EUROPEAN UNION AGENCY FOR RAILWAYS

Guide for the application of the CCS TSI

In accordance with Article 19(3) of Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016

Released by European Union Agency for railways

It may serve as a clarification tool without however dictating in any manner compulsory procedures to be followed and without establishing any legally binding practice. The guide provides explanations on the provisions contained in the TSIs and should be helpful for understanding the approaches and rules described therein. However, it does not substitute for them.

The guide is publicly available and it will be regularly updated to reflect progress with European standards and changes to the TSIs.

The reader should refer to the website of the European Union Agency for railways for information about its latest available edition.

The present document is a non-legally binding guidance of the European Union Agency for Railways. It is without prejudice to the decision-making processes foreseen by the applicable EU legislation. Furthermore, a binding interpretation of EU law is the sole competence of the Court of Justice of the European Union.

Document History

Version date	*Section number*	*Modification description*
1.0 – 24/02/2012	1.1; Table 1	Reference to the published CCS TSI
2.0 – 12/06/2013	Table 1; 4.3; 4.5	Update of informative specifications, according to CCS TSI amendment 2012/696/EU
3.0 – 12/02/2015	Table 1; 3.4.7; 3.4.9; 3.6.3; 4.3; 4.5	Update of informative specifications, according to CCS TSI amendment (EU) 2015/14; editorial improvements
4.0 – 01/07/2016	3.4; 3.6; Table 1; Annex 3 added	Reference to the published CCS TSI – clarifications on chapter 6; update of informative specifications
5.0 – 19/02/2018	Table 3; Table 5.1, 5.2 and 5.3	Release version for publication Inclusion of references for Ss-113 and GSM-R SIM card test cases catalogue.
6.0 – 20/12/2019	All	Release version for publication. Updates following the Regulation (EU) 2019/776
6.1 – 05/02/2020	Table 5.1, 5.2 and 5.3. Header	Editorial errors corrected.
7.0 – 17/11/2020	All	Release version for publication. 2nd update following the Regulation (EU) 2019/776. Adjusted following Regulations (EU) 2020/387 and (EU) 2020/420.
7.1 – 07/04/2021	Table 6.1, 6.2, 6.3 2.4.36 2.6.96	SS-113 updates to be published in the Agency webpage. Numbering error corrected in the headers of the tables 6.x. Wording adjustment from the TDC workgroup. Correction on the "main" difference between GSM-R Baselines
7.2 - 15/03/2022	Tables 6.1, 6.2 and 6.3 Table 6.3	Modification of the version of indexes 5, 37, 59, 60, 61 and 62 and Note 4. Index 53 update version SS-118 v1.6.0 with editorial corrections.
7.3 – 09/01/2023	Annex 9 and 10	Update URL after Agency website migration.

Table of Contents

1. SCOPE OF THIS GUIDE

1.1. Content of the guide

1.1.1. This document is an annex to the "Guide for the Application of TSIs". It provides information on the application of Technical Specification for Interoperability for "Control-Command and Signalling" set out as Annex to the Commission Regulation (EU) 2016/919 [8] amended by Commission Implementing Regulation (EU) 2019/776 [9] and Commission Implementing Regulation (EU) 2020/387 [10] and corrected by Commission Implementing Regulation (EU) 2020/420 [11].

1.1.2. This document needs to be read and used only in conjunction with the "Control-Command and Signalling" TSI. It is intended to facilitate its application but it does not substitute for it. The general part of the "Guide for the Application of TSIs" has also to be considered.

1.1.3. Guidance is of voluntary application. It does not mandate any requirement in addition to those set out in the "Control-Command and Signalling" TSI.

1.1.4. Chapter 2 provides clarifications for certain concepts and requirements of the Control-Command and Signalling TSI. To facilitate the use, this chapter has the same structure as the TSI: each section of chapter 2 refers to a section of the TSI.

1.1.5. Guidance is not provided where the "Control-Command and Signalling" TSI does not requires further explanations.

1.1.6. Chapter 3 lists the specifications and standards supporting the assessment of compliance with the TSI requirements. The scope of each standard is clarified through the reference to the corresponding basic parameter.

1.1. Document reference/s

Table 1: Document reference/s

DOCUMENT REFERENCE	*TITLE*	*LAST ISSUE*
[1] (EU) 2016/796	Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) No 881/2004	L 138, 26.5.2016, p. 1-43
[2] (EU) 2016/797	Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union	L 138, 26.5.2016, p. 44-101
[3] (EU) 2016/798	Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety	L 138, 26.5.2016, p. 102-149
[4] 2012/34/EU	Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area	L 343, 14.12.2012, p. 32-77

Table 1: Document reference/s

DOCUMENT REFERENCE	*TITLE*	*LAST ISSUE*
[5] 2010/713/EU	Commission Decision 2010/713/EU of 9 November 2010 on modules for the procedures for assessment of conformity, suitability for use and EC verification to be used in the technical specifications for interoperability adopted under Directive 2008/57/EC of the European Parliament and of the Council	L 319, 4.12.2010, p. 1-52
[6] 768/2008/EC	Decision 768/2008/EC of the European Parliament and of the Council of 9 July 2008 on a common framework for the marketing of products, and repealing Council Decision 93/465/EEC	L 218, 13.8.2008, p. 82-128
[7] (EC)765/2008	Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93	L 218, 13.8.2008, p. 30-47
[8] (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*
[9] (EU) 2019/776	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*
[10] (EU) 2020/387	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*
[11] (EU) 2020/420	COMMISSION IMPLEMENTING REGULATION (EU) 2020/420 of 16 March 2020 correcting the German language version of Regulation (EU) 2016/919 on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union	*L 94 20.3.2020 p.5*

Table 1: Document reference/s

DOCUMENT REFERENCE	*TITLE*	*LAST ISSUE*
[12] (EU) 2018/545	COMMISSION IMPLEMENTING REGULATION (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council	*L 90 6.4.2018 p.66*
[13] (EU) 2019/250	COMMISSION IMPLEMENTING REGULATION (EU) 2019/250 of 12 February 2019 on the templates for 'EC' declarations and certificates for railway interoperability constituents and subsystems, on the model of declaration of conformity to an authorised railway vehicle type and on the 'EC' verification procedures for subsystems in accordance with Directive (EU) 2016/797 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 201/2011	*L 42 13.2.2019 p. 9*
[14] (EU) 2019/773	COMMISSION IMPLEMENTING REGULATION (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU	*L 139I , 27.5.2019, p. 5–88*
[15] (EU) 2019/777	COMMISSION IMPLEMENTING REGULATION (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU	*L 139I , 27.5.2019, p. 312–355*
[16] (EU) 1302/2014	Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the rolling stock — locomotives and passenger rolling stock subsystem of the rail system in the European Union	*L 356 12.12.2014, p. 228*
[17] (EU) 1303/2014	Commission Regulation (EU) No 1303/2014 of 18 November 2014 concerning the technical specification for interoperability relating to 'safety in railway tunnels' of the rail system of the European Union	*L 356, 12.12.2014, p. 394*
[18] 2011/665/EU	COMMISSION IMPLEMENTING DECISION 2011/665/EU of 4 October 2011 on the European register of authorised types of railway vehicles	*L 264, 8.10.2011, p. 32*
[19] (EU) 2020/424	COMMISSION IMPLEMENTING REGULATION (EU) 2020/424 of 19 March 2020 on submitting information to the Commission as regards non-application of technical specifications for interoperability in accordance with Directive (EU) 2016/797	*OJ L 84, 20.3.2020, p. 20*

Table 1: Document reference/s

DOCUMENT REFERENCE	*TITLE*	*LAST ISSUE*
[20] (EU) 402/2013	Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009 Commission Implementing Regulation (EU) 2015/1136 of 13 July 2015 amending Implementing Regulation (EU) No 402/2013 on the common safety method for risk evaluation and assessment	*L 121, 3.5.2013, p. 8–25* *L 185, 14.7.2015, p. 6–10*
[21] 2014/30/EU	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the Member States relating to electromagnetic compatibility (recast)	L 96 29.3.2014 p 79
[22] 2014/53/EU	Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to making available on the market of radio equipment and repealing Directive 1995/5/EC	*L 153 22.5.2014 p 62*
[23] 2015/C 014/01	Commission communication in the framework of the implementation of Directive 2004/108/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC	*C 14, 16.01.2015 p. 1*
[24] 2018/C 282/03	Commission communication in the framework of the implementation of the Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community (recast)	*C 282 of 10/08/2018*
[25] (EU) 2020/453	COMMISSION IMPLEMENTING DECISION (EU) 2020/453 of 27 March 2020 on the harmonised standards for railway products drafted in support of Directive 2008/57/EC of the European Parliament and of the Council on the interoperability of the rail system within the Community	*L 95/1, 30.03.2020 p. 1*
[26] PRO_CCM_002	Procedure Change Control Management (link)	2.1
[27] ERA_ERTMS_028528	Terms of Reference of the “Notified Bodies ad hoc Group for ERTMS”	1.0

Table 1: Document reference/s

DOCUMENT REFERENCE	*TITLE*	*LAST ISSUE*
[28] 2011/217/EU	Commission Recommendation of 29 March 2011 on the authorisation for the placing in service of structural subsystems and vehicles under Directive 2008/57/EC of the European Parliament and of the Council	*L 95, 8.4.2011 p. 1*
[29]2015/C 226/07	Commission communication in the framework of the implementation of the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity	*C 226, 10.07.2015 p. 103*
[30] ECC/DC(02)O5 as amended 8 March 2013	ECC Decision of 5 July 2002 on the designation and availability of frequency bands for railway purposes in the 876 – 880 and 921 – 925 MHz bands	-
[31] ERA_ERTMS_040001	Assignment of values to ETCS variables (link)	*1.28 or upper version*
[32] 2014/897/EU	Commission Recommendation of 5 December 2014 on matters related to the placing in service and use of structural subsystems and vehicles under Directives 2008/57/EC and 2004/49/EC of the European Parliament and of the Council	*L355 12.12.2014 p. 59*
[33] ERA/GUI/07-2011/INT	Guide for the application of Technical Specifications for Interoperability (TSIs) (General Part)	*1.0.2*
[34]BCA B3MR1 -	Baseline Compatibility Assessment Baseline 3 Maintenance Release 1 Final Report (link)	*1.0.0*
[35]BCAB3R2 -	Baseline Compatibility Assessment Baseline 3 Release 2 Final Report (link)	*1.1.0*
[36] ERA/OPI/2020-2	Opinion of the EU Agency for Railways for European Commission regarding Error Corrections to CCS TSI	-
[37] Agency's Opinion register	https://www.era.europa.eu/library/opinions-and-technical-advices_en	-
[38] CR-Art10 Report-	Error CRs Compatibility Assessment Art10 Report (link)	*1.2.0*
[39] Generic ETCS driver's Handbook	Generic ETCS driver's Handbook (link)	-

1.2. Definitions and abbreviations

Table 2: Definitions

TERM	*DEFINITION/ SOURCE*
Acts issued by the Agency	Are those listed in Article 4 of Regulation (EU) 2016/796 of the European Parliament and of the Council (Agency Regulation)
Basic parameter	Any regulatory, technical or operational condition which is critical to interoperability and is specified in the relevant TSIs (Article 2(12) of Directive (EU) 2016/797)
Basic Design Characteristic	Means the parameters that are used to identify the vehicle type as specified in the issued vehicle type authorisation and recorded in the European Register of Authorised Vehicle Types ('ERATV')
Conformity assessment	Process demonstrating whether specified requirements relating to a product, process, service, subsystem, person or body have been fulfilled (Article 2(41) of Directive (EU) 2016/797)
Conformity assessment body	Body that has been notified or designated to be responsible for conformity assessment activities, including calibration, testing, certification and inspection; a conformity assessment body is classified as a 'notified body' following notification by a Member State; a conformity assessment body is classified as a 'designated body' following designation by a Member State (Article 2(42) of Directive (EU) 2016/797)
Contracting entity	Public or private entity which orders the design and/or construction or the renewal or upgrading of a subsystem (Article 2(20) of Directive (EU) 2016/797)
ESC check	Check (e.g. by paper analysis or by performing ESC Tests) as part of the set of checks submitted by an Infrastructure Manager to provide ESC evidence for an ESC Type by an Entity applying for ESC Demonstration. Refer to Section 6.1.2.4 of [9]
ESC IC Statement	Document prepared by the Entity applying for ESC Demonstration stating ESC of the OBU for use in different on-board subsystems; the ESC IC Statement should include the summary of the Check Report on the results, which are valid independent from the specific configuration parameters of the OBU and can therefore be used in every specific vehicle type on the on-board CCS subsystem level; if a Check Report contains Conditions they should also be included in the ESC IC Statement. ESC IC Statement should also include the full list of ESC checks performed for each of the different ESC Types and the NoBo assessment.

Table 2: Definitions

TERM	*DEFINITION/ SOURCE*
ESC Statement	Document according to Table 7.1 of the CCS TSI prepared by the Entity applying for ESC Demonstration at on-board CCS subsystem level, which states ESC of a specific vehicle type to the ESC Types. The ESC Statement should include the summary of the Check Report and should demonstrate the level of fulfilment of all the necessary checks submitted by the Infrastructure Manager to ERA; if a Check Report or an ESC IC Statement referred to in the ESC Statement contains Conditions they should be closed-out, managed or recorded in the ESC Statement. ESC Statement should also include the full list of ESC IC statements taken into account in the assessment (if any), the conditions (if any) with respects to the different ESC Types and the NoBo assessment.
ESC Type	Each ESC Type is determined by the Infrastructure Manager, corresponding to a distinct engineering of the train protection part of the trackside CCS subsystem(s). A vehicle can demonstrate ESC based on the set of checks for each ESC Type. The set of checks for each ESC Type in a Member State's network should be notified to ERA by the Infrastructure Managers and they will be publicly available in a technical document published by ERA. In RINF, each section of line should be assigned its corresponding ESC Type(s); in ERATV, each vehicle type and type version should indicate with which ESC Types the vehicle has demonstrated compatibility.
European Register of Authorised Types of Vehicles (ERATV)	Register of types of vehicles authorised by the Member States for placing on the market. It contains the technical characteristics of vehicles' types as defined in the relevant TSIs, the manufacturer's name, dates, references and Member States granting authorisations, restrictions and withdrawals (Article 48 of Directive (EU) 2016/797)
Existing rail system	Infrastructure composed of lines and fixed installations of the existing, rail network as well as the vehicles of all categories and origin travelling on that infrastructure (Article 2(16) of Directive (EU) 2016/797)
Harmonised standard	European standard adopted on the basis of a request made by the Commission for the application of Union harmonising legislation (Article 2(1)(c) of Regulation (EU) No 1025/2012)
Infrastructure Manager	Anybody or firm responsible for the operation, maintenance and renewal of railway infrastructure on a network, as well as responsible for participating in its development as determined by the Member State within the framework of its general policy on development and financing of infrastructure (Article 3(2) of Directive 2012/34/EU)
Non-application of a TSI	Certain circumstance, by which projects can be exempted from having to comply with all or part of a TSI or TSIs (Article 7 of Directive (EU) 2016/797). Further information can be found in [19].
Open point	Certain technical aspect corresponding to the essential requirements, which cannot be explicitly covered in a TSI(Article 4(6) of Directive (EU) 2016/797)

Table 2: Definitions

TERM	*DEFINITION/ SOURCE*
Placing in service	All the operations by which a subsystem is put into its operational service (Article 2(19) of Directive (EU) 2016/797)
Placing on the market	First making available on the Union's market of an interoperability constituent, subsystem or vehicle ready to function in its design operating state (Article 2(35) of Directive (EU) 2016/797)
Project at an advanced stage of development	Any project the planning or construction stage of which has reached a point where a change in the technical specifications may compromise the viability of the project as planned (Article 2(23) of Directive (EU) 2016/797)
Railway Undertaking	Railway undertaking as defined in point (1) of Article 3 of Directive 2012/34/EU, and any other public or private undertaking, the activity of which is to provide transport of goods and/or passengers by rail on the basis that the undertaking is to ensure traction; this also includes undertakings which provide traction only (Article 2(45) of Directive (EU) 2016/797)
Register of infrastructure (RINF)	Register of infrastructure indicates the main features of fixed installations, covered by the subsystems: infrastructure, energy and parts of control-command and signalling. It publishes performance and technical characteristics mainly related to interfaces with rolling stock and operation (Article 49 of Directive (EU) 2016/797)
Renewal	Any major substitution work on a subsystem or part of it, which does not change the overall performance of the subsystem. (Article 2(15) of Directive (EU) 2016/797)
RSC check	Check (e.g. by paper analysis or by performing RSC Test) as part of the set of checks submitted by an Infrastructure Manager to proof RSC for an RSC Type by an Entity applying for RSC Demonstration. Refer to Section 6.1.2.5 of [9]
RSC IC Statement	Document prepared by the Entity applying for RSC Demonstration stating RSC of the IC (EDOR or GSM-R cab radio) for use in different applications of the IC; the RSC IC Statement should include the summary of the Check Report on the results, which are valid independent from the specific configuration of the IC and can therefore be used in every specific vehicle type on the on-board CCS subsystem level; if a Check Report contains Conditions they should also be included in the RSC IC Statement. RSC IC Statement should also include the full list of RSC checks performed for each of the different RSC Types and the NoBo assessment.

Table 2: Definitions

TERM	*DEFINITION/ SOURCE*
RSC Statement	Document according to Table 7.1 of the CCS TSI prepared by the Entity applying for RSC Demonstration at on-board CCS subsystem level, stating RSC of a specific vehicle type to the RSC Type for which the Entity applying for RSC Demonstration has requested RSC Checks for. The RSC Statement should include the summary of the Check Report and should demonstrate the level of fulfilment of all the necessary checks submitted by the Infrastructure Manager to ERA; if a Check Report or an RSC IC Statement referred to in the RSC Statement contains Conditions, they should be closed-out or managed before drawing-up the RSC Statement. RSC Statement should also include the full list of RSC IC statements taken into account in the assessment (if any), the conditions (if any) with respects to the different RSC Types and the NoBo assessment.
RSC Type	Each RSC Type is determined by the Infrastructure Manager, corresponding to a distinct engineering of the voice radio and/or ETCS data radio part(s) of the trackside CCS subsystem(s). A vehicle can demonstrate RSC based on the set of checks for each RSC Type. The set of checks for each RSC Type in a Member State's network should be notified to ERA by the Infrastructure Managers and they will be publicly available in a technical document published by ERA. In RINF, each section of line should be assigned its corresponding RSC Type(s); in ERATV, each vehicle type and type version should indicate with which RSC Types the vehicle has demonstrated compatibility.
Specific case	Any part of the rail system which needs special provisions in the TSIs, either permanent, because of geographical, topographical or urban environment constraints or those affecting compatibility with the existing system, in particular railway lines and networks isolated from the rest of the Union, the loading gauge, the track gauge or space between the tracks and vehicles strictly intended for local, regional or historical use, as well as vehicles originating from or destined for third countries (Article 2(13) of Directive (EU) 2016/797)
Substitution in the framework of maintenance	Any replacement of components by parts of identical function and performance in the framework of preventive or corrective maintenance (Article 2(17) of Directive (EU) 2016/797)
Upgrading	Any major modification work on a subsystem or part of it which results in a change in the technical file accompanying the 'EC' declaration of verification, if that technical file exists, and which improves the overall performance of the subsystem (Article 2(14) of Directive (EU) 2016/797)

Table 3: Abbreviations

ABBREVIATION	*FULL TEXT*
AC	Alternating Current
AsBo	Assessment Body

ABBREVIATION	*FULL TEXT*
B2	Baseline 2
B3	Baseline 3
BDC	Basic Design Characteristic
BSS	Base Station Subsystem
BTS	Base Transceiver Station
CAN-Bus	Controller Area Network Bus
CCS	Command Control and Signalling
CEN	European Committee for Standardisation (Comité Européen de Normalisation)
CENELEC	European Committee for Electrotechnical Standardisation (Comité Européen de Normalisation Électrotechnique)
CEPT	European Conference of Postal and Telecommunications Administrations (Conférence européenne des administrations des postes et des télécommunications)
CER	The Community of European Railway and infrastructure companies
CCM	Change Control Management
COST	European Cooperation in the field of Scientific and Technical Research (Cooperation européenne dans le domaine de la recherche Scientifique et Technique)
CR	Change Request
DC	Direct Current
DeBo	Designated Body
DMI	Driver-Machine Interface
EC	European Commission
EDOR	ETCS Data Only Radio
EEA	European Economic Area
EEC	European Economic Community
EEIG	European Economic Interest Group
E-GPRS	Enhanced GPRS
EIM	European Rail Infrastructure Managers
EIRENE	European Integrated Radio Enhanced Network
EMC	Electro Magnetic Compatibility
EN	European standard
ERA	European Union Agency for Railways also called “the Agency”
ERADIS	Interoperability and Safety database managed by the European Union Agency for railways

ABBREVIATION	*FULL TEXT*
ERATV	European Register of Authorised Types of Vehicles
ERTMS	European Rail Traffic Management System
ESC	ETCS System Compatibility
ESO	European Standardisation Organisation
ETCS	European Train Control System
ETS	European Telecommunications Standard
ETSI	European Telecommunications Standards Institute
EU	European Union
EVC	European Vital Computer
FC	Function Code
FFFIS	Form Fit Functional Interface Specification
FFFS	Form Fit Functional Specification
FIS	Functional Interface Specification
FRS	Functional Requirements Specification
FTS	Fixed Terminal System
GPRS	General Packet Radio Service
GID	Group call IDentity
GSM	Global System for Mobile communications
GSM-R	Global System for Mobile communications - Railway
GPRS	Generalized Packet Radio Service
HD	Harmonisation Document
HTML	HyperText Markup Language
HW	Hardware
IC	Interoperability Constituent
IEC	International Electrotechnical Commission
IM	Infrastructure Manager
INF	Infrastructure
IOT	Interoperability Test
ISO	International Organisation for Standardisation
ISV	Intermediate Statement Verification
JPC	Joint Programming Committee of CEN/CENELEC/ETSI
JPCR	Joint Programming Committee Rail
JWG	Joint Working Group

ABBREVIATION	*FULL TEXT*
KMS	Key Management System
MR1	Maintenance Release 1
MS	EU or EEA Member State
MVB	Multifunction Vehicle Bus
NoBo	Notified Body
NB-Rail	Coordination group of notified bodies for railway products and systems
NNTR	Notified National Technical Rule
NSA	National Safety Authority
NSR	National Safety Rule
NSS	Network Subsystem
NTC	National Train Control
NTR	National Technical Rule
OB	On-board
OBU	On-board Unit
OJ	Official Journal of the European Union
OPI	Agency Opinion
PRM	Person with Disabilities or Person with Reduced Mobility
Profibus	Process Field Bus
PS	Packet Switched
QMS	Quality Management System
QoS	Quality of Service
R2	Release 2
RAMS	Reliability, Availability, Maintainability and Safety
RBC	Radio Block Center
RFU	Recommendation for Use
RINF	Register of Infrastructure
RISC	Railway Interoperability and Safety Committee
RP	Railway Package
RR	Revision Request
RRA	Revision Request Author
RS	Rolling Stock
RSC	Radio System Compatibility
RU	Railway Undertaking

ABBREVIATION	*FULL TEXT*
SC	Standard Committee
SIM	Subscriber Identity Module
SMB	Stop Marker Board
SRS	System Requirements Specifications
SRT	Safety in Railway Tunnels
SS	Subset
STM	Specific Transmission Module
SW	Software
TC	Technical Committee
TIU	Train Interface Unit
TR	Technical Report
TS	Technical Specification
TSI	Technical Specification for Interoperability
UIC	International Union of Railways (Union Internationale des Chemins de Fer)
UIP	International Union of Private Wagons Owners (Union Internationale d'associations de Propriétaires de wagons de particuliers)
UIRR	International Union of Combined Road–Rail Transport Companies (Union Internationale des opérateurs de transport combiné Rail-Route)
UITP	International Association of Public Transport (Union Internationale des Transports Publics)
UNIFE	Union of the European Railway Industries (Union des Industries Ferroviaires Européennes)
UNISIG	Union Industry of Signalling (working party within UNIFE): steering committee involved in the development and implementation of ERTMS
UNITEL	Working party within UNIFE, committee involved in the development and implementation of GSM-R and the future interoperable railway communication system (FRMCS/Next Generation)
WG	Working Group
WP	Working Party

2. GUIDANCE ON THE APPLICATION OF THE CCS TSI

2.1. Introduction

2.1.1. This section contains clarifications to help readers understanding the TSI Control-Command and Signalling.

2.1.2. Subjects of clarifications can be added in the future based on return of experience.

2.2. Scope and definition of the subsystem

2.2.1. The fig. 1 gives an overview of the scope of the TSI Control-Command and Signalling.

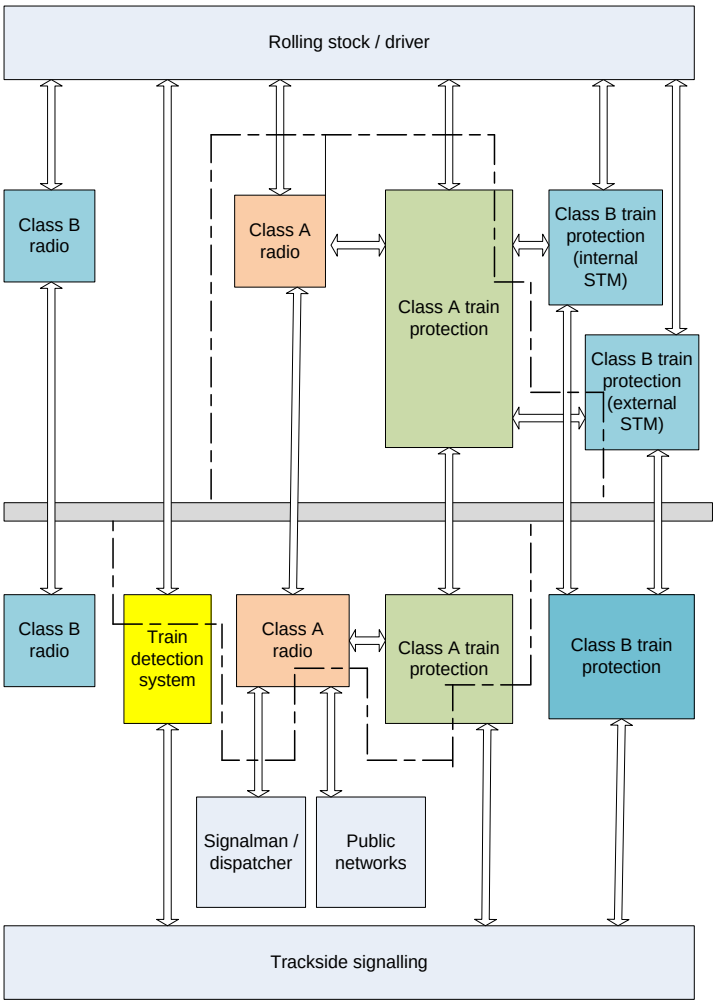


Figure 1: Scope of TSI Control-Command and Signalling

2.2.2. The picture shows the Control-Command and Signalling subsystems and their interface with rolling stock and operators.

2.2.3. The requirements of the TSI apply to the parts within the dotted line; the grey horizontal line separates Control-Command and Signalling On-board and Trackside subsystem.

2.2.4. With reference to the description of the composition of the Control-Command and Signalling subsystems provided in chapter 2 of the CCS TSI, the following considerations should be taken into account.

CCS TSI references to the amended and corrected versions

2.2.5. Regulation (EU) 2020/420 only corrects the German language version of the CCS TSI. Applicants German language should refer to Regulation (EU) 2016/919 as amended by Regulations (EU) 2019/776 and (EU) 2020/387 and corrected by Regulation (EU) 2020/420.

2.2.6. Applicants in other languages should refer to Regulation (EU) 2016/919 as amended by Regulations (EU) 2019/776 and (EU) 2020/387.

CCS TSI, section 2.2- Scope

2.2.7. The TSI Control-Command and Signalling does not require full standardisation of all Control-Command and Signalling functions, but only of the ones that are strictly necessary to achieve interoperability while complying with the essential requirements.

2.2.8. The TSI Control-Command and Signalling gives harmonised solutions for the functions, performance and interfaces that are relevant for interoperability and makes their implementation mandatory for the on-board (to ensure that vehicles may move uninterrupted throughout the EU) but allows flexibility for their implementation trackside. As a consequence, it is the responsibility of each trackside implementation to define, for example, if shunting operations are allowed/ supervised, if in-fill is required, etc.

CCS TSI and other regulations

2.2.9. Requirements of other European regulations apply to all parts of the Control-Command and Signalling subsystems described in fig. 1, including those within the scope of the TSI Control-Command and Signalling and those outside the scope of the TSI Control-command and Signalling.

2.2.10. The TSI Control-Command and Signalling does not address compliance with the requirements of other European regulations. Compliance to other European regulations is specified in the corresponding Directives. This is clarified in chapter 3 of [9] (see also chapter 2.3 of this Application Guide).

CCS TSI, section 2.3- Trackside application levels

2.2.11. The TSI Control-Command and Signalling allows a choice between the following possibilities for the installation of trackside ETCS:

- Level 1: intermittent track to train communication;
- Level 2: continuous track to train and train to track communication;
- Level 3: as level 2, with train integrity provided on-board.

  It is possible to implement multiple levels in the same trackside subsystem.

2.2.12. In addition, in the TSI Control-Command and Signalling, level 0 and level NTC are defined for the operation of an ETCS on-board on lines respectively without track-side train protection systems or equipped with legacy systems.

CCS TSI migration to interoperability

2.2.13. The TSI Control-Command and Signalling requires that Class B equipment is to progressively be replaced by Class A equipment.

2.2.14. The rules to be followed for the migration are specified in chapter 7 of the TSI Control-Command and Signalling. See section 2.7 of this Guide.

2.3. Essential requirements

CCS TSI, section 3.1 – General

2.3.1. The essential requirements are described in chapter 3 of the TSI Control-Command and Signalling, which also provides, for each essential requirement, the link with the corresponding basic parameter(s).

2.3.2. The general concept is applied, that compliance with the basic parameters specified in the TSI Control-Command and Signalling ensures that the corresponding essential requirement is respected.

CCS TSI, section 3.2.1 – Safety, section 3.2.2 Reliability and Availability

2.3.3. The TSI Control-Command and Signalling defines railway specific requirements (i.e., requirements specifically related to design, construction, placing in service, upgrading, renewal, operation and maintenance of the subsystems as well as the professional qualifications and health and safety conditions of the staff who contribute to its operation and maintenance). It does not address general aspects (non "railway specific") of these essential requirements (e.g., product safety, like protection against fulmination), because they are in the scope of other European regulations.

2.3.4. As far as railway specific aspects are concerned, the Railway Safety Directive [3] applies to the whole system; it is possible to respect both the Interoperability ([2], [28], [32]) and the Railway Safety Directive [3], because:

1. When designing a new trackside Control-Command and Signalling subsystem or when performing a major modification/upgrade of an existing subsystem where the application of the TSI is required in accordance with the provisions of [2], the CSM risk analysis [20] identifies the functions, performance and interfaces to be implemented trackside in order that the overall safety objective for the railway system can be achieved without any exported requirement to the on-board Control-Command and Signalling subsystems, which might contradict or exceed what is specified in the TSI.
2. When designing a new on-board Control-Command and Signalling subsystem or when performing a major modification/upgrade of an existing subsystem where the application of the TSI is required in accordance with the provisions of [2], the CSM risk analysis identifies the requirements for the installation on the rolling stock, in order that the safety requirements specified in the relevant TSIs are met.
3. The provisions of [3] are applied to prove compliance with the essential requirement "safety" defined in the TSI Control-Command and Signalling, when conformity of Interoperability Constituents is checked and EC verification of trackside and on-board subsystem is performed.
4. The EC verifications of the trackside and on-board subsystem prove that all the functions, interfaces and performance required in the subsystems on the basis of the analysis described in bullets 1 and 2 above, are implemented and comply with the requirements specified in the TSI.

2.3.5. From the explanations and references in Annex 10, it is concluded that the independent assessment of "RAM+S" requirements of both ETCS Class A subsystems and interoperability constituents falls fully under the responsibility of the CSM AsBo.

2.3.6. The CCS TSI and Regulation 402/2013 [20] do not permit the independent assessment activities to be carried out by a CENELEC ISA for any part of the ETCS Class A subsystem, including interoperability constituents or groups of interoperability constituents.

CCS TSI, section 3.2.3 – Health, section 3.2.4 Environmental Protection

2.3.7. As stated in CCS TSI Basic Parameter 4.2.16, the requirements for materials referred to in Regulation (EU) 1302/2014 [16] should be respected regarding the essential requirements "Health" and "Environmental protection".

CCS TSI, section 3.2.5 – Technical Compatibility

2.3.8. The electromagnetic compatibility between the railway system and the "external world" is part of the "Environmental protection" essential requirements and is fully covered by [21] and [22], together with the harmonised standards [23] and [29] .

2.3.9. The "Technical compatibility" essential requirement addresses the interferences between equipment inside the railway system.

2.3.10. The Directives [21] and [22] (with the support of the harmonised standards [23] and [29]) cover these aspects, with a relevant exception, i.e., the compatibility between vehicle and trackside Control-Command and Signalling equipment (e.g., track circuits and axle counters); the Control-Command and Signalling TSI defines (mores specific Index 77) therefore requirements and verification procedures for this issue.

CCS TSI, section 3.2.6 – Accessibility

2.3.11. According to the principle stated above, the TSI Control-Command and Signalling specifies no requirements or checks in addition to the ones foreseen by the other regulations applicable for the essential requirements "Accessibility".

2.4. Characterisation of the subsystem

CCS TSI, section 4.2.1 – Control-Command and signalling reliability, availability and safety characteristics relevant to interoperability

2.4.1. This basic parameter refers to both the essential requirement "safety" and the essential requirement "availability/reliability". In the scope of the TSI Control-Command and Signalling only the availability/reliability aspects that may negatively affect the system safety are taken into consideration.

2.4.2. More stringent availability/reliability requirements for commercial reasons are possible, but, being not part of the essential requirement, they can be managed in the context of contracts between IMs and RUs and not as criteria for authorisation to place in the market or to determine technical compatibility or safe integration.

2.4.3. The safety requirements for Control-Command and Signalling subsystems are expressed in terms of technical performances (functions, tolerable hazard rates) of equipment.

2.4.4. Compliance with the safety requirements specified in CCS TSI should be demonstrated in order to ensure the safe integration of Control-Command and Signalling subsystems into the railway system, respecting the safety objective for the service, as determined according to the provisions of [3].

2.4.5. To achieve interoperability, the TSI requires that every on-board Control-Command and Signalling subsystem fully respects the mandatory requirements. The TSI does not forbid less stringent safety requirements for a trackside Control-Command and Signalling implementation, when they are enough to

achieve the safety objective for the service and as far as the safe movement of vehicles equipped with TSI compliant Control-Command and Signalling subsystem is not hindered.

2.4.6. The CCS TSI does not include harmonised safety requirements for train detection systems for the following reasons: The safety requirements of such train detection equipment are dependent on the operational framework conditions (including e.g. from mere information of the signalmen to support him with his tasks to higher levels of automation) and the way all task and functions of the trackside signalling system (including e.g. the interlocking or level crossing functions which are for the moment outside the scope of the CCS TSI) are actually integrated. The definition of the safety requirements of the train detection equipment are part of the overall risk assessment of the trackside signalling system by applying the CSM-RA procedure as specified in Regulation (EU) No 402/2013. In addition the standards EN50126, EN50128 and EN 50129 provide requirements related to the design of train detection systems for safety related functions.

CCS TSI, section 4.2.2 – On-board ETCS functionality, section 4.2.3 – Trackside ETCS functionality

2.4.7. The implementation of certain functions and interfaces specified in the TSI Control-Command and Signalling is optional. These optional functions and interfaces can be used neither as criteria to grant or refuse vehicle authorisations nor to define, limit or specify requirements for technical compatibility or safe integration between on-board and trackside subsystems having an EC Declaration of verification. There are exceptions for some specific conditions, listed in the appropriate sections of chapter 4 and summarised in section 7.2.6 of the TSI Control-Command and Signalling and related to on-board implementation of:

1. In-fill (Euroloop and radio in-fill) for Trackside Level 1 Applications,
2. Radio data transmission for Trackside level 2 and 3 Applications,
3. Train integrity supervision on-board for Trackside level 3 Applications,
4. “K interface” for STM.

2.4.8. The Cold Movement Detection function is specified as optional for the on-board in the ETCS SRS.

2.4.9. In the Set of Specifications #3, defined in the CCS TSI Annex A Table A 2.3, the installation trackside of GPRS for ETCS is optional (for on-board is mandatory); also, the installation of an online KMS (using GPRS) for trackside is optional.

CCS TSI, section 4.2.4 – Mobile communication functions for railways

2.4.10. The TSI Control-Command and Signalling describes the radio communication functions that have to be implemented in the On-board and the Trackside subsystems. These functions have to follow the general principle on which the TSI is based, as expressed in its point 4.1.2, to enable a Trackside subsystem to be compatible with CCS TSI compliant On-board subsystems. The flexibility that is allowed in the configuration of the Trackside subsystem shall not limit the movement of TSI-compliant On-board subsystems.

2.4.11. This implies that the Trackside subsystem has to be configured in a way that any TSI compliant On-board subsystem can use the functionality offered by the Trackside subsystem. In order to provide this capability, the Trackside subsystem has to be configured to allow the GSM-R SIM card integrated in the On-board subsystem, which has to move in the Trackside subsystem, in the GSM-R network. According to the Control-command and Signalling TSI, the Trackside subsystem shall not impose any restriction to an On-board subsystem. This requirement may involve the establishment of roaming agreements between GSM-R network operators, the physical link between GSM-R networks and other configurations in the GSM-R network. In other to demonstrate the technical compatibility between the two subsystem

Radio System Compatibility check may be required. For more details, refer to section 6.1.2.5 of the CCS TSI and to section 2.6.21 of this Application Guide.

2.4.12. The configuration of options in the Trackside subsystem (if applied) shall not impose restrictions to On-board subsystems that comply with the requirements of the TSI. For example:

1. The configuration of Group Call ID 555 and Group Call ID 200 is an option for the GSM-R network. On-board subsystems compliant to previous TSIs may not be able to use GID 555 (i.e. they may be fitted with a GSM-R SIM card compliant to previous TSI, where there was no obligation to include GID 555 in the configuration). If the Trackside subsystem implements the option and the trains authorised to run in it cannot make use of it, an alternative has to be provided to the Railway Undertaking by the Infrastructure Manager to be able to run in the network.

   Note: the cab radio shall use the content of the SIM card necessary for operation, as indicated in CCS TSI Annex A Index 33.
2. The use of public radio networks thanks to roaming agreements between the GSM-R operator and a public operator is an option for the Trackside subsystem. On-board subsystems compliant to the TSI may not be able to use the public networks, due to the use of filters or due to other reasons. If the Trackside subsystem implements the option and the trains authorised to run in it cannot make use of it, an alternative has to be provided to the Railway Undertaking by the Infrastructure Manager to be able to run in the network.

CCS TSI, section 4.2.5 – ETCS and GSM-R air gap interfaces

2.4.13. The Control-Command and Signalling TSI specifies technical characteristics of equipment and includes the operational frequency band for the radio communication.

2.4.14. To operate GSM-R, it is necessary that Member States allow the use of this frequency band. The most appropriate way is the implementation of the relevant ECC recommendations [30]. NOTE: asking for a more stringent protection against interferences on-board to a supplier is possible, but it may not be imposed since different technical requirements to those in the CCS TSI may not be requested to access to an infrastructure.

2.4.15. The CCS TSI specifies that the On-board subsystems shall be protected against interference. This requirement applies at the subsystem level. The Interoperability Constituents (GSM-R voice cab radio and GSM-R EDOR) compliant to the TSI already provide this protection. In point 2.6.95 of this Application Guide, guidance is provided for Interoperability Constituents certified for older TSIs.

2.4.16. The CCS TSI indicates that for data communication, the protocols shall comply with what is specified in the Annex A indexes 10, 39 and 40. This means that an On-board Subsystem that is compliant with the Table A 2.3 (set of specifications #3) has to be capable of using both the Circuit Switched and Packet Switched communication modes in order to meet the TSI requirements. Therefore, in this case, the GSM-R SIM card, the EDOR and the ETCS On-board have to enable the use of both Circuit Switching and Packet Switching.

CCS TSI, section 4.2.6 – On-board Interfaces Internal to Control-Command and Signalling

2.4.17. No additional clarification necessary.

CCS TSI, section 4.2.7 – Trackside Interfaces Internal to Control-Command and Signalling

2.4.18. No additional clarification necessary.

CCS TSI, section 4.2.8 – Key Management

2.4.19. The cryptographic keys are used by the ETCS train to track communication protocol to calculate a code that protects the integrity and the authenticity of the exchanged messages.

2.4.20. If the key used to calculate the protection code for the messages is kept confidential*, the defenses to the threats identified in EN 50159-2 (insertion, corruption, masquerade) are obtained*.

2.4.21. All the technical characteristics of the protocols are completely defined in the mandatory specifications. The requirements for the confidentiality of the keys with respect to risks related to safety of railway operations are not in the scope of the TSI Control-Command and Signalling.

2.4.22. The CCS TSI requires the ETCS equipment to comply with the specified interfaces to store, modify and delete keys, while possible requirements for their management are the responsibility of Infrastructure Managers and Railway Undertakings (and determined, for example, by regulations of authorities responsible for the security of the transport systems). Compliancy of the interfaces KMC-ETCS entity/KMAC entity to SS-038, SS-114, SS-137 fall into the point 5 of Table 6.3 of CCS TSI. In addition, if KMC is present, only the interfaces as defined in SS-038 and SS-137, and, if applicable, the generation of certificates have to be checked.

2.4.23. Considering that requirements related to security might become an obstacle to the free movement of trains (like it may happen with national safety rules; see art. 8 of [3]), Member States should communicate them to the European Commission, in order to have a coordinated approach.

CCS TSI, section 4.2.9 – ETCS-ID Management

2.4.24. The procedures for the allocation of variables are specified in [31]. The allocation can be done through the website of the Agency, in the ECTS Variables page in the ERMTS Section: https://www.era.europa.eu/activities/european-rail-traffic-management-system-ertms_en#meeting4.

CCS TSI, section 4.2.10 – Trackside Train Detection Systems

2.4.25. For this basic parameter the TSI Control-Command and Signalling makes reference to the specification in its Annex A, Index 77, which defines the parameters of the interface between the train detection systems (which are part of the Control-Command and Signalling trackside subsystem) and other subsystems – mainly rolling stock.

2.4.26. The defined requirements related to train detection systems including all interfacing subsystems (mainly rolling stock). The basic principle is that train detection systems have to work reliably and safely under the conditions specified in Index 77.

2.4.27. The technology of train detection systems can evolve (mechanical or optical detection principles) as long as these technologies do not impose any new requirements to the interfacing subsystems in addition to those already specified in Index 77 (see chapter 2 of Index 77).

2.4.28. Should future innovative technologies require additional interface parameters in Index 77, then they can only be introduced in the framework of the next revision of the CCS TSI / interface document.

2.4.29. In addition there are specific European standards such as EN 50126, 50128, 50129 (see also section 2.4.6 of this application guide) concerning the design of train detection systems – which can be used for safety related train detection.

2.4.30. It has to be noted, that some characteristics of rolling stock, relevant for the compatibility with track circuits, can be specified and checked at the level of a single vehicle, while others apply to the complete consist of more vehicles, like, for example, the impedance between wheels and pantograph (section 3.2.2.1 of Index 77) and are therefore related also to the use of vehicles and not only to their authorisation to place on the market. The Index 77 includes a table indicating which subsystem may be affected by any parameter, (see Index 77, Table 1 in chapter 2).

2.4.31. Special attention is necessary for the “shunting impedance for track circuits” (see also Annex 1 of this Application Guide).

2.4.32. As explained there, some of the elements that contribute to the “shunting impedance” (section 3.1.10 of Index 77) can be managed at the level of a single vehicle. The contact resistance between wheel and rail, however, depends on the interaction of several factors both in static (vehicle at standstill) and dynamic conditions (vehicle is running).

2.4.33. In some Member States rules exist, related to the use of composition of vehicles, to ensure that the resulting consist is detected by the track circuits. Being, at the present state, impossible to harmonise these rules, they are indicated as an open point. The following clarifications have to be taken into account:

1. These rules do not involve technical characteristics of vehicles other than the ones already indicated in the specification Index 77, but only refer to the interaction of these characteristics; for this reason the rules do not apply to the authorisation of a vehicle, but only to its use within a consist;
2. The indication of an open point (section 3.1.10 of Index 77) means only to have the existing rules managed in a transparent way, for manufacturer and operators;
3. As with all open points, the Agency expects that the notified rules will contribute to its clarification, harmonisation and closure.

2.4.34. For brake blocks (section 3.1.6 of Index 77), the requirements of the TSI Control-Command and Signalling are satisfied by the types `approved` according to the provisions stated in the TSI for freight wagons.

2.4.35. The minimum detection length of a track circuit depends on the maximum distance between two consecutive axles. In addition it could also depend on:

- the maximum speed of the line,
- the reaction time of the other parts of the signalling system which uses this detection information.

As example, the time that the track circuit outputs a reliable information about its condition including system delays must be longer than the time to transmit and process this information in the other parts of the signalling system (section 3.1.2.1 of Index 77).

2.4.36. The requirement 3.1.2.4 of Index 77 has to be fulfilled for all lines where train with an overhang of more 4.2m (these are usually “high speed trains”) will operate. For this reason, if such trains run e.g. over conventional lines, this distance must also be applied for these lines (section 3.1.2.4 of Index 77).

The maximum distance between the end of a train and the first axle (bx) as mentioned under 3.1.2.4 and 3.1.2.5 of Index 77 have to be fulfilled by TSI compliant trains:

- On new high speed lines the distance b_x does not exceed 5 000 mm.
- On other lines with 1435 mm, 1524 mm, 1600 mm and 1668 mm track gauge: The distance b_x does not exceed 4200 mm.
- On other lines with 1520 mm track gauge: The distance b_x does not exceed 3500 mm.

The Infrastructure is designed in such way, that a TSI conform vehicle with these dimensions can run safely on the Network. (Positioning and functioning of the train detection system, interlocking functionality,…) For trains running on different kind of these lines, the smallest maximum distance has to be taken into account.

2.4.37. Shunt assisting devices (section 3.1.8 of Index 77) help to break down the rust between the wheel and the rail. The principle is based on the transformer function where the primary coil is a cable loop just near the wheels of the vehicle (yellow bar on the figure below). The secondary coil is created by the wheels, the axles and the rails. Shunt assister devices should have the possibility to be switched off.

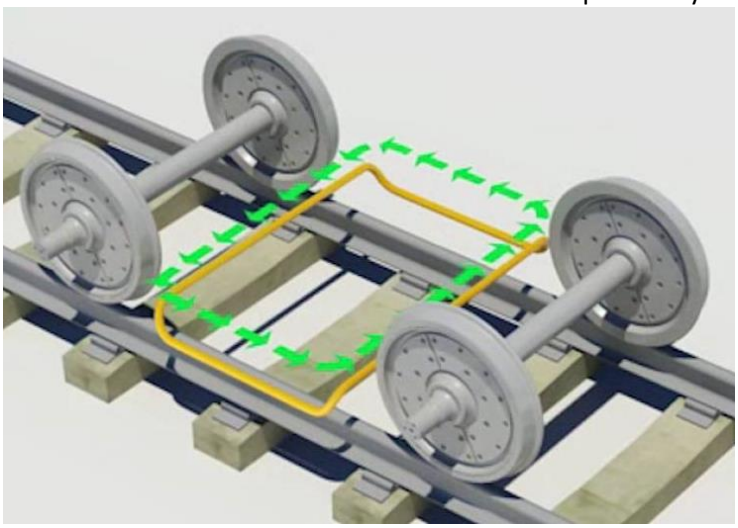


Figure 2.- Shunt assisting device – working principle

2.4.38. The cable loop current (green arrows, primary current) is generated from a resonance circuit with a capacitor and working on a high frequency (typically: 100 - 170 kHz).

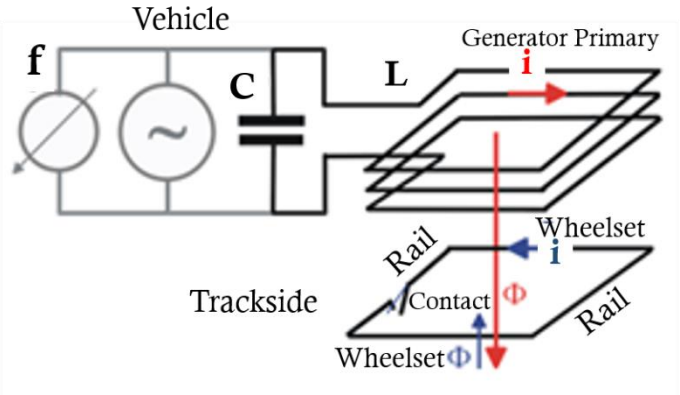


Figure 3.- Electrical behaviour

2.4.39. The cable loop current (primary current) generates a secondary current in the loop consisting of wheel, axles and rails (secondary loop). In the case of high resistance between wheel and rail in the secondary loop the primary loop current tries to maintain the current and create a higher voltage between wheel and rail in the secondary loop. This higher voltage (breakthrough or fritten voltage) reduces the electrical resistance and - by that - ensures the electrical contact between wheel and rail which results in a better shunting behaviour.

2.4.40. National rules in some Member States require the use of shunt assisting devices. However, because of compatibility constraints, these devices may not be used in every country or may even be prohibited from use. In addition, operational rules might be defined in Member States to reliably switch on or switch off this equipment.

2.4.41. Annex 4 including its appendix 1 provides further information about demonstrating compatibility with loops (section 3.1.7.2 of Index 77).

CCS TSI, section 4.2.11 – Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment

2.4.42. For explanations related to electromagnetic fields see Annex 2 of this Application Guide.

2.4.43. For explanations related to conducted interferences see Annex 3 of this Application Guide.

2.4.44. In relation with Index 77, the following European Standards define infrastructure related and vehicle related requirements for demonstrating compatibility between vehicle and train detection systems.

2.4.45. Compatibility with axle counters and wheel sensors (section 3.2.1 of Index 77):

- According section 4.1 of Index 77, the EC declaration of conformity for axle counter products shall cover all parameters of the table 16 applicable for IC certification of axle counters.

- It is possible that the architecture of the axle counter product (Which can be different from manufacturer to manufacturer….) does not allow the declaration of conformity for all parameters from the table 16 applicable for axle counters. In this case the EC declaration for conformity shall explicitly mention these parameters.

- In practice, the axle counter as IC is in most of the cases a combination of the trackside equipment and the track vacancy evaluation unit (Figure 1 of EN 50617-2), because otherwise it is difficult to check all the relevant parameters from table 16. The supplier of the axle counter defines the system borders for the IC and declares conformity to the IC requirements.

- The EN Standards EN 50592 and EN 50617-2 are applicable

2.4.46. Compatibility with track circuits (section 3.2.2 of Index 77):
- The EN Standard 50617-1 is applicable

2.4.47. Sections 3.2.2.4, 3.2.2.5, 3.2.2.6 of Index 77 concerning the frequency management of track circuits are not requirements for placing on the market of TSI compliant vehicles until the open point in relation to the harmonised vehicle test method (section 3.2.2.7 of Index 77) is closed.

CCS TSI, section 4.2.12 – ETCS DMI (Driver-Machine Interface)

2.4.48. Acknowledging the lack of a harmonized manual for the use of ETCS, ERA developed a generic ETCS driver's handbook [39] to address the needs of the users. This Handbook concerns baseline 3 On-board Units (OBUs), i.e. those applying sets of specifications #2 and #3 of CCS TSI Annex A (2.3.0d OBUs are not in scope as the Driver Machine Interface is not harmonized under set of specifications #1). Please refer to the Agency web page section for further details: https://www.era.europa.eu/activities/european-rail-traffic-management-system-ertms_en#meeting5

2.4.49. The Handbook covers both B3 software versions (SRS 3.4.0 and SRS 3.6.0), all possible system versions X.Y, all operating levels, modes, OBU options and screen technologies. It is provided in open-source Microsoft Word and HTML versions, in English, French and German.

2.4.50. This Handbook is meant to serve the following uses (indicative list):
- Be a reference user's manual for all possible configurations of B3 OBUs;
- Be used to derive dedicated drivers' manuals for specific OBU implementations in different rolling stock types (customization instructions are provided);
- Constitute a comprehensive harmonized tutorial for drivers' training purposes;
- Serve to elaborate questions for drivers' competence certification;

CCS TSI, section 4.2.13 – GSM-R DMI (Driver-Machine Interface)

2.4.51. No additional clarification necessary.

CCS TSI, section 4.2.14 – Interface to data recording for regulatory purposes

2.4.52. No additional clarification necessary.

CCS TSI, section 4.2.15 – Visibility of trackside Control-Command and Signalling objects

2.4.53. No additional clarification necessary.

CCS TSI, section 4.2.16 – Construction of equipment used in CCS subsystems

2.4.54. The mandatory environmental conditions for some equipment (e.g., debris for Eurobalise) are defined in the corresponding specifications.

2.4.55. In addition, chapter 6 of the TSI Control-Command and Signalling, requires that for each interoperability constituent and subsystem the applicable working conditions are indicated.

CCS TSI, section 4.2.17 – ETCS and Radio System Compatibility

2.4.56. The following picture describes the general context for the ESC/RSC in the Vehicle Authorisation and in the Route Compatibility Check. At least one ESC and RSC Statements (voice and data) have to be provided as part of the demonstration of the technical compatibility with each network equipped with Class A CCS systems (ETCS and/or GSM-R) inside the area of use in order to get the vehicle authorisation with Class A CCS systems. Additional ESC/RSC can be performed at a later stage for the already authorised area of use. No other checks are foreseen to demonstrate technical compatibility of the vehicle with a route.

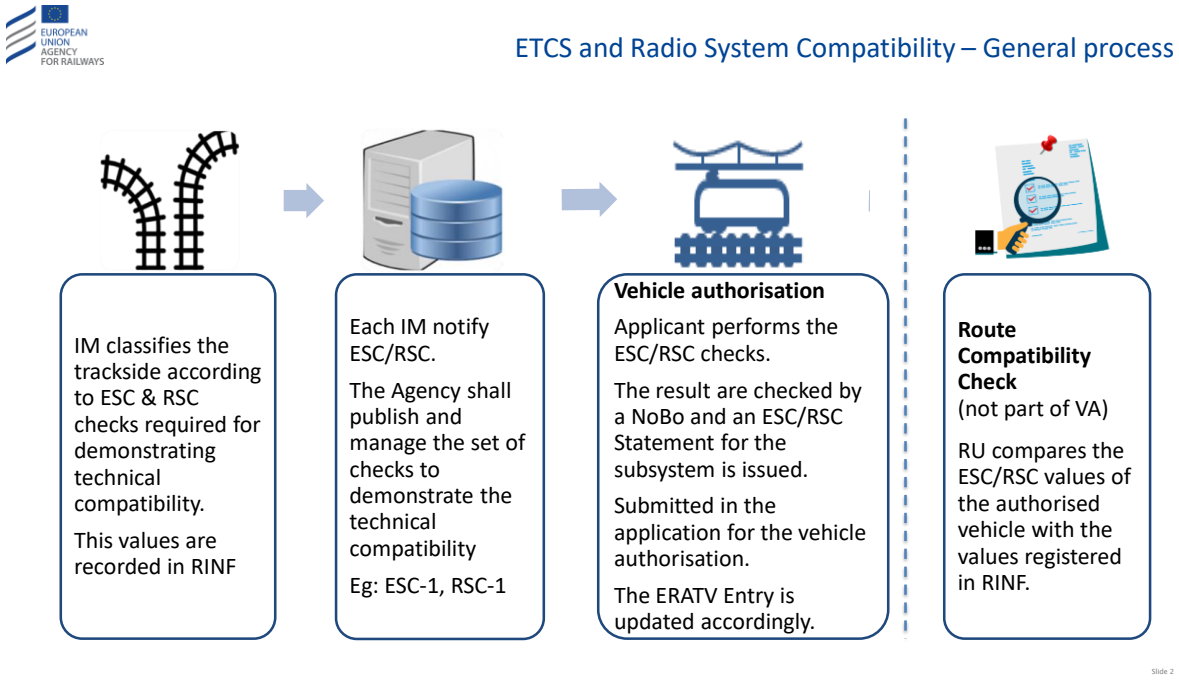


Figure 4.- ESC/RSC General process

CCS TSI, section 4.3 – Functional and technical specification of the interfaces to other Subsystems

2.4.57. CCS TSI section 4.3 contains the tables with the interfaces and interdependencies with other TSIs, in order to correctly interface and integrate all subsystems in the Union rail system. The guidance provided in this Application Guide aims to clarify some points where doubts has been raised and not to provided an exhaustive review of the interfaces.

2.4.58. The ETCS Stop Marker Board (SMB), defined in document 06E068 (index 38 of Annex A2) constitutes:

- a functional interface with OPE TSI Appendix A (4.3.1, through the rules describing the operational effect of the SM when driving under ETCS);
- a functional and technical interface with LOC & PAS TSI (4.3.2, through the provisions ensuring good visibility of the SM by the driver);
- a technical interface with INF TSI (4.3.3, through the requirement to observe the clearance gauge when installing the SMB).

2.4.59. Regarding the interface with the SRT TSI [17] , the SRT TSI in Clause 4.2.1.8 of the SRT SI states that, for tunnels longer than 1 km: *"Radio communication between the train and the infrastructure manager control centre shall be provided in each tunnel with GSM-R"*. The reason for having this requirement is to make sure that communication is possible inside the tunnel for workers, rescue teams

and for those trains equipped with a GSM-R cab radio. When installing GSM-R, the infrastructure manager will have it assessed and certified by a NoBo for the CCS TSI, not by a NoBo for the SRT TSI. The NoBo for SRT should only check that tunnels longer than 1 km have GSM-R installed, for which the EC Certificate for the GSM-R should be is present.

2.4.60. Regarding the interface with LOC&PAS TSI [16] and the LOC&PAS requirements for kinematic gauge in section 4.2.3.1, it should also be considered the position of the radio antennas, for voice and/or data, as for CCS TSI section 4.2.4. The verification of the kinematic gauge is part of the assessment of the LOC&PAS NoBo.

CCS TSI, section 4.4 – Operating rules

2.4.61. Refer to the Application Guide section 2.4.48 for reference to the generic ETCS driver's handbook.

CCS TSI, section 4.5 – Maintenance rules

2.4.62. No additional clarification necessary.

CCS TSI, section 4.6 – Professional competences

2.4.63. No additional clarification necessary.

CCS TSI, section 4.7 – Health and safety conditions

2.4.64. No additional clarification necessary.

CCS TSI, section 4.8 – Registers

2.4.65. No additional clarification necessary.

CCS TSI, section 4.9 – Route compatibility checks before the use of authorised vehicles

2.4.66. The intention of the ESC/RSC introduction is to minimise the number of test required at the route compatibility stage. The foreseen tests are mostly related to the vehicle characteristics in combination with the characteristics of the intended route. Please refer to section 2.6.54 about ESC/RSC in the vehicle authorisation.

2.4.67. The verification of the presence of the adequate cryptographic keys to allow the communication of an ETCS on-board with the RBCs in a desired route makes part of the checks described in section 4.2.2.7 of [14] "Ensuring that the train is in running order". In order to be ready to run in ETCS Level 2/3, the ETCS on-board needs to have received the valid keys for all the RBCs that may encounter in its intended route prior to the start of the trip in case the keys are distributed off-line. If the keys can be received on-line, a check needs to be done to demonstrate that the corresponding valid key could be received before the ETCS on-board may be required to establish a communication session with an RBC.

2.4.68. Appendix D1 in [14] has included amongst the route compatibility checks to be done before the use of authorised vehicles the parameter "1.1.1.3.3.5 GSM-R networks covered by roaming agreement". A verification is needed to ensure that the train can make use of the GSM-R networks that cover the intended route. In case the GSM-R SIM card Home network is not in the list of networks having a roaming agreement with the GSM-R networks available in the route, the GSM-R voice and data services will not be

available. In that case, the vehicle will not be able to communicate via GSM-R with the traffic management centre nor will it be able to run in ETCS Level 2/3. The establishment of the roaming agreement with the Home network of the GSM-R SIM card intended to be used should be facilitated by the Infrastructure Manager upon request of the Railway Undertaking. It should be noted that the establishment of such agreement is a lengthy process and it should be requested with sufficient time to avoid unwanted delays. Each Infrastructure Manager should provide a procedure to receive the requests for the establishment of roaming agreements with the GSM-R network that provides coverage to the routes it manages. In case part of the routes are covered by GSM public networks (with which the GSM-R network of the Infrastructure Manager may have signed a bilateral roaming agreement), the Infrastructure Manager should ensure that all the foreign GSM-R SIM cards are included in that agreement to allow the vehicles to use the services provided by the public network without distinction of the origin of the GSM-R SIM cards.

2.4.69. Appendix D1 in [14]has also included amongst the route compatibility checks to be done before the use of authorised vehicles the parameter “1.1.1.3.3.4 Use of Group 555”. A verification is needed to find out if this group can be used by the GSM-R cab radio on-board. In case it cannot be used, and if it is configured along the intended route, an alternative procedure should be established between the Railway Undertaking and the Infrastructure Manager to allow the communication of the vehicle and the traffic management centre. Not being able to use on-board the Group 555 shall not lead to the declaration of the incompatibility of the route: an alternative operational procedure should be provided to the vehicle.

2.5. Interoperability Constituent(s)

Principles

2.5.1. The TSI Control-Command and Signalling specifies a set of “basic interoperability constituents” and allows their “grouping” to allow flexibility for development and implementation.

2.5.2. The TSI only specifies interfaces that are necessary to achieve interoperability; for interfaces between trackside and on-board the TSI requires that their implementation (functions, protocols, electrical and physical aspects) complies with the mandatory specifications.

2.5.3. For other interfaces (e.g., between equipment allocated either on-board or trackside) different solutions are acceptable, provided that functional, safety and performance requirements relevant for the achievement of interoperability are respected. These mandatory requirements are part of the basic parameters of the TSI.

2.5.4. To support an open market and the management of interoperability constituents during the whole lifetime (including maintenance and upgrade), voluntary harmonisation of aspects not mandated by the TSI is encouraged; the corresponding standards are listed in chapter 3 of this application guide.

2.5.5. Please refer to section 2.6.109 for the difference between groups of IC and parts of the subsystem.

Special considerations RBC

2.5.6. The functions implemented in an RBC depend on its integration with trackside signalling, which is not harmonised in the scope of the TSI Control-Command and Signalling (see the consideration in chapter 2.2 above).

2.5.7. The specifications referenced in and given mandatory status by the TSI only define requirements for the functions implemented in the RBC, in order to achieve interoperability.

2.5.8. The necessity of implementing functions (e.g., if and in which conditions to authorise shunting, to send commands to raise / lower pantographs, etc.) depends upon the characteristics of the specific application.
2.5.9. As a consequence, different "types" of RBC interoperability constituents will be developed, to interface and cooperate with different trackside signalling functions.

2.5.10. The design documentation for the RBC will indicate which functions are implemented.

2.5.11. The advantage of defining the RBC as an Interoperability Constituent is twofold:

1. functions, interfaces and performance certified will not require repetitions of testing when the RBC is integrated into a Control-Command and Signalling trackside subsystem

2. the availability on the market of already certified RBCs will support the harmonisation of the overall trackside design, to exploit existing products and reduce the need to search for new technical solutions.

ERADIS Group of ICs

2.6.1. The CCS TSI, in section 5.2.2, allows to group interoperability constituents, without fixing a restricted number of options in the groups. In that sense, it is not possible to foresee all possible combinations of certificates for group of ICs to be registered in ERADIS. In the ERADIS database the current examples mentioned in the CCS TSI tables 5.1.b and 5.2.b are available. If at the time of registering a certificate of a Group of ICs in ERADIS, the corresponding option is not available, the Agency should be contacted in order to include that group of ICs into the possible options in ERADIS. This can be done through the contact us form in the Agency webpage: https://www.era.europa.eu/can-we-help-you/contact-us-0_en

2.6. Conformity assessment and EC verification

CCS TSI, section 6.1.1.3 – Partial fulfilment of TSI requirements

2.6.2. Art. 15(7) of [2] states that "If the relevant TSIs allow, the notified body may issue certificates of conformity for a series of subsystems or certain parts of those subsystems".

2.6.3. The TSI Control-Command and Signalling in section 6.3.2 supports the issuing of certificates for a series of subsystems through the application of the modules.

2.6.4. The parts of On-board and, respectively, Trackside Control-Command and Signalling subsystems for which a certificate may be issued are specified in section 2.2 and section 4.1 of the TSI. The corresponding rules for implementations are in section 7.2.1 and the rules for assessment are in section 6.4.1.

2.6.5. In addition, following feedback from several stakeholders (applicants, Notified Bodies and National Safety Authorities), some concepts have been further clarified:

1. section 6.1.1.3 of the TSI specifies the conditions under which control-command and signalling interoperability constituents and subsystems, that do not implement all functions, performance

and interfaces as specified in Chapter 4 of the TSI, may obtain EC certificates of conformity or, respectively, EC certificates of verification.
2. section 6.4.3 of the TSI specifies the detailed requirements on the issuing and the content of the corresponding certificates.

2.6.6. The scope of these provisions is not to open the door to new non-TSI compliant implementations, but to keep under control the situation that occurred in the initial phase of deployment of ETCS and GSM-R. A role is foreseen for the ERTMS Notified Conformity Assessment Bodies Network chaired by the Agency. The complete scope of work of this group is specified in [27].

2.6.7. The concepts stated in section 6.1.1.3 and 6.4.3 do not substantially change the original content of the TSI Control-Command and Signalling, but only provide an improved text for better understanding. For this reason, the amended sections 6.1.1.3 and 6.4.3 may be used also when a previous version of the TSI Control-command and signalling is applied.

2.6.8. The template required to provide the information in the technical file regarding the restrictions or the added functions that is referred to in section 6.1.1.3 is the Annex 9 (Template for restrictions and added functions). The input for the template should be provided by the applicant in collaboration with the Notified Body (NoBo).

CCS TSI, section 6.1.2.2 – Operational Test Scenarios

2.6.9. The certification of Trackside subsystems is a critical step to achieve interoperability. In this respect, the operational test scenarios (see definition in point 6.1.2.2 of the TSI Control-Command and Signalling) are a very important tool:

1. an early verification that design and installation of the Trackside subsystem will not require on-board functions or performance conflicting with requirements of the TSI can be done checking the operational test scenarios specified by the applicant. See point 6.1.2.3 of the TSI Control-Command and Signalling;
2. once this check has been successfully passed, the operational test scenarios will be the test cases for the certification of Control-command and Signalling Trackside subsystem.

2.6.10. Point 6.5 of the TSI Control-Command and Signalling clarifies the responsibilities and procedures to follow when product failures or incompatibilities are detected.

CCS TSI, section 6.1.2.4 & 6.1.2.5 – Requirements for ETCS System Compatibility & for Radio System Compatibility

2.6.11. **Infrastructure Managers**
2.6.12. Definition of the ESC

2.6.13. The objective of the ESC in a first stage is to capture the current practice already in place in the different networks. Currently, in order to get the authorisation to run in a line or set of lines, vehicles are often requested to perform some tests or checks (sometimes referred to as Train-Track integration); in some cases, there are even list of ICs that are exempted from some checks since they are integrated in vehicles already running on these lines. These checks are in many cases recommended by the Infrastructure Manager to the NSA to ensure the compatibility of the vehicle. Due to the changes introduced with the application of the 4th Railway Package, the process for Vehicle Authorisations for placing in service has been modified, and ERA has become the authorising entity in many cases, which requires having full visibility of the steps and requirements that were previously in place for the

authorization for placing in service in the Member State or for the route access as defined by the associated infrastructure manager.

2.6.14. These are the kind of checks that should be submitted by the Infrastructure Manager to ERA. In that sense, no specific template will be provided for the definition of the ESC, to allow the Infrastructure Managers to submit the list of checks currently in use, but there is a minimum set of requirements to be fulfilled (information that should be included in the definition of each ESC Type):

- Definition of each check to be performed
- Criteria to pass each check
- If a check can be performed at IC level
- Preferred location to perform each check (laboratory or trackside)
- Contact details in order to request the performance of each check (if applicable)

2.6.15. It is relevant that the amount of ESC checks defined should be limited to provide evidences that are not covered in the subsystem or interoperability constituent certification phase (for example purely on-board functionality DMI display should not be part of these checks).

2.6.16. Some ESC checks may be done via documental analysis: this can be either indicated by the IM or considered as such by the Entity performing the checks.

2.6.17. For ESC checks that can be performed in a laboratory (for a section or the entire network of the area of use), IM should provide information of the laboratories on which this checks can be performed and the contact details. The CCS TSI does not set any accreditation requirement for these laboratories.

2.6.18. Checks that require running with a vehicle on a specific ETCS section should clearly be expressed (e.g., check to verify a nominal run on the line, or due to physical characteristics).

2.6.19. Infrastructure Managers should also consider the responsibilities according to Regulation (EU) 2018/545 [12].

2.6.20. The Infrastructure Manager is in charge of the definition of ESC Types; in principle, each Type should correspond to a specific engineering, or to the use of a specific functionality in one line or set of lines (e.g. lines implementing certain packets may have one ESC Type, lines making use of GPRS for ETCS may have two ESC Types– one for operation in CS and one for operation in PS). The definition of ESC Types should support a minimum effort to perform ESC checks for the applicable areas of use (i.e. for the related railway undertakings).. A brief explanation of what is the reason for the definition of each ESC Type should be provided together with the notification of each Type (i.e. what makes the Type different to others: inclusion of a different functionality, details of the specific engineering, etc.). In case an existing ESC Type becomes invalid or it is substituted is should be communicated to the Agency.

2.6.21. Definition of the RSC

2.6.22. The objective of the RSC in a first stage is to capture the current practice already in place in the different networks. Currently, in order to get the authorisation to run in a line or set of lines, vehicles are often requested to perform some tests or checks (sometimes referred to as Train-Track integration or interoperability tests); in some cases, there are even list of ICs that are exempted from some checks since they are integrated in vehicles already running on these lines. These checks are in many cases recommended by the Infrastructure Manager to the NSA to ensure the compatibility of the vehicle. Due to the changes introduced with the application of the 4th Railway Package, the process for Vehicle

Authorisations for placing in service has been modified, and ERA has become the authorising entity in many cases, which requires having full visibility of the steps and requirements that are in place for the authorisation in each area of use (i.e. in each Member State).

2.6.23. These are the kind of checks that should be notified by the Infrastructure Manager to ERA. In that sense, no specific template will be provided for the definition of the RSC, to allow the Infrastructure Managers to submit the list of checks currently in use, but there is a minimum information that should be included:

- Definition of each check to be performed
- Criteria to pass each check
- If a check can be performed at IC level
- If a check is only required for trains equipped with certain set of specifications
- Preferred location to perform each check (laboratory or trackside)
- Contact details in order to request the performance of each check (if applicable)

2.6.24. It is relevant that the amount of RSC checks defined should be limited to provide evidences that are not covered in the subsystem or interoperability constituent certification phase (for example purely on-board functionality such as reception of a voice call or a data call should not be part of these checks).

2.6.25. Some RSC checks may be done via documental analysis: this can be either indicated by the IM or considered as such by the Entity performing the checks (some examples of these checks are specific configuration of Group Call IDs in the SIM card, the enabling or disabling of certain functionality…).

2.6.26. For RSC checks that can be performed in a laboratory (for a section or the entire network of the area of use), the IM should provide the contact information of the laboratories.

2.6.27. Checks that require running with vehicle on a specific Radio section should clearly be expressed (e.g., check to verify a nominal run on the line, or due to physical characteristics or coverage).

2.6.28. Infrastructure Managers should also consider the responsibilities according to Regulation (EU) 2018/545 [12]

2.6.29. The Infrastructure Manager is in charge of the definition of RSC Types; in principle, each Type should correspond to a specific engineering/configuration, or to the use of a specific functionality in one line or set of lines (e.g. lines using a specific Group Call ID may have one RSC Type for voice, lines making use of GPRS for ETCS may have two RSC Types for ETCS data – one for CS and one for PS). The definition of a high number of RSC Types in the same area of use (i.e. in a Member State) should be avoided. It is expected that, if any, only one RSC Type for voice is defined. A brief explanation of what is the reason for the definition of each RSC Type should be provided together with the notification of each Type (i.e. what makes the Type different to others: inclusion of a different functionality, details of the specific engineering, etc.). In case an existing RSC Type became invalid or it is substituted it should be communicated to the Agency (see Application Guide section 2.6.53).

2.6.30. **Submission to the Agency**

2.6.31. For submitting the ESC/RSC an e-mail should be sent to esc-rsc@era.europa.eu.

2.6.32. After an IM notifies ERA of an ESC/RSC Type, the Agency should make sure that the information received is correct and complete, in which case the Agency will assign a unique identifier to each ESC/RSC type which will be communicated to the Infrastructure Manager. The Agency will provide an interim

updated version of the technical document containing all the ESC/RSC checks submitted up to that moment (pending further revision) notifying the IM within 5 Agency's working days.

2.6.33. The Agency will proceed to publish regularly updates of the document at the Agency website and to inform the relevant working parties, to allow the sector (especially the VA applicants) to plan their activities accordingly. The new version published will include all the ESC/RSC Types notified and checked by ERA until the publication date.

2.6.34. The corresponding identifiers will be also included by the Agency in the predefined list of values to be selected in RINF and ERATV. The IM will be informed when this is available.

2.6.35. Infrastructure Managers should submit to the Agency any changes on the referred checks for their networks, by using the same e-mail (esc-rsc@era.europa.eu) and making reference to the modified ESC/RSC type.

2.6.36. The technical document for ESC/RSC will be available in the Agency Webpage.

2.6.37. RINF

2.6.38. Infrastructure Manager (IM) shall classify each sections of their lines to identify with the support of the ETCS suppliers the necessary checks for ESC/RSC types, for demonstrating technical compatibility between a CCS on-board subsystem covered by an EC Declaration of verification and a CCS trackside subsystem covered by an EC Declaration of verification in the area of use of a vehicle. There could be one type for the complete network in one or several Member State(s) or several ESC/RSC types for several sections (see 6.1.2.4 of CCS TSI 2019).

2.6.39. As explained above, each type will be uniquely referred to with an identifier, generated by ERA and communicated to the IM that notified the type.

2.6.40. The relevant RINF parameters to be filled are

- 1.1.1.3.2.9 ETCS system compatibility
- 1.1.1.3.3.9 Radio system compatibility voice
- 1.1.1.3.3.10 Radio system compatibility data

2.6.41. For those parameters, it is possible to define multiple values to a particular section, but regarding the Route Compatibility Checks, vehicles will be considered compatible with the infrastructure regarding the related parameter, if they match any of the values declared in RINF by the IM.

2.6.42. This will allow the future reduction of ESC/RSC types definition inside the networks, in order to consolidate in a minimum set of different ESC/RSC.

2.6.43. As requested in the CCS TSI sections 6.1.2.4 and 6.1.2.5 Infrastructure Managers, with the support of the ETCS and/or GSM-R suppliers for their networks, shall submit to the Agency the definition of the necessary checks (as defined in CCS TSI section 4.2.17) on their network by 16 January 2020 at the latest.

2.6.44. ESC/RSC are to be used from the moment they are published in the ERA technical document and they are assigned to a section in RINF. The IM can give an indication on the date that they will become applicable for a certain section at the time of submitting them to the Agency.

2.6.45. It is also possible that for some Infrastructure Managers there is no need to perform additional checks to prove technical compatibility. In that case the special value in technical document containing the ESC/RSC types for this situation should be used, and the fact that there is no need to perform

compatibility checks should be communicated to the Agency. In that situation all vehicles with TSI compliant subsystems will be compatible with that infrastructure.

2.6.46. The IM will assign in RINF the corresponding ESC/RSC Type identifier and should select the special value indicating that there are no additional checks needed for the concerned sections.

2.6.47. Trackside changes

2.6.48. The following picture describe the basic steps to be done by the Infrastructure Manager in case of performing changes that impact the technical compatibility.

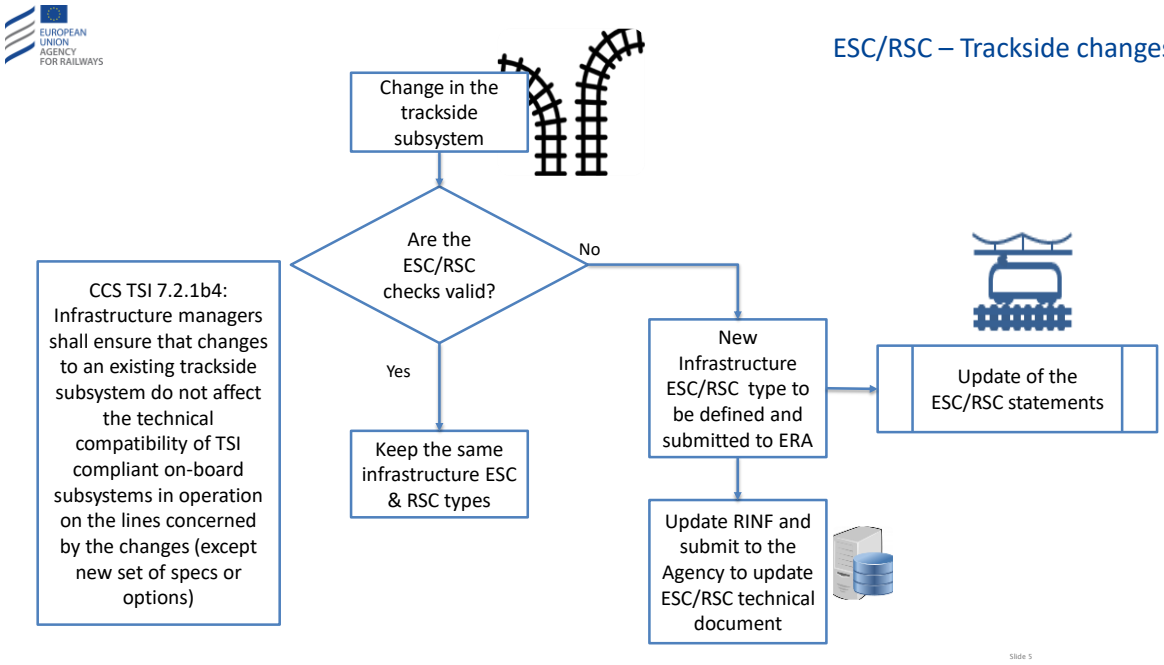


Figure 5.- Trackside changes impacting ESC/RSC

2.6.49. As requested by CCS TSI 7.2.1b4 the IM shall ensure that changes have no impact on TSI-complaint on-board operation. The Network Statement is a potential mean to inform in advance RUs about upcoming changes that may require new ESC/RSC types and checks and their date of applicability.

2.6.50. As generally stated for the SMS when an IM wants to perform a change it needs to identify if this could affect the users of its infrastructure and the necessary measures to cover the identified hazards.

2.6.51. If an on-board needs to be rechecked, only the new/updated ESC/RSC checks needs to be done, applying the principle that already passed checks remains valid, if the vehicle is not modified.

2.6.52. In order to allow a proper consolidation of the ESC/RSC for each network, is possible to add new ESC/RSC Types to an existing section. (See section 2.6.37 RINF, in particular 2.6.41 and 2.6.42). More compatible ESC/RSC type values can be added, after IM consolidation, without affecting the existing vehicles that have demonstrated compatibility with the previous versions of the ESC/RSC types.

2.6.53. In case an ESC/RSC type becomes invalid, this should be communicated to the Agency. The impacted sections in RINF should be update with the new ESC/RSC type. Existing operating vehicles may be impacted and may require an ESC/RSC Statement according to the new ESC/RSC type.

2.6.54. **Applicants for vehicle authorisation**

2.6.55. This section describes the first authorisation of a vehicle or any subsequent (e.g. extension of area of use, new authorisation after a change).

2.6.56. It is responsibility of the applicant for the authorisation to perform the ESC/RSC checks to demonstrate the technical compatibility.

2.6.57. It is required that at least one ESC/RSC Statement defined for each network inside the area of use is provided at the time of the requesting the vehicle authorisation. The provided ESC/RSC Statement must demonstrate the complete technical compatibility of the Class A systems, i.e. not limited to Level 0 or Level NTC operations. The ESC/RSC statement for the subsystem should include all the evidences (or proper justifications) for all the ESC/RSC type checks. If some of the checks have been done at the IC level, justification of their validity at subsystem level should be provided.

2.6.58. The ESC/RSC Statements and the related NoBo ESC/RSC Statement Report should be included by the applicant of vehicle authorisation in the Technical File accompanying the EC Declaration of Verification. If there is any ESC /RSC IC Statements it should be included in the Technical File accompanying EC Declaration of Conformity. Each time the ESC/RSC Statements in a vehicle type are updated, this should be reflected in the Technical File accompanying the EC Declaration of Verification and therefore a new EC Declaration of Verification should be issued.

2.6.59. The ESC/RSC checks successfully passed by the on-board subsystem and verified by a NoBo will be recorded in the authorisation as Basic Design Characteristics. They will also be included in ERATV in the relevant parameters (See Application Guide section 2.6.66 Basic Design Characteristics and ERATV).

2.6.60. In case no information is available in RINF concerning ESC/RSC, Interoperability Directive 2016/797 article 23 (b) applies. The infrastructure manager shall provide any relevant information free of charge and within a reasonable period of time.

2.6.61. In case the result of the ESC/RSC requires some conditions to be applied (e.g. for checks not successfully passed), these conditions should be included in the ESC Statement and recorded in the Authorisation as Conditions for Use.

2.6.62. These conditions should be reflected using the template for restrictions and added functions indicated in 2.6.8.

2.6.63. <u>After the first authorisation of the vehicle</u>

2.6.64. After the authorisation adding, removing or updating an ESC/RSC from the vehicle type is defined as a version (see Table 7.1 of CCS TSI 2019), so it does not require a new authorisation, if all the conditions are met:

(1) The vehicle should not be functionally changed after performing the ESC/RSC checks, considering the conditions in CCS TSI Section 7.2.1a.2.

(2) No new conditions are required by the ESC/RSC Statement (e.g. for checks not successfully passed) to be included. Conditions for use are defined as a BDC, and changing them triggers a new authorisation.

2.6.65. The following picture describe the process:

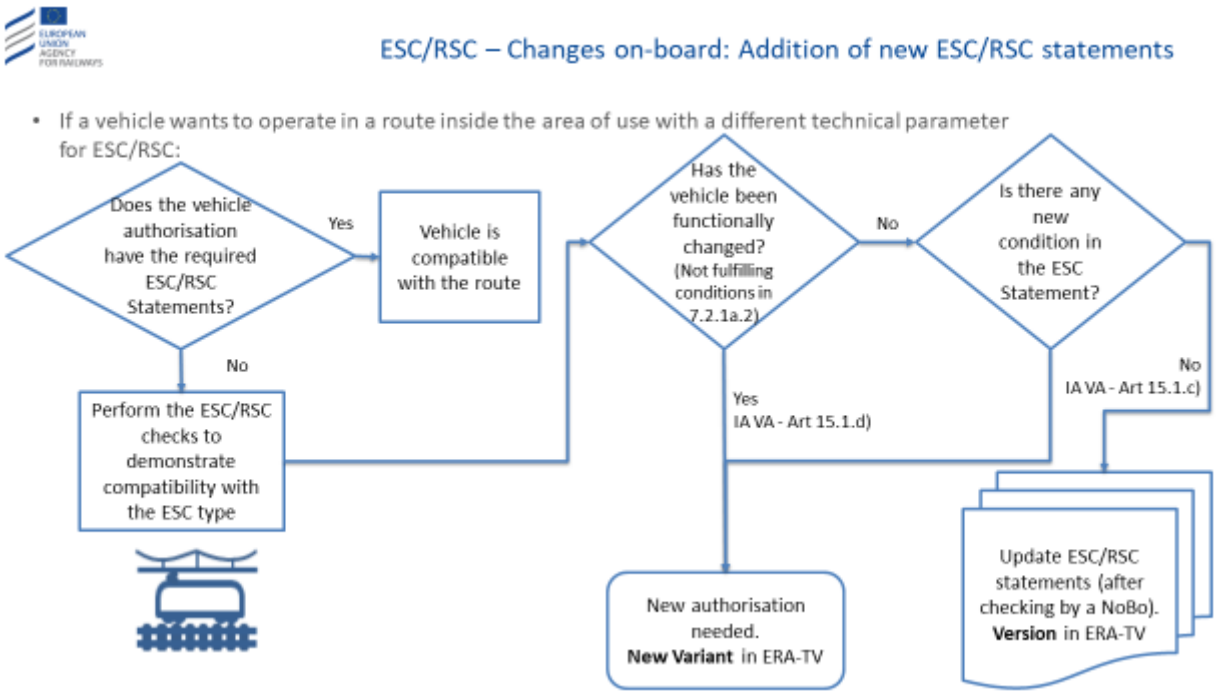


Figure 6.- Adding new ESC/RSC statement to an already authorised vehicle

2.6.66. Basic Design Characteristics and ERATV

2.6.67. As defined in the CCS TSI Table 7.1, the ESC/RSC Statements with the checks passed by the CCS on-board subsystem are Basic Design Characteristics.

2.6.68. The relevant ERATV parameters are:

- 4.13.1.8 ETCS System Compatibility
- 4.13.2.5 Radio Voice System Compatibility
- 4.13.2.8 Radio Data System Compatibility

2.6.69. For these parameters the ESC/RSC types that have been checked for the vehicles, should be defined by the ESC/RSC identifiers in the Agency Technical Document.

2.6.70. In case the vehicle is not equipped with ETCS or GSMR the value of the corresponding ERATV parameter (4.13.1.8, 4.13.2.5 and/or 4.13.2.8) value should be “Not applicable”.

2.6.71. In case the vehicle has demonstrated the compatibility according with CCS TSI section 7.4a, or in case ESC/RSC are not available in time preventing application of clauses 6.1.2.4 and 6.1.2.5 second part, the corresponding ERATV parameter (4.13.1.8, 4.13.2.5 and/or 4.13.2.8) value should be “National procedure according CCS TSI 7.4a”. The detail list of procedures and sections for which the technical compatibility has been demonstrated will be recorded as a non-coded restrictions (ERATV parameter 3.1.2.4).

2.6.72. **CCS NoBo with regards ESC/RSC checks**

2.6.73. Verifications Trackside CCS NoBo

2.6.74. The NoBo should verify that the ESC/RSC checks for the infrastructure are published in the Agency Technical Document as required in the CCS TSI - Table 6.3 – Row 10.

2.6.75. On-board ESC/RSC CCS NoBo

2.6.76. The main task of the NoBo with regards to the ESC/RSC statement(s) and associated report is to verify the correctness and completeness of the check report for the subsystem, according to the requirements in the CCS TSI Section 6.3.3.1. As indicated in Annex 6, it is possible to have checks passed at IC level test, but they should remain valid and reported in the final check report for the subsystem.

2.6.77. The sequence of inputs and assessment to the ESC/RSC (IC) statements are:

- The input for the NoBo assessment is the Check Report, for the IC or for the subsystem
- The NoBo performs the assessment as describe in the CCS TSI Section 6.3.3.1 and clarified in this Application Guide and produce a Statement Report
- The Entity applying for ESC/ RSC Demonstration draws the ESC/RSC (IC) Statement using the templates in Annex 7 or 8.

2.6.78. The tasks of the NoBo for the ESC/RSC verification are:

- to assess the completeness of the checks performed with respect to 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 track or if it may be performed in a lab – ensuring that the lab used is according to the agreement between the IM and the Entity applying for the ESC/RSC);
- to summarise the evaluation of the results (considering the pass/fail criteria indicated in the ESC/RSC type definition);
- to highlight the limitations or exported constraints, if any, that appear as a consequence of the results provided.

2.6.79. Since the ESC/RSC checks are not required in CCS TSI Table 6.2, they are not required for issuing an on-board subsystem certificate. Such a vehicle therefore has not demonstrated technical compatibility to run in any infrastructure, and at least one ESC/RSC check should be performed before requesting the vehicle authorisation.

2.6.80. It is possible to have a different NoBo assessing the subsystem certificate than the one verifying the ESC/RSC checks performed by the vehicle.

2.6.81. The NoBo will draw up a statement report with their check of the ESC / RSC check report, including the conditions (if any), to be attached to the vehicle technical file in the EC Declaration of verification drafted by the applicant of vehicle authorisation.

2.6.82. the NoBo should verify the Check report for the subsystem or for the IC assessing:

#	Assessment	Applicable for	
		Subsystem	IC
1	that the report gives reference to the necessary checks according to the technical document published by ERA and that all required ESC/RSC check in that ESC/RSC type has been performed (as required in CCS TSI 6.3.3.1, point a), thanks to what is included in ESC/RSC IC Statements, documentary checks or the test performed. For the IC check report it should be clearly indicated which checks has been verified from the ESC/RSC Type.	x	x
2	that ESC/RSC results indicate for every ESC/RSC Check whether the ESC/RSC Check was passed as specified or not;	x	x
3	that for every ESC/RSC Check which was not passed as specified, the incompatibilities and errors encountered during ESC/RSC Checks are stated (as required in CCS TSI 6.3.3.1, point c);	x	x
4	that for every ESC/RSC Check which was not passed as specified, an analysis of the effects on ESC/RSC has been performed and recorded using the template provided in Annex 9.	x	x
5	that all conditions were closed-out by the Entity applying for ESC/ RSC Demonstration. If not all conditions are closed, they are referred to in the check report.	x	
6	that the results from ESC/RSC IC Statement (if any) are applicable to the subsystem for which ESC/RSC checks have been performed.	x	

2.6.83. **Performing the ESC**

2.6.84. For additional guidance on the execution of the ESC refer to Annex 5 (ESC principles). The scope of the document is the process up to the Check Report and the ESC IC Statement.

2.6.85. The outcome of the process described in the Annex 5 is the check report with the evidences for all the ESC checks for an ESC Type. With those results an Applicant for an ESC demonstration should draw an ESC Statement, after the NoBo verification of the Check Report, as indicated in Section 2.6.82.

2.6.86. The ESC Statement should follow the template in annex 7.

2.6.87. **Performing the RSC**

2.6.88. For additional guidance on the execution of the RSC refer to Annex 6 (RSC principles). The scope of the document is the process up to the Check Report and the RSC IC Statement/RSC Statement.

2.6.89. The outcome of the process described in the Annex 6 is the check report with the evidences for all the RSC checks for an RSC Type. With those results an Applicant for an RSC demonstration should draw an RSC Statement, after the NoBo verification of the Check Report, as indicated in Section 2.6.82

2.6.90. The RSC Statement should follow the template in annex 8.

CCS TSI, section 6.2.4.1 – Mandatory test for the on-board ETCS

2.6.91. The conformity assessment for ETCS on-board IC in relation with table Basic Design Characteristic 7.1 for the type of change :

- First conformity assessment against a set of specification or change of set of specifications: Full subset-076 test campaign.
- Change of on-board implementation (same set of specifications):
    - Change of realisation: Proprietary tests (covered by AsBo report)
    - Implementation of Art 10 Agency Opinion CR (Application Guide section 2.7.16): Proprietary tests (covered by AsBo report) and eventually complemented with updated Test Cases/Test Sequences made available by Agency (covered by NoBo report)
    - Functional change: Proprietary tests (covered by AsBo report) + Impact analysis and repetition of Test Sequences (covered by NoBo report)

2.6.92. The conformity assessment for ETCS on-board IC in relation with applicable ss-076 versions pursuant the application of CCS TSI Art 13.3 use of TSI 2016/919 and the relevant Agency Opinions:

- Conformity assessment according to set of spec #3: In case ETCS on-board IC is initially certified with TSI 2016/919 (where no Test Cases/Test Sequences were available), then §6.2.4.1 “The applicant is responsible to define the test cases and their organisation in sequences, if this is not included in specifications referenced in this TSI… these tests were carried out in a laboratory accredited…” shall apply. Any further assessment of ETCS IC and depending on the type of change (see above conditions) should use test cases 076-5-2 v3.3.0 and test sequences 076-6-3 v3.2.0 as reference
- Conformity assessment according to set of spec #2: In case ETCS on-board IC is initially assessed with TSI 2016/919 (where Test Cases and Test Sequences were in version 3.1.0 and 3.0.0 respectively) , then any further assessment of ETCS IC and depending on the type of change (see above conditions) should use test cases 076-5-2 v3.2.0 and test sequences 076-6-3 v3.1.0 as reference

CCS TSI, section 6.3.3 – Assessment requirements for an On-board Subsystem, GSM-R SIM card

2.6.93. As indicated in the first row of Table 6.2 of the TSI Control-Command and Signalling, the On-board Subsystem has to be assessed with a GSM-R SIM card that is compliant to the requirements of the TSI. Due to the special characteristics of this Interoperability Constituent, the replacement of a TSI compliant GSM-R SIM card by another TSI compliant GSM-R SIM card does not affect the compliancy to the TSI of the On-board Subsystem. This implies that there is no need to reassess the On-board Subsystem in the case of replacement of a GSM-R SIM card compliant to the TSI with another one also compliant to the TSI.

2.6.94. For SIM cards placed on the market after entry into force of Control-command and Signalling TSI specifying the GSM-R SIM card as Interoperability Constituent, compliance with TSI is ensured by the EC Declaration of conformity. Regarding SIM cards placed on the market before the entry into force of that TSI (and therefore without EC Declaration of conformity):

1. where a Notified Body has evidence (e.g. from their previous use or from check of relevant documentation) that they are compliant with the requirements of the TSI, those SIM cards can be used to verify Control-command and Signalling On-board subsystems;
2. where a manufacturer or contracting entity can justify that their use does not affect the compliancy to the TSI of the On-board Subsystem, then, as per the article 110.1 in [32], the replacement of the SIM card can be considered a "substitution in the framework of maintenance", like in the case of SIM cards holding an EC Declaration of conformity.

CCS TSI, section 6.3.3 – Assessment requirements for an On-board Subsystem, Interoperability Constituents certified for a different version of the TSI

2.6.95. The CCS TSI (see first row of its Table 6.2) permits the use of Interoperability Constituents that have been certified against a different version of the TSI, provided the Notified Body assesses that the certificate of Verification of the subsystem still ensures compliance with the requirements of the TSI in force.

2.6.96. In the case of GSM-R, a new Baseline (Baseline 1) has been introduced in the TSI, replacing the previous one (Baseline 0). The main differences between both Baselines for the Interoperability Constituents defined are:

- for the GSM-R voice cab radio, the protection against interferences;
- for the GSM-R SIM card to be used in an EDOR, the support of GPRS[1];
- for the GSM-R EDOR, the protection against interferences and the support of Packet Switched communication.

2.6.97. GSM-R Interoperability Constituents that have been certified against older versions of the TSI will not present the characteristics indicated in Application Guide section 2.6.96. However, these Interoperability Constituents can be integrated in On-board Subsystems, when the resulting subsystem complies with the requirements in the TSI. It is important to understand that only the Table A2.3 (set of specifications #3) includes the transmission of ETCS data over GPRS. In particular, the following cases can be expected:

1. A GSM-R voice cab radio or a GSM-R EDOR that do not present protection against interference can be integrated in an On-board Subsystem where an external filtering device is fitted, provided that the resulting subsystem presents the characteristics required in the TSI;
2. A GSM-R voice cab radio or a GSM-R EDOR that do not present protection against interference, when integrated in an On-board Subsystem without an external filtering device, will result in an On-board Subsystem that is not compliant to the TSI requirements;
3. A GSM-R EDOR or GSM-R SIM card that do not support GPRS can be integrated in an On-board Subsystem that is compliant either with the Table A 2.1 (set of specifications #1) or with the Table A 2.2 (set of specifications #2).The resulting subsystem will be compliant to the TSI requirements;
4. A GSM-R EDOR or GSM-R SIM card that do not support GPRS when integrated in an On-board Subsystem that is compliant with the Table A 2.3 (set of specifications #3) will result in an On-board Subsystem that is not compliant to the TSI requirements.

Note that the set of specifications #3 foresees for the EDOR the possible operation with different data communication flows (which requires the support of multiple virtual interfaces). This is not a TSI

[1] Note that if non-GPRS aware SIM cards are used, the GPRS service can be used but it may not be possible to use all the cryptographic algorithms.

requirement (not “Mandatory for Interoperability” in CCS TSI Index 33). Therefore, the implementation of this feature in the EDOR should be considered as an option in the TSI; in case the option is implemented, the details are described in CCS TSI Index 34 and they shouldbe verified by the NoBo.

CCS TSI, section 6.3.4 – Assessment requirements for a Trackside Subsystem

2.6.98. The CCS TSI (see first row of its Table 6.3) permits the use of Interoperability Constituents that have been certified against a different version of the TSI, provided the Notified Body assesses that the certificate of Verification of the subsystem still ensures compliance with the requirements of the TSI in force.

2.6.99. The CCS TSI Table 6.3 rows 6 and 9 require test with a certified on-board subsystem. This is only feasible by the integration of the subsystem into a vehicle. In general, a complete on-board subsystem is needed, since Table 6.3 row 6 indicates that it should cover Basic Parameters 4.2.3 Trackside ETCS functionality, 4.2.4 mobile communication (both voice and data) and 4.2.5 ETCS and GSM-R air gap. This on-board subsystem should be able to process all the functions configured trackside, i.e. process all the packets with the higher M_VERSION (X,Y) from trackside. If only one part of the trackside subsystem is under certification, an on-board with only the relevant part can be used, e.g. a certified ETCS on-board subsystems without Voice Cab-Radio part, can be used to certified a trackside where only the train protection part of the trackside subsystem is installed. In case the on-board implements more than one part, an on-board subsystem certificate is needed. ISV are not acceptable as substitute of the certificates.

2.6.100. It is not enough to execute the Operational Test Scenarios only in lab testing for certification of the trackside. In the absence of a second certified on-board subsystem integrated into a vehicle, it may be acceptable to do the same set of Operational Test Scenarios in a lab[2] environment representative of the trackside to be certified, with a second certified group of on-board ICs from a supplier different than the certified on-board subsystem supplier, as long as there are no restrictions or conditions for use that make impossible to execute the tests.

2.6.101. Regarding the possible implementation and certification of compatible packets with the same X of the M_VERSION but with a higher Y of the M_VERSION, e.g. implementing M_VERSION 1.1 packets on a M_VERSION 1.0 trackside, or M_VERSION 2.1 packets on a M_VERSION 2.0 trackside, several scenarios are possible as explained below.

2.6.102. If the trackside is already certified and in operation, with one M_VERSION, the possible modification to include higher Y packets to ensure compatibility with vehicles according to later version of the specifications, should be consider as an added functionality, that should be certified against the TSI and set of specification where this new functions are defined. In that sense, this additional certificate will be a delta one, only covering the added functions implemented, without the need to reassess and recertify the unmodified part. The final subsystem certificate will remain according to the original TSI and set of specification, but mentioning the added functionality according to the updated TSI and set of specifications.

2.6.103. In case it is implemented in a new trackside, it should be installed and certified according to the latest TSI and the set of specifications where the new functionalities are defined, using the provisions on chapter 6 to use an earlier M_VERSION if necessary.

[2] The laboratory does not need to be certified according to the standard ISO/IEC 17025:2015.

CCS TSI, section 6.3.3 and 6.3.4 – Check of values of ETCS IDs

2.6.104. In CCS TSI Annex table 6.2 row 2 and table 6.3 row 2, it is indicated to check that the values of ETCS ID are in the allowed range and, if required by this TSI, to have an unique value. These checks should be performed according to the Agency document "ERA_ERTMS_040001 – Assignment of values to ETCS variables" [31] in the latest available version on the date of assessment.

CCS TSI, section 6.3.4 – Conformity assessment of IC Axle Counter (Table 6.3 – row 2)

2.6.105. The technical compatibility requirements are only related to the interface between the axle counter and the vehicle. They are specified in Index 77.

2.6.106. Because the Axle Counter is fixed trackside equipment it is not necessary to meet the complete range of conditions of use (e.g. in terms of track gauge, speed) in Index 77:

- For track gauge dependent parameters, i.e. axles distances, wheel geometry and axle load it is sufficient to fulfil the requirements for the specific track gauge where it is intended to be used and to indicate it in the certificate of verification.
- For speed dependent parameters related to the vehicle design, e.g. axle distances and minimum wheel diameter, the Axle Counter can be certified for a lower maximum speed than 400 km/h. This maximum speed has to be indicated in the certificate of verification.

2.6.107. The following table provides an overview, which parameters of Index 77 have to be assessed at constituent level and how (see table 16 of Index 77):

3.1.2.2 Minimum axle distance	The worst case for the time between two subsequent axles is 19,4 ms for trains with 2160 mm axle distance running with a speed of 400 km/h. The compliance can be demonstrated with a test in the lab in combination with simulations and/or calculations.
3.1.3.1 Minimum wheel rim width 3.1.3.2 Minimum wheel diameter 3.1.3.3 Minimum flange thickness 3.1.3.4 Flange height	The minimum values of these parameters in combination are the worst case for axle counters. The compliance can be demonstrated with tests in the lab in combination with simulations and/or calculations. The sinusoidal sway (60 mm acc. to EN 50617-2, section 7.4) should be regarded (not part of Index 77). An alternative could be a test with a virtual wheel combining all worst case values over all track gauges (diameter= 330 mm, rim width = 126 mm, flange thickness = 21,0 mm, flange height = 27,5 mm).
3.1.3.5 Metal and inductive components-free space between wheels	Metal parts, placed 40 mm over rail head should have no influence on axle counter; As no specific requirements on magnetic brakes and eddy current brakes are yet defined in the interface document, the assessment of axle counters with regards

	to the compatibility with these brakes is not part of the IC certification.
3.1.3.6 Wheel material	Lab tests should be done with real wheels or with simulated wheels with comparable properties (e.g. in terms of conductivity, permeability).
3.2.1.1 Frequency management 3.2.1.2 Vehicle emission limits and evaluation parameters 3.2.1.3 Evaluation of exceedances of limits 3.2.1.4 Measurement specification	The measurements for the axle counter should be done with a compatibility margin of + 9 dB (See EN 50617-2 § 6.1.2.; § 6.2.3. and § C.9 a) . It is acceptable to use another method.

2.6.108. The following parameters of an axle counter system are not covered by the IC certification because they are related to the application engineering. They are assessed in the framework of the verification of the subsystem:

3.1.2.1 Maximum axle distance	The length of an axle counter section should be greater than the maximum axle distance of a vehicle. Otherwise the vehicle could span the section completely without having an axle inside the section.
3.1.2.4 / 3.1.2.5 Distances between the nose and the first axle of the train and the distance between the last axle and the tail of the train	This parameter is relevant for the positioning of axle counters in the required distance to danger points (e.g. boundary marks at switches).

CCS TSI, section 6.4.1 – Assessment of parts of control-command and signalling subsystems

2.6.109. Parts should not be confused with Groupings of Interoperability Constituents. A grouping should be treated as an IC for certification purposes. A grouping targets normally to group functions of basic interoperability constituents (e.g. ETCS on-board and Odometry, LEU and Balise, LEU and Euroloop,…).

2.6.110. Parts can be used for certification purposes and the basic parameters in accordance with the relevant essential requirements are allocated to each part (see Table 4.1 of CCS TSI). A part targets normally to not re-certify CCS solutions or at least to minimise it to the relevant interfaces. Parts were introduced to allow the migration of Subsystems (on-board and trackside) in a "natural way" for the IMs and RUs: it is common to upgrade/install the radio separately from the signalling system, in many cases with years of difference, and this mechanism permits the authorisation based on a full certificate only covering the Part. When the Subsystem is only including Class A for one of the defined Parts, the Subsystem certificate covers that Part and the integration of the Part in the corresponding Subsystem.

2.6.111. In any case, applicants cannot use the addition of parts as substitution of the EC declaration of verification of the subsystem and/or EC certificates of verification of subsystems, because the integration between parts must be checked by the NoBo in charge of the verification of the subsystem (It is only true if there is one single part in the vehicle).

2.6.112.The following figure illustrate the components inside an EC declaration of verification of the on-board subsystem:

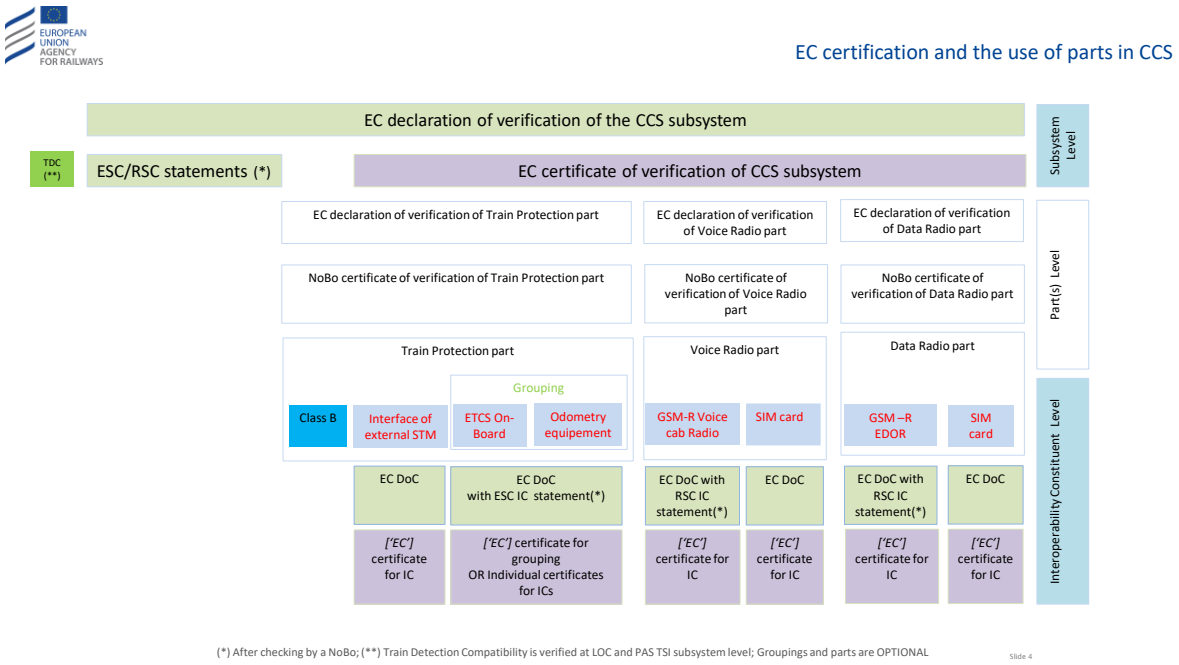


Figure 7.- EC certification and the use of parts in CCS

2.7. Implementation

Management of ERTMS specifications

2.7.1. Functional enhancement and error correction of the ETCS and GSM-R specifications is managed by the Agency, as system authority, applying its procedures for management of documents and the procedures for ERTMS Change Control Management [26].

2.7.2. The application of the principles for system version management ensures that the evolution of the ETCS and GSM-R specifications respects the conditions and limitations of backward compatibility.

Changes on CCS on-board software

2.7.3. The following picture describes a basic flowchart on the software changes on the CCS on-board changes, regarding the BDC “on-board ETCS implementation”:

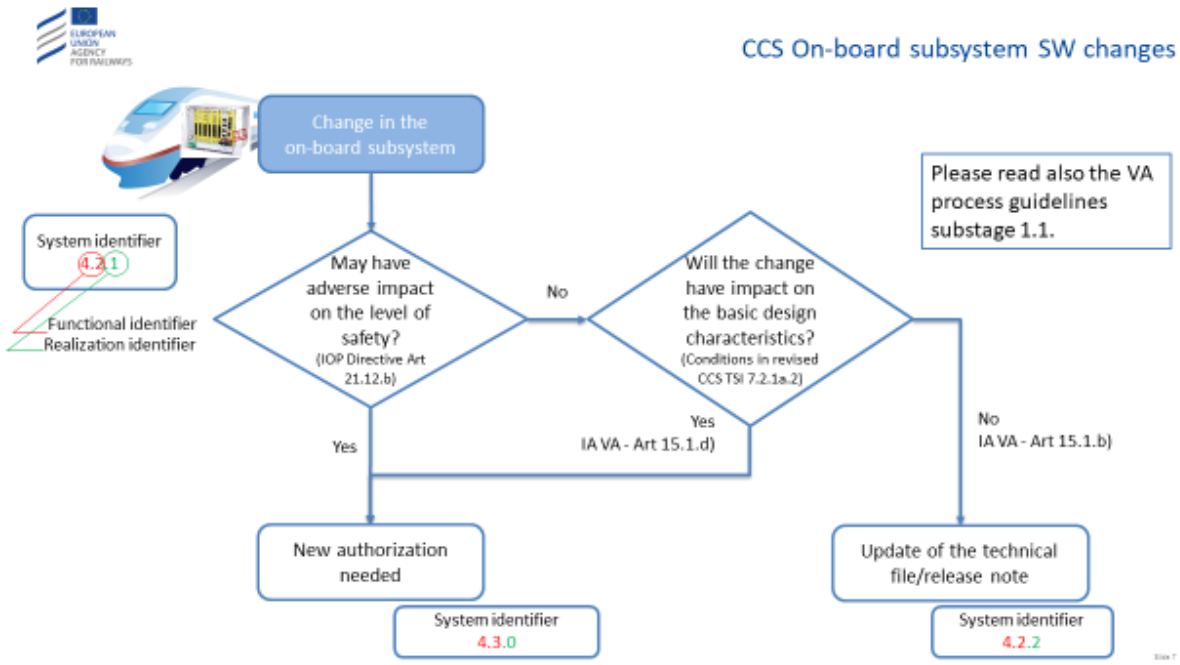


Figure 8.- CCS On-board software changes

Implementation Rules

2.7.4. The TSI Control-Command and Signalling specifies provisions for the management of the legacy systems (defined “Class B” in the TSI) during the transition phase under the responsibility of the relevant Member State. This includes the obligation to ensure that their functionality remains unchanged (with the only exception of modifications necessary to mitigate safety related flaws).

2.7.5. Section 7.3 of the TSI Control-Command and Signalling refers to the rules for implementation of GSM-R (on-board and trackside), section 7.5 to the rules for train detection systems (only trackside, rules for vehicles are stated in the corresponding TSIs).

2.7.6. Rules for ETCS are stated in chapter 7.4 of the TSI Control-Command and Signalling. It must be taken into account that, where installation of ETCS is not mandatory, a Member State may only require on-board installation of Class B train protection systems listed in the Technical Document referenced in section 2.2 of the TSI Control-Command and Signalling.

2.7.7. In section 7.4.2.1 the meaning of “new vehicles” in the CCS TSI is newly built vehicles.

2.7.8. In the case of upgrading or renewal of an existing vehicles, as indicated in section 7.4.2.2 the obligation to install ETCS is only for high-speed vehicles. But in all cases where ETCS is installed in an existing vehicle only the sets of specifications applicable for on-board in the latest TSI should be use (i.e. set of specifications #2 or #3), as indicated in the headers of CCS TSI Table A.2.1.

2.7.9. Set of specifications #1 is only applicable for trackside CCS subsystems.

2.7.10. For the CCS on-board subsystem there is transition period defined in 7.4.2.3 to use set of specifications #1 for a limited time, and is only applicable for new vehicles, considering what has been indicated in this Application Guide in clause 2.7.7 for the meaning of “new vehicles”.

2.7.11. According to section 7.4.2.1.3 all vehicle types based on set of specifications #1, can no longer be used for conformity to type of new vehicles.

2.7.12. For the existing vehicle types in ERATV the parameter 3.1.2.1 "Status" should be set to the value "to be renewed", under the 4th RP regime. This option does not exist under the 3rd RP regime, so the closest option is "withdrawn". For the definitions refer to Section 6.- Glossary of ERATV Decision [18]. In all cases, this change needs to be done by the authorising entity of the vehicle type.

Baseline Compatibility Assessments

2.7.13. In order to facilitate transparency and interoperability between the different sets of specifications laid down in the TSI Control-Command and Signalling, a double exercise for checking the compatibility of the B3 MR1 and B3 R2 have been carried out.

2.7.14. The first assessment [34] was undertaken by UNISIG and ERTMS Users Group experts and provides the results of checking the delta between the Baseline 2 (B2) and the Baseline 3 Maintenance Release 1 (B3 MR1). The Analysis was performed for the backwards compatibility of each CR included in the B3 MR1 with regards to the B2.

2.7.15. The second assessment [35] was undertaken by the Agency in cooperation with the sector organisations (UNISIG and ERTMS Users Group experts) and provides the results of analysing that the Baseline 3 Release 2 (B3 R2) is fully backward/forward compatible with the Baseline 3 Maintenance Release 1 (B3 MR1), but also to check both the backward compatibility between Baseline 3 Release 2 (B3 R2) trains and a Baseline 2 (B2) trackside and the compatibility between a Baseline 3 Release 2 (B3 R2) trackside operated with system version X=1 (i.e. a B3 R2 trackside using only B2 functions) and B2 trains

Agency's Opinions

2.7.16. Article 10 of the TSI Control-Command and Signalling requests to the Agency to provide an Opinion (OPI) on the errors logged in the ERTMS change request database that could prevent a normal service. Furthermore, it requests that the Agency publishes as early as possible the respective solutions to correct them as well as the evaluation of their impact in the compatibility and stability of the existing ERTMS deployment. The technical opinion contains the final solutions for the errors and also recommended temporary mitigation measures which could be implemented on the trackside to overcome the detected errors .This Opinion is referenced as ERA/OPI/2020-2 [36] in the ERA Opinions register. This opinion repeals and replaces the previous opinion ERA/OPI/2017-2.

2.7.17. It is important to highlight that also other opinions could be provided by the Agency at any moment on request and in accordance to the Agency's Regulation. These opinions are accessible through the Agency's Opinion register in our website [37].

2.7.18. In relation with the application of CCS TSI Art 13.3 use of TSI 2016/919 and the relevant Agency Opinions, the conformity assessment for the subsystem should include an impact analysis of Article 10 Change Requests as referred in ERA technical opinion(s), on the specific ETCS on-board implementation.

2.8. Appendices of the CCS TSI (Annexes of the CCS TSI)

CCS TSI, Annex A – Tables A.2 – Slipping references to standards

2.8.1. Some of the documents listed in Tables A.2 make references to clearly identified points of EN standards without explicit identification of a particular version of the EN standard ('slipping' references). In such cases according to section 3.2.1 of the Application Guide for TSIs General part [33] "the reference is to the version of the document in force at the time of adoption of the latest version of the TSI in question". For some TSI amendments, that did not intend to modify Annex A requirements, this creates some inconsistency on the references. As a temporary solution, while the proper correction on the documents list in Tables A.2 is published, it is provided in this Application Guide the correct reference to be used in the identified inconsistent references:

a) Index 9 – SUBSET-036 FFFIS for Eurobalise

· Section 6.6.4: The reference to sub-clause 4.12 of EN 50125-1 should be consider to the version EN 50125-1:1999.

· Section 5.9.2: Replace "sub-clause 3.3.8" with "chapter 4", and "sub-clauses 6.2.3 and 6.2.4" with "sub-clauses 7.3 and 7.4" to the version EN 50122-1 1:2011 + A1:2011 + AC:2012 + A2:2016 + A3:2016 + A4:2017.

CCS TSI, Annex A – Table A.3 – List of mandatory standards

2.8.2. This section of the Application Guide refers to the EN 50126, EN 50128, EN 50129 and EN 50159 standards, listed in Annex A, table A3 of the Control-Command and Signalling TSI (and also as harmonised standards in [24]).

2.8.3. The concepts of these standards are used:

1. in SUBSET-091 (mandatory specification for the TSI Control-Command and Signalling, see Index 27 of Annex A, tables A-2) to clarify the relationship between quantitative Tolerable Hazard Rates (THRs) and the requirements for the management of systematic failures during the development of a product;
2. in chapter 6 of the TSI Control-Command and Signalling, for the requirements related to the assessment of "RAMS"

2.8.4. Some provisions within the standards are based on the assumption of the organisation of the railways before the entry in force of the different "railway packages" of European Directives, in particular the opening of the market and the separation of train operation from infrastructure management. A statement in Annex A of the TSI Control-Command and Signalling, before table A3, ensures that, where conflicts or possibility of different interpretation exist, the Directives and TSIs take precedence.

CCS TSI, Annex G – Open Points

2.8.5. The open points related to Control-Command and Signalling are listed in Annex G of the TSI Control-Command and Signalling.

2.8.6. According to art 13 and 14 of [2] the Member States should notify national rules for the management of open points, until they are completely solved with an update of the TSI.

However, a Control-Command and Signalling Trackside or On-board subsystem where a National Rule is applied:

1. usually does not allow interoperability, and
2. might also be incompatible with future Control-Command and Signalling subsystems where the harmonised solution for the open point is applied

2.8.7. It is therefore advisable to limit as much as possible the negative effects of applying national rules in the implementation of Control-Command and Signalling subsystems. For this reason the Members States are invited, before deciding the rules to be notified, to check the “Notes” in Annex G and, if necessary, contact the Agency, to gather information about the scope of the open point and the state of the work for its solution.

2.8.8. Moreover, art 8 of [3] requires Member States to submit draft safety rules to the Agency and the European Commission for examination; the Agency and the European Commission will assess strictly the introduction of any new rule in order to prevent further barriers from being created, according with Art 25(1) of [1].

3. APPLICABLE SPECIFICATIONS AND STANDARDS

3.1. Foreword

3.1.1. The requirement for compliance with TSI Control-Command and Signalling is supported by a set of specifications and standards, to promote an open market and to facilitate the management of equipment during the whole lifetime (including maintenance and upgrade).

3.2. Use of the specifications and standards

3.2.1. The specifications and standards in the tables of this chapter have been listed by the Agency, after a check of their scope and content with the cooperation of experts from the working parties (reference to Agency regulation) and with the opinion of Notified Bodies and National Safety Authorities. See [26].

3.2.2. The application of the specifications and standards listed in this Application Guide remains voluntary, as they refer to aspects of the Subsystems where the adoption of solutions that are not harmonised does not prejudice interoperability (provided the solution respects functional and performance requirements specified in the relevant basic parameters).

3.2.3. These specifications and standards should not be confused with the specifications listed in the Annex A of the TSI Control-Command and Signalling, which are essential part of the definition of the basic parameters and are therefore mandatory.

3.3. References

3.3.1. Table 3 indicates for each basic parameter (chapter 4 of the TSI Control-Command and Signalling) the corresponding harmonised standards and/or informative specifications, which can support the development of interoperability constituents and subsystems and their certification

Table 4: References

Reference in chapter 4 of TSI Control-Command and Signalling	No (see table 4 or 5)
4.1	
4.1c	
4.2.1	
4.2.1 a	19, 20, 21, 22, 23, 24, 43, 44, 47, 53, 55
4.2.2	
4.2.2.a	
4.2.2.b	4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 39, 40, 41, 42, 45, 50, 51

Reference in chapter 4 of TSI Control-Command and Signalling	No (see table 4 or 5)
4.2.2.c	
4.2.2.d	
4.2.2.e	
4.2.2.f	54, 55
4.2.3	
4.2.3 a	
4.2.3 b	9, 10, 11, 12, 13, 14, 15, 16, 17, 39, 40, 41, 42, 50, 52
4.2.3 d	
4.2.4	
4.2.4 a	59, 60, 62
4.2.4 b	59, 62
4.2.4 c	61
4.2.4 d	59, 62
4.2.4 e	5, 37
4.2.4 f	58, 59, 60, 61, 62
4.2.4 g	59, 60
4.2.4 h	59, 62
4.2.4 j	59, 62
4.2.4.k	59, 62
4.2.5	
4.2.5 a	
4.2.5 b	
4.2.5 c	
4.2.5 d	57
4.2.5 e	
4.2.6	
4.2.6 a	3, 7, 8

Reference in chapter 4 of TSI Control-Command and Signalling	No (see table 4 or 5)
4.2.6 b	
4.2.6 c	
4.2.6 d	
4.2.6 e	
4.2.7	
4.2.7 a	56
4.2.7 b	
4.2.7 c	
4.2.7 d	
4.2.7 e	
4.2.8	
4.2.8 a	
4.2.9	
4.2.9 a	
4.2.10	
4.2.10 a	
4.2.11	
4.2.11 a	H4, H5, H6 48, 49, 49A
4.2.12	
4.2.12 a	25, 27, 28, 29, 30, 34, 51
4.2.13	
4.2.13 a	25, 27, 28, 29, 30, 34

Reference in chapter 4 of TSI Control-Command and Signalling	No (see table 4 or 5)
4.2.14	
4.2.14 a	
4.2.15	
4.2.15 a	
4.2.16	H2, 2, 63

3.4. Harmonised standards

3.4.1. The following standards are referenced [24].

Table 5: Harmonised standards

No	Reference	Document Name	Version	Notes
H1		Intentionally deleted		
H2	EN 50125-3	Railway applications — Environmental conditions for equipment — Part 3: equipment for signalling and telecommunications	2003	
H3	Intentionally deleted			
H4	EN 50617-1	Railway applications - Technical parameters of train detection systems for the interoperability of the trans-european railway system - Part 1: track circuits	2015	
H5	EN 50617-2	Railway applications - Technical parameters of train detection systems for the interoperability of the trans-european railway system – Part 2: axle counters	2015	
H6	EN 50592	Railway applications. Testing of rolling stock for electromagnetic compatibility with axle counters	2016	

3.4.2. NoBos should check the versions that are referred in the TSI. The new versions can be used if it is demonstrated that fulfil the requirement of the version referred to in the CCS TSI.

3.5. Informative specifications

3.5.1. The following Tables list the informative specifications that are relevant for each of the Table A 2.1, A 2.2 or A 2.3 of the Control-Command and Signalling TSI.

3.5.2. In the "Notes" column of the following tables some of the informative specifications are related to a mandatory specification, identified through the Index in the tables of Annex A of the TSI Control-Command and Signalling.

Table 6.1: List of supporting informative specifications related to Table A-2.1 of CCS TSI

No.	Set of specifications #1 (ETCS baseline 2 and GSM-R baseline 1)			
	Reference	**Document Name**	**Version**	**Notes**
1	02S126	RAM requirements (chapter 2 only)	6	Index 28
2	97S066	Environmental conditions	5	
3	SUBSET-074-1	Methodology for testing FFFIS STM	1.0.0	Index 36
4	97E267	Odometer FFFIS	5	
5	O_2475	ERTMS GSM-R QoS test specification	4.0.0	Index 33 and Note 4
6	Intentionally deleted			
7	SUBSET-074-3	FFFIS STM Test specification traceability of test cases with specific transmission module FFFIS	1.0.0	Index 36
8	SUBSET-074-4	FFFIS STM Test specification traceability of testing the packets specified in the FFFIS STM application layer	1.0.0	Index 36
9	SUBSET 076-0	ERTMS/ETCS Class 1, test plan	2.3.3	Index 37
10	SUBSET 076-2	Methodology to prepare features	2.3.0	Index 37
11	SUBSET 076-3	Methodology of testing	2.3.1	Index 37
12	SUBSET 076-4-1	Test sequence generation: methodology and rules	1.0.2	Index 37
13	SUBSET 076-4-2	ERTMS/ETCS Class 1 states for test sequences	1.0.2	Index 37
14	SUBSET 076-5-3	On-board data dictionary	2.3.0	Index 37
15	SUBSET 076-5-4	SRS v.2.3.0 traceability	2.3.3	Index 37
16	SUBSET 076-6-1	UNISIG test database	2.3.3	Index 37
17	SUBSET 076-6-4	Test cases coverage	2.3.3	Index 37
18	Intentionally deleted			
19	SUBSET 077	UNISIG causal analysis process	2.2.2	Index 27
20	SUBSET 078	RBC interface: failure modes and effects analysis	2.4.0	Index 27
21	SUBSET 079	MMI: failure modes and effects analysis	2.2.2	Index 27
22	SUBSET 080	TIU: failure modes and effects analysis	2.2.2	Index 27

23	SUBSET 081	Transmission system: failure modes and effects analysis	2.3.0	Index 27
24	SUBSET 088	ETCS Application levels 1 and 2 — safety analysis	2.3.0	Index 27
25	TS50459-1	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface Part 1 — General principles for the presentation of ERTMS/ETCS/GSM-R information	2015	Index 33 and Note 1
26	Intentionally deleted			
27	TS50459-2	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — Driver Machine Interface Part 2 — Ergonomic arrangements of GSM-R information	2015	Index 33 and Note 1
28	TS50459-4	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface Part 4 — Data entry for the ERTMS/ETCS/GSM-R systems	2005	Index 33 and Note 1
29	TS50459-5	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface Part 5 — Symbols	2005	Index 33 and Note 1
30	TS50459-6	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface Part 6 — Audible information	2005	Index 33 and Note 1
31	Intentionally deleted			
32	Intentionally deleted			
33	Intentionally deleted			
34	ERA/ERTMS/0155560	ERTMS/ETCS Driver Machine Interface	2.3	Note 1
35	Intentionally deleted			
36	Intentionally deleted			
37	SUBSET-093	GSM-R Bearer Service Requirements	4.0.0	Index 33 and Note 4
38	Intentionally deleted			
39	SUBSET-076-5-1	ERTMS ETCS Class 1 feature list	2.3.3	Index 37
40	ERA/ERTMS/040063	Test sequences evaluation and validation	1.2.0	Index 37
41	SUBSET-076-6-8	Generic train data for test sequences	1.0.1	Index 37
42	SUBSET-076-6-10	Test sequence viewer (TSV)	3.2.2	Index 37
43	04E083	Safety requirements and requirements to safety analysis for interoperability for the control-command and signalling subsystem	1.0	Index 27

44	04E084	Justification report for the safety requirements and requirements to safety analysis for interoperability for the control-command and signalling subsystem	1.0	Index 27
45	ERA/ERTMS/003205	Traceability of changes to ETCS FRS	1.0	Index 1
46	Intentionally deleted			
47	SUBSET-113	ETCS Hazard Log	ERA website	Index 27 Note 9
48	EN 50617-1	Railway Applications – Technical Parameters of train detection systems for the interoperability of the trans-European Railway system : Part 1 Track Circuits	2015	Index 77
49	EN50617-2	Railway Applications – Technical Parameters of train detection systems for the interoperability of the trans-European Railway system : Part 2 Axle Counters	2015	Index 77
49A	EN50592	Railway Applications – Testing of Rolling Stock for electromagnetic compatibility with axle counters	2016	Index 77
50	ERA/ERTMS/040054	ETCS Engineering guidelines	1.0.0	Index 4
51	ERA/ERTMS/040055	ETCS DMI objects - START / STOP conditions	**1.0.0**	**Index 4 and Index 6**
52	ERA/ERTMS/040022	Baseline 2 requirements for implementation of braking curves functionality	**5.0**	**Index 4**
53	Intentionally deleted			
54	Intentionally deleted			
55	Intentionally deleted			
56	Intentionally deleted			
57	Intentionally deleted			
58	O-2875	ERTMS/GSM-R Quality of Service test specification for EIRENE QoS requirements	2.0.0	Index 33
59	O-3001-1	GSM-R Cab radio test cases catalogue	1.1.0	Index 32 and Index 33
60	O-3001-2	GSM-R EDOR test cases catalogue	1.1.0	Index 32 and Index 33
61	O-3001-3	GSM-R SIM card test cases catalogue	1.1.0	Index 33 and Index 67
62	O-3001-4	GSM-R Network test cases catalogue	1.2.0	Index 32 and Index 33
63	EN 50125-1	Railway applications — Environmental conditions for equipment — Part 1: equipment on board rolling stock	2014	Note 8

Note 1: This specification is related to the ergonomics aspects of the DMI. The DMI is an open point in the ETCS Baseline 2. Concerning the ETCS DMI, Index 6 of TSI Control-Command and Signalling Appendix A provides the details of the mandatory specification harmonised for the ETCS B3 MR1 and R2. With regards to the GSM-R DMI, this Index

provides additional information to implement the mandatory requirements of the EIRENE SRS.

Note 4: O-2475 version 4.0.0 and SS-093 version 4.0.0 including the KPIs for GSM-R CS and for GSM-R PS, have been published in this CCS TSI Application Guide.

Note 7: Intentionally deleted.

Note 8: For the requirements about "Vibrations and Shocks" refer to version 1999. See CSS TSI Application Guide Section 2.8.1.

Note 9: The latest version of SS-113 will be available in the Agency webpage under the following link:
https://www.era.europa.eu/sites/default/files/activities/docs/subset_113.pdf

Table 6.2: List of supporting informative specifications related to Table A-2.2 of CCS TSI

No.	Set of specifications #2 (ETCS baseline 3 Maintenance Release 1 and GSM-R baseline 1)			
	Reference	**Document name**	**Version**	**Notes**
1	02S126	RAM requirements (chapter 2 only)	6	Index 28
2	97S066	Environmental conditions	5	
3	SUBSET-074-1	Methodology for testing FFFIS STM	3.0.0	Index 36
4	97E267	Odometer FFFIS	5	
5	O_2475	ERTMS GSM-R QoS test specification	4.0.0	Index 33 and Note 4
6	Intentionally deleted			
7	SUBSET-074-3	FFFIS STM Test specification traceability of test cases with specific transmission module FFFIS	3.0.0	Index 36
8	SUBSET-074-4	FFFIS STM Test specification traceability of testing the packets specified in the FFFIS STM application layer	3.0.0	Index 36
9	ERA/ERTMS/040092	ERTMS/ETCS test plan and methodology	1.0.0	Index 37
10	Intentionally deleted			
11	Intentionally deleted			
12	Intentionally deleted			
13	Intentionally deleted			

14	Intentionally deleted			
15	Intentionally deleted			
16	ERA/ERTMS/040093	test database	3.2.0	Index 37
17	Intentionally deleted			
18	Intentionally deleted			
19	SUBSET 077	UNISIG causal analysis process	3.0.0	Index 27
20	SUBSET 078	RBC interface: failure modes and effects analysis	3.3.3	Index 27
21	SUBSET 079	MMI: failure modes and effects analysis	3.13.0	Index 27
22	SUBSET 080	TIU: failure modes and effects analysis	3.0.12	Index 27
23	SUBSET 081	Transmission system: failure modes and effects analysis	3.4.3	Index 27
24	SUBSET 088	ETCS Application levels 1 and 2 — safety analysis	3.5.4	Index 27
25	TS50459-1	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 1 — General principles for the presentation of ERTMS/ETCS/GSM-R information	2015	only for Index 33 and Note 2
26	Intentionally deleted			
27	TS50459-2	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — Driver Machine Interface - Part 2 — Ergonomic arrangements of ERTMS/GSM-R information	2015	only for Index 33 and Note 2
28	TS50459-4	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 4 — Data entry for the ERTMS/ETCS/GSM-R systems	2005	only for Index 33 and Note 2
29	TS50459-5	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 5 — Symbols	2005	only for Index 33 and Note 2
30	TS50459-6	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 6 — Audible information	2005	only for Index 33 and Note 2
31	Intentionally deleted			
32	Intentionally deleted			

33	Intentionally deleted			
34	Intentionally deleted			
35	Intentionally deleted			
36	Intentionally deleted			
37	SUBSET-093	GSM-R Bearer Service Requirements	4.0.0	Index 33 and Note 4
38	Intentionally deleted			
39	Intentionally deleted			
40	ERA/ERTMS/040063	Test sequences evaluation and validation	3.0.0	Index 37
41	Intentionally deleted			
42	Intentionally deleted			
43	04E083	Safety requirements and requirements to safety analysis for interoperability for the control-command and signalling subsystem	1.0	Index 27
44	04E084	Justification report for the safety requirements and requirements to safety analysis for interoperability for the control-command and signalling subsystem	1.0	Index 27
45	Intentionally deleted			
46	Intentionally deleted			
47	SUBSET-113	ETCS Hazard Log	ERA website	Index 27 Note 9
48	EN 50617-1	Railway Applications – Technical Parameters of train detection systems for the interoperability of the trans-European Railway system : Part 1 Track Circuits	2015	Index 77
49	EN50617-2	Railway Applications – Technical Parameters of train detection systems for the interoperability of the trans-European Railway system : Part 2 Axle Counters	2015	Index 77
49A	EN50592	Railway Applications – Testing of Rolling Stock for electromagnetic compatibility with axle counters	2016	Index 77
50	Intentionally deleted			
51	ERA/ERTMS/040055	ETCS DMI objects - START / STOP conditions	1.1.0	Index 4 and Index 6
52	Intentionally deleted			
53	SUBSET-118	Functional Safety Analysis of ETCS DMI for ETCS Auxiliary Hazard	1.3.0	Index 27

54	SUBSET-119	Train Interface FFFIS	0.1.13	Index 81
55	SUBSET-120	FFFIS Train Interface - Safety analysis	0.2.11	Index 82
56	SUBSET-129	FIS for the RBC/RBC Handover involving a Baseline 2 RBC	0.0.3	Index 12
57	Intentionally deleted			
58	O-2875	ERTMS/GSM-R Quality of Service test specification for EIRENE QoS requirements	2.0.0	Index 33
59	O-3001-1	GSM-R Cab radio test cases catalogue	1.1.0	Index 32 and Index 33
60	O-3001-2	GSM-R EDOR test cases catalogue	1.1.0	Index 32 and Index 33
61	O-3001-3	GSM-R SIM card test cases catalogue	1.1.0	Index 33 and Index 67
62	O-3001-4	GSM-R Network test cases catalogue	1.2.0	Index 32 and Index 33
63	EN 50125-1	Railway applications — Environmental conditions for equipment — Part 1: equipment on board rolling stock	2014	Note 8

Note 2: With regards to the GSM-R DMI, this Index provides additional information to implement the mandatory requirements of the EIRENE SRS.

Note 3: Intentionally deleted.

Note 4: O-2475 version 4.0.0 and SS-093 version 4.0.0 including the KPIs for GSM-R CS and for GSM-R PS, have been published in this CCS TSI Application Guide.

Note 7: Intentionally deleted.

Note 8: For the requirements about “Vibrations and Shocks” refer to version 1999. See CSS TSI Application Guide Section 2.8.1.

Note 9: The latest version of SS-113 will be available in the Agency webpage under the following link:
https://www.era.europa.eu/sites/default/files/activities/docs/subset_113.pdf

Table 6.3: List of supporting informative specifications related to Table A-2.3 of CCS TSI

No.	Set of specifications #3 (ETCS baseline 3 Release 2 and GSM-R baseline 1)			
	Reference	**Document name**	**Version**	**Notes**
1	02S126	RAM requirements (chapter 2 only)	6	Index 28
2	97S066	Environmental conditions	5	
3	SUBSET-074-1	Methodology for testing FFFIS STM	3.1.0	Index 36
4	97E267	Odometer FFFIS	5	
5	O_2475	ERTMS GSM-R QoS test specification	4.0.0	Index 33 and Note 4
6	Intentionally deleted			
7	SUBSET-074-3	FFFIS STM Test specification traceability of test cases with specific transmission module FFFIS	3.1.0	Index 36
8	SUBSET-074-4	FFFIS STM Test specification traceability of testing the packets specified in the FFFIS STM application layer	3.1.0	Index 36
9	ERA/ERTMS/040092	ERTMS/ETCS test plan and methodology	1.1.0	Index 37
10	Intentionally deleted			
11	Intentionally deleted			
12	Intentionally deleted			
13	Intentionally deleted			
14	Intentionally deleted			
15	Intentionally deleted			
16	ERA/ERTMS/040093	test database	3.3.0	Index 37
17	Intentionally deleted			
18	Intentionally deleted			
19	SUBSET 077	UNISIG causal analysis process	3.0.0	Index 27
20	SUBSET 078	RBC interface: failure modes and effects analysis	3.4.0	Index 27

21	SUBSET 079	MMI: failure modes and effects analysis	3.14.0	Index 27
22	SUBSET 080	TIU: failure modes and effects analysis	3.2.0	Index 27
23	SUBSET 081	Transmission system: failure modes and effects analysis	3.5.0	Index 27
24	SUBSET 088	ETCS Application levels 1 and 2 — safety analysis	3.7.0	Index 27
25	TS50459-1	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 1 — General principles for the presentation of ERTMS/ETCS/GSM-R information	2015	only for Index 33 and Note 6
26	Intentionally deleted			
27	TS50459-2	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — Driver Machine Interface - Part 2 — Ergonomic arrangements of ERTMS/GSM-R information	2015	only for Index 33and Note 6
28	TS50459-4	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 4 — Data entry for the ERTMS/ETCS/GSM-R systems	2005	only for Index 33 and Note 6
29	TS50459-5	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 5 — Symbols	2005	only for Index 33 and Note 6
30	TS50459-6	Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — driver machine interface - Part 6 — Audible information	2005	only for Index 33 and Note 6
31	Intentionally deleted			
32	Intentionally deleted			
33	Intentionally deleted			
34	Intentionally deleted			
35	Intentionally deleted			
36	Intentionally deleted			

37	SUBSET-093	GSM-R Bearer Service Requirements	4.0.0	Index 33 and Note 4
38	Intentionally deleted			
39	Intentionally deleted			
40	ERA/ERTMS/040063	Test sequences evaluation and validation	3.0.0	Index 37
41	Intentionally deleted			
42	Intentionally deleted			
43	04E083	Safety requirements and requirements to safety analysis for interoperability for the control-command and signalling subsystem	1.0	Index 27
44	04E084	Justification report for the safety requirements and requirements to safety analysis for interoperability for the control-command and signalling subsystem	1.0	Index 27
45	Intentionally deleted			
46	Intentionally deleted			
47	SUBSET-113	ETCS Hazard Log	ERA website	Index 27 Note 9
48	EN 50617-1	Railway Applications – Technical Parameters of train detection systems for the interoperability of the trans-European Railway system : Part 1 Track Circuits	2015	Index 77
49	EN50617-2	Railway Applications – Technical Parameters of train detection systems for the interoperability of the trans-European Railway system : Part 2 Axle Counters	2015	Index 77
49A	EN50592	Railway Applications – Testing of Rolling Stock for electromagnetic compatibility with axle counters	2016	Index 77
50	Intentionally deleted			
51	ERA/ERTMS/040055	ETCS DMI objects - START / STOP conditions	1.2.0	Index 4 and Index 6
52	Intentionally deleted			

53	SUBSET-118	Functional Safety Analysis of ETCS DMI for ETCS Auxiliary Hazard	1.6.0	Index 27
54	SUBSET-119	Train Interface FFFIS	1.1.0	Index 81
55	SUBSET-120	FFFIS Train Interface – Safety analysis	1.1.0	Index 82
56	SUBSET-129	FIS for the RBC/RBC Handover involving a Baseline 2 RBC	1.0.0	Index 12
57	SUBSET-116	Eurobalise On-board equipment susceptibility test specification	1.1.0	Index 9
58	O-2875	ERTMS/GSM-R Quality of Service test specification for EIRENE QoS requirements	2.0.0	Index 33
59	O-3001-1	GSM-R Cab radio test cases catalogue	1.1.0	Index 32 and Index 33
60	O-3001-2	GSM-R EDOR test cases catalogue	1.1.0	Index 32 and Index 33
61	O-3001-3	GSM-R SIM card test cases catalogue	1.1.0	Index 33 and Index 67
62	O-3001-4	GSM-R Network test cases catalogue	1.2.0	Index 32 and Index 33
63	EN 50125-1	Railway applications — Environmental conditions for equipment — Part 1: equipment on board rolling stock	2014	Note 8

Note 4: O-2475 version 4.0.0 and SS-093 version 4.0.0 including the KPIs for GSM-R CS and for GSM-R PS, have been published in this CCS TSI Application Guide.

Note 5: Intentionally deleted.

Note 6: With regards to the GSM-R DMI, this Index provides additional information to implement the mandatory requirements of the EIRENE SRS.

Note 7: Intentionally deleted.

Note 8: For the requirements about “Vibrations and Shocks” refer to version 1999. See CSS TSI Application Guide Section 2.8.1.

Note 9: The latest version of SS-113 will be available in the Agency webpage under the following link:
https://www.era.europa.eu/sites/default/files/activities/docs/subset_113.pdf

Annex 1: Basic parameter 4.2.10 - Shunting impedance for track circuits

A track circuit is a section of the railway line, separated by the adjacent sections by means of insulated or electrical joints; a signal is fed at one side of it and, in normal conditions, reaches the receiver at the opposite side.

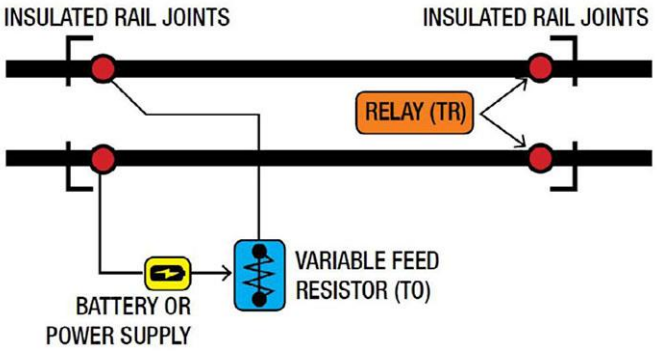


Figure 1.- Track circuit example

If an axle of a vehicle "shunts" the rails, the level of the signals at the receiver is lowered below a threshold, indicating that the section is occupied.

To design a track circuit it is therefore necessary to determine the "shunting impedance", i.e., the maximum impedance between the rails causing the signal at the receiver become lower than the threshold value.

Such "shunting impedance" is given by: $R_{contact\ rail} + Z_{wheelset} + R_{contact\ rail}$, where $Z_{wheelset}$ includes Z_{axles} and Z_{wheels} (see Figure below)

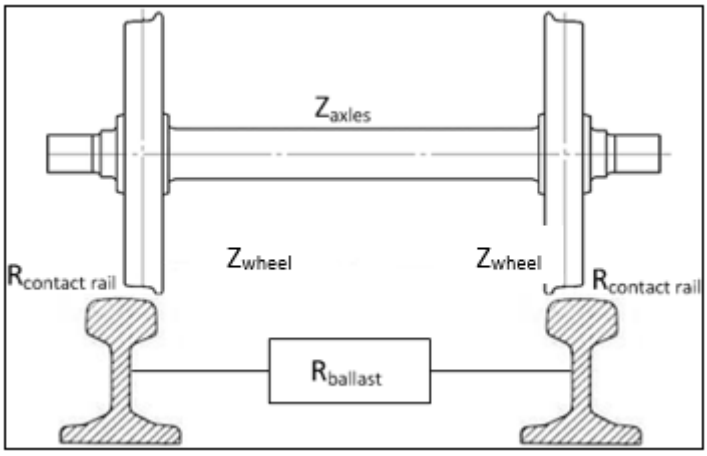


Figure 2.- Shunting impedance

Many factors contribute to the shunting impedance (non exhaustive list):

1. Axle load (i.e., the force pressing the wheel surface against the rail surface, influences $R_{contact\ rail}$)
2. Number of axles (i.e. electrical connected together, earthing contacts, driven/no driven axles..)
3. Independently rotating wheels (a system in which each of the wheels on an axle, both left and right, can rotate at different speeds)
4. Type of brake (disk brake or brake shoes (iron or composite brakes) have an direct influence on the contamination and the surface of the wheel)

5. Traction current (a current flowing at the contact surface may decrease the impedance between the wheel and the rail)
6. Dimension of the contact surface between wheels and rails furthermore depending on wheel and rail profile, the material and the resulting properties of wheel and rail (e.g. hardness of the steel), the running behaviour/sinusoidal sway and train operation e.g. mono culture or frequency of train operation (influences $R_{contact\ rail}$)
7. Corrosion on the surface of the wheels (influences $R_{contact\ rail}$)
8. Corrosion on the surface of the rails (influences $R_{contact\ rail}$)
9. Pollution on the surface of the wheels (influences $R_{contact\ rail}$)
10. Pollution on the surface of the rails (influences $R_{contact\ rail}$)
11. Sanding / amount of sand (influences $R_{contact\ rail}$)
12. Surface/track conditioning lubricants (influences $R_{contact\ rail}$)
13. The voltage, the working frequency and the power of the track circuits
14. Number of train runs / axles per time (influences $R_{contact\ rail}$)

The factors 1 to 5 are driven by rolling stock parameters exclusively.

The factor 6 is influenced by the dynamics of train movement, i.e., the relative displacement of wheels and rails during the movement, the speed and the train weight.

As far as factors 7, 8, 9 and 10 are concerned, some sources of pollution are typical for trackside (e.g., leaves on rails), while other sources may deposit an isolating film both on wheels and rails:

1. Brake blocks (composite types)
2. Sanding (11)
3. Conditioning lubrication (on-board devices, trackside devices, 12).

Today many different types of track circuits are in service, operating at different frequencies and with different sensitivity for shunting impedance (parameters for track circuits are described in EN 50617-1).

Some factors can be determined accurately and maintained during the vehicle life, like the values of impedance between the surfaces of wheels (clean) and the axle load: they are therefore harmonised as interface parameters between rolling stock and trackside Control-Command and Signalling equipment in the TSI.

Other factors are more complex to manage:

1. Some depend on the interaction between a vehicle and a specific infrastructure, like the dimension of the contact surface.
2. Some are vehicle characteristics (affecting all infrastructures where the vehicle runs), and can be kept under control with operational rules related to vehicle movements (like corrosion on wheels).
3. Some are trackside characteristics, only affecting one infrastructure, and can be kept under control with operational rules related to vehicle movements (like corrosion on rails).
4. Some are originated trackside and affect both vehicles and infrastructures, creating isolating layers on wheels and rail surfaces (like trackside flange lubrication).
5. Some are originated on-board and affect both vehicles and infrastructures, creating isolating layers on wheels and rail surfaces (like on-board flange lubrication, brake blocks and sanding).

Annex 2: Basic parameter 4.2.11 - Electromagnetic fields

General principles

The proposed frequency management principle is based upon the integration of known axle counter immunity levels, coupled with rolling stock emissions, for compatibility purposes, to enable present and future interoperability.

The frequency management – defined in CCS TSI Index 77 section 3.2.1 with respect of the compatibility between rolling stock with axle counters - is based upon the list of known axle counters listed in Annex A of CLC/TS 50238-3. The rolling stock emission limits and the evaluation parameters have been determined from the known in-band susceptibility threshold limits for axle counters, which includes a 9 dB margin pertinent to the correct bandwidths of operation of the respective axle counter, established from laboratory tests.

The harmonised European Standard EN 50617-2 (Railway Applications – Technical parameters of train detection systems - Part 2: Axle counters) specifies parameters for the design and usage of axle counter systems. The standard defines the technical parameters of axle counter systems associated with the magnetic field limits for rolling stock in the context of interoperability. In addition test methods (e.g. laboratory tests) are defined for establishing the conformity and the performance of axle counter products. Beside specific axle counter system parameters numerous train based parameters, directly linked to requirements defined in Index 77 of CCS TSI, as well as track based parameters and environmental (and other parameters) are defined in the standard. The EN 50617-2 defines also the procedures to show the fulfilment of the single requirements as far as necessary.

The EN 50617-2 is intended to be used to assess compliance of axle counter systems (and other forms of wheel sensors) used for train detection, in the context of the Interoperability Directive and the associated technical specification for interoperability relating to the control-command and signalling trackside subsystems. The supplier of the axle counter (or wheel sensor) defines the system borders of the axle counter system, based on the architecture of the system.

The frequency management – defined in Index 77 of CCS TSI - proposes three distinct frequency bands. These ranges have been established from known technologies and encompass the differences in manufacturing, to allow for flexibility and compatibility between axle counters when mounted close to each other on the infrastructure.

The influence of active magnetic brakes, eddy current brakes or inductively coupled resonant circuits up to axle counters is still under investigation. Index 77 does not contain requirements in this context, as the relevant vehicle parameters are not known and no specific national requirements are defined.

Rolling stock emission requirements

For the purposes of the defined frequency management in respect of the compatibility between rolling stock and axle counters, particular attention is drawn to the pulsed switching circuits in operation on modern railway vehicles. These can produce higher levels of harmonics and transients in return currents than previously seen on railway vehicles containing less complex technologies. Nevertheless, they can be considered as the main source of interference to axle counters. Critical to this are the short rise-time pulses with high repetition rates.

Pulsed oscillating magnetic fields at or near the axle counter sensor position are generated by common-mode currents underneath the railway vehicles, flowing in uncontrolled paths. As a consequence, the qualification of rolling stock emitted magnetic field levels is highly dependent upon the filter bandwidth used for the qualification for evaluation.

In-band emission limits for the three frequency bands and the corresponding evaluation parameters including frequency range, bandwidth and integration time have been optimised for due consideration of both rolling stock and axle counters. Out of band emission limits are defined as a result of practical experience with max emissions envelope of magnetic field levels for existing rolling stock and considerations for compatibility with the EMC Directive.

The harmonised European standard EN 50592 (Railway applications – Testing of rolling stock for electromagnetic compatibility with axle counters) defines, for the purpose of ensuring compatibility between rolling stock and axle counter systems, the measurement and evaluation methods of rolling stock emissions to demonstrate compatibility. In Index 77 of CCS TSI the established limits for compatibility are defined as magnetic fields that can disturb the axle counter detectors, as part of the axle counter system.

Demonstrating the compatibility of magnetic brakes, eddy current brakes or inductively coupled resonant circuits on the vehicle in use with axle counters is still under investigation. The non-active magnetic brake and eddy current brake in rest position are covered by the requirements of metal free space (Index 77 of CCS TSI, section 3.1.3.5).

Annex 3: Basic parameter 4.2.11 – Conducted interference

General principles

The proposed frequency management principle is based upon the integration of known preferred track circuits immunity levels, coupled with rolling stock emissions, for compatibility purposes, to enable present and future interoperability.

The frequency management – defined in CCS TSI Index 77 section 3.2.2 with respect of the compatibility between rolling stock with track circuits - is based upon the list of known preferred track circuits listed in Annex A of CLC/TS 50238-2. The rolling stock emission limits and the evaluation parameters have been determined from the known susceptibility threshold limits for these preferred track circuits, which includes safety and availability margins pertinent to the correct bandwidths of operation of the respective preferred track circuits, established from field tests, simulations and analysis.

The harmonised European Standard EN 50617-1 (Railway Applications – Technical parameters of train detection systems - Part 1: Track circuits) specifies parameters for the design and usage of track circuits. The standard defines the technical parameters of track circuits systems associated with the interference current limits for rolling stock measured at the pantograph in the context of interoperability. In addition test methods (e.g. field tests) are defined for establishing the conformity and the performance of track circuits. Beside specific track circuit parameters, train based parameters, directly linked to requirements defined in Index 77 of CCS TSI, as well as track based parameters and environmental (and other parameters) are defined in the standard.

EN 50617-1 is intended to support the assessment of track circuits used for train detection, in the context of Index 77 of CCS TSI.

Each preferred track circuit is designed for specific infrastructure parameters provided by the manufacturer. It is therefore installed in a certain infrastructure environment (meeting these infrastructure parameters) and gives a certain susceptibility threshold limit. A change of one of these infrastructure parameters influences the susceptibility threshold limits for these preferred track circuits. The fulfilment of the requirements defined indirectly by the frequency management for track circuits (Index 77) has to be demonstrated – based on the infrastructure parameter given by the track circuit manufacturer and infrastructure manager and the applied infrastructure parameters within the infrastructure environment – for the authorisation of the trackside CCS (train detection).

The interference current is flowing from the substation through the hot-path (catenary) to the rolling stock and flowing back by the cold-path (rails and earth in some cases, see figure below). This current is influenced by the impedance of all the elements in the circuit. Some impedances (e.g. impedance of substation/overhead line system, impedance of rolling stock) are still under investigation and therefore an Open Point in Index 77.

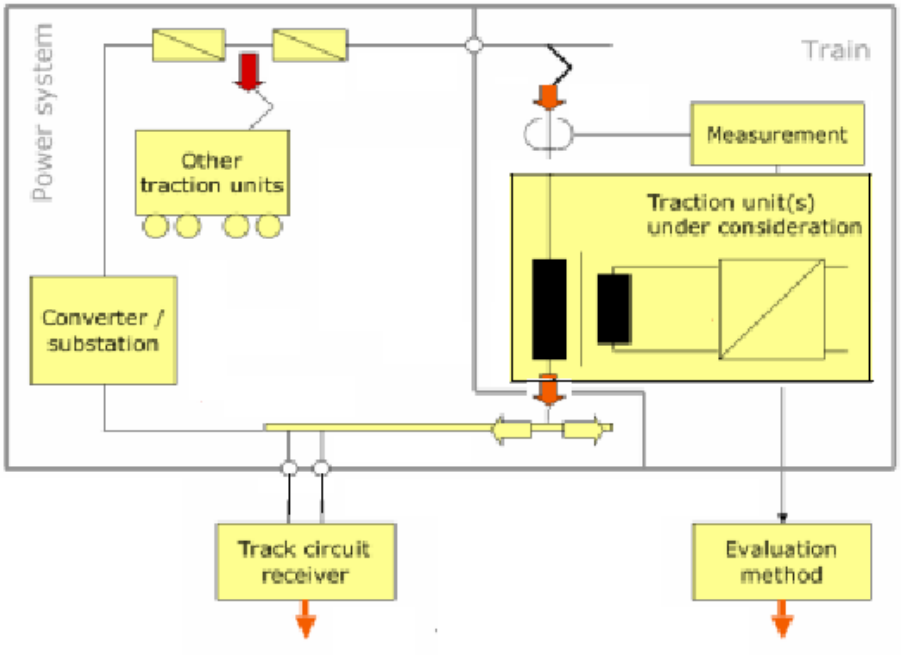


Figure 1.- Interference current flow (for track circuits)

Rolling stock emission requirements

Index 77 of CCS TSI defines the limits and associated parameters for the evaluation of rolling stock emissions. A harmonised test method is not yet available to test the rolling stock against these limits. Therefore the application of the Frequency Management (section 3.2.2 of Index 77) is not mandatory for the placing on the market of TSI compliant vehicles.

For this reason, a European standard is currently being drafted, for the purpose of ensuring compatibility between rolling stock and track circuits, specifying the measurement and evaluation methods of rolling stock emissions to demonstrate compatibility. In Index 77 of CCS TSI the established limits for compatibility are defined as interference current limits that can disturb the track circuits.

Annex 4: Basic parameter 4.2.11 – Requirements concerning the compatibility to loops (vehicle metal construction)

Foreword

This annex gives additional information related to the parameter „Vehicle metal construction" specified in Index 77 section 3.1.7.2 concerning the characteristics which are relevant for compatibility between vehicles and loop based detection systems. Furthermore it gives examples of short circuit rings resulting from constructive elements of a vehicle.

Application of inductive loops

Inductive loops may be used to detect the presence of vehicles, for example to command the operation of the technical systems of level crossings (closing the barriers, flashing lights, etc.). Figure 1 shows an example of the positioning of loops around a level crossing on a line that is able to have train running on both tracks in both directions. For example the loops "FS11b" and "FS1b" switch on the technical systems of the level crossing for regular track 2 (closing the barriers, flashing lights, etc.). In this example, two loops are used to guarantee a proper and safe function of the system and to detect the driving direction of the train. The loop "FS13b" switches the system off again when the last vehicle of a train has left this loop and so has left the level crossing, also. So this loop also detects if a level crossing is still occupied by a vehicle.

If a railway vehicle cannot be detected appropriately by a loop, this may lead to an untimely opening of the level crossings barriers or switching off flashing lights when the vehicle comes to a standstill above the loop even if the level crossing is still occupied by a railway vehicle. Therefore it is necessary that a railway vehicle can be detected by a loop over its full length.

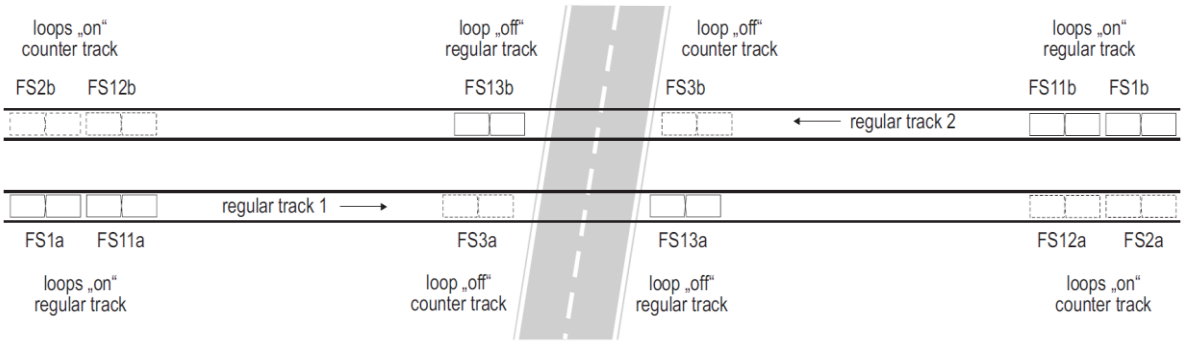


Figure 1.- Position of loops on level crossings - principle

Principles of operation

Electrical background

A typical solution is the installation of a loop on the track like a lying "8", as shown in the following figure 2. It is mounted and fixed to the sleepers between the rails.

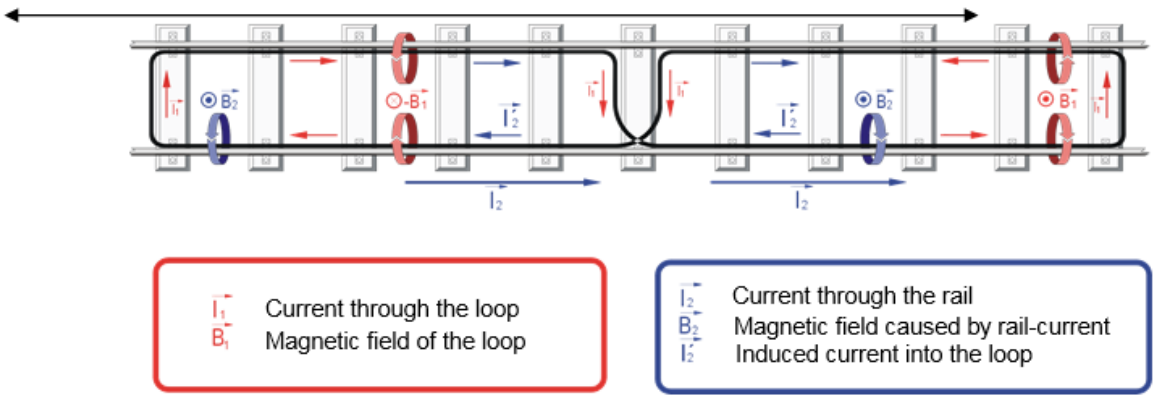


Figure 2.- Example of loop installation

The detection of a vehicle is based on the variation of the inductance of the loop which is part of a resonant circuit (see figure 3 below). This variation can be detected, for example, by changes in the electrical behaviour (e.g. resonance frequency) of the resonant circuit.

Influencing factors

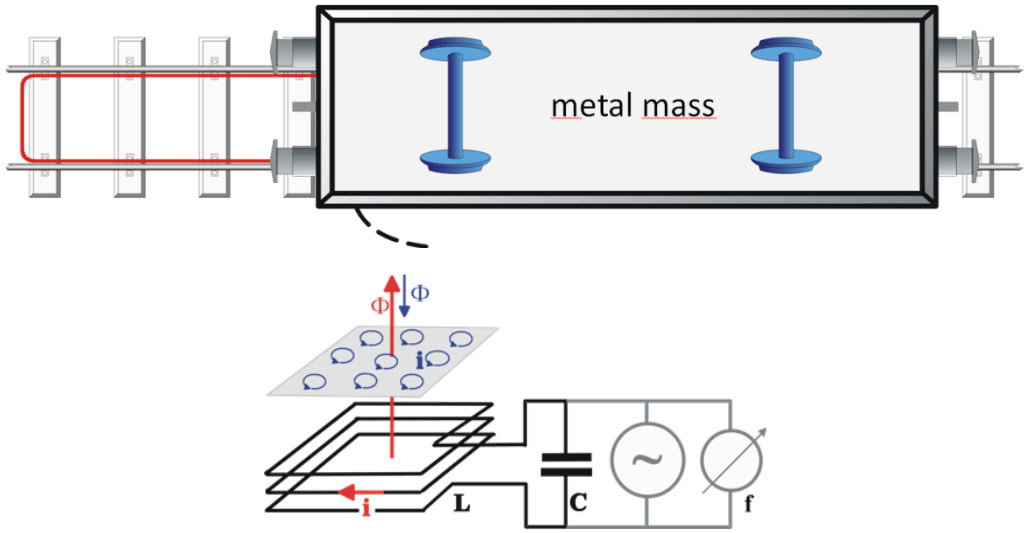
The variation of the loop inductance is caused by generation of eddy currents and mutual induction with conductive elements interacting with the magnetic field of the loop.

Railway vehicles can therefore vary the inductance by the following influencing factors:

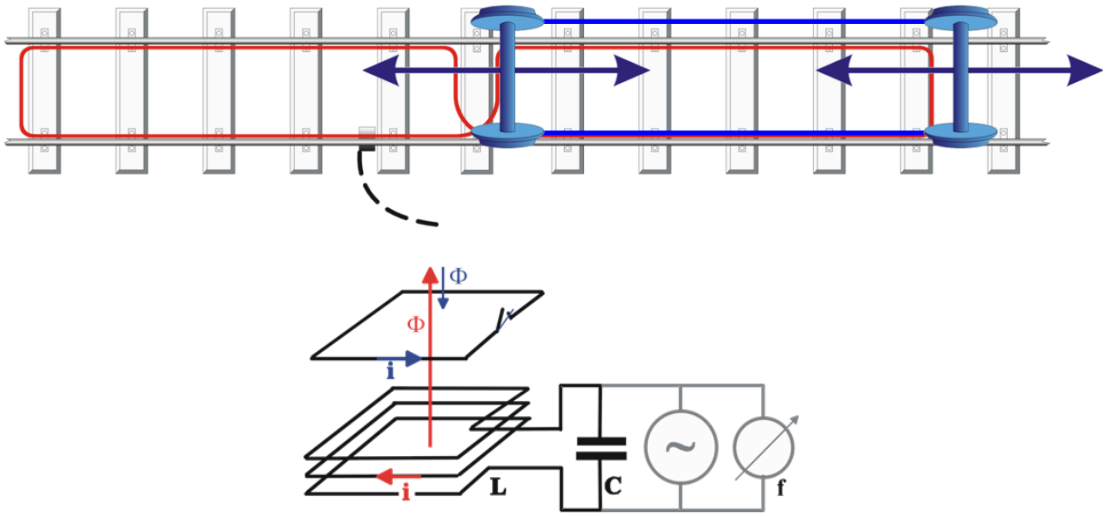
A. Metal construction (bogies, metal parts of the vehicle, metal vehicle floor) above the loop within a defined distance to the rail and within a defined conductivity.
B. Electrical short circuit rings (electrical conducting loops) built by constructive elements of a vehicle e.g. frame beams with cross connections or electrically connected and conducting constructive parts below the vehicles floor within a defined distance to the rail. These parts are electrically connected in a suitable way to form electrically conducting short circuit rings with defined dimensions and defined electrical resistance.
C. Electrical Wheel – rail short circuit rings (electrical conducting loops) built by the path wheel set – rail – wheel set – rail. This is only an additional factor (not further taken into account in the discussion below) because the quality of these short circuit rings depends on the resistance of the train shunt. In case of a high contact resistance between wheel and rail (e.g. caused by rust or particles of dust) the influence of this short circuit ring becomes lower. But in any case the influence to the loop is improved.

These three factors usually occur in combination. The design of almost all existing vehicles includes constructive solutions, which are sufficient to fulfil the requirements for their detection by loops.

Because of its massive mechanical robust construction - several massive beams and conductive connections - a boogie provides a variety of metal parts and short circuit rings which are able to influence a loop sufficiently. Therefore it is generally assumed that a boogie will be detected by a loop in any case. So the worst-case situation occurs if only influencing factor A) or B) are affecting the loop, without any influence of bogies.



Variation of inductance by displacing the lines of magnetic flux by metallic mass (influencing mechanisms A) and/or B))



Variation of inductance by short circuit ring formed by the path wheel set – rail – wheel set – rail (influencing mechanism C))

Figure 3.- Influencing mechanisms of loops

The extent of the influence of short circuit rings and metal constructions to inductive loops depends on the:

- dimensions of short circuit rings and metal constructions,
- distance of short circuit rings and metal constructions from the top of the rail,
  Note: the correlation between distance and influence on the loop is not linear.
- conductivity of the metal construction,
- ohmic resistances (e.g. of the train shunt or conductive parts of the vehicle).

Relation with the vehicle metal construction

Vehicle design

According to the requirements in the CCS TSI, a loop detection system needs to ensure proper operation with vehicles designed in compliance with the interface parameters defined in Index 77.

Usually, on the side of the vehicle, these parameters can be checked on the basis of vehicle design drawings and of electrical conductivity/resistivity of the relevant vehicle parts, estimated through their dimensions and electrical properties.

The figures 4-10 give some examples.

Examples for short circuit rings
(electrically conducting Loops)

This chapter gives additional examples for short circuit rings below a vehicles floor formed by constructive elements of the vehicle and fulfilling the conditions for loop detection stated in Annex A, Index 77 of [1]. Other combinations are also possible, and their combination may be as well applied.

Constructive structures

Short circuit rings can be formed by constructive structures below the vehicles floor consisting of longitudinal frame beams symmetrical on both sides of the vehicle and cross connections (cross beams) which are electrically connected (e.g. welded) together.

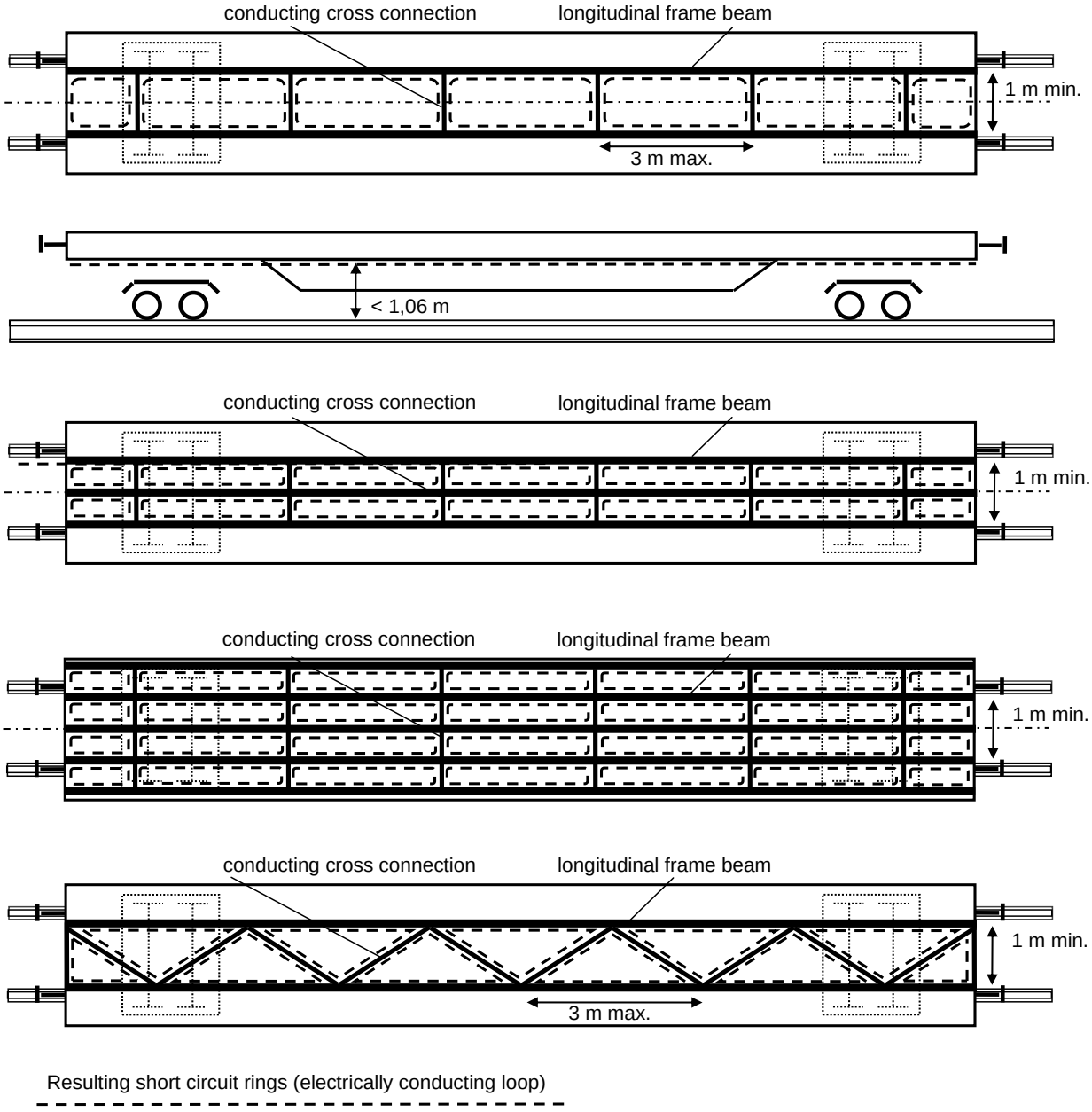


Figure 4.- Examples for short circuit rings built by frame beams and cross connections

Electrically connected conducting constituents

Short circuit rings can also be formed by electrically connected conducting constituents below the vehicles floor. For the relevant resulting distance between short circuit ring and top of the rail, the maximum distance of the connecting cables or metallic parts to the top of the rail will be relevant (see below).

Explanation for the following drawings:

Principle way of cable or metallic part routing for electrical connection of constituents; to be connected always to the outer edges of the constituents

Resulting short circuit rings (electrically conducting loop)

Electrical conductive constituent

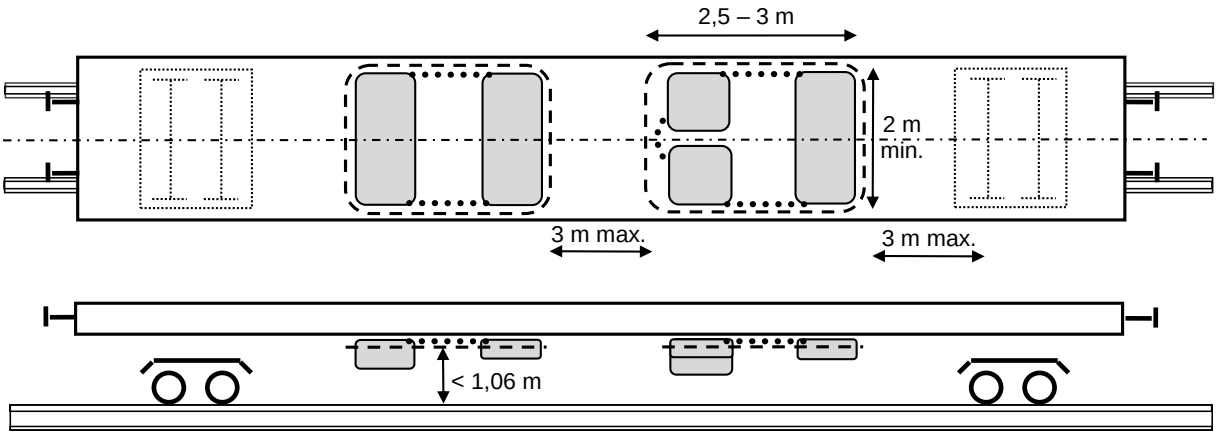


Figure 5.- Examples for short circuit rings built by electrically connected conducting constituents – side view

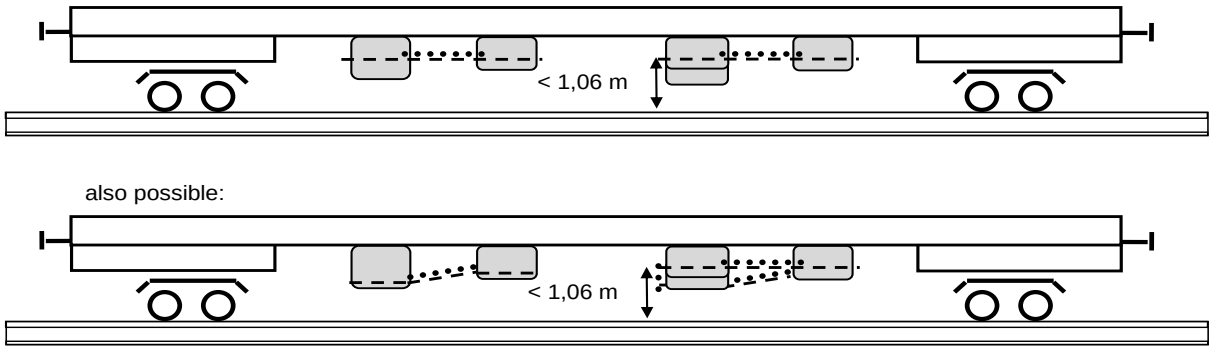


Figure 6.- Examples for short circuit rings built by electrically connected conducting constituents – side view for higher vehicles

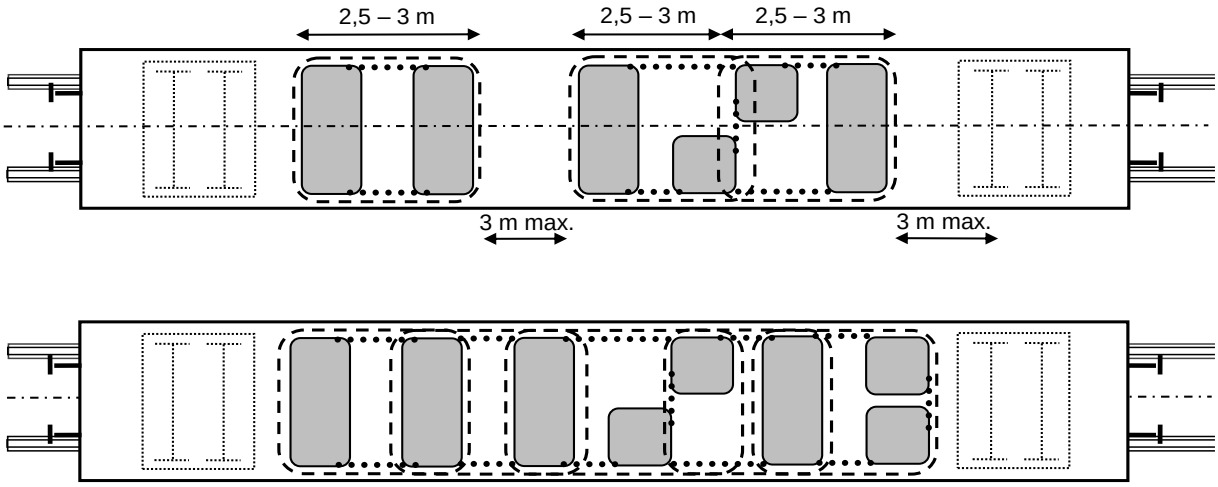


Figure 7.- Examples for short circuit rings built by electrically connected conducting constituents – top view

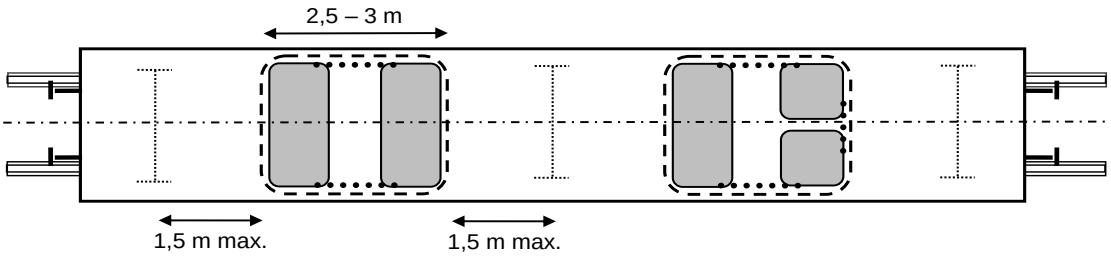


Figure 8.- Examples for short circuit rings built by electrically connected conducting constituents on a vehicle with two single axes – top view

Short circuit rings formed by bogies

Because of its massive mechanical robust construction consisting of metal, several massive beams and conductive connections a boogie provide a variety of metal masses and short circuit rings which are able to influence a loop sufficiently. The following figures show examples of possible short circuit rings built by the structures of a boogie.

Explanation:

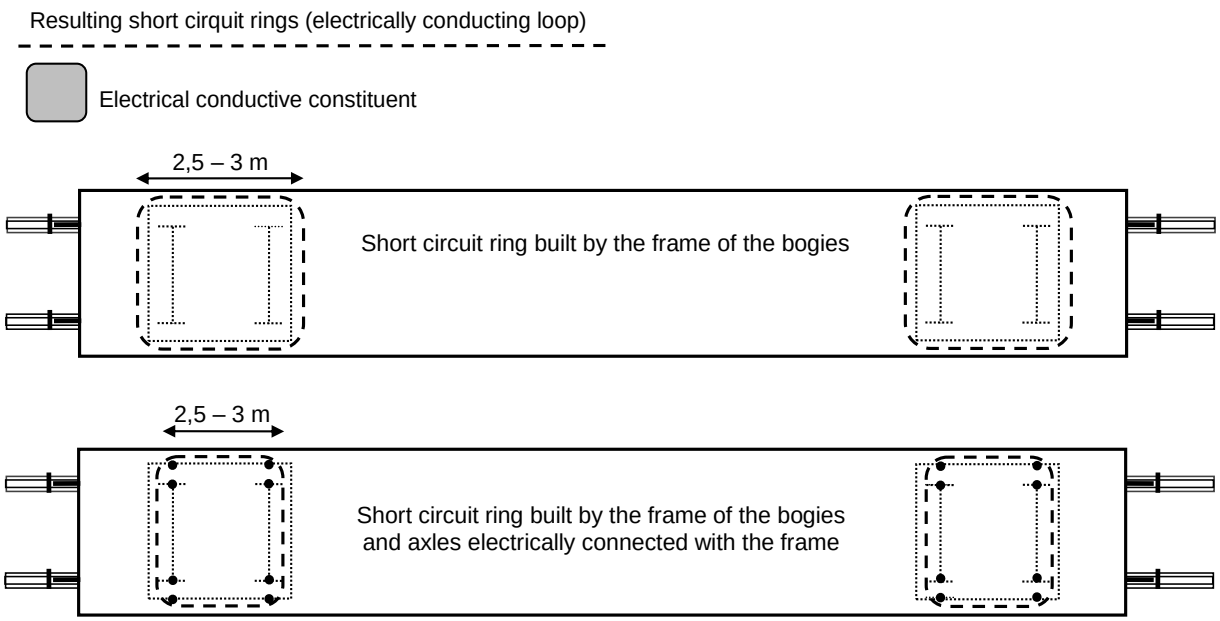


Figure 9.- Example for short circuit rings built by constructive and conducting parts of bogies with

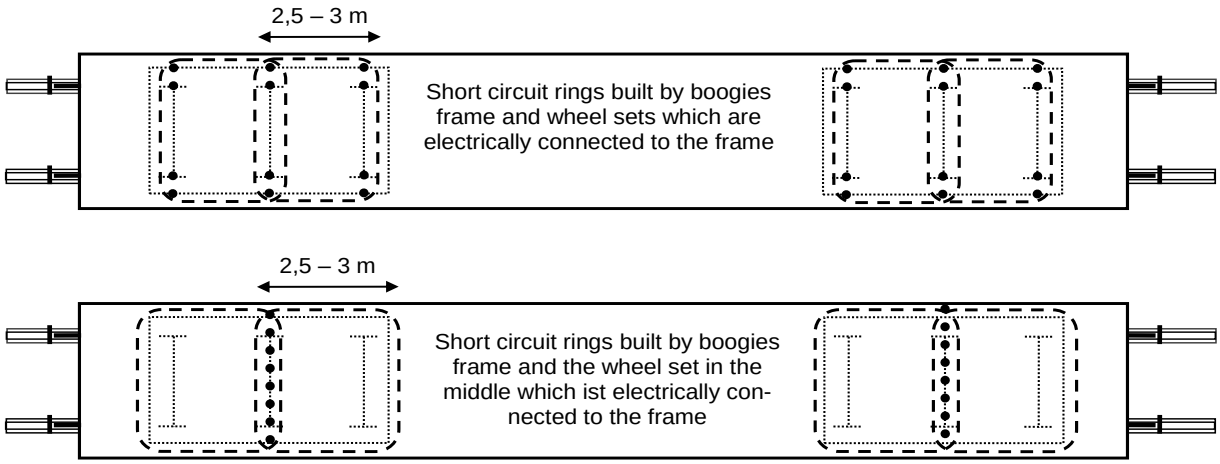


Figure 10.- Example for short circuit rings built by constructive and conducting parts of bogies with a length > 3 m and three axles

Appendix 1 – Alternative methods for the Verification of vehicle metal construction

Alternatively to the method defined in Index 77, chapter 3.1.7.2 (see also Annex 4 above) compatibility of vehicles with loops can be shown by the measurement and evaluation of the change of the inductivity of a reference loop by passing of a vehicle (the definitions below are related on loops, used for level crossing with a track gauge of 1435mm).

Measurement arrangement

- The reference loop is installed in the form of an "8" (see Figure 1)
- The loop is formed by an insulated copper cable 3 * 1,5 mm2 (like H07RN-F) and is located at the rail base between the running rails above the sleepers (wood or concrete sleepers, no steel sleepers). The distance of the cable from the rail should be 10 – 20mm (see Figure 2).
- The reference loop should have three turns (windings) including a connection wire of 3,5 m.
- The length of a half-loop is 3,0m +0m/-0,05m
- The distance between both half-loops is 0,1m ± 0,05 m at the middle of the loop (see Figure 1)

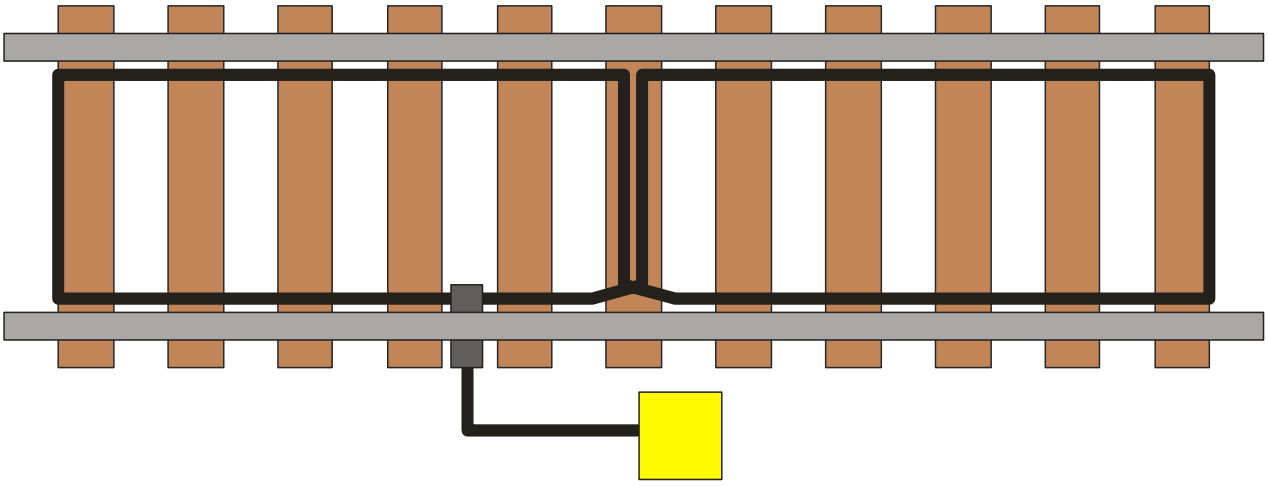


Figure 1.- Reference loop mounted at the track (figure based on a track gauge of 1435 mm).

Measurement process

- The passing vehicle is electrically passive while passing the reference loop. All electrical equipment/consumers are – as far as possible - switched off.
- The running speed of the vehicle is less than 30 km/h while passing the reference loop (based on the required detection period, defined below)
- Tests should be carried out twice in both running directions. Tests with the vehicle and without the vehicle should be carried out in short time distance.

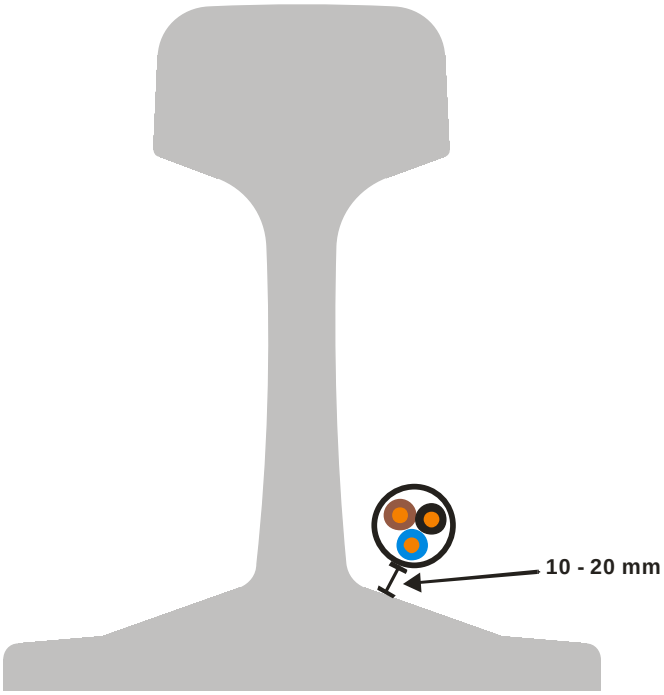


Figure 2.- Mounted cable (the distance between cable and rail should be inside the tolerance over the whole loop)

Measurement and evaluation

- The inductivity of the reference loop should be measured with the passing vehicle and without the vehicle; The relevant parameter is the relative reduction of the inductivity of the loop defined by $(L_0 – L) / L_0$ in percent, when the vehicle runs over the loop, where:
    - L_0: is the inductivity of the loop without vehicle and
    - L: is the inductivity of the loop with vehicle.
- The inductivity should be measured
    - without the vehicle and
    - while the vehicle is passing over the loop.
- It is sufficient to perform the measurement at a frequency of 60 kHz only (measurements done at 60 kHz are valid for loops working in frequency ranges from 20 kHz upto 110 kHz).
- The determination of the relative inductivity change should have an accuracy of 0,1% (concerning only the results of the delta measurement).
- Measurement window (detection period) should be maximum 10ms (overlap 50%)
- The relative reduction of inductivity of the loop should be:

    a) equal or greater than 3,5 % at the beginning of the vehicle (when the first axle is more than 3 m within the loop)

    b) equal or greater than 0,8 % between the first and the last axle of a vehicle or train

    c) less than 0,5 % when the vehicle has completely passed the loop.

Annex 5: ESC Principles

Extract from document “Principles for the demonstration of ETCS System Compatibility” [version 1.2draft 2019/11/29], created by the Test & Validation subgroup of the ERTMS Stakeholders Platform, sent to ERA by Unisig (UNIFE) as Deliverable 3.2.1 of the WP3 defined in the S2R specific contract#1 S2R.18.OP.2 “Support to the ERTMS Deployment action plan as baseline for Shift2Rail (IP2) innovative solutions”.

The contents of the mentioned document are being reviewed by the relevant subgroup. Updates coming from this work in process will be included in next versions of this Application Guide.

Table of Contents

1 Preamble

One of the key objectives of ETCS is to ensure full European-wide interoperability of train control systems and reach a situation where the "free circulation of ETCS equipped vehicles" over ETCS-equipped lines in Europe is technically possible. One of the crucial requirements for ETCS interoperability is ETCS System Compatibility (ESC).

As a precondition ESC requires Technical Compatibility of the on-board and trackside subsystem built by (mostly separate) manufacturers. Even if each manufacturer takes all endeavours to build quality into its own part, combining subsystems into one system under real operational conditions discloses new failure modes that are not apparent when viewing the parts separately.

ESC is influenced by the interaction among CCS TSI requirements, Operational Scenarios, Engineering Rules, the interpretation of these requirements by each involved stakeholder and the specific technical solutions of each ETCS on-board and Trackside Supplier. ESC is required to gain confidence in the technical compatibility of the CCS on-board subsystem in a specific area. Thus, the purpose of the Principles for the demonstration of ESC is to define a harmonised organisational framework for the conduct of ESC Checks in an efficient, flexible and reliable way, which will include a description of the overall test process, its participants and their respective contributions.

The framework and processes described in the Principles are intended to be used to perform ESC Checks at the request of an Entity applying for ESC Demonstration (typically manufacturers) wishing to perform such checks on their already (Notified Body) certified OBUs or on vehicles with certified OBUs installed or to perform ESC Checks for interested third parties (e. g. Railway Undertakings, Infrastructure Managers, National Safety Authorities).

The following boundary condition apply:

- the CCS TSI defines ESC as a part of the Basic Design Characteristics for a vehicle; therefore, ESC can be finally stated on the on-board CCS subsystem level only;
- however, ESC Checks can be performed in different stages of the life-cycle of an OBU (e.g. on the interoperability constituent (product) or subsystem level) and their result should primarily be regarded as a product capability of the OBU;
- ESC Checks can be ESC Tests or other type of checks (e.g. paper analysis);
- ESC Tests should be based on Operational Scenarios and Trackside Implementations;
- ESC Tests should be performed in ESC Test Facilities representing the relevant parts of real trackside implementations for one or more ESC Types;
- only tests which cannot be performed in a laboratory environment, according to the ESC checks definition provided by the IM, should be conducted on actual trackside;
- ESC Tests are not for product conformity testing; OBU and trackside subsystems for which ESC is being tested should be compliant to the CCS TSI; as for that, ESC is a complementary quality proof to the demonstration of CCS TSI requirements and the associated EC declaration of conformity of the OBU or the EC declaration of verification of the on-board CCS subsystem;
- OBU compliance to the CCS TSI is assumed as soon as evidence for demonstration of the CCS TSI requirements have been provided on the (group of) interoperability constituent(s) level or on on-

board CCS subsystem level and an OBU Supplier has drawn up an EC declaration of conformity or verification;

    - Based on this evidence an analysis should be conducted to ensure that all unimplemented or added functions, interfaces and performance and known restrictions and conditions of use are evaluated regarding their impact for the specific ESC Types;

- Trackside compliance is assumed as soon as an applicant has drawn up an EC declaration of verification for the trackside CCS subsystem;
- ESC Tests should be managed by the ESC Test Manager with support of the Trackside Supplier and OBU Supplier, the entity in charge of trackside engineering and the Infrastructure Manager;
- the result of ESC Checks should be described in a Check Report and cover
    - the checked configuration;
    - the result (based on analysis or Test Results (incl. the identified errors));
    - the Conditions; these should be acceptable for the Infrastructure Manager after their SMS management (e.g. close-out);
- a Check Report with a positive conclusion will result in an ESC Statement or ESC IC Statement for the OBU, which should be used to increase confidence that the ETCS on-board and trackside CCS jointly fulfil the specified operational requirements.

For all the routes and their corresponding ESC Types for which a railway undertaking wants to demonstrate compatibility according to Article 23 of EU Directive 2016/797/EU in the Area of Use of a Vehicle, it should be assured that all ESC Statements are available and that possible constraints referenced therein are managed on the on-board CCS subsystem level.

2 Definitions

If not otherwise specified, the terms and definitions of EU Directive 2016/797/EU apply.

Furthermore, capitalised terms in these principles have the meaning set forth below:

- **Check Report** means the report drafted by either the ESC Test Manager (in case ESC Tests are required), by the Infrastructure Manager (in case ESC Tests are not required) or by both (in case ESC Tests and other types of checks (e.g. paper analysis) are required) according to the activities described in Section 5 with the support of other Parties, e.g. upon completion of the Test Campaign, which describes the Test Results; the Check Report should always give a complete summary about the fulfilment of the set of checks submitted by the Infrastructure Manager to ERA for the respective ESC Type, even if only a subset of the ESC Tests has been performed (e.g. as regression tests after a modification); the Check Report should define, whether results of the checks are representative for all possible configurations of the OBU and are therefore applicable also for the product level; a Check Report can include Conditions;

- **Condition** means a constraint to be followed on on-board CCS subsystem level in order to achieve full compliance to the set of checks; conditions can arise from limits of the test laboratory, from test which could not be done in the laboratory, from issues found during the Test campaign or from checks which require characteristics of a vehicle type;

- **Engineering Rule** means a requirement for the intended ETCS track design (e.g. the conditions for the installation of the trackside elements related to specific national infrastructure);

- **ESC Check** means a check (e.g. by paper analysis or by performing ESC Tests) as part of the set of checks submitted by an Infrastructure Manager to provide ESC evidence for an ESC Type;

- **ESC IC Statement** means a document prepared by the Entity applying for ESC Demonstration stating ESC of the OBU for use in different on-board subsystems; the ESC IC Statement should include the summary of the Check Report on the results, which are valid independent from the specific configuration parameters of the OBU and can therefore be used in every specific vehicle type on the on-board CCS subsystem level; if a Check Report contains Conditions they should also be included in the ESC IC Statement; ESC IC Statement should also include the full list of ESC checks performed for each of the different ESC Types and the NoBo assessment.

- **ESC Statement** means a document according to Table 7.1 of the CCS TSI prepared by the Entity applying for ESC Demonstration on on-board CCS subsystem level, which states ESC of a specific vehicle type to the ESC Types; the ESC Statement should include the summary of the Check Report and should demonstrate the level of fulfilment of all the necessary checks submitted by the Infrastructure Manager to ERA; if a Check Report or an ESC IC Statement referred to in the ESC Statement contains Conditions they should be closed-out, managed or recorded in the ESC Statement; ESC Statement should also include the full list of ESC IC statements taken into account in the assessment (if any), the conditions (if any) with respects to the different ESC Types and the NoBo assessment.

- **ESC Test** means a test to provide evidence for ESC, i.e. under the functional, technical and operational conditions of the ESC Types where the OBU is intended to be used; ESC Test is known

under various designations, such as track/train-integration tests, network access test, complementary test, IOP test, track-train system validation (TTSV);

- **ESC Test Facility** means a facility representing an ESC Type, where ESC can be tested. An ESC Test Facility may be a lab[3] appointed by the Infrastructure Manager, a representative (set of) track(s), or a combination of both; it can be owned, operated and maintained by the Trackside Supplier, or it can be owned, operated and maintained by the Infrastructure Manager or a third party owning or managing the trackside reference; as a minimum requirement it should be based on real products (e.g. the hardware and software implementing the RBC functionality) and real engineering to reflect the real characteristics of the trackside; the radio connection can be real or simulated; if the ESC Test Facility is established as a laboratory environment, it should be based on agreed specification for the interface between OBU Test Bench and ESC Test Facility in case of laboratory environments[4];

- **ESC Test Manager** means the Party who is responsible for managing the Test Campaign;

- **ESC Type** means one or a group of certified train protection part(s) of the trackside CCS subsystem(s) (one or more sections of a network equipped with ETCS), for which an OBU can demonstrate ESC based on a dedicated set of checks for each ESC Type. An ESC Type is determined by the Infrastructure Manager; each ETCS section in a network should be assigned to one ESC Type; the set of checks for each ESC Type in a Member State will be publicly available;

- **ETCS System Compatibility (ESC**) shall be the recording of technical compatibility between ETCS on-board and ETCS trackside parts of the CCS subsystems within an Area of Use of a Vehicle[5];

- **Interoperability Issue** means an issue identified during a Test Campaign as a deviation from an expected test result and whose resolution will require an amendment of the ERTMS specifications according to the CCM process or specific mitigation measures; product-related issues are not covered by this definition;

- **Involved Parties** means Parties who are involved in the activities according to Section 5;

- **OBU** means a generic ETCS on-board unit which comprises at least the interoperability constituents 'ETCS on-board' and 'Odometry' according to Table 5.1 of EU regulation 2016/919/EU (CCS TSI); the version of the OBU should be identified by a system identifier according to the CCS TSI;

- **OBU Supplier** means a Party responsible for the design and implementation of the OBU;;

[3] The laboratory does not need to be certified according to the standard ISO/IEC 17025:2015.
[4] e.g. Subset-110/111/112 (review by ERA still pending)
[5] The ETCS on-board part of the CCS subsystem shall at least be a Representative Configuration and the ETCS trackside parts of the CCS subsystem shall be a certified real implementation or a copy of that real implementation (e.g. in a laboratory environment). Certification of on-board and trackside can be performed along with the demonstration of ESC. Nevertheless, certification is assumed an appropriate means to proof the maturity of interoperability constituents or subsystems and should be finished before the performance of ESC Tests, if possible.

- **OBU Test Bench** means any technical equipment provided by the OBU Supplier additional to the OBU in order to establish a working communication between ESC Test Facility and OBU required for the Test Campaigns;

- **Operational Scenario** means the description of the intended railway system operation in situations relevant for ETCS (e.g. entry of a train into an equipped area, awakening of a train, overriding a signal at stop), by means of a sequence of trackside and on-board events related to or influencing the Control-command and Signalling subsystems;

- **Principles** mean the principles for the demonstration of ESC described in this document;

- **Representative Configuration** means a configuration on the basis of which test results can be achieved, which are valid for various configurations of the same certified OBU;

- **Technical Compatibility** means an ability of two or more structural subsystems or parts of them which have at least one common interface, to interact correctly with each other in all conditions under which the subsystems are intended to operate;

- **Test Campaign** means a series of tests performed according to the activities described in Section 5;

- **Test Results** mean a summary of the functional description of the tests performed during the Test Campaign, the test objectives and the corresponding results;

- **Trackside Implementation** means the actual design of the certified CCS trackside subsystem based for example on Operational Scenarios, signalling principles, Engineering Rules and supplier dependent product characteristics;

- **Trackside Supplier** means a Party responsible for the design and implementation of ETCS trackside products (e.g. the RBC).

3 Scope

3.1 Overall scope

This document defines basic guidelines and requirements to ensure a smooth demonstration of ESC Checks. This includes the definition of

- Involved Parties,
- their contributions and responsibilities,
- the process to be followed.

The Principles will be implemented for the demonstration of ESC for one or more ESC Types, through a request from an Entity applying for ESC Demonstration to an Infrastructure Manager. Each Party commits to follow the process and activities defined in these Principles in good faith and with due diligence.

More specifically, each Infrastructure Manager undertakes to promptly respond to a request from an Entity applying for ESC Demonstration. Furthermore, all Involved Parties should make findings and restrictions resulting from the activities according to Section 5 fully transparent to the other parties involved.

The result of the checks for the demonstration of ESC will be laid down in a Check Report and finally summarised in an ESC Statement.

3.2 Scope of the Test Campaign

As the organisationally complex part of ESC Checks will be ESC Tests, the main focus of the Principles are Test Campaigns performed in an ESC Test Facility. A general overview of the performance of Test Campaigns is given in Figure 1.

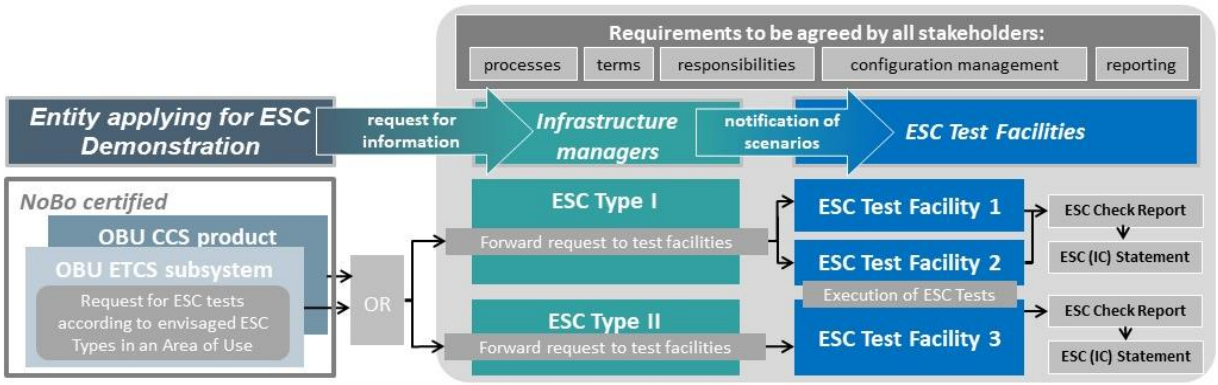


Figure 1: General overview of the performance of the Test Campaigns

The object under test is the ETCS part of the on-board CCS subsystem. As the test result for the object under test is mainly influenced by the OBU regardless of its specific configuration (specific SW data preparation and specific HW configuration (e.g. specific odometry sensors, specific TIU configuration (MVB, CAN-Bus, Profibus, ...)), ESC should be regarded as a capability of the (group of) interoperability constituent(s) (product level). This principle should generally be followed, even if the Test Campaign is performed on the on-board CCS subsystem level.

Therefore, the goal of a Test Campaign is to give sufficient evidence for ESC of an OBU with an existing ETCS trackside solution. In that respect the emphasis of the ESC Tests is the demonstration of compatibility of the interfaces between OBU and ETCS trackside. If limited regression testing for configurations different

from the Representative Configuration is deemed required for the on-board CCS subsystem level and agreed in the analysis phase, it should be justified and recorded as constraints therein. These constraints should then be managed at the on-board CCS subsystem level (e.g. closed-out, accepted by the Infrastructure Manager or Railway Undertaking).

The amount of tests needed for the demonstration of ESC should be defined for each Test Campaign during the analysis phase Section 5.2 (phase 2). Re-use of tests from a previous Test Campaign is possible. The Check Report should always give a conclusion on the fulfilment of the complete set of necessary checks submitted to ERA by the Infrastructure Manager for the ESC Types, even if only a subset of the checks has been execute, e.g. as part of a specific Test Campaign. In that case, evidence should be provided why the execution of only a subset of the set of checks was sufficient (e.g. by consideration of previously achieved results).

This document focus on ETCS and do not encompass legacy systems. Therefore, the ETCS functionalities linked to Class B systems will be tested only as far as dynamic transitions are concerned.

3.3 Scope of the types of ESC statements

In order to facilitate re-use of already achieved results of the checks and in order to be compliant with the CCS TSI, two types of ESC statements have been defined in the Principles:

- ESC Statement (mandatory) according to Table 7.1 of the CCS TSI to prepared on the on-board CCS subsystem level;
- ESC IC Statements (optional) prepared on the product level for multiple re-use in different applications.

An overview is given in Figure 2.

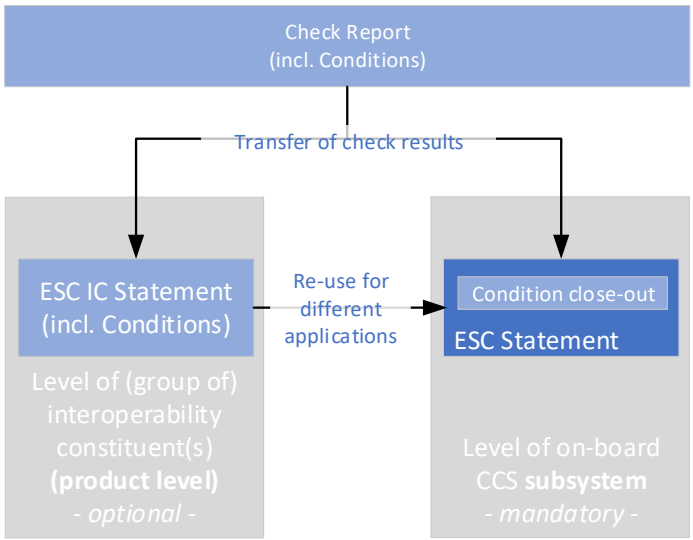


Figure 2: Types of ESC statements

3.3.1 ESC IC Statements

All test results of an OBU which are valid regardless of the OBU's configuration or regardless of the specific vehicle type should be recorded in an ESC IC Statement also checked by a Notified Body in order to facilitate re-use of already achieved results on the on-board CCS subsystem level. As ESC is a complementary quality proof to the demonstration of CCS TSI requirements, the ESC IC Statement should

be attached to the EC declaration of conformity of the OBU. Results achieved at the on-board CCS subsystem level and valid regardless of the specific configuration of the OBU (e.g. if stated so in the Check Report) can be transferred to the ESC IC Statement. Any condition included in the ESC IC Statement (e.g. constraint to perform specific field tests, which could not be performed in a laboratory) should be followed and closed on the on-board CCS subsystem level in order to achieve the ESC Statement.

In any case and as a fundamental principle, tests already performed and where their results are valid for the specific configuration must not be repeated.

In order to reuse the ESC IC Statement, the NoBo verification of the Check Report should be the ones indicated as applicable for the ESC IC Statement in this Application Guide section 2.6.82,

3.3.2 ESC Statement

According to the CCS TSI, Table 7.1 the BDC ETCS System Compatibility shall be based on an ESC Statement checked by a Notified Body. The ESC Statement and the result of its check by the Notified Body should be provided by the holder of the vehicle type authorization to the authorising entity in order to register the new vehicle type version in ERATV.

A summarising example of the relation of ESC IC Statements and ESC statements is given in Figure 3.

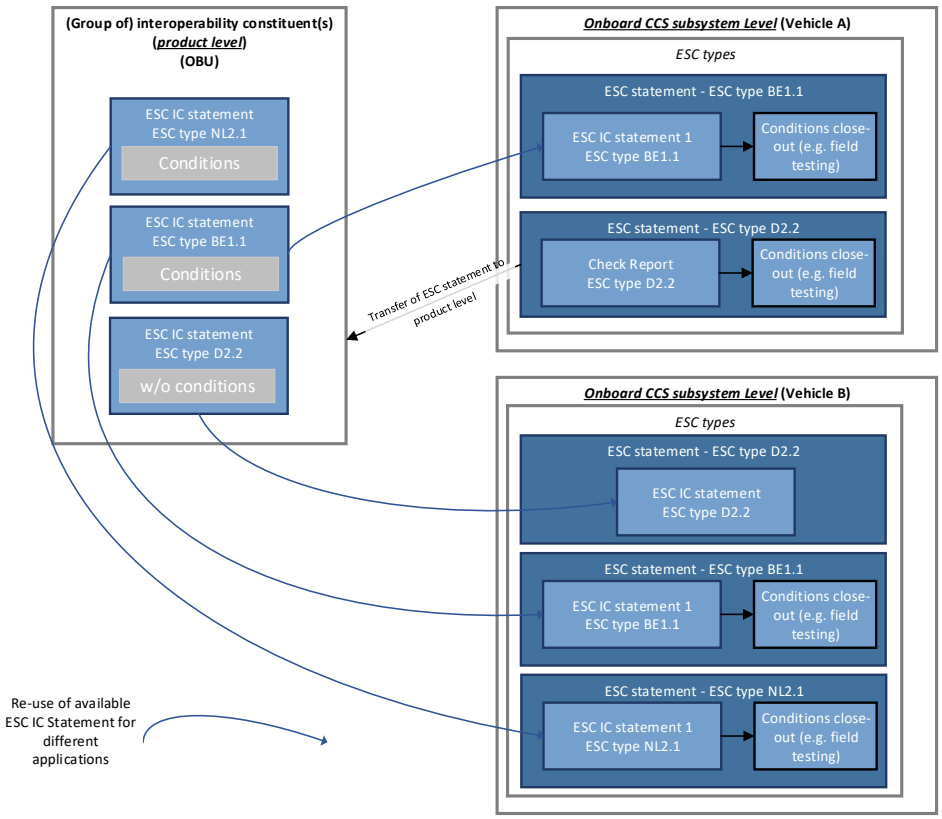


Figure 3: Relation between ESC IC Statements and ESC Statement

4 Roles and Responsibilities of the Involved Parties

An organization can perform one or more of the roles described in this Section if a sufficient impartiality is assured. Sufficient impartiality is assured if the roles are performed by different independent

organisations. If two or more roles are performed by one organisation, other Involved Parties should agree.

4.1 Roles and responsibilities of the Infrastructure Manager

An Infrastructure Manager should

- assign their trackside to one or more ESC Types;
- manage Engineering Rules in order to reduce technical variability of trackside solutions;
- if ESC Checks do not encompass ESC Tests, prepare the Check Report and agree with the Entity applying for ESC Demonstration on the final Check Report;
- if ESC Checks encompass ESC Tests:
    - make sure that an ESC Test Facility representing their reference trackside for the ESC Types is available and accessible to an Entity applying for ESC Demonstration upon request for ESC Tests and compliant with the conditions of the Principles (e.g. processes, technical compliance to agreed specification for the interface between OBU Test Bench and ESC Test Facility in case of laboratory environments))[6];
    - deliver the necessary information to the ESC Test Facility Manager to continuously maintain the ESC Test Facility according to the ESC Types and its modifications;
    - appoint the ESC Test Manager in consultation with the Entity applying for ESC Demonstration;
    - make the specific commercial and technical conditions for access to the ESC Test Facility for their ESC Types publicly available;
    - make sure that the ESC Tests are performed in a non-discriminatory manner; priority rules for parallel demands should be defined on a case by case basis, involving all Entities for ETCS System Compatibility Testing, who initiated the parallel demands and the concerned ESC Test Facility Managers;
    - support test analysis with their operational knowledge and confirm the acceptability of any exported constraints to the ESC Types and its operation on request of the ESC Test Manager;
    - in case of an infrastructure change assess the functional changes to ESC Types and should consider the impact analysis with respect to an already existing ESC Statement for an OBU;
    - agree with the OBU Supplier, the ESC Test Facility Manager and if required the Trackside Supplier on the final Check Report (testing part prepared by the ESC Test Manager).

[6] e.g. Subset-110/111/112 (review by ERA still pending)

Note: An Infrastructure Manager can initiate / organize a Test Campaign for his own purpose in case of changes to the infrastructure.

4.2 Roles and responsibilities of the Entity applying for ESC Demonstration

The Entity applying for ESC Demonstration should

- ask one or more Infrastructure Managers to initiate / organize a Test Campaign pursuant to the terms laid down in these Principles; this will typically but not necessarily be the OBU Supplier (e.g. vehicle manufacturer, railway undertaking, Infrastructure Manager, vehicle owner);
- appoint the ESC Test Manager in consultation with the Infrastructure Manager;
- provide the certified OBU hardware and software with the corresponding ETCS Baseline and preferably in a Representative Configuration during a defined test period according to the exact conditions defined in the process as described in Section 5 and equip the OBU Test Bench for tests in laboratory environments with interfaces corresponding to the technical concept described in the Subsets (e.g. agreed specification for the interface between OBU Test Bench and ESC Test Facility);
- support the activities according to Section 5 in terms of lab integration, test execution, maintenance of the OBU Test Bench and analysis of findings during the test period.

4.3 Roles and responsibilities of the ESC Test Facility Manager

The ESC Test Facility Manager should

- be responsible for managing the ESC Test Facility;
- provide the ESC Test Facility for ESC Tests;
- ensure in case of lab tests the integration of the OBU Test Bench with the ESC Test Facility and coordinate the provision corresponding to the technical concept described in the interface specifications (e.g. agreed specification for the interface between OBU Test Bench and ESC Test Facility);
- set up a generic database of ESC Tests for execution in the ESC Test Facility with relation to the activities according to Section 5;
- operate the ESC Test Facility during the activities according to Section 5 and ensure a smooth running of the Test Campaign;
- ensure the maintenance/update of the ESC Test Facility.

For the ESC Checks which do not encompass ESC Tests, this role is not required.

4.4 Roles and responsibilities of the ESC Test Manager

The ESC Test Manager should

- be competent for the job;
- not be influenced by the Involved Parties in his decision making;
- organize and lead the execution of and act as “master“ for the activities according to Section 5, whereas the OBU acts as “slave”;
- provide a Check Report prepared according to the process described in Section 5;
- agree with the OBU Supplier, the Infrastructure Manager and if required the Trackside Supplier on the content of the final Check Report and issue it.

For the ESC Checks which do not encompass ESC Tests, this role is not required.

4.5 Roles and responsibilities of the Trackside Supplier

The Trackside Supplier should

- support the Infrastructure Manager, ESC Test Facility Manager and ESC Test Manager with knowledge about the Trackside Implementation and about the relevant ESC Tests;
- support the process in case of Trackside Implementation issues revealed during a Test Campaign.
- if required by the Parties, agree with the ESC Test Manager, OBU Supplier and the Infrastructure Manager to issue the final Check Report.

4.6 Roles and responsibilities of the OBU Supplier

The OBU Supplier should

- support the Entity applying for ESC Demonstration by providing mandatory evidence, such as the EC declaration of conformity and the limitations against the requirements of the CCS TSI;
- define a Representative Configuration, if ESC Checks are performed on the product level;
- support the creation of the Check Report;
- support the process in case of OBU issues revealed during a Test Campaign.

4.7 Roles and responsibilities of the Notified Body

The roles and responsibilities of the Notified Body related to ESC are included in Section 6.3.3.1 of the CCS TSI. The necessary activities of the CCS TSI, Section 6.3.3.1 a), b) and c) are described in

- Section 3.3 of this document for CCS TSI, Section 6.3.3.1, point a) and
- Section 5.2, step 17 of this document for CCS TSI, Section 6.3.3.1, points b) and c).

5 Check process, execution of the work and deliverables

5.1 General

The following descriptions detail the preceding sections concerning the achievement of the results for the ESC Checks and the close-out of related Conditions including the assessment by a Notified Body. The check of completeness on the availability of all required ESC Statements for the envisaged ESC Types are not part of this section. This is part of the detailed descriptions in the CCS TSI application guide and of Section 3.3.1 of this document.

5.2 Check process

The flow chart contained in Appendix 1 should be used as a blueprint for the Test Campaign, unless the Involved Parties unanimously agree otherwise.

Each step of the flow chart is listed below with additional information.

Box/Step	Activity	Remark
Process to demonstrate ESC		
1	Entity applying for ESC Demonstration applies for ESC Check and provides the following information in liaison with the OBU Supplier: • EC-declarations of conformity (CCS TSI) and • Limitations, restrictions or added functions of the OBU.	The EC declaration of conformity and underlying certificates by a Notified Body should confirm that a specimen of the OBU has passed a suitable test campaign (all the tests necessary to achieve the EC-declaration of conformity for the (group of) interoperability constituent (e.g. Subset-076)) for the demonstration of the correct implementation of the applicable CCS TSI requirements. Limitations, restrictions or added functions of the OBU against requirements of the CCS TSI should also be made available, using the template in Annex 9. OBUs are typically highly configurable systems with various optional interfaces (e.g. digital, MVB, Profibus, CAN-Bus) and configurations. For ESC Tests performed on the product level, it is up to the OBU Supplier to define a Representative Configuration, which covers the ETCS functional behaviour required for the ESC Tests. If ESC Tests are performed only for one specific on-board ETCS configuration (e.g. under the sole responsibility of an Entity applying for ESC Demonstration not being the OBU Supplier and for one

Box/Step	Activity	Remark
		specific vehicle type) a Representative Configuration needs not to be defined.
2	Entity applying for ESC Demonstration agrees with the Infrastructure Manager about ESC Checks required for one or more ESC Types (incl. analysis of limitations of the OBU).	The step is about the extent of ESC Checks and the conditions for their execution. The OBU Supplier and the Trackside Supplier will be consulted if necessary. If the limitations of the OBU provided in step 1 are not acceptable for the Infrastructure Manager, the process ends. The Involved Parties should check which ESC Checks are applicable with respect to the trackside configurations or operational conditions (e.g. speed, location) and the special characteristics of the OBU (e.g. product limitations and maturity (e.g. based on existing ESC evidence)). The decision whether or not ESC Tests need to be performed or repeated should be made at this stage and finally be justified in the Check Report (step 13). This is also required if the Involved Parties decide not to perform ESC Tests, even though required according to the set of checks for the ESC Type.
3	Infrastructure Manager forwards the request to the ESC Test Facilities representing the reference trackside for the requested ESC Tests.	-
4	Infrastructure Manager inform the Entity applying for ESC Demonstration about the actual ESC Test Facilities to be used and the associated conditions.	-
5	Infrastructure Manager and Entity applying for ESC Demonstration appoint ESC Test Manager.	-
6	ESC Test Facility Manager and OBU Supplier identify agreed specification for the	It is assumed that the OBU Supplier has to be involved in case of tests in a laboratory environment, especially if the

Box/Step		Activity	Remark
		interface between OBU Test Bench and ESC Test Facility.	OBU Test Bench is integrated with the ESC Test Facility for the first time. Other solutions are possible. This step might probably be skipped if ESC Test Facility is not a laboratory environment.
7		ESC Test Facility Manager and OBU Supplier check the functionality of the communication link between ESC Test Facility and OBU Test Bench.	It is assumed that the OBU Supplier has to be involved in case of tests in a laboratory environment, especially if the OBU Test Bench is integrated with the ESC Test Facility for the first time. Other solutions are possible. This step might probably be skipped if ESC Test Facility is not a laboratory environment.
8		ESC Test Manager establishes a specific database of executable ESC Tests for the Test Campaign.	The specific database should be based on the generic database (see 'box' III in the pre-conditions of this table).
9		*Test Execution*	
	9a	ESC Test Manager executes ESC Tests according to the identified ESC Test database.	In a laboratory environment this should be done in liaison with the OBU Supplier.
	9b	If a test is failing (a test cannot be executed) the ESC Test Manager liaises with the ESC Test Facility Manager and OBU Supplier to solve the issue.	It is assumed that for the analysis of failed test, the OBU Supplier has to be involved for technical reasons, even if the OBU Supplier is not the Entity applying for ESC Demonstration.
	9c	Preliminary Check Report	The Preliminary Check Report should contain the test result categorized by 'OK', 'NOK', 'possible IOP issue'. Possible IOP issues are the ones that could be due to an error as defined in CCS TSI Section 6.5 (2).
	9d	ESC Test Manager coordinates the analyses of the preliminary Check Report and the list of issues with OBU Supplier, Infrastructure Manager and Trackside Supplier.	It is assumed that for the analysis of failed test, the OBU Supplier has to be involved for technical reasons, even if the OBU Supplier is not the Entity applying for ESC Demonstration.
10		*Issue handling*	

Box/Step		Activity	Remark
	10a-d	Infrastructure Manager, ESC Test Facility Manager, OBU Supplier to decide on required actions.	For the remaining issues the responsible Involved Parties will decide on consequences on operational, product, engineering or interoperability issues. This might require raising the issue to other stakeholders (e.g. the European Union Agency for Railways (ERA) in case of possible interoperability issues).
	10e	Re-execution of tests or re-evaluation of Test Results if required.	Based on the conclusions (according to steps 10a-d) tests might be re-executed.
11		At the end of the analysis the ESC Test Manager, the OBU Supplier and the Infrastructure Manager (and if required the Trackside Supplier) agree on a final Check Report.	It is assumed that for the creation of the final Check Report, the OBU Supplier has to be involved to assure an objective conclusion, even if the OBU Supplier is not the Entity applying for ESC Demonstration.
12		*Preparation of final Check Report.*	
	12a	The Infrastructure Manager issues a final Check Report.	This step is only required of the ESC Checks do not encompass ESC Tests. A Check Report must always show the complete result on all required set of checks.
	12b	The ESC Test Manager and the Infrastructure Manager issue a final Check Report.	This step is required if the ESC Checks encompass one or more ESC Tests. If ESC Checks only consist of ESC Tests, the Infrastructure Manager does not necessarily need to be author of the Check Report. A Check Report must always show the complete result on all required set of checks, even if it was decided not to fully execute them according to step 2 for a specific Test Campaign.
13		Output: Check Report	-
14		Applicability of check results?	The Check Report will define which results of the checks are applicable for the product level of the OBU or for the on-board CCS subsystem level. In the

Box/Step		Activity	Remark
			latter case the results are only applicable to the specific configuration of the OBU.
15		*Applicability of the results of the checks*	
	15a	Entity applying for ESC Demonstration draws up the IC Check Report.	This step applies, if the Check Report (or parts of it) are applicable to the product level and the Entity applying for ESC Demonstration decides to issue an ESC IC Statement.
	15b	Entity applying for ESC Demonstration closes-out conditions of report (if any)	This step applies, if the Check Report (or parts of it) are applicable to the on-board CCS subsystem level. If the Check Report contains Conditions the Entity applying for ESC Demonstration should provide a description of how these are managed or how they were closed-out.
16		*Handover to the Notified Body*	
	16a	Output: IC Check Report	The Entity applying for ESC Demonstration hands-over the IC Check Report to the Notified Body for assessment.
	16b	Output: Condition-close out (optional)	The Entity applying for ESC Demonstration hands-over the Check Report and (in case of applicable Conditions) a Condition close-out description to the Notified Body for assessment.
17		Check of the Notified Body (CCS TSI, Section 6.3.3.1 b) and c))	The NoBo checks • that the report gives reference to the necessary checks according to the technical document published by ERA; • that ESC checks has been performed and the results indicate for every ESC Check whether the ESC Check was passed as specified or not; • that for every ESC Check which was not passed as specified, the

Box/Step	Activity	Remark
		incompatibilities and errors encountered during ESC Checks are stated; • that for every ESC Check which was not passed as specified, an analysis of the effects on ESC has been performed in accordance with step 11. Depending on the applicability of the Check Report (according to step 15) the Notified Body checks in addition that all the applicable results and conditions were transferred correctly and completely to the Check Report; • that Conditions were closed-out by the Entity applying for ESC Demonstration.
18	Notified Body assessment OK?	The Notified Body assesses the Check Report, ESC IC Statement or the condition-close provided by the Entity applying for ESC Demonstration. If the result of the assessment requires rework of the objects of assessment, they should be updated accordingly.
19	Output: Notified Body confirmation. Assessment Report	If the assessment of the Notified Body end with a positive result, he should confirm that in an Assessment Report.
20	Use of Principles' outcomes in vehicle authorisation process (for first authorisation or for changes to an authorised type) ► see Figure 3 as an example	For further information see Section 3.3. More details are not specified in the Principles as these activities are more related to vehicle authorisation.
Pre-condition		This is a general task or pre-condition and not related to a specific Test Campaign.
I	Infrastructure Managers submits ESC Tests to ESC Test Facilities.	The ESC Tests should be in line with the necessary checks submitted to ERA.

Box/Step	Activity	Remark
IIa	ESC Test Facility Manager prepares database and implements ESC Tests.	-
IIb	ESC Test Facility Manager maintains database.	-
III	Complete database library for test scenarios per ESC Type.	The generic database library may often be confidential for IPR reasons as specific tests may give away the implementation of trackside products. E.g. tests are often specific to the realization of an RBC by a company and show how it works in detail. These inner workings of the product are the IPR of the manufacturer and should not be made public implicitly by publishing very detailed test cases.

5.3 Procedures and rules with regards to the Principles

The procedures, processes and tools described in the Principles and in any other document therein referenced are the only ones suitable for the ESC Checks.

5.3.1 Change management

ETCS components are mainly computer systems and the behaviour can be changed by changing software. To improve safety and quality, a reasonable way of introducing changes must be defined, without the necessity of re-performance of the activities according to Section 5.2. Therefore, the following conditions have been defined to judge whether ESC Test activities are required after changes.

5.3.2 Changes of the OBU

If one of the conditions according to Point 7.2.1a.2 of the CCS TSI is not fulfilled, an existing ESC Statement is not valid anymore and the complete process of Section 5.2 has to be followed, albeit potentially with a smaller number of tests.

5.3.3 Changes of the trackside

For trackside changes it must be distinguished between changes of the trackside engineering and changes of the trackside products.

A Test Campaign does not have to be re-performed after changes of the ETCS trackside, if all of the following conditions are fulfilled:

For changes in Infrastructure Manager's trackside engineering or operational rules:

- Coherent extensions or changes of the ESC Types based on the same Operational Scenarios and Engineering Rules.

For changes in trackside products the conditions specified in Point 7.2.1b.2 of the CCS TSI apply.

In any other case the Infrastructure Manager analyses the changes with the relevant ESC Test Facility Manager or Trackside Supplier in order to determine if OBUs need to be re-tested fully or partially and if the ESC statement requires an update.

5.4 Contact person for the Test Campaign

Each Involved Party should define a contact person for each Test Campaign.

The nominated contact person should be the interface between the Involved Parties during the Test Campaign.

6 Appendixes

APPENDIX I - Process Flow Chart

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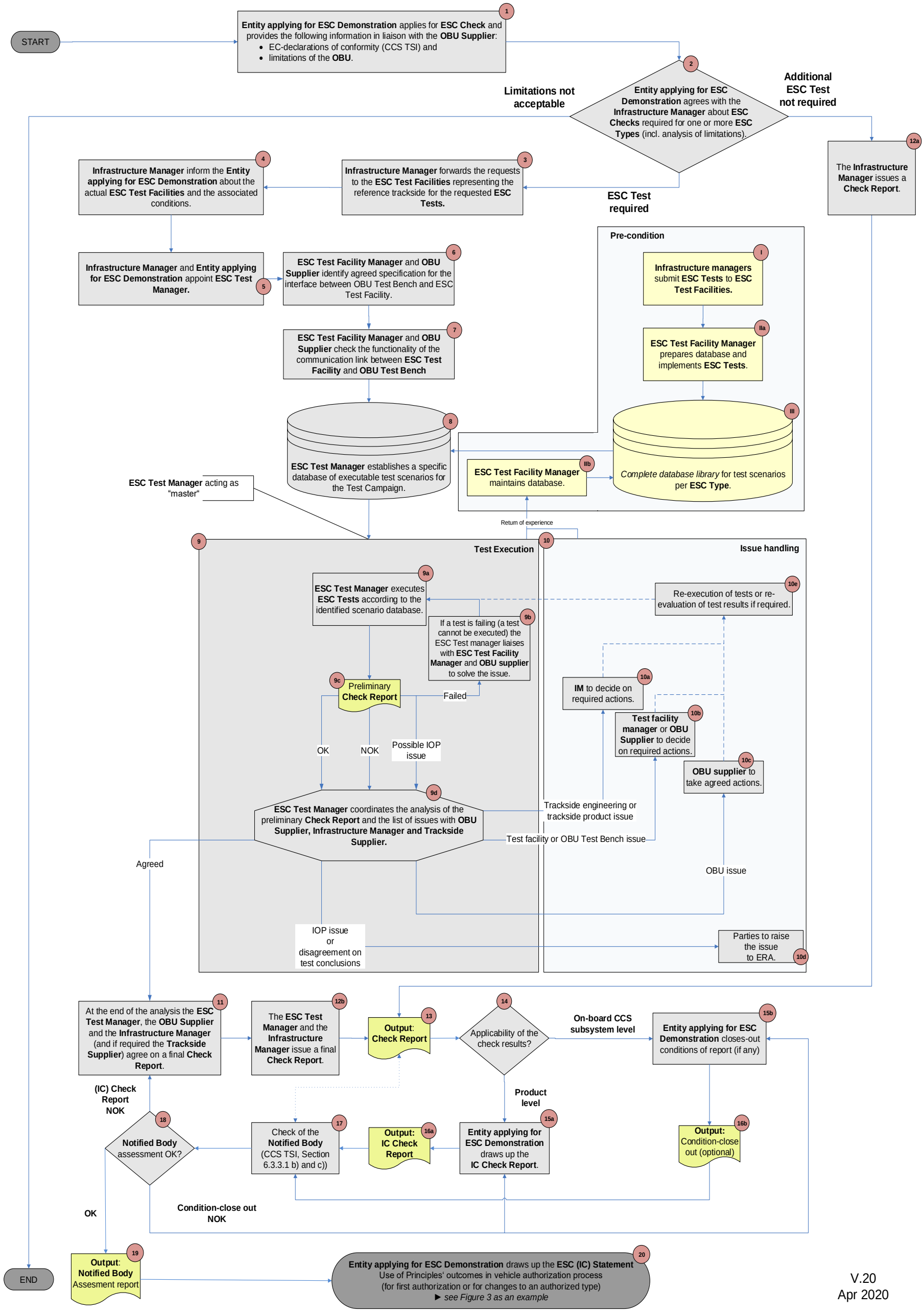
APPENDIX I - Process Flow Chart



V.20
Apr 2020

Annex 6: RSC Principles

Extract from document “Principles for the demonstration of Radio System Compatibility – RSC” [reference O-3325 version 1], created by UIC and UNITEL as Deliverable 3.2.4 of the Work Package 3 defined in the Shift2Rail specific contract#1 S2R.18.OP.2 “Support to the ERTMS Deployment action plan as baseline for Shift2Rail (IP2) innovative solutions”.

List of Contents

1. References

Normative references

[1] EIRENE, Functional Requirements Specification, version 8.0.0

[2] EIRENE, System Requirement Specification, version 16.0.0

[3] COMMISSION IMPLEMENTING REGULATION (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU

[4] 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

[5] COMMISSION IMPLEMENTING REGULATION (EU) 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU

Informative references

[1i] ETSI EN 301 515 v3.0.0, “Global System for Mobile Communication (GSM); Requirements for GSM operation on railways”

[2i] ETSI TS 102 281 v3.1.1 “Railways Telecommunications (RT); Global Systems for Mobile Communication (GSM); Detailed requirements for GSM operation on Railway”

[3i] O-3001 Test specifications for GSM-R MI related requirements (Part 1: Cab Radio, Part 2- EDOR, Part 3-SIM cards, Part4-Network)

RSC Introduction

Radio System Compatibility RSC has first been introduced in the CCS TSI COMMISSION IMPLEMENTING REGULATION (EU) 2019/773 released in 2019 [3].

The purpose of this document is to identify the necessary and sufficient conditions to determine the compatibility of a radio device on a vehicle with the routes on which that vehicle is operating.

Even a successful certification process cannot always exclude that, when an on-board CCS subsystem interacts with a trackside CCS subsystem, one of the subsystems repeatedly fails to function or perform as intended under certain conditions. This may be due to engineering and national operational rules, possible deficiencies or different interpretations in the specifications. Therefore, checks might be required to demonstrate the technical compatibility of the CCS subsystems in the area of use for a vehicle. The necessity of these checks should be considered as a temporary measure on TSI level to increase the confidence on the technical compatibility between the subsystems. In order to reach this confidence, paper analyses, test in a laboratory or if not indispensable tests with a vehicle on the line are measures to reach this confidence – the measure sufficient enough in each case should be used. In order to enable the possibility of executing checks in a laboratory representing the trackside configuration(s) it is to be made available by the Infrastructure Manager.

It has to be noted that GSM-R system is fully specified according to ETSI European Norm EN 301 515 [1i] and TS 102 281[2i] and according to FRS and SRS and thoroughly tested.

These RSC checks are not the tests done for the certification/verification of the Cab radio/EDOR nor for the on-board subsystem certification. The corresponding tests are already done prior to RSC checks. RSC checks need to be demonstrated at the vehicle (on-board) subsystem level. These type of checks/tests are sometimes called “homologation” or “integration” or “interoperability” tests and are required to ensure compatibility between vehicles and the routes on which they are to be operated corresponding to the vehicle authorisation.

The concept of RSC checks corresponds to those checks/tests that are currently requested to any train who wants to be authorised to run in a network which are usually done either in a lab with a replica of the real configuration, (lab with BTSs with access to the real core) or directly on the real network/tracks.

National Class B systems are excluded from the RSC process.

RSC definitions

Principles:

Principles for the demonstration of RSC.

Radio System Compatibility (RSC):

The recording of technical compatibility between voice and data radio on-board and the trackside GSM-R parts of the CCS subsystems within an area of use of a vehicle.

RSC Checks:

A check to provide evidence for RSC, i.e. under the functional, technical and operational conditions of the RSC Types where the GSM-R on-board Subsystem is intended to be used; RSC Checks are known under various designations, such as homologation, integration or interoperability tests, that are required for the authorisation of a vehicle.

RSC Checks are not the checks/tests done for the certification/verification of the GSM-R on-board subsystem.

RSC Test Facility:

A facility representing an RSC Type, where RSC can be tested. An RSC Test Facility may be either a lab with a replica of the real configuration, a lab with BTSs with access to the real core or directly on the real network/tracks/site.

RSC Test Manager:

The Party who is responsible for managing the RSC Test Campaign.

RSC Type:

One or a group of certified radio communication element(s) of the trackside CCS subsystem(s) (one or more sections of a network equipped with GSM-R), for which an on-board subsystem can demonstrate RSC based on dedicated set of checks for each RSC Type. An RSC Type is determined by the Infrastructure Manager. All GSM-R sections in a network should be assigned to one or more RSC Types. The set of checks for each RSC Type in a Member State will be submitted to the Agency and published in a technical document. On-board CCS subsystems should ideally have demonstrated RSC for all RSC Types being part of the Area of Use of a Vehicle.

RSC Test Campaign:

A series of tests performed according to the activities for the RSC checks.

RSC Test Report:

The Report drafted by the RSC Test Manager according to the activities of the RSC checks with the support of other Parties, upon completion of the RSC Test Campaign.

RSC check and validation

According to CCS TSI Radio System Compatibility (RSC) shall be the recording of the technical compatibility between voice or data radio on-board and the trackside radio parts of the CCS subsystems on 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.

After the RSC checks for an RSC Type are performed, the RSC statement, including the results of the analysis of the checks for that specific RSC Type, is provided to a NoBo. The NoBo will assess the completeness of the checks and will indicate any inconsistency found. This information is then included in the Technical File of the On-board Subsystem EC Declaration.

The RSC Check & Validation define the compatibility check of the radio system (voice and/or data) requested in the Common specifications for the register of railway infrastructure - RINF (EU) 2019/777 [5] and European Register of Authorised Types of Vehicles - ERATV (EU) 2019/776) [4]

Both RINF and ERATV databases have to be kept updated with the most up-to-date information. The process for achieving this is out of the scope of this RSC principles document.

Appendix D1 (COMMISSION IMPLEMENTING REGULATION (EU) 2019/773) [3] sets out all the parameters that shall be used in the process of the railway undertaking before the first use of a vehicle or train configuration in order to ensure all vehicles composing a train are compatible with the route(s) the train is planned to operate on including, where appropriate, deviation routes and routes to workshops.

Basic parameters like voice radio communication and data radio communication required for checking the vehicle-route compatibility are indicated by a 'X' in the column 'Vehicle level' in accordance with Appendix D (Route compatibility and Route Book) to Implementing Regulation (EU) 2019/773 [3].

The infrastructure manager should not require additional technical checks for the purpose of route compatibility beyond the list laid down in Appendix D1 - of (EU) 2019/773 [3]. The mechanism to perform the analysis of route compatibility is out of the scope of this RSC principles document.

Route compatibility check interface	Vehicle information (either from ERATV, the technical file, or any other appropriate means of information)	Route information available in Register of Infrastructure (RINF) or provided by Infrastructure manager until RINF is complete	Vehicle level	Train level	Procedure to check the vehicle and train compatibility over the route intended for operation
GSM-R	Radio System Compatibility Voice	1.1.1.3.3.9 Radio System Compatibility Voice	X		Comparison Radio System Compatibility voice value in RINF is included in the vehicle authorisation.
GSM-R	Radio System Compatibility Data	1.1.1.3.3.10 Radio System Compatibility data	X		Comparison Radio System Compatibility data value in RINF is included in the vehicle authorisation.
GSM-R	SIM Card GSM-R Home Network	1.1.1.3.3.5 GSM-R networks covered by a roaming agreement	X		Comparison that the SIM Card GSM-R Home Network is in the list of GSM-R networks with roaming agreement for all sections in the route. This has to be performed for all SIM Cards in the vehicle (Voice and Data).
GSM-R	SIM Card support of group ID 555	1.1.1.3.3.4 Use of Group 555	X		Check that the Group ID 555 is used trackside. If this is not configured on-board, alternative operational procedures should be prior established with the Infrastructure Manager

Table 1: D1- Parameters (radio part) for the vehicle and train compatibility over the route intended for operation - (EU) 2019/773 [3]

Current status of Checks/Tests

Voice Radio communications (Cab Radio)

It is in particular to be noted that the currents status is that the authorisation is mainly based on documentation produced showing the results of the tests conducted for the certification of the Voice Radio Part of the on-board Subsystem.

Most of the IMs rely on these tests and any additional testing is mainly focusing specifically on NTRs and optional features:

- To ensure compatibility with IMs specific network's parameters and Cab Radio product software and hardware version, in combination with the parameters in the SIM card fitted.
- To check that national specificities do not negatively impact the system behaviour (even if the option is not used by the Cab Radio).

ETCS Data Only Radio (EDOR) communications

For EDOR the current situation is that there are no specific tests required, other than the tests conducted for the certification of the ETCS Data Radio Part of the on-board Subsystem.

Principles for RSC testing

Compatibility checks should be carried out to demonstrate the technical compatibility between voice and data radio on-board and the trackside parts of GSM-R of the CCS subsystems in the area of use for a vehicle.

RSC type should 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 should have the same RSC type.

These checks are not in the scope of a certificate of verification. If they are performed, the corresponding documentation should identify the Control-command and Signalling Subsystems with which compatibility has been checked, with indication of types and versions of equipment and of operational test scenarios applied.

In particular, the principles applicable to those checks should be transparent and prepare the ground for further harmonisation. The possibility of executing those checks in a laboratory representing the trackside configuration to be made available by the Infrastructure Manager should be prioritised.

Some of the checks may not need any additional test, and may be fulfilled based on documentary evidences.
In case of need to perform specific tests, the Infrastructure Manager should indicate which of them may be done at Interoperability Constituent (IC) level (i.e. at Cab Radio, SIM card, and/or EDOR level) and which have to be done necessarily at On-board subsystem level, specifying if needed the exact location and scenario to perform them.

If checks are made at IC level, the analysis can be reused for the analysis of the compatibility of any On-board Subsystem that integrates that IC.
In any case, the RSC checks for a determined RSC type should contain at least the definition of the check to be performed, the expected result of the check, if the check can be performed at IC level, if documentary evidences are sufficient to perform the check or if a specific test is strictly needed for it (for which, details of the laboratory to be used for them and/or track locations where tests have to be made need to be included, together with the contact details of the RSC Test Facility).

Consideration should be given on the necessary steps in the shortest possible time to increase the confidence on the technical compatibility and to reduce and eliminate the tests or checks to prove technical compatibility of on- board units with different Control-command and Signalling Subsystems.

RSC checks, when describing RSC tests, should preferentially refer to the definition of the test scenarios available in the test cases specifications [3i]:

- O-3001-1 Test specifications for GSM-R MI related requirements-Part 1 Cab Radio
- O-3001-2 Test specifications for GSM-R MI related requirements-Part 2 EDOR
- O-3001-3 Test specifications for GSM-R MI related requirements-Part 3 SIM Card
- O-3001-4 Test specifications for GSM-R MI related requirements-Part 4 Network

Therefore, test scenarios may just refer to the test case in one of the documents above.

Definition and Scope of the RSC Checks for Voice and non-ETCS data Radio Subsystem

RSC checks aim at demonstrating technical compatibility of an on-board radio subsystem with the trackside subsystem.

Checks may include documentary evidences of for example certain configuration of the SIM card fitted in the on-board subsystem.
Specific options implemented in a network may require a check of the compatibility of both the on-boards that implement the option and those that do not implement it (to make sure that there is no unexpected behaviour).
In addition, the following radio communication system parameters/functions may be addressed.

Cross Border Operation

At border crossing, the following specification from EIRENE SRS 16.0.0 shall be fulfilled:

4.8.1 When operating outside the home country, national functions that use non- internationally harmonised national values shall be disabled. (MI)

These requirement in the SRS specification is assigned as **MI** - **Mandatory for Interoperability** but the specific configuration in the Infrastructure Manager network may have not been checked by the NoBos.

This requirement is also not included in the test document - **Document O-3001 Test specifications for GSM-R MI related requirements [3i].**

Non-harmonised national values for GSM-R GIDs and Function Codes (FCs) per country are listed in the UIC Network Management Group Document N-9023, which can be used as a guide to evaluate the need to include checks related to this item.

EIRENE FRS and SRS Optional features

These requirements allow the selection (or non-selection) of a set of requirements on a national basis and should not be used as a precondition for the acceptance of on-board Subsystems on GSM-R networks. When an option is selected, the method defined in the SRS and FRS by which such features are implemented becomes mandatory (M), both to provide a consistent service and to present a recognised and agreed standard to manufacturers in order to obtain economies of scale in development and manufacture.

When added functions and interfaces (not specified in the TSI) are implemented, they should not lead to conflicts with implemented functions specified in the TSI.

Based on the decision of the IM to implement requirements that are classified as optional (O) in EIRENE FRS 8.0.0 [1] and EIRENE SRS 16.0.0 [2] or to implement other added functions, the IM should consider taking into account these requirements and functions for checking the vehicle-route compatibility (such as e-REC or the use of specific messages to indicate that the train is ready, for example).

Definition and Scope of the RSC Checks for ETCS data Radio Subsystem

RSC checks aim at demonstrating technical compatibility of an on-board radio subsystem with the trackside subsystem.

Checks may include documentary evidences of certain configuration of the SIM card fitted in the on-board subsystem.

For ETCS, there are no specific options to be implemented in a GSM-R network. The only valuable test seen from IM perspective are train-to-track integration end to end testing on the real network at On-board Subsystem level (this is, including EDOR, antenna system and ETCS OBU) to address compatibility with the IMs specific GSM-R network's parameters. In some cases, tests may be performed in order to ensure that an EDOR product software and hardware versions are compatible with the IMs specific GSM-R network's parameters.

In addition, the testing may address the use and support of GSM-R PS-mode, in particular GPRS/EGPRS.

This functionality is present in a trackside only in the case of having implemented ETCS level 2 and level 3 and radio in-fill applications over PS.

RSC Test campaign

RSC Tests should be managed by Railway Undertakings and Infrastructure Managers with support of the Trackside and Mobile equipment supplier, if applicable.

An Infrastructure Manager can initiate / organize an RSC Test Campaign in case of changes to the infrastructure to ensure that the vehicles that were compatible with the infrastructure before these changes continue to be compatible.

RSC tests should be performed in a non-discriminatory manner.

The Infrastructure Manager may provide a list of RSC tests to be tested by considering the reference trackside.

The result of the RSC Tests should be described in a RSC Test report handed over to the Railway Undertakings and Infrastructure Managers and cover:

- Tested configuration;
- Test results and analysis;
- Restrictions and application conditions.

The entire series of tests has to be completed successfully once. The order of the tests during the test run might vary.

If the result of a test case is PASSED then it does not need to be redone.

If the result of a test case is FAILED, the cause of the failure should be determined.

If the failure is not due to the Mobile equipment or on-board subsystem under test the test case needs to be retested after correction of the fault.

If the failure is due to the Mobile equipment or on-board subsystem under test this should be recorded in the RSC test report.

Location for performing the RSC Checks

IMs have to provide guidance on the conditions for performing each RSC check as in the table 2 below:

Check	Accepted when done at IC level	Laboratory evidence	Track to train field evidence	Specific location
Check 1	X	X		Railway Lab Test
Check 2			X	
Check 3			X	*Location XYZ*
Check 4		X	X	

Table 2: Example of conditions for performing each RSC check

In the provided example:

- The Check 1 can only be executed in the designated laboratory, and may be performed at IC level or at Subsystem level;
- The Check 2 can only be executed on track at Subsystem level;
- The Check 3 can only be executed on track, and in the indicated location, at Subsystem level;

- The Check 4 can be executed either based on documentary check and/or in laboratory and/or on track, only at Subsystem level.

For RSC checks that can be performed in a laboratory (for a section or the entire network of the area of use), IM should provide the contact information of the laboratories.

For the RSC checks that should be performed on track and if particular locations are required, this corresponding location should be provided.

RSC checks that may require the dynamic behaviour of the train should not be performed in laboratory or at IC level, except if laboratories are suitably equipped for simulating dynamic tests.

Annex 7: ESC Statement template

TEMPLATE FOR ETCS SYSTEM COMPATIBILITY STATEMENT

ETCS SYSTEM COMPATIBILITY STATEMENT

ETCS System Compatibility Statement document *[Document number]* (1)

We, Applicant:

[Business name] [Complete

postal Address]

Declare under our sole responsibility that the following subsystem (2):

[Name/short description of the subsystem, relevant configuration, unique identification of the subsystem]

to which this statement refers has been subject to the relevant verifications that corresponds to the following ESC Type:

[Reference to: ESC Type Identifier as published in the Agency Technical Document]

has been assessed by the following Notified body:
Business name

Registration number

Full address

In accordance with the following report(s):

[Report(s) number(s), date(s) of issue]

The following conditions of use and other restrictions apply (3)(4):

[Reference to document with the list of conditions of use and other restrictions]

The following ESC IC Statements has been considered:

[Indicate use of ESC IC Statements]

Reference to former ETCS System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant

First Name, Surname

(1) The information in square brackets [ ] is provided to support the user in correctly and exhaustively compiling the template.
(2) The description of the subsystem should enable unique identification and allow for traceability.
(3) When a reference to a list of conditions of use and other restrictions is made, such list should be accessible to the authorising entity.
(4) Template for restrictions and added functionality in the CCS Application Guide Annex 9 should be provided

Annex 8: RSC Statement template

TEMPLATE FOR RADIO SYSTEM COMPATIBILITY STATEMENT

RADIO SYSTEM COMPATIBILITY STATEMENT

Radio System Compatibility Statement document *[Document number]* (1)

We, Applicant:

[Business name] [Complete

postal Address]

Declare under our sole responsibility that the following subsystem (2):

[Name/short description of the subsystem, relevant configuration, unique identification of the subsystem]

to which this statement refers has been subject to the relevant verifications that corresponds to the following RSC Type:

[Reference to: RSC Type Identifier as published in the Agency Technical Document]

has been assessed by the following Notified body:
Business name

Registration number

Full address

In accordance with the following report(s):

[Report(s) number(s), date(s) of issue]

The following conditions of use and other restrictions apply (3)(4):

[Reference to document with the list of conditions of use and other restrictions]

The following RSC IC Statements has been considered:

[Indicate use of RSC IC Statements]

Reference to former Radio System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant

First Name, Surname

(1) The information in square brackets [ ] is provided to support the user in correctly and exhaustively compiling the template.
(2) The description of the subsystem should enable unique identification and allow for traceability.
(3) When a reference to a list of conditions of use and other restrictions is made, such list should be accessible to the authorising entity.
(4) Template for restrictions and added functionality in the CCS Application Guide Annex 9 should be provided

Annex 9: Template for restrictions and added functions

Certification: Restrictions and added functions

Guideline for the European Union Agency for Railways template

The document describing the template and its use is in the Agency Web page in the ERTMS section under Certification issues. Can be directly access through this link:

https://www.era.europa.eu/system/files/2022-11/restrictions_and_added_functions_en.doc

Annex 10: Guidance on the independent assessment of CCS ICs

The document describing the guidance on the independent assessment of CCS ICs is Agency Web page in the TSI section under Guidance for CCS TSI. Can be directly access through this link:

https://www.era.europa.eu/system/files/2022-10/Annex%2010%20of%20Guide%20for%20application%20of%20the%20CCS%20TSI%20%E2%80%93%20Independent%20assessment%20of%20CCS%20ICs.pdf