RSC and it was required to the IM to submit to the Agency the necessary definition of those check to demonstrated technical compatibility between the CCS on-board and trackside subsystems.

This report provides the summary status of that activity by May 2020 and the preliminary analysis performed by the Agency on the received information. At the end of the report, the Agency also identifies some findings and proposes some actions as future steps, to be considered in the feedback from this activity for the CCS TSI revision cycle.

At the time of writing, many IM has contacted the Agency submitting information about ESC/RSC checks. Nevertheless, some IM, whose networks contain at least one ETCS/ERTMS line in operation, have not communicated any information to the Agency. The initial deadline foreseen in the CCS TSI was 16 January 2020.

The Agency has contacted EIM and CER to inform the missing IMs that are members of these organisations to fulfil the requirement in the CCS TSI. The Agency will also coordinate with the different NSAs to contact other IMs that are not part of any European organisation, in order to complete the submissions.

The process followed by the Agency is in line with the indications in the CCS TSI Application Guide [2] in section 2.6.31:

Once an IM first sends its ESC/RSC proposal, the Agency notifies the reception of those ESC/RSCs and conducts a preliminary analysis. The purpose of this analysis is to verify the types of ESC/RSCs proposed and their completeness, as well as to verify the content of the ESC/RSCs in order to eliminate tests that do not fall within the definition of ESC/RSCs.

At that time, the ESC/RSC types are placed in the "reserved" state in ERA ESC/RSC Technical Document TD/011REC1028 [3].

The Agency has been supported by the Deployment Management Team contracted by the European Commission on performing some analysis of the received ESC/RSC and on the analysis of the current ETCS and GSM-R deployment on the Member States.

Once the comments are taken into account by the IM, with the publication of a new version of the ESC/RSC catalogue if necessary, the Agency asks the concerned NSAs whether the proposed ESC/RSC catalogue eliminates the NNTR relating to ETCS/GSMR on-board-trackside testing and integration. Once the positive feedback from the NSA is received, the ESC/RSC type is set to "valid" state in ERA ESC/RSC Technical Document TD/011REC1028 and the corresponding definition of the checks is made available in ERA web page.

The Agency document includes both the ESC/RSC tests that have been reviewed and validated by the Agency, with “valid” status, as well as those that have not been yet validated by the Agency, with “reserved” status.

However, it is important to point out that the tests in ‘reserved’ status include both the names of the ESC/RSC type that have been communicated to the Agency, but without further details on the content of the checks, and also the ESC/RSC types whose tests have been provided and have been commented on by the Agency and that must be taken into account by the IM before it can be in ‘valid status. The Agency cannot consider the ESC/RSC checks to be in “valid” status until the details on the content of the checks and the expected results (pass/fail criteria) are provided (otherwise, the process cannot be followed, since Notified Bodies cannot assess the reports of the ESC/RSC checks).

During the transitional period when ESC/RSC checks are not yet in the state ‘valid’, the Agency provides a special code in ERATV that allows the old testing procedures to be used instead of ESC/RSC. This measure is temporary and is intended to no longer be permitted after the ESC/RSC are published. See section 2.6.70 in TSI CCS application guide.

5. Classification

5.1. ESC types summary table

This table includes the Member States (except Malta and Cyprus) plus Switzerland, Norway and United Kingdom.

Status valid indicates that the ESC Types are published in the Agency ESC/RSC document [3].

Status reserved indicates that the ESC Types has been submitted to the Agency but the validation is not complete.

Status pending indicates that there is no submission to the Agency by any IM in that Members State.

Table 1 : ESC types

MS / IM	*Status*	*Number of ESC types*	*Does IM indicate a laboratory for ESC check execution at IC level?*
Austria / ÖEBB	Reserved	No type defined yet	No
Belgium / Infrabel	Reserved	4	No
Bulgaria	Pending		
Czech Republic / SŽDC	Reserved	1	No
Croatia	No ETCS lines		
Denmark / Banedanmark	Reserved	2	Yes
Estonia	No ETCS lines		
Finland	Pending		
France / SNCF Réseau	Reserved	6	No
Germany / DB Netz	Reserved	1	?
Greece	No ETCS lines		
Hungary	Reserved	No type defined yet	
Ireland	No ETCS lines		
Italy / RFI	Reserved	8	Yes
Latvia	No ETCS lines		
Lithuania	No ETCS lines		
Luxembourg	Pending		
Norway / Bane NOR	Reserved	1	No
Poland / PKP PLK	Reserved	4	No
Portugal	No ETCS lines		
Romania /CFR	Reserved	1	No
Slovakia	Pending		
Slovenia	Pending		

Spain / ADIF	Reserved	10	No
Sweden / Trafikverket	Valid	5	Yes
Switzerland / SBB	Reserved	3	Yes
The Netherlands / ProRail	Reserved	23	Yes
United Kingdom / NetworkRail	Reserved	5	No

Table 2 : ESC types status summary

Status	*Number MS and other countries*	*% Over ETCS MS and other countries (21)*
Valid	1	4,7 %
Reserved	15	71,4 %
Pending	5	23,81 %
No ETCS Deployment	7	

5.2. ESC details per Member State / Infrastructure Manager and other countries

5.2.1. Austria / OËBB

There is no type defined yet. Proposed checks are based on Trackside operational scenarios. The details of the check and the expected results (end situation) are defined.

5.2.2. Belgium / Infrabel

The classification of the 4 ESC types is based on a combination level/set of specifications, which covers the type of network (conventional/high speed).

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1 and L2), but these tests also include tests following bad experience in the past, transition tests and the demonstration of interoperability as a result of situations covered by some CR.

The details of the checks and the exact sequence of messages/packets exchanged between the on-board and the trackside are not specified

Pass/fail criteria have been defined

5.2.3. Czech Republic / SŽDC

The single ESC type comprises the checks for a line with several sections.

The checks aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L2).

The exact sequence of messages/packets exchanged between the on-board and the track is specified, and the expected results have been provided.

5.2.4. Denmark / Banedanmark

There are 2 types of ESC which are defined by both their geographical nature and the supplier of TRK.

The tests proposed aim to check the behaviour of the on-board with some or all of the functions used at the TRK level and of the level transition tests (ETCS L2).

The exact sequence of the messages/packets exchanged between the on-board and the track is specified in detail and expected results for each check have been provided.

Pass/fail criteria have been defined

5.2.5. France / SNCF Réseau

The types of ESC (received from one specific IM only) are organised by functionalities for level 1 (ESC for level 2 are not yet provided).

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1), level transition tests and national functions (packet 44).

The exact sequence of messages/packets exchanged between the on-board and the track is not specified, expected results for each check have been provided.

Pass/fail criteria have been defined.

5.2.6. Germany / DB Netz

The single ESC type comprises the tests for a line with several sections.

The tests aim to check the behaviour of the on-board with certain functions used at the level of the TRK (ETCS L2) as well as to the level transition tests.

The exact sequence of messages/packets exchanged between the on-board and the track is not specified, expected results for each check have been provided.

5.2.7. Hungary

The checks has been received in the context of the NNTR on fixed installations discussion with the Agency.

5.2.8. Italy / RFI

The classification of the 8 ESC types is based on the existing lines (TRK supplier based).

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1 and L2).

The exact sequence of the messages/packets exchanged between the on-board and the track is specified in detail and expected results for each check have been provided.

Pass/fail criteria have been defined.

5.2.9. Luxembourg

Preliminary exchange with the Agency is on-going on the context of the NNTR review.

5.2.10. Norway / Bane NOR

The single ESC type comprises the tests for a (pilot) line.

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L2) and to the level transitions

The exact sequence of messages/packets exchanged between the on-board and the track is specified.

5.2.11. Poland / PKP PLK

The classification of the 4 ESC types is based on the existing lines and ETCS levels

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1 and L2).

The exact sequence of information exchanged between the on-board and the track is specified in detail

Pass/fail criteria have been defined.

5.2.12. Romania / CFR

The single ESC type comprises the tests for a line.

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level and to the level transitions (ETCS L2).

The exact sequence of messages/packets exchanged between the on-board and the track is not specified.

5.2.13. Spain / ADIF

The classification of the 10 ESC types is based on the existing lines (TRK supplier based)

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1 and L2), the level transition tests and the demonstration of interoperability following situations covered by certain CR.

The exact sequence of messages/packets exchanged between the on-board and the track is not specified.

5.2.14. Sweden / Trafikverket

The 3 ESC types comprise the tests for 3 lines (TRK supplier based). 2 additional ESC types are included for the migration of the level 2 lines to Baseline 3.

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L2 and L3) and to the level transitions.

The exact sequence of messages/packets exchanged between the on-board and the track is specified.

5.2.15. Switzerland / SBB

The types of ESC are organised by ETCS level (L2 and L1) knowing that only one ESC has to cover the whole network. Certain tests within these ESC types are only defined for a particular baseline or line. There is also a classification in order to determine whether or not a test should be carried out, depending on whether the same on-board is installed in another vehicle and/or whether the route is identical.

The tests to be carried out in a laboratory (laboratory of each TRK supplier) were not reported, although they were made mandatory through a NNTR. These tests are therefore specific for each TRK line/supplier.

Expected results have been defined.

The exact sequence of messages/packets exchanged between the on-board and the track is not specified.

5.2.16. The Netherlands / ProRail

The 23 classification of the ESC types is based on the existing ETCS lines, which can also be fitted with double signalling, as well as on the conditions for entering or leaving the line, which de facto multiplies the number of ESC (but reduces the number of tests within ESC).

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1 and L2) and to the level transitions

The exact sequence of messages/packets exchanged between the on-board and the track is specified.

5.2.17. United Kingdom / NetworkRail

The 5 ESC types comprise the tests for 4 lines (TRK supplier based) and 1 type reserved for future rollout

The tests aim to check the behaviour of the on-board with certain functions used at the TRK level (ETCS L1 and L2), Class B functionality, level transitions and demonstration of coverage of safety related constraints from Trackside.

The exact sequence of messages/packets exchanged between the on-board and the track is not specified.

Pass/fail criteria have been defined.

5.3. ESC Analysis

5.3.1. ESC types analysis

The number IM from different MS that have submitted the ESC definition to the Agency represents the 75% of the Members states with some ETCS deployment. The Agency is in advance validation phase with most of the IMs to publish the submitted ESC as valid.

Most of the IM have chosen to define ESC types based on existing ETCS/ERTMS lines and according to ETCS level and eventually TRK supplier. In addition, some IMs have chosen to define ESC types according to specific sections of an ETCS line. In this case, the number of ESC types is higher but the number of checks within the type are fewer.

So far, from all information received from IMs that have more than one line in service, there is no one with a single ESC type definition to cover all of them.

A possibility to be explored would be to have one ESC/RSC Type applicable for different IMs and Member States covering one corridor, so this ESC/RSC Type would prove compatibility among all the sections in the corridor.

5.3.2. ESC checks content analysis

In terms of the content of the checks, there is also a wide variety. There are generic test definitions where only the functionality and the expected result are indicated; there are also cases where the complete exchange between the on-board part, TRK or even the train operator is clearly detailed.

The ESC checks content shows also a variety in terms of objectives that go beyond the definition of ESC as defined in TSI.

The detailed analysis comparing the definition of the ESC checks between different ESC Types and their dependence from trackside configuration has not been performed. It has been concluded that in order to study a possible convergence among different ESC Types and their ESC checks, the detailed knowledge of the specific trackside engineering is required. This can only be done by the concerned IMs together with the suppliers. A possible starting point are the RFC.

Proposed action 1: When an ESC check does not depend on specific Trackside configuration, this check could be removed from the ESC type and it should be checked if the test is not already covered by the generic on-board test specification. If not, the check could be added into generic on-board test specification.

Proposed action 2: In order to limit an inconsistent definition of ESC by the different IMs, one ESC type could be defined for the complete existing RFC, with each IM involved in each corridor having to ensure that there is no duplication of tests for each of the sections that would be included in the definition of this overall ESC. This analysis can be monitored by the T&V subgroup.

5.4. RSC Classification

For the radio system compatibility, there are two different BDCs: one for the voice communication, with checks for the GSM-R voice functionality, provided by the GSM-R cab radio; and another for the data communication, with checks for the GSM-R ETCS data functionality, provided by the EDOR. These two types of checks correspond to two different parameters in ERATV and RINF. In the Agency technical document, two different tables are created to differentiate the set of checks for voice and for ETCS data communication. In some cases, the RSC data checks are embedded in the Level 2 or Level 3 ESC checks.

5.5. RSC Voice types summary table

This table includes the Member States (except Malta and Cyprus) plus Switzerland, Norway and United Kingdom.

Table 3 : RSC Voice types

MS/IM	*Status*	*Number of RSC voice type*	*Does IM indicate a laboratory for RSC check execution at IC level*
Austria	Pending		
Belgium / Infrabel	Reserved	1	Yes
Bulgaria	No GSM-R network		
Croatia	No GSM-R network		
Czech Republic / SŽDC	Reserved	0	Not applicable
Denmark	Pending		
Estonia	No GSM-R network		
Finland	No GSM-R network		
France / SNCF Réseau	Reserved	1	Yes
Germany / DB Netz	Reserved	0	Not applicable
Greece	Pending		
Hungary	Pending		
Ireland	Pending		
Italy	Reserved	0	
Latvia	No GSM-R network		
Lithuania	No GSM-R network		
Luxembourg	Pending		
Norway / Bane NOR	Reserved	0	Not applicable
Poland / PKP PLK	Reserved	1	Yes
Portugal	No GSM-R network		
Romania / CFR	Reserved	1	No
Slovakia	Pending		
Slovenia	Pending		

Spain / ADIF	Valid	4	Yes
Sweden / Trafikverket	Valid	1	Not applicable: documentary checks.
Switzerland / SBB	Reserved	1	Yes
The Netherlands / ProRail	Valid	0	Not applicable
United Kingdom	Reserved	1	

Table 4 : RSC Voice types status summary

Status	*Number MS and other countries*	*% Over GSM-R MS and other countries (21)*
Valid	3	14,3%
Reserved	10	47,6%
Pending	8	38,1%
No GSM-R Deployment	7	

5.6. RSC Voice details per Member State / Infrastructure Manager and other countries

5.6.1. Belgium / Infrabel

One RSC draft document has been provided with the reference to the checks to be performed.

The exact sequences for the checks are not specified in detail and the expected results (pass/fail criteria) for each check have not been provided.

Some checks can be performed in laboratory, while others need to be performed dynamically in the TRK.

Some checks refer to optional features that may be present in the voice cab radio or in the vehicle, which are expected to be used for information, to be considered by the RU in its SMS, since these features cannot be required to CCS TSI compliant vehicles. This will be reviewed when pass/fail criteria for them will be provided.

5.6.2. Czech Republic / SŽDC

No specific RSC voice checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.6.3. France / SNCF Réseau

One RSC voice type is defined for the whole network.

The exact sequences for the checks are specified in detail, referring for many of them to the generic test cases described in the catalogue available in the CCS TSI Application Guide; the expected results (pass/fail criteria) for each check have been provided.

Some checks can be performed in laboratory, while others need to be performed dynamically in the TRK, mounting the cab radio in the IM testing train.

5.6.4. Germany / DB Netz

A trilateral discussion is on-going with the IM and the NSA to conclude on the need or not of RSC voice checks.

5.6.5. Italy / RFI

No specific RSC voice checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility. A review in the context of the NNTR analysis should confirm this approach.

5.6.6. Norway / Bane NOR

No specific RSC voice checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.6.7. Poland / PKP PLP

One RSC voice type is provided with the definition of checks to be executed on the cab radio.

The tests aim to check the behaviour of the GSM-R cab radio in the specific network environment with respects to the general functionality defined in the CCS TSI.

The exact sequences for the checks are specified in detail, and the generic test cases described in the catalogue available in the CCS TSI Application Guide are listed as references (although no relation has been yet expressed between the test descriptions provided and the catalogue); the expected results (pass/fail criteria) for each check are provided.

All checks can be performed in laboratory at IC level, but some need to be performed also in TRK.

5.6.8. Romania / CFR

One RSC voice type is provided with the definition of checks to be executed on the cab radio.

The tests aim to check the behaviour of the GSM-R cab radio for the registration of Train Running Number.

The exact sequences for the checks are specified in detail and the expected results (pass/fail criteria) for each check have been provided.

Checks shall be performed in the TRK, since there is no laboratory available.

5.6.9. Spain / ADIF

The 4 RSC voice types comprise the tests for 4 different network configurations (with elements from different suppliers and software levels existing in the network). The same checks are repeated in each network configuration to assess the compatibility with each RSC voice type.

The tests aim to check the behaviour of the GSM-R cab radio in the specific network configurations with respects to the general functionality defined in the CCS TSI.

The exact sequences for the checks are specified in detail, referring to the generic test cases described in the catalogue available in the CCS TSI Application Guide; the expected results (pass/fail criteria) for each check are provided in the documents referred.

All checks can be performed in laboratory at IC level, but if this is not convenient for the RU, the IM will collaborate to organise the testing in TRK.

5.6.10. Sweden / Trafikverket

1 RSC voice types is defined for the whole network, limited to documentary checks.

The checks make reference to the protection against interferences defined in the CCS TSI. There is a question to identify if a specific Swedish filter is implemented. The pass/fail criteria does not take this into account (a CCS TSI compliant train will pass the checks without further remarks).

5.6.11. Switzerland / SBB

Following the discussion on the National Technical Rules, one RSC voice type may be proposed to deal with the possible compatibility issues. No draft has been submitted yet to the Agency.

It has been indicated that a laboratory environment would be available to perform this kind of checks.

5.6.12. The Netherlands / ProRail

No specific RSC voice checks are required and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.6.13. United Kingdom / NetworkRail

The definition of the RSC has been provided. The Agency is analysing the received information, since the checks are related to UK National Rules.

5.7. RSC Data types summary table

This table includes the Member States (except Malta and Cyprus) plus Switzerland, Norway and United Kingdom.

Table 5 : RSC Data types

MS / IM	*Status*	*Number of RSC data type*	*Does IM indicate a laboratory for RSC check execution at IC level*
Austria	Pending		
Belgium / Infrabel	Reserved	0	Not applicable
Bulgaria	No GSM-R network		
Croatia	No GSM-R network		
Czech Republic / SŽDC	Reserved	0	Not applicable
Denmark	Pending		
Estonia	No GSM-R network		
Finland	No GSM-R network		
France / SNCF Réseau	Reserved	1	Yes
Germany / DB Netz	Reserved	0	Not applicable
Greece	No ETCS L2/L3		
Hungary	Pending		
Ireland	No ETCS L2/L3		
Italy	Reserved	0	
Latvia	No GSM-R network		
Lithuania	No GSM-R network		
Luxembourg	Pending		
Norway	Reserved	0	Not applicable
Poland	Reserved	0	Not applicable
Portugal	No GSM-R network		
Romania / CFR	Reserved	0	Not applicable
Slovakia	Pending		
Slovenia	Pending		
Spain / ADIF	Valid	4	Yes
Sweden / Trafikverket	Valid	1	Not applicable: documentary checks.
Switzerland / SBB	Reserved	1	Unknown
The Netherlands / ProRail	Valid	0	Not applicable

United Kingdom	Pending		

Table 6 : RSC Data types status summary

Status	*# MS and other countries*	*% Over GSM-R & ETCS L2/L3 MS and other countries (19)*
Valid	3	15,8%
Reserved	9	47,4%
Pending	7	36,8%
No GSM-R Deployment	7	
GSM-R but no ETCS L2/L3 deployment	2	

5.8. RSC Data details per Member State / Infrastructure Manager and other countries

5.8.1. Belgium / Infrabel

No specific RSC data checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.8.2. Czech Republic / SŽDC

No specific RSC data checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.8.3. France / SNCF Réseau

One RSC data type is defined with reference to the generic test cases to be executed.

The exact sequences for the checks are specified in detail, referring for some of them to the generic test cases described in the catalogue available in the CCS TSI Application Guide [2]; the expected results (pass/fail criteria) for each check have been provided.

Some checks can be performed in laboratory, while others need to be performed dynamically or statically in the TRK, mounting the cab radio in the IM testing train.

5.8.4. Germany / DB Netz

A trilateral discussion is on-going with the IM and the NSA to conclude on the need or not of RSC data checks.

5.8.5. Italy / RFI

No specific RSC data checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility, but an active EDOR is required during the ESC testing. A review in the context of the NNTR analysis should confirm this approach.

5.8.6. Norway / Bane NOR

No specific RSC data checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility, but an active EDOR is required during the ESC testing.

5.8.7. Poland / PKP PLK

No specific RSC data checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility

5.8.8. Romania / CFR

No specific RSC data checks are expected and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.8.9. Spain / ADIF

The 4 RSC data types comprise the tests for 4 different network configurations (with elements from different suppliers and software levels existing in the network). The same check is repeated in each network configuration to assess the compatibility with the RSC data type.

The tests aim to check the behaviour of the EDOR in the specific network configurations with respects to the general functionality defined in the CCS TSI.

The exact sequence for the checks is specified in detail, referring to a generic test case described in the catalogue available in the CCS TSI Application Guide; the expected results (pass/fail criteria) for the check proposed are provided in the document referred.

All checks can be performed in laboratory at IC level, but if this is not convenient for the RU, the IM will collaborate to organise the testing in TRK.

5.8.10. Sweden / Trafikverket

1 RSC data type is defined for the whole network, limited to documentary checks.

The checks make reference to the protection against interferences defined in the CCS TSI. There is a question to identify if a specific Swedish filter is implemented. The pass/fail criteria indicates that when the specific Swedish filter is not implemented, an alternative mitigation measure may be considered by the RU inside its SMS to deal with the risk of interferences.

5.8.11. Switzerland / SBB

Following the discussion on the National Technical Rules, one RSC data type may be proposed to deal with the QoS possible issues. No draft has been submitted yet to the Agency.

5.8.12. The Netherlands / ProRail

No specific RSC data checks are required and the certificates of the subsystems are considered enough to demonstrate technical compatibility.

5.9. RSC Analysis

5.9.1. RSC types Classification analysis

The number of IMs that have submitted the RSC definition to the Agency represents over 60% of the Members States with some GSM-R deployment. The Agency is in an advanced validation phase with most of the IMs in order to consider the submitted RSC as valid and to publish them.

It is important to highlight that from the 13 IMs that have provided some information to the Agency, 5 do not required RSC for voice and 8 do not require RSC for data. There are some IMs that have indicated that they consider there is no need for RSC checks neither for voice nor for data, but this position is still under discussion together with the corresponding NSA in the context of the NNTR analysis.

In all cases when no RSC checks are needed for voice, the subsystem certificates are enough to presume the technical compatibility with the infrastructure.

In some cases when no RSC checks are needed for data, the subsystem certificates are enough to presume the technical compatibility with the infrastructure. In some other cases, the checks are embedded in the ESC checks for data (Level 2 or 3), and are, therefore, implicit.

When the RSC types are defined, they correspond to the different network configurations with network elements from different vendors and/or with different software levels that are installed in the GSM-R network. The checks for Radio System Compatibility require to be performed in a specific network environment (either in a laboratory that replicates the configuration or in the real network), therefore it would not be possible to perform them during the certification of the ICs (where only a generic network may be simulated).

Most of the IMs have defined only one RSC type for voice and one RSC type for data for the whole network, which shows a high level of stability and compatibility between the radio systems.

5.9.2. RSC checks content analysis

For the definition of the checks in some of the RSC received, a reference to the catalogue of current test cases currently included in the CCS TSI Application Guide is provided. This would be the best solution for all RSC definitions: the steps for the checks are clearly defined, the expected result is described and both the supply industry and the NoBo are familiar with the execution of these tests. The description of the checks via a reference to the specific tests in the catalogues included in the CCS TSI Application Guide should be promoted in order to limit an inconsistent definition of RSC by the different IMs.

In terms of the content of the checks, there is some variety. Most of the checks focus on functionalities that have been verified during the certification phase, in order to confirm the technical compatibility with the specific network; examples are the registration to Functional Numbers, incoming or outgoing Railway Emergency Calls, handling of different call types, etc. In some of the RSC checks received, there is a request to prove if optional or additional functionalities have been implemented and if they provide the expected results. In those checks, there shall be a clear indication that the check will always have a "Pass" result, and the information gathered during the compatibility check could be used either by the RU (to include in its SMS some considerations) or by the IM in the allocation of preferential slots to certain vehicles (to be indicated in the Network Statement). The same approach could be applied if checks related to Quality of Service are to be included as part of the RSC.

Regarding the RSC checks for data, they are in most cases implicit with the ESC checks for ETCS Level 2/3 lines. Those available focus on the basic functionality (establishment of the data call with the required characteristics). This suggests a very low appearance of compatibility issues related to the EDOR in the existing deployments.

Due to the nature of the GSM-R network and the content of the checks, when a laboratory is available (which provides the same configuration as in the real network), most checks can be done at IC level in the laboratory. Only a few checks need to be performed in the TRK; in some cases, no checks are needed in the TRK.

5.10. Additional ESC/RSC remarks

In the CCS TSI WP meeting #53, CER raised the question that in some Member States there are several IMs and all of them shall submit the ESC/RSC types to the Agency.

Proposed action 3: The Agency in cooperation with the NSAs, to verify if other IMs with ETCS or GSM-R deployment shall submit the ESC/RSC types to the Agency.

Also in the CCS TSI WP meeting #53 it was clarified that according to the CCS TSI [1] it is not possible for a NoBo to issue a certificate without ESC/RSC types definitions published in the Agency Technical document, since this one of the requirements for the TRK certificate in CCS TSI in Table 6.3 row 10.

Some of the ESC/RSC checks may be used by an IM to get information on the compatibility of the vehicle with a specific option (e.g. Euroloop/radio in-fill as in-fill information without release speed 0, GSM-R interference filtering stronger than TSI requirements). In all cases the result of these checks should always be successful and the information gathered could be used for traffic management. The ESC/RSC shall not be used to enforce the need of a specific technical solution not considered as mandatory by the CCS TSI.

It is possible to define an ESC/RSC type with all possible the checks (including options for on-board) and that in some cases these checks are not applicable to the specific vehicle configuration.

ESC/RSC checks for which there is no detailed description nor a clear pass/fail criteria cannot be considered as "valid": this is needed to be able to assess the completeness of the checks executed and the results

obtained (this is, the content of the checks report to be analysed by a NoBo). Although the status of these submissions is “Reserved”, there is a big difference between those that do not include the description and the criteria and those that do include them. For the latter ones, the process of review by the Agency can advance, and they are close to their publication.

In case a vehicle or IC fails one of the ESC/RSC checks, an analysis should be done in order to find the root cause of the failure. If this is due to a design of the test protocol that is not in line with the TSI, then the definition of the checks of the ESC/RSC type shall be modified.

6. Findings

6.1. Transition from current NTRs

As mentioned in section §2, not all ESC/RSC proposed by IMs have been sent to ERA or have considered comments from ERA to be considered in "valid" status.

In most of the MSs, specific NNTRs related to ETCS and/or GSMR testing are temporary accepted, pending the publication of ESC/RSC.

In order to not penalize vehicle authorisation project that could be impacted by the first publication of ESC/RSC types during this period, it should be possible before the deadline to still use the previous National procedure (codes ESC-NP-CCS7.4a or RSC-NP-CCS7.4a in ERATV) for ESC/RSC demonstration, for those networks where ESC/RSC type are not in valid state.

After the proposed deadline, it is assumed that all ESC/RSC types have been proposed and validated by ERA and the use of previous national procedure will not be possible anymore.

The ESC/RSC which had not been communicated to the Agency or in the 'reserved' status after this deadline would be automatically translated into 'not defined' status in the RINF for all the concerned sections.

Proposed action 4: a final deadline could be proposed for the temporary acceptation NNTRs related to testing, pending the final publication of ESC/RSC.

6.2. Update of an already published ESC/RSC type

When an Infrastructure Manager plans to make a change TRK, the possible impact of the already existing ESC/RSC needs to be taken into account. CCS TSI [1] section 7.4.2.3 consider the impact on the already operating TSI compliant vehicles, but it needs to be also considered the possible on-going VA applications that maybe impacted after the entry into force of the new ESC/RSC required by the IM.

In general, the expected update of the ESC/RSC Types following a trackside change is not detailed in any of the received information from the IMs. Only a few of them have discussed this procedure with the Agency.

Proposed action 5: To discuss possible options to cope with the ESC/RSC Type update, as consider a possible indication of a delay on the validity of an updated ESC/RSC Type of a minimum of 4 months, to allow the existing VA applications to be completed with current requirements or updated to the new ESC/RSC Type requirements.

6.3. ESC/RSC content as property of trackside supplier

In some cases, the exact content of the ESC/RSC is not made public; with the main justification being that those test cases are the property of the trackside supplier.

ERA disagrees with this position, as mentioned in TSI CCS: "Infrastructure Managers, with the support of the ETCS suppliers (GSM-R suppliers) for their network, shall submit to the Agency the definition of the necessary checks (as defined in 4.2.17) on their network…"

Therefore, Agency's opinion is that the provision of those ESC/RSC remains the responsibility of IM. As soon as those tests are related to demonstrate technical compatibility between on-board and trackside CCS ICs or subsystems based on ETCS/GSM-R requirements defined in the TSI, those checks shall be made public. As a consequence, the use of trackside supplier proprietary tests cannot be used as a basis for ESC/RSC demonstration for a vehicle.

Proposed action 6: T&V subgroup to identify, with the concerned trackside suppliers and IMs, in such situation, the public test cases to be used for ESC/RSC demonstration.

Proposed action 7: T&V subgroup to improve the supplier support to IMs.

6.4. Lack of harmonisation of laboratories facilities for ESC

As written in §6.3.3.1 of TSI CCS, ESC/RSC can be executed at the level of IC, in order to reduce the number of checks at subsystem level. By principle, tests at IC level can only be executed in a laboratory. In order to facilitate integration between on-board and trackside products in a laboratory1, a harmonisation of laboratories facilities has to be set in place.

Today not all IM have defined the possibility to run ESC/RSC in a laboratory and different standard/versions of inter-ETCS laboratories interfaces are existing (for Radio the interfaces are harmonised).

Proposed action 8: T&V subgroup to deliver a clear picture of existing ESC laboratories facilities (on-board supplier, trackside supplier, IMs, external laboratories...) with an indication of used standards and versions.. Action should also propose a merge of different laboratory facilities interfaces (e.g. subset 111 and subset-94) in order to define only one standard.

6.5. Lack of confidence on lab testing compared to track testing

While for the radio checks, the use of a laboratory that replicates the configuration available in the real network is not questioned, there is some reluctance expressed by the Infrastructure Managers for the ETCS checks.

It is obvious that some specific checks require their execution in the TRK: those that are affected by certain conditions in the infrastructure. Some examples could be the measurement of the radio silence time during a handover when running at the maximum allowed speed, or the confirmation of whether a train surpasses or not the danger point when overriding an End of Authority at the limit of the release speed in a location with the worst slope in the line. However, the majority of the checks submitted correspond to sequences of messages exchanged between the on-board and the TRK that are fully replicable in a laboratory that includes exactly what is in the TRK. The reaction of the train to the on-board signals should have been already assessed during the safe integration of the subsystems, but if there are aspects to be checked, these have to be done in the TRK as well.

Holding doubts on the validity of the checks in a laboratory compared to testing in the track by some Infrastructure Managers leads to a bigger effort placed on track testing where in some cases, testing in the laboratory is feasible.

The pre-requisite for having a laboratory testing that is equivalent to testing in the TRK is the availability of the exact replica of the information implemented in the track. When the exact position of the ETCS balises and the messages included in them is made available to the lab, when the RBC used for the test is exactly the same one installed in the trackside, and when the accuracy of the simulation of the movement of the train along the track is adequate, the behaviour of the on-board and the interchange of messages between on-board and trackside in the laboratory replicates the behaviour in the trackside. It should be reminded that the functional checks involve two specific software entities that exchange messages amongst themselves and this exchange is the result of the flow of information provided.

In fact, in some of the most advanced ETCS labs in Europe, many real lines have been tested and they have performed tests of handover between different suppliers RBC's, speed restrictions, timers and confidence intervals checking, signals at danger in dynamic ways, simulating degraded situations in a safe way; they have also simulated multiple trains controlled by one single RBC in the same area; in summary, almost any ETCS functionality involving information transmission between on-board and TRK has been covered. Test efficiency

[1] Can be also in different remote laboratories

is much higher in a lab than in the field for the same testing time, with the additional advantage of not affecting commercial operation.

In order to make the most effective use of the laboratory testing, the efforts to perform the testing (data preparation, laboratory configuration, maintenance of the laboratory) shall be lower than the effort to perform the testing in the TRK. For this, it is imperative to promote the use of harmonised interfaces to allow the data preparation and the integration of the different elements, together with the establishment of well managed procedures to ensure that the information in the laboratory replicates what is installed in the trackside. This is valid both for ETCS and for radio testing.

Proposed action 9: In case an IM or ETCS/ERTMS System integrator would decide to setup a laboratory (owned or outsourced), T&V subgroup shall define the generic technical requirements to be considered by IM/ System Integrator to support this activity and to demonstrate equivalence compared to real TRK implementation. Existing ESC/RSC laboratories should transparently highlight the restrictions of their laboratories.

6.6. ESC/RSC in the overall process

One of the objectives of the introduction of ESC/RSC in the TSI CCS is to remove specific NNTRs related to ETCS/GMS-R testing and to make the need of this testing known to the RUs that wish to operate in an area. These tests have been performed up to now as a requirement to be authorised to run in many of the areas operated in ETCS Levels 1 or 2. Therefore, ESC/RSC checks are not a new concept[2], and it is expected that, except for their formalisation and the definition of the ESC/RSC type(s) in RINF, the use of those checks does not modify significantly the processes of certification and authorisation, compared to the situation when those checks were considered as NNTRs or required for the authorisation or verification of technical compatibility without being notified.

The efficiency improvements from ESC/RSC process will be perceived when this new process is fully applied in the VA and RCC, in particular with the use of laboratories at IC level.

Nevertheless, the ESC/RSC concept introduced in the CCS TSI requires some further clarifications, as any new step introduced in an ongoing process, and in particular its interaction with other activities:

- The role of ESC/RSC in subsystem conformity assessment demonstration.

Currently, point 6.2 in TSI CCS Annex “Integration with Control-Command and Signalling Trackside Subsystems and other subsystems: tests under conditions representing the intended operation” indicates that tests shall be performed under conditions representing the intended operation. These can be either based on generic functional scenarios or on ESC/RSC checks corresponding to an ESC/RSC type, when they cover sufficiently the functional integration. The Agency has received some points of view pointing to the consideration of the checks inside the certificates (for the IC and/or for the On-board Subsystem).

However, during the discussion of the ESC/RSC concept, it was also requested that the demonstration of ESC/RSC to additional types without modification to the Subsystems would not affect the certificates, to minimise the administrative overhead. In order to obtain this benefit, the solution was to not to include them in the certificate. The characteristics of the vehicle type will be updated accordingly and the EC Declaration as well, without impacting the authorisation.

- The role of ESC/RSC in safe integration demonstration

The information and ESC/RSC conditions obtained from the ESC/RSC checks execution shall be considered for the safe integration of the vehicle with the infrastructure. Any limitation, exported constraint or risk shall be analysed.

[2] Also known as TTI, IOP or TTSV tests

When the vehicle performs additional ESC/RSC checks for another type, even when no changes in the Subsystem have been done, the corresponding information has to be also considered for the safe integration, and, if required, the demonstration may need to be modified.

Depending on the modification of this demonstration, other actions, according to the Safety and Interoperability Directives, may need to be triggered. Proposed action 10: Study how to reflect in the ESC/RSC process a possible impact of issues coming from safe integration.

In addition, requirements for safe integration have been included in some ESC/RSC checks submitted by some IM, despite the fact that it is not in line with ESC/RSC definition.

- The role of ESC/RSC in vehicle authorisation procedure and route compatibility check

As expressed in TSI CCS application guide, ESC/RSC are Basic Design Characteristics and, therefore, part of vehicle authorization. For VA, compatibility with at least one ESC/RSC type per network in the area of use shall be demonstrated. This implies that when the vehicle demonstrates its technical compatibility with at least one type, it will be able to succeed the route compatibility check with at least one route.

The RU is responsible to check which are the ESC/RSC types required to be compatible with the desired routes. The ideal situation would be that the ESC/RSC checks are passed for all the types before requesting the VA. However, this may not be always possible, due to the scheduling of the testing, or due to the placing in service of a new line requiring different ESC/RSC types after obtaining the VA.

ESC/RSC checks for additional types may be performed after obtaining the VA for an area of use. When the checks are passed without any modification done to the vehicle (for the subsystem or considered in the safe integration), there is no need to ask for a new authorisation: the characteristics in ERATV have to be updated (creating a new version of the vehicle type) and route compatibility check will be succeeded for the routes corresponding to the additional ESC/RSC type.

Proposed action 11: ERA to further clarify ESC/RSC procedure interaction with other activities listed above (Authorisation procedure, Route Compatibility and Safe Integration).

6.7. Role of the NoBo

In the frame of the Agency CCS TSI revision working party, there is an on-going discussion about the verification process performed by the NoBo prior to the drawing of the ESC/RSC IC Statement and the ESC/RSC Statement.

Since the ESC/RSC IC Statement is a verification of a part of the necessary checks for the complete ESC/RSC Statement (performed at IC level), the Agency proposal is to have the same kind of terms and steps both at IC and at Subsystem level, so the final traceability and completeness check can be ensured.

Proposed action 12: To align the ESC/RSC IC Statement and the ESC/RSC Statement process and terms in the CCS TSI and the Application Guide to have the similar approaches on the NoBo verification both at the IC and Subsystem level.

The task of the NoBo for the ESC/RSC verification is to assess the completeness of the checks performed with respects with what is described in the corresponding ESC/RSC type (including the justification provided in case some checks do not apply to the specific vehicle); to ensure that the execution of the checks is in line with the indications provided by the IM (if a check shall be performed in the TRK or if it may be performed in a lab – ensuring that the lab used is the one defined in the ESC/RSC type-); to conclude on the evaluation of the results (considering the pass/fail criteria indicated in the ESC/RSC type definition) and to highlight the limitations or exported constraints, if any, that appear as a consequence of the results provided.

As a more general reflection from the Agency, the ESC/RSC Statement and the EC certificates are two documents to be provided by the NoBo and they are part of the Declaration of Verification, as indicated in Section 2.6.103 of the CCS TSI Application Guide [2].

In the CCS TSI [1] BDC table 7, it is stated that the addition or removal of ESC/RSC Statements does not require a new authorisation, since it is classified as a new version. In order to simplify the management of all the necessary documentation, it can be considered to include the ESC/RSC verifications by the NoBo inside the EC certificate as a complementary part.

Proposed action 13: To discuss in the frame of the CCS TSI 2022 revision the possible inclusion of ESC/RSC NoBo verification in the scope of the EC Certificate to have a single document, without modifying the NoBo tasks for the ESC/RSC verification.

6.8. Registers Status

Even tough ESC/RSC types are defined, the data in RINF, and in particular the assignment of those types to the relevant sections, are not up to date and some delay could be expected before the real data is in available in RINF.

For the same reasons, some delays could be expected between the publication of valid ESC/RSC types in technical document and their availability in ERATV.

When nothing is specified in RINF, this should allow the possibility to select the national procedure for technical compatibility demonstration for the vehicle, with the use of ERATV parameters Art7.4a non-coded restriction.

Proposed action 14: IM to submit with ESC/RSC type submission an estimation on the date where this data will be available in RINF.

Proposed action 15: ERA to work on the efficient update procedure to include the new options inside the predefined values lists in the parameters in the Registers after the update of the ESC/RSC technical document.

6.9. Misuse of ESC/RSC

ESC/RSCs are sometimes used to cover situations that are not initially foreseen according to the definition of ESC/RSCs given in the TSI. For example, ESC/RSCs are sometimes used:

- to demonstrate the implementation of an NNTR;

- to impose the implementation of a solution to a Change Request "Art10" at on-board level. ESC/RSC may be used to demonstrate that the possible incompatible situation identified in the CR does not occurs. In case a mitigation is needed, this should be applied trackside;

- to demonstrate the functionality of a Class B system, when operated with an ETCS on-board;

- to impose the implementation of optional TSI requirements;

In the above cases, the Agency is of the opinion that the tests mentioned may possibly be present in the test document, but this cannot be a criteria for non-passing ESC/RSC check, for example, the test of an optional requirement would always have the result "Passed".

Any RU facing this situation should report to the IM and to the Agency.

Proposed action 16: In case of above situations, IMs shall identify those checks and the NoBo shall not consider them in the ESC/RSC Statement.

7. Proposed next actions

The following actions are proposed to be considered for the next CCS TSI 2022 revision and to be coordinated by the Agency CCS TSI Revision working party.

Action number	*Proposed actions*	*Responsible*
1	Assessment on the difference and proposal on reduction, To check the possibility of transferring some of the ESC defined at IC level to generic on-board test specifications.	ERA, T&V subgroup, ERTMS accredited laboratories
2	To define common single ESC/RSC type(s) for each RFC.	Concerned IMs and suppliers for each RFC. To be monitored by T&V subgroup.
3	The Agency in cooperation with the NSAs, to verify if other IMs with ETCS or GSM-R deployment shall submit the ESC/RSC types to the Agency	ERA and NSAs, IMs
4	To propose a mandatory deadline for the definition of the ESC/RSC type(s) and the removal of the NNTR on compatibility testing.	European Commission
5	To discuss possible options to cope with ESC/RSC Types as consider a possible indication of a delay on the validity of an updated ESC/RSC Type of a minimum of 4 months, to allow the existing VA applications to be completed with current requirements or updated to the new ESC/RSC Type requirements.	ERA
6	To eliminate proprietary test cases for ESC/RSC to allow their publication and assessment of the checks results.	T&V subgroup, trackside supplier(s)
7	How to improve the suppliers support to IMs.	T&V subgroup
8	To deliver a state of play from IMs of the use of laboratories for ESC/RSC demonstration; to merge different laboratories facilities interfaces.	T&V subgroup
9	T&V subgroup shall define the generic technical requirements to be considered by IM or System Integrator to support creation of ESC laboratory and to demonstrate equivalence compared to real TRK implementation. ESC/RSC laboratories to share limitations and restrictions of their laboratories	T&V subgroup, ESC/RSC laboratories
10	Study how to reflect in the ESC/RSC process a possible impact of issues coming from safe integration.	ERA, T&V subgroup
11	To make a clarification of ESC/RSC procedure interaction with other activities	ERA
12	To align the ESC IC Statement and the ESC Statement process and terms in the CCS TSI and the Application Guide to have the similar approaches on the NoBo verification both at the IC and Subsystem level.	ERA, T&V subgroup
13	To discuss in the frame of the CCS TSI 2022 revision to possible inclusion of ESC/RSC NoBo verification in the scope of the EC Certificate to have a single document, without modifying the NoBo tasks for the ESC/RSC verification	ERA, T&V subgroup

14	IM to submit with ESC/RSC type submission an estimation on the date where this data will be available in RINF.	Infrastructure Managers
15	ERA to work on the efficient update procedure to include the new options inside the predefined values lists in the parameters in the Registers after the update of the ESC/RSC technical document.	ERA
16	In case checks are not fulfilling ESC/RSC definition, IMs shall identify those checks and the NoBo shall not consider them in the ESC/RSC Statement.	IMs, NoBo

8. Legal Background

COMMISSION REGULATION (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union amended by Commission Implementing Regulation (EU) 2019/776 of 16 May 2019 and Commission Implementing Regulation (EU) 2020/387 of 9 March 2020:

Article 11a ERTMS compatibility and future revision

1. By 1 June 2020, the Agency shall send a report to the Commission on the implementation of ETCS system compatibility (ESC) and radio system compatibility (RSC). The report shall include an assessment of the differing types of ESC and RSC, and the potential for reducing the underlying technical divergences of ESC and RSC types. Member States shall provide the Agency with the necessary information to complete the analysis.

4.2.17. ETCS and Radio System Compatibility

Due to the different possible implementations and the status of the migration to fully compliant CCS Subsystems, checks shall be performed in order to demonstrate the technical compatibility between the on-board and trackside CCS Subsystems. The necessity of these checks shall be considered as a measure to increase the confidence on the technical compatibility between the CCS subsystems. It is expected that these checks will be reduced until the principle stated in 6.1.2.1 is achieved.

4.2.17.1. ETCS System Compatibility

ETCS System Compatibility (ESC) shall be the recording of technical compatibility between ETCS on-board and the trackside parts ETCS of the CCS subsystems within an area of use. ESC type shall be the value assigned to record the technical compatibility between an ETCS on-board and a section within the area of use. All sections of the Union network which require the same set of checks for the demonstration of ESC shall have the same ESC type.

4.2.17.2. Radio System Compatibility

Radio System Compatibility (RSC) shall be the recording of technical compatibility between voice or data radio on-board and the trackside parts of GSM-R of the CCS subsystems. RSC type shall be the value assigned to record the technical compatibility between a voice or data radio and a section within the area of use. All sections of the Union network which require the same set of checks for the demonstration of RSC shall have the same RSC type.

6.1.2.1. Principle

The principle is that a Control-Command and Signalling On-board Subsystem covered by an 'EC' declaration of verification is able to run on every Control-Command and Signalling Trackside Subsystem covered by an 'EC' Declaration of verification, under the conditions specified in this TSI, with no additional verifications.

Achievement of this principle is facilitated by: (1) rules for the design and installation of the Control-Command and Signalling On-board and the Trackside subsystems; (2) test specifications to prove that the Control-Command and Signalling On-board and Trackside Subsystems comply with the requirements of this TSI and are mutually compatible.

6.1.2.4. Requirements for ETCS System Compatibility

The Agency shall set up and manage in a technical document the set of checks to demonstrate the technical compatibility of an on-board subsystem with the trackside subsystem. Infrastructure Managers, with the support of the ETCS suppliers for their network, shall submit to the Agency the definition of the necessary checks (as defined in 4.2.17) on their network by 16 January 2020 at the latest. Infrastructure Managers shall classify the ETCS lines according to ESC types in RINF. Infrastructure Managers shall submit to the Agency any

changes on the referred checks for their network. The Agency shall update the technical document within 5 working days.

6.1.2.5. Requirements for Radio System Compatibility

The Agency shall set up and manage in a technical document the set of checks to demonstrate the technical compatibility of an on-board subsystem with the trackside subsystem. Infrastructure Managers, with the support of the GSM-R suppliers for their network, shall submit to the Agency the definition of the necessary checks (as defined in 4.2.17) on their network by 16 January 2020 at the latest. Infrastructure Managers shall classify their lines according to RSC types for voice and, if applicable, ETCS data in RINF. Infrastructure Managers shall submit to the Agency any changes on the referred checks for their network. The Agency shall update the technical document within 5 working days.

6.3.3.1. ETCS and radio system compatibility checks

Particular attention shall be given to assessing the conformity of the on-board CCS subsystem regarding the Basic Parameter ETCS and radio system compatibility referred to in 4.2.17. Regardless of the module selected for the previous EC verification procedure for the on-board subsystem, the Notified Body shall check: (a) the availability of the result of the technical compatibility checks for the selected area of use of the vehicle. (b) That the technical compatibility checks have been performed in accordance with the technical document published by the Agency, referred in points 6.1.2.4 and 6.1.2.5. (c) Based on the report of the checks, that the technical compatibility checks results indicate all the incompatibilities and errors encountered during the technical compatibility checks. The Notified Body shall not check again any aspect covered during the already performed EC Verification procedure for the on-board subsystem.

The Notified Body performing these checks may be a different one from the Notified Body performing the EC Verification procedure for the on-board subsystem. Performing these checks also at the level of Interoperability Constituent may reduce the amount of checks at the level of Control-command and Signalling Subsystem.

Table 7.1 Basic design Characteristics

1. TSI Point	2. Related basic design characteristic(s)	3. Changes not impacting the basic design characteristics according to 15(1)(b) of Regulation (EU) 2018/545	4. Changes impacting the basic design characteristic but inside the acceptable range of parameters therefore to be classified as Art 15.1(c) of Regulation (EU) 2018/545	5. Changes impacting the basic design characteristic and outside the acceptable range of parameters therefore to be classified as Art 15.1(d) of Regulation (EU) 2018/545
4.2.2 On-board ETCS functionality	Set of specification of Annex A	Not Applicable	Not Applicable	Use another Annex A set of specifications
	On-board ETCS implementation	Fulfilling all the conditions in point 7.2.1a.2 (change of realisation)	Not Applicable	Not fulfilling all the conditions in point 7.2.1a.2 (Functional change)
	Managing information about the completeness of the train	Not applicable	Adding or removing train integrity supervision	Not applicable
4.2.17.1 ETCS System Compatibility	ETCS System Compatibility	Not applicable	Adding or removing ESC statements, after checking by a NoBo	Not applicable

1. TSI Point	2. Related basic design characteristic(s)	3. Changes not impacting the basic design characteristics according to 15(1)(b) of Regulation (EU) 2018/545	4. Changes impacting the basic design characteristic but inside the acceptable range of parameters therefore to be classified as Art 15.1(c) of Regulation (EU) 2018/545	5. Changes impacting the basic design characteristic and outside the acceptable range of parameters therefore to be classified as Art 15.1(d) of Regulation (EU) 2018/545
4.2.4 Mobile communication functions for railways GSM-R 4.2.4.2 Voice and operational communication application	GSM-R Baseline	Use another Baseline fulfilling all the conditions in point 7.2.1a.3.	Not Applicable	Use another Baseline not fulfilling all the conditions in point 7.2.1a.3.
	Voice and operational communication implementation	Fulfilling all the conditions in point 7.2.1a.3 (change of realisation)	Not Applicable	Not fulfilling all the conditions in point 7.2.1a.3 (Functional change)
	SIM Card support of Group ID 555	Not applicable	Change the SIM Card support of Group ID 555	Not applicable
4.2.17.2 Radio System Compatibility	Radio Voice System Compatibility	Not applicable	Adding or removing RSC statements, after checking by a NoBo	Not applicable
4.2.4 Mobile communication functions for railways GSM-R 4.2.4.3 Data communication applications for ETCS	GSM-R Baseline	Use another Baseline fulfilling all the conditions in point 7.2.1a.3.	Not Applicable	Use another Baseline not fulfilling all the conditions in point 7.2.1a.3.
	Data communication for ETCS implementation	Fulfilling all the conditions in point 7.2.1a.3 (change of realisation)	Not Applicable	Not fulfilling all the conditions in point 7.2.1a.3 (Functional change)
4.2.17.2 Radio System Compatibility	Radio Data System Compatibility	Not applicable	Adding or removing RSC statements, after checking by a NoBo	Not applicable

7.4a. ETCS and radio system compatibility checks implementation rules Existing vehicles shall be deemed compatible with the ETCS and radio system compatibility types of the networks on which they are operating by 16 January 2020 without any further checks, maintaining the existing restrictions or conditions for use. Any subsequent modification of the vehicle or the infrastructure regarding the technical or route compatibility shall be managed according to the requirements specified for ETCS and Radio system compatibility.