

**ACCOMPANYING REPORT N. ERA-REC-123-2015/ACR TO THE
RECOMMENDATION
OF THE EUROPEAN RAILWAY AGENCY**

ON

**AMENDING AND RECASTING COMMISSION DECISION 2012/88/EU ON THE
TECHNICAL SPECIFICATION FOR INTEROPERABILITY RELATING TO THE CONTROL-
COMMAND AND SIGNALLING SUBSYSTEMS**

Disclaimer:

The present document is a non-legally binding report of the European Railway Agency. It does not represent the view of other EU institutions and bodies, and 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.



Contents

1.	Executive summary	4
2.	Introduction	5
3.	References, terms and abbreviations	6
3.1.	References.....	6
3.2.	Terms and abbreviations.....	7
4.	Working method	8
4.1.	Before consultation.....	8
4.2.	After consultation	8
5.	Modifications of the CCS TSI text	10
5.1.	Foreword.....	10
5.2.	Consistent use of acronyms	10
5.2.1.	Reason for change.....	10
5.2.2.	Changes in the CCS TSI	10
5.2.3.	Positions of stakeholders before consultation	11
5.2.4.	Decisions after consultation.....	11
5.3.	Missing reference.....	11
5.3.1.	Reason for changes	11
5.3.2.	Changes in the CCS TSI	11
5.3.3.	Positions of stakeholders before consultation	12
5.3.4.	Decisions after consultation.....	12
5.4.	Certification and compatibility check	12
5.4.1.	Reason for changes	12
5.4.2.	Changes in the CCS TSI	14
5.4.3.	Positions of stakeholders before consultation	14
5.4.4.	Decisions after consultation.....	15
5.5.	Tests in accredited laboratories.....	15
5.5.1.	Reason for changes	15
5.5.2.	Changes in the CCS TSI	16
5.5.3.	Positions of stakeholders before consultation	16
5.5.4.	Decisions after consultation.....	16
5.6.	GSM-R	16
5.6.1.	Reason for changes	16
5.6.2.	Changes in the CCS TSI	17
5.6.3.	Positions of stakeholders before consultation	18
5.6.4.	Decisions after consultation.....	18
5.7.	Specific cases.....	19
5.7.1.	Reason for changes	19
5.7.2.	Changes in the CCS TSI	19
5.7.3.	Positions of stakeholders before consultation	19
5.7.4.	Decisions after consultation.....	19



5.8.	Closure of open points	19
5.8.1.	Reason for changes	19
5.8.2.	Changes in the CCS TSI	20
5.8.3.	Positions of stakeholders before consultation	20
5.8.4.	Decisions after consultation.....	20
5.9.	List of train protection Class B systems	20
5.9.1.	Reason for changes	20
5.9.2.	Changes in the CCS TSI	20
5.9.3.	Positions of stakeholders before consultation	20
5.9.4.	Decisions after consultation.....	20
5.10.	Release 2 of ETCS Baseline 3	21
5.10.1.	Reason for changes	21
5.10.2.	Changes in the CCS TSI	21
5.10.3.	Positions of stakeholders before consultation	21
5.10.4.	Decisions after consultation.....	21
5.11.	Implementation	22
5.11.1.	Reason for changes	22
5.11.2.	Changes in the CCS TSI	22
5.11.3.	Positions of stakeholders before consultation	22
5.11.4.	Decisions after consultation.....	22
6.	Additional changes after consultation	22
6.1.	Clarification in Annex A	22
6.2.	Track-side ETCS optional functions	23
6.3.	DMI safety	23
6.1.	Improvement of the TSI text	23
7.	Economic Evaluation	24
7.1.	Summary	24
7.2.	Light Impact Assessment on Change Request related to GPRS	25
7.3.	Light Impact Assessment on Change Request related to Interferences	29



1. Executive summary

The CCS TSI set out as annex to Commission Decision 2012/88/EU has been amended two times:

1. With Commission Decision 2012/696/EU, introducing the Baseline 3 specifications for the train protection part ETCS ;
2. With Commission Decision (EU) 2015/14, extending the scope to the whole EU rail network, closing some open points and providing clarifications for the certification process.

The EC has requested to change the legal state of the CCS TSI, from a Commission Decision to a Regulation, according to what already done for other TSIs.

This recast is an opportunity to improve the text of the CCS TSI, with clarifications deriving from return of experience.

In addition, the Annex A of the CCS TSI will be updated with references to the “release 2” of ETCS baseline 3 and to GSM-R baseline 1.

This report:

1. Explains the legal base of the activity;
2. Describes the work methods applied;
3. Justifies the changes in the CCS TSI proposed by the Agency;
4. Reports the different positions of stakeholders.

A complete text of the CCS TSI, to be used as annex to the Regulation, is proposed as an attachment to the Agency Recommendation to EC.



2. Introduction

The recast of the Control-command and Signalling TSI is proposed by the Agency according to art 12 (b) of Agency regulation [2]:

The Agency shall: ... ensure that the TSIs are adapted to technical progress and market trends and to the social requirements and propose to the Commission the amendments to the TSIs, which it considers necessary and the adopted Work Program 2015.



3. References, terms and abbreviations

3.1. References

Table 1 : References

<i>N°</i>	<i>Document Reference</i>	<i>Title</i>	<i>Version</i>
[1]	Directive 2008/57/EC	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)	<i>OJ L 91, 18.7.2008, p. 1</i>
[2]	Regulation (EC) 881/2004	Regulation (EC) No 881/2004 of the European Parliament and of the Council of 29 April 2004 establishing a European Railway Agency (Agency Regulation)	<i>OJ L 220, 21.6.2004, p. 3</i>
[3]	Regulation 1335/2008	Regulation (EC) No 1335/2008 of the European Parliament and of the Council of 16 December 2008 amending Regulation (EC) No 881/2004 establishing a European Railway Agency (Agency Regulation)	<i>OJ L 354, 31.12.2008, p. 51</i>
[4]	2012/88/EU	Commission Decision of 25 January 2012 on the technical specification for interoperability relating to the control-command and signalling subsystems of the trans-European rail system	<i>OJ L 51, 23.2.2012, p.1</i>
[5]	2012/696/EU	Commission Decision of 6 November 2012 amending Decision 2012/88/EU on the technical specifications for interoperability relating to the control-command and signalling subsystems of the trans-European rail system	<i>OJ L 311, 10.11.2012, p. 3–13</i>
[6]	(EU) 2015/14	Commission Decision (EU) 2015/14 of 5 January 2015 amending Decision 2012/88/EU on the technical specification for interoperability relating to the control-command and signalling subsystems of the trans-European rail system	<i>OJ L 3, 7.1.2015, p. 44–58</i>
[7]	ERA_ERTMS_0001	ERTMS Change Control Management	2.0
[8]	Memorandum of Understanding ERTMS	Memorandum of Understanding (MoU) between the European Commission, the European Railway Agency and the European Rail sector Associations (CER - UIC - UNIFE - EIM - GSM-R Industry Group - ERFA) concerning the strengthening of cooperation for the management of ERTMS	Memorandum of Understanding concerning the strengthening of cooperation for the management of ERTMS
[9]	08/57-DV73 EN01	Management of ERTMS specifications in the context of an ERTMS breakthrough program	27/05/2014
[10]	B3 R2 Plan	ETCS B3 Release 2 Project Plan	www.era.europa.eu (project plan updated)



3.2. Terms and abbreviations

Table 2 : Terms and abbreviations

CCS	Control-command and Signalling
CER	Community of European Railways and Infrastructure Companies
EIM	European Rail Infrastructure Managers
ERFA	European Rail Freight Association
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
GSM-R	Global System for Mobile Communication – Railway
IM	Infrastructure Manager
RU	Railway Undertaking
TSI	Technical Specification for Interoperability
UNIFE	Association of European Railway Industries
WP	Working Party



4. Working method

4.1. Before consultation

The proposals of changes in the text of the CCS TSI have been submitted by the Agency for discussion the “Control-command and Signalling Working Party” (CCS WP).

This is a permanent WP, in charge of revisions of the CCS TSI and acting as Change Control Board for the ETCS and GSM-R specifications, according to the procedures of the Change Control Management (see [7]).

The following representative organisations have nominated experts for the CCS WP: CER, EIM, UNIFE (UNISIG) and “GSM-R Industry Group”. Representatives of the NB Rail subgroup for ERTMS and of National Safety Authorities (NSAs) attend regularly all meetings of the CCS WP.

The discussion was held in the CCS WP meetings on March 4th, May 7th and an ad hoc special meeting on May 28th.

Additional discussions have been held in the NSA Focus group on ERTMS meeting of March 3rd and May 6th.

The results have been presented and discussed in a meeting of the ERTMS WG of the RISC on June 3rd.

4.2. After consultation

The consultation according to articles 4 and 5 of Regulation 881/2004 [2] started on 10/06/2015 and ended on 16/09/2015.

Comments have been sent by:

1. Ministère de l'écologie, du développement durable et de l'énergie (FR)
2. RSSB on behalf of GB railways (IMs, RUs, suppliers, NSA)
3. CER
4. EIM
5. UNIFE (UNISIG)
6. SSICF – DVIS (BE NSA)
7. Federal Office of Transport – CH (through OTIF)
8. ORR (UK NSA)
9. Deutsche Bahn AG
10. Notified Body TUV

In addition to the formal comments listed above:

1. EBA requested the addition of two specific cases related to train detection systems
2. Informal comments put in evidence the need of editorial corrections in the proposed text of the CCS TSI.

All formal comments have been answered by the Agency (see attachments to this report).

Further discussions have been made:

1. NSA Focus group meeting of September 15th
2. CCS WP meeting of September 16th



3. Meetings with the coordination of NSAs for Rail Freight Corridor 1 and 3 and UNISIG
4. Meeting of the ERTMS WG of the RISC on October 6th
5. NSA Focus group meeting of November 24th
6. CCS WP meeting of November 25th

The modifications to the original proposal of the Agency for the text of the CCS TSI are described and justified in the following chapters.



5. Modifications of the CCS TSI text

5.1. Foreword

The following sections describe the state of the Agency proposals for the different changes in the CCS TSI, according to the results of discussions after the comments received during the consultation.

For each of the items below, sections 5.y.1, 5.y.2 and 5.y.3 contain the same text that was submitted to consultation, indicating:

1. The reason for modifications, as identified by the Agency are explained;
2. The detailed modification proposed;
3. The positions of representative organisations, safety authorities and NB Rail.

Sections 5.y.4 summarises the comments received and the decisions for each item taken after consultation.

Section 6 describes some additional improvements of the text of the CCS TSI, according to more general comments received.

This report is accompanied by a new text of the CCS TSI, with revision marks against the “consolidated” Annex III to [4], as amended by [5] and [6].

5.2. Consistent use of acronyms

5.2.1. Reason for change

In the current text of the CCS TSI, discrepancies exist on the use of acronyms:

1. In chapters 1 to 6, the Class A system for train protection is indicated as “ERTMS/ETCS”, and the Class A system for radio communication is indicated as “GSM-R”;
2. In chapter 7, the Class A system for train protection is indicated sometimes as “ETCS” and sometimes as “ERTMS/ETCS”;
3. The reference to on-board GSM-R is sometimes unclear (voice or data radio); also the reference to GSM-R in the trackside is not always clear if it refers to a network intended for both “voice and ETCS data” and “only voice”.

5.2.2. Changes in the CCS TSI

The following principles are proposed:

1. Always use “ETCS” to indicate the Class A train protection system;
2. Always use “GSM-R” to indicate the radio communication system (no change necessary);
3. Distinguish, where necessary, between “GSM-R voice cab radio” and “GSM-R ETCS data only radio” and between GSM-R network for both voice and ETCS data or only voice;
4. Clarify, as a note, that in some documents, the term “ERTMS (European Rail Traffic Management System)” is used to indicate a system including both ETCS and GSM-R.

More in details:

1. In chapters 1 to 6 and in Annex G, change all occurrence of “ERTMS/ETCS” into “ETCS”;
2. In section 2.2 add the note: “in some documents referenced in this TSI, the term “ERTMS (European Rail Traffic Management System)” is used to indicate a system including both ETCS and GSM-R and “ETCS” is indicated as “ERTMS/ETCS”;



3. In section 2.3 change the second bullet to “A train equipped with class A on-board train protection for level 1 need not be equipped with GSM-R ETCS Data Only Radio but must already implement all level 2 and level 3 functions so as to ensure that the mere connection of GSM-R ETCS Data Only Radio at a later stage will ensure it is equipped for level 2 and level 3”;
4. In section 4.4 change “ERTMS/ETCS” into “ETCS and GSM-R”;
5. In table 5.1a, in the list of interfaces for “ETCS on-board”, change “ERTMS/ETCS GSM-R on-board” into “GSM-R ETCS Data Only Radio”;
6. In table 5.1b, in the list of interfaces for the group of constituents “ETCS on-board/odometry equipment”, change “on-board ERTMS/ETCS – GSM-R” into “GSM-R ETCS Data Only Radio”;
7. In table 5.2a, in the list of interfaces for “RBC” and for “Radio in-fill unit”, change “ERTMS/ETCS GSM-R trackside” into “GSM-R”;
8. Review section 4.2.4 and introduce a clarification where needed to indicate requirements for voice and for ETCS Data transmission.

Changes in chapter 7 according to the same principle.

5.2.3. *Positions of stakeholders before consultation*

No objection has been received by the Agency.

5.2.4. *Decisions after consultation*

No comment has been received by the Agency on this subject.

5.3. Missing reference

5.3.1. *Reason for changes*

The LOC&PAS and SRT TSI have a cross reference to CCS TSI, stating that requirements for fire protection are also valid for CCS on-board equipment.

The corresponding requirement is missing in the CCS TSI.

5.3.2. *Changes in the CCS TSI*

Modify the parameter 4.2.16

“4.2.16 Construction of equipment used in CCS subsystems

The environmental conditions mandated in the specifications referenced in this TSI shall be respected.

Requirements for materials stated in LOC&PAS TSI (e.g. related to fire protection) shall be respected by CCS on-board subsystems”

Add a line to table in 4.3.2

“Construction of equipment; clause 4.2.16 linked with requirement 4.2.10.2.1 in LOC&PAS TSI”

Modify item 16 in the list in section 4.1.

Modify in tables of chapter 5 “Environmental conditions” into “Construction of equipment”



Modify in table 6.1 “Environment” to “construction of equipment”; delete “environmental” in the first row of “What to assess” and change “supporting evidence” to “documentation on material used and, where necessary, tests to ensure that...”

Add reference to basic parameter 4.2.16 in table 6.2, “Integration with rolling stock”

5.3.3. *Positions of stakeholders before consultation*

No objection has been received by the Agency.

5.3.4. *Decisions after consultation*

No comment has been received by the Agency on this subject.

5.4. Certification and compatibility check

5.4.1. *Reason for changes*

The certification of Track-side subsystems is a critical step to achieve interoperability. In this respect, the operational test scenarios are a very important tool, and it is necessary to clarify better how they have to be used, i.e.:

1. Using the operational test scenarios to perform an early verification that design and installation of the subsystem do not require on-board functions or performance conflicting with requirements of the TSI;
2. When the check above has been successfully passed, using the operational test scenarios as test cases for the certification of CCS track-side;
3. Using the operational test scenarios to give the interested RUs transparent information about the characteristics of the track-side subsystems.

The current TSI makes reference to a harmonised format of these operational test scenarios, but this format is not yet available; it is therefore necessary to clarify better the scope and the content of the operational test scenarios and the role of applicants, Agency and MSs.

In addition, the recast of the CCS TSI can clarify the advantages of using the operational test scenarios as a basis for the checks that relevant operators (IMs and RUs) may need to perform before railway service is started with a new combination of track-side and on-board CCS subsystems. These should ideally only be “documental” checks of EC certificates of verification, but some experimental test of compatibility between on-board and track-side equipment is probably required, according to the concepts explained below.

1. These “compatibility tests” are not an alternative to the procedures specified in the Directive. Subsystems must in any case be separately certified, and relevant documentation (technical files) must be available, proving that all verifications required in the TSI (tables of chapter 6) have been successfully performed. Note that, in this context, appropriate use of operational scenarios, as explained above, can reduce dramatically the incompatibilities due to inappropriate application of TSIs and referenced specifications. Full application of procedures specified in the TSI is necessary to ensure that compatibility tests are performed in a transparent way and that errors detected are clearly understood and corrected.
2. The scope of compatibility tests is therefore a screening, to detect possible systematic errors in products or specifications, not recognised and corrected during the certification process. The



possibility that systematic errors appear during the life of equipment (depending on the external conditions and the interactions between them) can never be fully eliminated. When a new “combination” of on-board and track-side subsystems is activated (including the case of a modification of an existing subsystem) a residual risk that previously undetected systematic errors appear cannot be excluded. Ensuring compatibility between two certified subsystems is therefore part of the “normal” supervision of railway operation that a NSA must carry out during the entire life of subsystems.

3. This normal supervision should be performed “relying on the SMS of operators”. It is recognised, however, that experience in this field is not yet complete and that in particular small RUs could find prohibitive to organise themselves with adequate competences and organisation. A possible solution is to allow NoBos to support them in the performance and assessment of tests. While passing the verifications listed in the tables 6.1; 6.2 and 6.3 is sufficient to obtain the corresponding certificates, the documentation supporting such certificates may be progressively extended with annexes indicating which “compatibility tests” have been successfully passed by a subsystem (e.g. which operational behaviour has been checked, in simulated environment or against real trackside installations, etc.). With increasing experience, the involvement of the NSA can progressively be reduced (in other words, the compatibility tests do not put in question the certificates of the subsystems – unless errors are detected requiring modifications – but NSAs may limit the operation of an RU or IM, until evidence is provided that they are able and have taken all precautions for the use of their technical systems).

This clarification requires a new section in chapter 6, which is also an opportunity to clarify the responsibilities and procedures to follow when product failures or incompatibilities are detected.

A final issue for certification is originated by the fact that, in some projects, the “compatibility tests” have shown a consistent amount of “errors” to be corrected in products. To limit the extent of the “compatibility checks” and avoid that they become *de facto* the real “certification” of products and subsystems, it is reasonable to stress the need that the certification of ICs include a strong process to detect and correct systematic failures, not only related to safety consequences, but also affecting the “reliability” of equipment during operation.

A typical way to address this problem is operating equipment in conditions as close as possible to the real ones, and correcting the detected errors, until the rate of occurrence of “failures” is low enough. Standards exist, providing guidance.

The current CCS TSI contains provisions at the level of subsystem (i.e., Tables 6.2 and 6.3 of chapter 6), requiring that tests in operational conditions are used to “increase confidence that there are no systematic failures”. It seems necessary that these measures are taken as early as possible, i.e. when ICs are certified, and that the certificates indicate which procedures have been followed and which criteria have been applied by the supplier (and assessed by the NoBo). This kind of transparency will allow the customers to select equipment with a level of “quality” adequate for their scope.

It is expected that, when ICs are verified according to this procedure, the risk of residual systematic failures and/or deficiencies in specifications that can affect compatibility between installed equipment (subsystems) will progressively decrease, requiring therefore a decreasing effort for operators to decide on the use of their subsystems (and a correspondent decreased effort of NSAs in supervising SMSs and operations).

For the CCS on-board ICs, one or more published trackside operational test scenarios can be used as typical conditions to perform “reliability growth tests”.



5.4.2. *Changes in the CCS TSI*

The following clarifications are necessary in the CCS TSI:

1. The section 6.1.2 needs to be clarified, stressing the use of operational test scenarios for certification of the track-side and clarifying the role of different stakeholders;
2. Table 6.1 must also contain the requirement to perform tests to detect and correct systematic failures (as part of verifications necessary to obtain a certificate of conformity);
3. Section 6.5 must be added, dealing with “compatibility tests”. The following concepts must be clarified:
 - › The annexes to the certification documents must include the type of equipment and installations with which compatibility has been tested;
 - › Compatibility tests are not necessarily on site; simulated environment in laboratory is possible;
 - › Procedures to apply in case product failures or compatibility issues are detected;

See attached document (changes marked against the current version according to [4], [5], [6]).

Note: The application guide can be extended with a section explaining the concepts above. Standards that are useful to facilitate “elimination of systematic failures” and compatibility tests in laboratories may be referenced.

5.4.3. *Positions of stakeholders before consultation*

Several comments have been received from representative organisations, NSAs and MSs, and some of them have been taken into account in the attached ERA proposal. ERA has provided answers to the members of CCS WP and NSA Focus group.

The main issues are the following:

1. Some stakeholder (e.g. EIM) expressed concern about the obligation of making operational test scenarios available (section 6.1.2) and the possible difficulties and delays that this could create in the deployment of a track-side project.
The opinion of the ERA is that specifying operational test scenarios is not an additional task with respect to the normal project deployment, and that checking them as early as possible reduces the risk of complex and expensive modifications at later stage. Anyway the text in the current proposal takes the comment into account, giving the possibility of making operational scenarios available with a timing adapted to the project needs.
2. Again on section 6.1.2, ES noted that ERTMS specifications must have reached stability, therefore operational test scenarios should not be used by ERA to assess the need of additional harmonised specifications.
This comment has been accepted in principle by ERA, and the relevant text has been amended, taking into account, however, the possibility that, while analysing operational scenarios, the need of improving specifications referenced in the TSI is detected.
3. Some stakeholder (e.g. DE, IT and CH safety authorities) would like that the tests described in section 6.5 are made mandatory, while others (e.g. ES) would prefer to have the results of such tests not recorded in annexes of certificates.
The opinion of the Agency is that making them mandatory for all possible combinations of on-board and track-side subsystems is not feasible, because this would imply a very extensive testing effort for all on-board CCS subsystems, with possible need of additional tests of systems already in



operation, when new operational scenarios are published. On the other hand, ERA recognises that such tests are justified and believes that:

- › requiring that they are performed on the basis of published operational scenarios increases the transparency, especially for small railway undertakings;
 - › recording the results of such tests can give evidence to the safety authority of the capability of an operator to decide appropriately on the use of its subsystems and also avoid unnecessary repetitions of verifications already performed.
4. Concerns have been raised (UK) that recording the results of compatibility tests performed for on-board subsystems already authorised in an annex of the documents accompanying its EC certificate of verification could affect the documentations kept by the safety authority. ERA accepted this comment and the text in section 6.5 addresses now this issue.
5. UNISIG expressed concern that the proposal of ERA could make the TSI more complex; they stressed that the application of CENELEC standard should be sufficient to achieve the goal of delivering safe products. The Agency recognises the suitability of the processes currently adopted, anyway notes that there is also the need of transparency, especially regarding the track-side implementations; the publication of operational scenarios and their use for certification and “compatibility check” are important steps in this direction.

5.4.4. *Decisions after consultation*

The outcome of received comments and discussions with stakeholder has been consolidated in a revised proposal for chapter 6.

Together with different editorial improvements, this new version contains:

1. a better definition of the concept of “operational test scenario”;
2. a clearer explanation of the obligation to send operational test scenarios to EC and ERA, ensuring that this is not a reason for delaying projects;
3. a clearer separation between verifications that are required to obtain certificates, “additional” tests and compatibility tests.

5.5. Tests in accredited laboratories

5.5.1. *Reason for changes*

Practical problems emerged during the certification of some constituents, because of misalignment between ETCS SRS and SUBSET-076.

It is necessary to rely on the capability of laboratories, according to input from the applicant and under the control of the NoBo, to manage new test cases and sequences or existing ones that have been adapted for new needs.

Considering that:

1. the architecture of the test system remains unchanged;
2. the methodology to perform tests and to evaluate results remain unchanged;
3. the responsibility to specify test cases and sequences should remain with applicant and NoBo;

it is possible that the accreditation of laboratories is not questioned.

In addition, it is advisable to distinguish clearly between the mandatory requirements (tests against SUBSET-076) and the “voluntary” tests against operational test scenarios. This distinction also permits a clarification



of the advantages of performing such tests against operational test scenarios already at the level of IC (possible reduction of effort at the level of subsystem verification).

5.5.2. *Changes in the CCS TSI*

Section 6.2.4.1 should be modified, splitting it in two parts:

1. One related to “mandatory tests” for the on-board ETCS Interoperability constituent. This part should clarify that
 - › test cases must be carried out in accredited laboratories;
 - › test cases must permit the verifications of all functions specified in this TSI;
 - › applicant and NoBo are responsible to define such test cases, when they are not included in specifications referenced by this TSI;
 - › the notified Body is responsible to evaluate the test results.
2. A second one related to “additional tests” of an on-board ETCS Interoperability Constituent using published operational tests scenarios, clarifying that
 - › These tests are not necessary for certification;
 - › These tests can be performed with real track-side equipment or in a simulated environment;
 - › Conditions and results of these test can be reported in annexes to the documentation supporting certificates, to reduce the amount of checks for verification and decision to operate an on-board CCS subsystem.

See attached document (changes marked against the current version according to [4], [5], [6]).

5.5.3. *Positions of stakeholders before consultation*

ES expressed its position against recording “additional tests” in certificates.

The opinion of the Agency is the one described in section 5.4.3 above, bullet 3.

5.5.4. *Decisions after consultation*

See section 5.4.4. above.

5.6. **GSM-R**

5.6.1. *Reason for changes*

Definition of “parts” of the CCS on-board subsystem:

Voice and data communication on-board are managed separately. For example, if ETCS level 1 is installed, installation of data communication is not necessary, and, in general, voice and data communication can be installed and renewed/upgraded independently from each other.

Defining them as two different parts, and applying the general rules for certification of parts already stated in the CCS TSI, would make their management easier.

GPRS:

GPRS allows increased capacity of the data communication channel and better spectrum efficiency and was seen as a necessity for dense areas, as mentioned in [8].



SIM card:

The SIM card allows the GSM-R network to identify the rights and capabilities of a network user; proper operation of the communication requires corresponding configuration of the SIM card and of the trackside GSM-R network:

1. Configuration of the SIM card is the responsibility of the entity operating the GSM-R network;
2. all On-board CCS Subsystems must be able to operate with any SIM card compliant with the requirements of the TSI.

Protection against interferences:

The protection can be at the IC level or at the subsystem level (e.g. installation of filters). The requirements in Index 32 and 33 are applied to the on-board ICs (cab radio and EDOR), but this requirement can be also fulfilled at the subsystem level.

Number of simultaneous communication sessions between on-board and track-side ETCS:

In some ETCS applications the temporary interruption of radio communication during RBC hand-over is considered not acceptable.

Roaming:

Existence of roaming agreement between operators of different networks is a precondition for the uninterrupted train movement.

5.6.2. *Changes in the CCS TSI*

Definition of “parts” of the CCS on-board subsystem:

- a) In section 2.2 specify that:

“The CCS subsystems include the following parts:

1. Train protection
2. Voice radio communication
3. Data radio communication
4. Train detection”

- b) In section 4.1 split the row related to CCS On-board – radio communication in two rows:

“voice radio communication – 4.2.4.1, 4.2.4.2, 4.2.13, 4.2.16

Data radio communication – 4.2.4.1, 4.2.4.3, 4.2.5.1, 4.2.6.2, 4.2.14, 4.2.16”

- c) In section 7.2 specify (with reference to section 2.2 of the CCS TSI) that:

“Upgrading or renewing the Control-Command and Signalling Track-side Subsystem may concern any or all of the following:

1. Train protection
2. Voice radio communication
3. Data radio communication
4. Train detection”



GPRS:

- a) In section 4.2.4.3, introduce a line indicating where are the specific coverage requirements for GSM-R networks (the referenced specification will explain that GPRS is mandatory on-board and optional track-side for ETCS B3 installations; compatibility with subsystems not implementing GPRS must be retained).

SIM card:

- a) Add a note to table 5.1.a, to explain that it is the responsibility of the network operator to deliver to railway undertakings SIM cards to be inserted in GSM-R mobiles.
- b) Clarify in Table 6.2 that the Verification of On-board CCS subsystem must prove that it is able to operate with any SIM card compliant with the requirements of the TSI; changing the SIM card is not a modification of the On-board subsystem.

Protection against interferences:

- a) Indicate in section 4.2.5.1 that the on-board subsystem should offer protection against interferences as indicated in EIRENE SRS and FRS;

Number of simultaneous communication sessions between on-board and track-side ETCS:

- a) Add a line 4.2.4.3 indicating the need that the on-board subsystem is able to establish 2 simultaneous communication sessions with the ETCS trackside (RBC).

Roaming:

Add in section 4.2.4.1: “design and installation of track-side GSM-R shall technically permit the establishment of roaming agreements”

5.6.3. Positions of stakeholders before consultation

No objection has been received by the Agency.

5.6.4. Decisions after consultation

According to discussions with stakeholders and ERA internal analysis, the following modifications have been done to the original proposals shown above.

Definition of parts of the CCS Subsystems:

The subdivision between voice and data radio communication has been done only for the On-board Subsystem, because at the current stage this separation is not applicable for the Track-side Subsystem, where GSM-R provides both services in an integrated way.

The reference to sections of chapter 4 in table 4.1 has been improved.

In addition, the subdivision of voice and data communication parts for the On-board Subsystem has required a clarification of the rules for GSM-R implementation in chapter 7.3.



Roaming:

The sentence proposed before consultation has been considered redundant, because the technical concept is already well explained in the EIRENE specifications referenced in the TSI.

5.7. Specific cases

5.7.1. Reason for changes

UK

The two UK specific cases related to section 4.2.12 of the CCS TSI (currently in section 7.2.9.3) are currently announced as necessary as soon as an open point will be closed. Now the open point only exists if baseline 2 ETCS specifications are applied and does not exist anymore with baseline 3.

FR

There is a 5 years deadline for a specific case that has already expired.

5.7.2. Changes in the CCS TSI

UK

Clarify in both cases that the specific case exists for baseline 3, while this is an open point for baseline 2.

FR

Clarify with FR.

5.7.3. Positions of stakeholders before consultation

No objection has been received by the Agency. Clarifications with relevant MSs are in progress.

5.7.4. Decisions after consultation

The FR specific case has been extended (classified as "T3").

In addition to the ones listed before, two specific cases related to train detection systems have been added for DE.

5.8. Closure of open points

5.8.1. Reason for changes

A test campaign has been carried out, to check the characteristics of existing vehicles and axle counters, regarding their compatibility.

The results of this test campaign make it possible to close the open point related to magnetic field for DC power systems.

Investigations on the possibility to extend the bands permitted for operation of axle counters are in progress.



5.8.2. *Changes in the CCS TSI*

The specification referenced as Index 77 in Annex A of the CCS TSI can be amended as follows:

1. In section 3.2.1.1 delete all references to DC and AC power systems;
2. The possibility of adding a frequency band to the three already listed, with corresponding modifications of Fig. 5, 6 and 7 and table 2, is under investigation.

5.8.3. *Positions of stakeholders before consultation*

No objection has been received by the Agency.

5.8.4. *Decisions after consultation*

According to feedback from test campaign and discussion in the expert group, it has been decided that no extension of the bands for axle counters is necessary.

Some editorial improvements have been made to the specification referenced as "Index 77".

5.9. List of train protection Class B systems

5.9.1. *Reason for changes*

An editorial error has been detected in ERA/TD/2011-11, regarding the BE Class B systems (TBL1+ on the wrong line).

Input is expected from UK, regarding some Class B systems.

5.9.2. *Changes in the CCS TSI*

Move "TBL1+" to the line below, in table 3.2 of ERA/TD/2011-11.

Update the version of ERA/TD/2011-11 in section 2.2 of the CCS TSI.

Input from UK could require additional updates in ERA/TD/2011-11.

5.9.3. *Positions of stakeholders before consultation*

No objection has been received by the Agency.

5.9.4. *Decisions after consultation*

Three Class B systems for UK have been added to the list in ERA/TD/2011-11.



5.10. Release 2 of ETCS Baseline 3

5.10.1. Reason for changes

The ETCS Baseline 3 was functionally defined for the first time in the Commission Decision 2012/696/EU ([5]). A first Maintenance Release (MR1) according to the ERTMS Change Control Management [7] was developed by the Agency together with the Sector resulting in the Commission Decision (EU) 2015/14 ([6]) that modified the Annex A of the Technical Specifications for Interoperability of the Control-Command and Signalling (TSI CCS) subsystem.

The definition of the next release of the ETCS Baseline 3, so called "ETCS Baseline 3 Release 2" results in the update of a certain number of the specifications referenced in the Annex A of the TSI CCS.

Key principles for the methodology, scope and timing of such activity are contained in the document [9].

All request for modifications to the ETCS specifications are recorded and managed via the CR database maintained by the Agency (ERA CR Database).

The principles and criteria for the definition of Release 2, and the resulting list of CR under processing, have been discussed and agreed also with the MS representatives at the RISC meeting number 71 and 72. The RISC has confirmed that the priority is compatibility with B3 MR1 and with B2 (2.3.0d). The project plan to deliver the Release 2 is detailed in the document [10].

5.10.2. Changes in the CCS TSI

The resolution of the CRs in the project plan will result in the update of a number of ETCS documents referenced in Annex A: each individual change and each individual document is indicated precisely in the solution field of the Cr database.

5.10.3. Positions of stakeholders before consultation

The position of the stakeholders on each individual CR is recorded in the relevant fields of the CR database. The ongoing discussions and statements expressed in the relevant working groups are recorded in the minutes of those meetings. The progressive discussions with the Sector and the Member States at the workshops before the RISC meetings are recorded in the respective minutes of meetings.

There is broad agreement about the need to preserve existing investments on lines and vehicles equipped with ETCS B2 (2.3.0d): the Agency is committed to the principle of backward compatibility: the Baseline Compatibility Analysis (BCA) approach is fully supported by the Agency, and the BCA is being performed on each of the CRs for the Release 2, in respect to MR1 and to B2. The BCA for R2 will be annexed to the Recommendation.

Specific requests to process a limited number of additional CRs have been made by certain Member States involved with early Baseline 3 implementations: the discussion between with their representatives and the Agency is ongoing.

The overall positions of stakeholders in relation to the final content of the Release 2 are expected to be formalised at a later time when the work on the individual CRs will be concluded, and will be annexed to the Agency Recommendation.

5.10.4. Decisions after consultation

The updated project plan of B3R2 is available on the ERA website. During the entire project, all decisions on change requests are subject to the carrying out of the Baseline Compatibility analysis in order to identify and



avoid potential compatibility problems. This Baseline Compatibility Analysis applies the principles of the System Version Management as referred to in subset 104.

5.11. Implementation

5.11.1. Reason for changes

It has been decided that it is convenient to manage the EDP as a separate Commission Decision. The chapter 7 of the CCS TSI must only contain the requirements for installation of ETCS that need to be respected in any case; on top of these requirements, the provisions of the EDP will apply.

It is also reasonable to clarify section 7.2.1, addressing both track-side and on-board CCS subsystems.

5.11.2. Changes in the CCS TSI

Eliminate requirements on Corridors from Chapter 7.

Clarify section 7.2.1.

In addition some editorial improvement have been made.

See attached document (changes marked against the current version according to [4], [5], [6]).

5.11.3. Positions of stakeholders before consultation

Comments received (ES, CER) regarding obligations to install ETCS track-side and to install ETCS baseline 3 on-board have been taken into account in the attached ERA proposal.

5.11.4. Decisions after consultation

The proposed changes in chapter 7 linked to the shifting of ETCS specific implementation rules for the revised EDP (points 7.3.1, 7.3.2, 7.3.4 and 7.3.5 of the Annex of Decision 2012/88/EU) shall be modified as such that they remain applicable by the CCS TSI until the implementing acts referred to in Article 47 of Regulation (EU) No 1315/2013 become applicable. This decision is taken in order to guarantee legal certainty during the process of adopting these 2 legal instruments.

6. Additional changes after consultation

6.1. Clarification in Annex A

A Notified Body reported that the wording in Annex A, explaining which documents shall be considered mandatory, could be misunderstood, because of conflicts with statements inside documents referenced in table A.2.

The text has been reworded, to make clear that, when a document referenced in table A.2 refers to a document not explicitly listed there, only clauses well identified shall be considered as mandatory, and not the document in its entirety.



6.2. Track-side ETCS optional functions

RSSB noted that ENE TSI requires that the track-side Energy subsystems always uses the ETCS function sending pantograph information to vehicles. On the ground of CCS TSI the implementation of this track-side function is however specified as “optional”, because it depends on the environment where ETCS is installed.

To avoid misunderstanding, the wording in section 4.2.3 and section 7.2.6 has been improved.

6.3. DMI safety

A Notified Body reported that, when the open point related to DMI safety requirement was closed with the amendment of the CCS TSI [6] containing the reference to the updated version of SUBSET-091, the last sentence in 4.2.1.1 still mentioned the open point.

This sentence has been deleted.

6.1. Improvement of the TSI text

Some comments put in evidence that certain sections of the current CCS TSI are quite long, and this makes it difficult to make reference to specific statements.

To improve the quality of the document, long sections have been split introducing appropriate sub-sections, without changing the text itself.



7. Economic Evaluation

7.1. Summary

ETCS Baseline 3 –Release 2:

The CCS TSI Revision consists mainly of incorporating additional functions (enhancements) and correcting errors in the set of specifications of ETCS (Annex A). The ETCS change requests are processed following the principle of the CCM-process. The additional (compatible) selected functions (see updated project plan – reference [10]) indicates that the objective of compatibility with the previous set of specifications (B3 – MR1) has to be guaranteed. Therefore, all error corrections and all the new/improved functionality will be defined in a compatible manner, meaning that vehicles equipped with Release 2 will be able to operate on lines equipped with MR1, and on lines equipped with B2 (2.3.0d), but also that MR1 vehicles will be able to operate in compatible manner on lines equipped with Release 2. Therefore, there is no impact on trains already being authorized with ETCS, and no mandatory retrofit of existing trains equipped with ETCS is required for interoperability. The additional (compatible) selected functions may lead to additional (performance) criteria for which the non-discriminatory character of each access criterion has to be assessed by the national economic railway regulator (as defined in the Access Directive 2012/34/EU).

The main enhancements in the set of ETCS specifications are related to provide solutions to improve the capacity of the network equipped with ERTMS (ETCS over GPRS, pre-indication).

Based on the priority of providing full compatibility between the B3 R2 and the previous B3 MR1, there is only the need of the technical assessment of the Baseline Compatibility Analysis and there is no need for further economic assessment if this principle is guaranteed.

GSM-R Baseline 1:

Besides the ETCS change requests, there are GSM-R change requests (linked to the radio network) that lead to a new Baseline version (moving from GSM-R Baseline 0 towards GSM-R Baseline 1). For the 2 main GSM-R change requests (GPRS and interferences) leading to a new Baseline version, there are 2 light impact assessment reports to evaluate the different policy options (see annex 1 and annex 2).

The GPRS change request is related to improving the capacity of the radio network (allowing an increase of capacity on dense lines or stations). The interference change request is related to specifications for improved CAB-radios (better resilience against radio signals caused by adjacent radio networks) which will lead to less radio communication losses in the railway operation (mainly positively impacting the punctuality/reliability of the railway operation). Both topics are evaluated as main priorities in an ex-post evaluation on the railway communication system (see <http://www.era.europa.eu/Document-Register/Pages/Ex-post-Evaluation---TSI-CCS---Operational-Requirements-of-Railway-Radio.aspx>). The policy option chosen is to make the GSM-R Baseline 1 mandatory for upgraded/renewed/new vehicles to be equipped with GSM-R (as there is no significant cost impact between installing GSM-R Baseline 0 versus installing GSM-R Baseline 1 radios). The main benefit is to create a single market for interoperable CCS-products. Infrastructure networks have to continue to support existing trains equipped with GSM-R Baseline 0, however additional non-discriminatory access criteria may be established under the framework of the Access Directive in order to incentivize retrofitting of trains equipped with GSM-R Baseline 0, so mandatory retrofitting of GSM-R Baseline 0 is not part of the CCS TSI specifications.

Conclusion:

Based on the above, the Agency evaluates that the CCS TSI Revision requires no further economic evaluation,

- as stakeholders have agreed in RISC 71 and 72 on the scope and objective of providing a compatible baseline, which restricts the number of change requests which can be accepted in this proposed



system release (only compatible enhancements and errors). This protects existing investments and does not require any potential retrofits of existing trains for interoperability reasons. For the other (pending) change requests which are not yet covered in this release, the Agency is developing in an ERTMS Longer Term Perspective in order to define an ERTMS specifications roadmap (based on an economic evaluation of the different options), which will focus on the strategic and organizational challenges related to ERTMS specifications and future releases for the period 2020-2025. This report will be presented in parallel with the Recommendation.

- as the other changes, mainly in chapter 6 and 7 are evaluated as further clarifications of the existing legal framework.

7.2. Light Impact Assessment on Change Request related to GPRS

Impact assessment (A. Context and Problem Definition)	
<p><i>What is the main problem which this initiative will address and what are the underlying problem drivers /causes?</i></p>	<p>GSM-R Baseline 1 addresses 2 main topics (mandatory support of GPRS by EDORs and interferences). This light impact assessment addresses the topic GPRS.</p> <p>Problem: In the case of dense traffic lines and stations, multiple radio connections have to be established at the same time to communicate with all trains. ETCS data connections and voice calls have to be established simultaneously.</p> <p>The circuit switching mode alone which is currently the only one mandated within GSM-R Baseline 0 and the existing ETCS specifications, does not provide the level of capacity which is needed in such cases.</p> <p>Opportunity in the context of this problem: Packet switching is part of the current standards within the telecom sector, it is already an option in GSM-R Baseline 0 (and some networks already implement it), which allows more capacity on the radio networks.</p> <p>Therefore, introducing packet switching (GPRS) allows an increased capacity to be used in the GSM-R network, thanks to the multiplexing of separate ETCS data transmission flows in the same radio channel.</p>
<p><i>Who is affected by the problems?</i></p>	<p>IMs (and indirectly RUs) suffer from shortage of capacity. The shortage of capacity could lead to less train paths on the infrastructure network. The locations most likely to suffer from capacity problems are: stations, areas where trains are stopped and missions are started, high density areas where multiple lines are covered by the same radio cell.</p>
<p><i>What is the baseline scenario?</i></p> <p><i>Is EU action justified on grounds of subsidiarity?</i></p>	<p>Multiple Member States have already decided to deploy GPRS on their network (DK, UK, NL) or are already investigating the possibility to migrate towards GPRS (CH, IT, SE, DE).</p> <p>ERA as ERTMS system authority has to develop an interoperable solution across Europe in order to facilitate cross-border railway traffic in Europe</p>



	(Single Railway Area). Failing to do so will result in different solutions implemented in each ERTMS L2 line, which may not be compatible.
<i>What is the evidence and magnitude of the problem and problem drivers?</i>	<p>An ex-post evaluation has been performed in 2014 to evaluate the operational requirements and performance of the GSM-R Baseline 0.</p> <p>The feedback from stakeholders confirm that 'ETCS over GPRS' is one of the 2 main priorities to be addressed. See http://www.era.europa.eu/Document-Register/Pages/Ex-post-Evaluation---TSI-CCS---Operational-Requirements-of-Railway-Radio.aspx</p>
Impact assessment (B. Objectives)	
What are the main objectives?	The main objective is to increase the ERTMS operational performance by including in the set of EU-specifications an interoperable solution for increased capacity (packet switching).
Impact assessment (C. Options)	
<i>What are the options being considered?</i>	<p>Baseline scenario: Keep GSM-R Baseline 0. GPRS functionality is not implemented or introduced in an arbitrary way (it is an option in Baseline 0, used by the IMs for different purposes, but it is not defined as a transport bearer for ETCS L2).</p> <p>Option 1: Define the framework for the use of GPRS in an interoperable way. The functionality is optional for new vehicles. This implies that RUs may implement GSM-R Baseline 0 (i.e. install EDORs that do not support GPRS) or GSM-R Baseline 1 (i.e. EDORs that support GPRS) depending on the procurement and needs of the RU/ROSCO.</p> <p>Option 2: Define the framework for the use of GPRS in an interoperable way and make the functionality mandatory for all new vehicles. This implies that all RUs implement Baseline 1 (i.e. EDORs that support GPRS); all of them will contract GSM-R Baseline 1 products after publication of the revised CCS TSI, when installing ETCS Baseline 3 r2 onboards.</p>
Impact assessment (D. Assessment of impacts)	
<i>What are the main benefits and costs of each of the options?</i>	<u>Option 1 and 2 (incremental impacts compared to the baseline):</u>



Suppliers of radio equipment (more specifically suppliers of EDORs¹) have to adapt their products (if not yet done) in order to be compliant with the new set of specifications within GSM-R Baseline 1.

Suppliers of ETCS equipment are impacted as they have to incorporate 'ETCS over GPRS' (packet switching) as additional communication solution (in addition to circuit switching mode) when producing on board equipment compliant to Baseline 3 r2.

IMs and RUs are positively impacted as they have a technical/interoperable solution to increase capacity (higher operational performance).

The cost for on-board mobiles will not significantly change due to GSM-R Baseline 1 Specifications (order of magnitude of 20 kEUR/on-board mobile).

1 supplier (1 out of 5) of EDORs indicated a cost increase (up to 1,5 times the current cost, due to GSM-R Baseline 1 for EDORs in case of E_GPRS/EDGE which is one of the 2 variants within GPRS), while the other suppliers indicated no relevant cost change (as GPRS functionality is already part of the radio chip used today), although they fear an increase in the cost identified due to the expected additional certification efforts. Therefore, the cost difference between GSM-R Baseline 1 compliant radios compared to GSM-R Baseline 0 radios is expected not to change significantly.

Difference in options 1 and option 2:

The RUs/ROSCOs are not always familiar with the optional technical functionalities into the CCS TSI legal framework. Therefore, making the GSM-R Baseline 1 mandatory for all new vehicles avoids the risk to RUs/ROSCOs of being limited in operational use by access criteria. ETCS on board equipment compliant to Baseline 3 r2 will implement PS, but if the EDORs installed do not support GPRS, PS could not be used.

Option 1 is also in line with the ETCS migration requirements in chapter 7 of CCS TSI of requiring ETCS on-board equipment using the latest ETCS Baseline.

Summary of options:

	Baseline Scenario (GSM-R Baseline 0)	Option 1 (GPRS support mandatory on new/upgraded/renewed vehicles)	Option 2 (GPRS support optional for new/upgraded/renewed vehicles)
Effectiveness			
ERTMS Operational Performance	0	++	+ (only on some new vehicles)

¹ ETCS Data Only Cab Radio



	Interoperability	0	0	0 or - (option 2 may lead to not interoperable solutions)
	Single EU-market for EDORs, CAB-radios	0	++	+
	Efficiency			
	Impact on magnitude of benefits/costs at RU-side	0	0 or + (more standardization could lead to positive impact being decrease of cost)	0 or - (not specified solution may mean individual cost to be supported by the RUs)
	Impact on magnitude of benefits/costs at IM-side	0	0 (no obligation to install GPRS on trackside)	0
<i>What are the main uncertainties (risks) of each of the options?</i>	<p>Retrofitting schemes of existing vehicles already equipped with GSM-R Baseline 0 are not part of the CCS TSI. Existing vehicles will have ETCS onboard equipment that does not support PS anyways (previous the Baseline 3 r2), so there will be no need to retrofit them due to this.</p> <p>The CCS TSI require that IMs have to install a GSM-R radio network that technically allows GSM-R Baseline 0 and Baseline 1 on-board CAB radios. So, the implementation of GPRS at network level does not technically prevent trains to run on a certain line with GSM-R Baseline 0 radios (not being equipped with GPRS-functionality) and ETCS on board equipment that does not allow the use of PS.</p> <p>However, IMs may introduce performance schemes (bonus/malus) in order to incentivise RUs to implement GPRS according to article 35 of the Access Directive 2012/34/EU (e.g. compliant with article 35 ‘performance schemes’) in order not to loose capacity (performance) on the line (e.g. during peak hours). The national railway regulator has to assess the non-discriminatory aspect of these access criteria. It is uncertain to which extend the IM will implement performance schemes.</p>			
Impact assessment (E. Comparison of options)				



<p><i>Indicate the preferred option(s)</i></p>	<p>The preferred option is option 1 as it introduces the functionalities (packet switching) while allow existing vehicles equipped with GSM-R Baseline 0 & ETCS onboard prior to Baseline 3 r2..</p>
<p><i>What are the main uncertainties related to the preferred option?</i></p>	<p>The main uncertainty is linked to the national approaches of handling the existing vehicles equipped with GSM-R Baseline 0 & ETCS onboard prior to Baseline 3 r2. (see above).</p> <p>This uncertainty is also valid for other performance requirements (e.g. reliability of on-board EVC) which may change the operational performance and which is not (yet) covered by strict migration requirements for all vehicles. The main reason not to put forward strict EU mandatory requirements is that the optimal requirement could be different according to the network or to a part of the network. The development of a balanced non-discriminatory scheme between Member States, RUs and IMs for potential retrofitting of GSM-R Baseline 0 on-board radios and ETCS on board equipment prior to Baseline 3 r2 is outside the scope of the TSIs.</p>
<p>Impact assessment (F. Monitoring and evaluation)</p>	
<p><i>What are the possible indicators to monitor after implementation of the selected option?</i></p>	<p>The main indicator to monitor is the railway indicator 3.1 'ERTMS Operational Performance' and verify if increased data capacity is removed from the list.</p>

7.3. Light Impact Assessment on Change Request related to Interferences

<p>Impact assessment (A. Context and Problem Definition)</p>	
<p><i>What is the main problem which this initiative will address and what are the underlying problem drivers /causes?</i></p>	<p>GSM-R Baseline 1 addresses 2 main topics (GPRS and interferences). This light impact assessment addresses the topic interferences.</p> <p>Problem: A number of interference cases within the radio communication system is currently seen as an increasing trend. It is due to the fact that current GSM-R radios modules are not resistant to interferences from other radio networks. New ETSI specifications defining requirements for improved radio receivers exist but are not included in GSM-R Baseline 0.</p> <p>Opportunity in the context of this Problem: Both improved radio receivers and filters fulfilling the requirements of the new ETSI specifications are available on the market.</p> <p>Remark: two main categories of interferences can affect GSM-R receivers:</p> <ul style="list-style-type: none"> • Cause 1: Blocking and intermodulation are interferences self-generated by the receiver itself in presence of interfering signals; • Cause 2: Out of Band emissions from radio services in the adjacent frequency band can also cause interference to GSM-R receivers;



<p><i>Who is affected by the problems?</i></p>	<p>IMs and RUs are negatively impacted by interferences as they suffer from communication losses. These communication losses could lead punctuality/reliability problems and could in worst case scenarios decrease the safety performance in case an emergency call is needed.</p>
<p><i>What is the baseline scenario?</i></p> <p><i>Is EU action justified on grounds of subsidiarity?</i></p>	<p>Multiple Member States suffer from communication losses due to interferences and are searching for solutions to be adopted.</p> <p>ERA as ERTMS system authority has to develop an interoperable solution across Europe in order to facilitate cross-border railway traffic in Europe (Single Railway Area).</p>
<p><i>What is the evidence and magnitude of the problem and problem drivers?</i></p>	<p>An ex-post evaluation has been performed in 2014 to evaluate the operational requirements and performance of the GSM-R system.</p> <p>The feedback from stakeholders confirm that ‘interference issues’ is one of the main priorities to be addressed. See http://www.era.europa.eu/Document-Register/Pages/Ex-post-Evaluation---TSI-CCS---Operational-Requirements-of-Railway-Radio.aspx</p>
<p>Impact assessment (B. Objectives)</p>	
<p>What are the main objectives?</p>	<p>The main objective is to increase the ERTMS operational and safety performance by providing a set of EU-specifications defining the minimum set of requirements for GSM-R radio modules to be interference resilient, leading to less communication losses due to interferences (improved CAB-radios).</p> <p>Two main categories of interference can affect GSM-R receivers:</p> <p>Cause 1: Blocking and intermodulation are interferences self-generated by the receiver itself in presence of interfering signals. → This kind of interference can be mitigated by means of technical measures, e.g. insertion of a filter or use of an improved radio receiver.</p> <p>Cause 2: Out of Band emissions from radio services in the adjacent frequency band can also cause interference to GSM-R receivers → This kind of interference can only be solved by means of coordination between public operators and for GSM-R operators, which may lead to the installation of filters in the antennas of the public operators or other measures.</p> <p>The objective of this initiative is to handle cause 1. For cause 2 (and partially for cause 1), the involvement of the national frequency regulator is required to set up agreements between the public radio operators and railway radio operators in order not to interfere each other radio network. The management of the spectrum is a national responsibility.</p>
<p>Impact assessment (C. Options)</p>	



<p><i>What are the options being considered?</i></p>	<p>Baseline scenario: Keep GSM-R Baseline 0. Improved technical solutions to tackle interference issues are introduced in an arbitrary way. EC will receive derogation requests to introduce national technical rules.</p> <p>Option 1: Define interoperable specifications for improved radio receivers. The functionality is optional for all new vehicles. This implies that RUs may choose to install equipment without improved radio receivers or with improved radio receivers.</p> <p>Option 2: Define interoperable specifications for improved CAB-radios and EDORs. The functionality is mandatory for all new vehicles. This implies that all RUs implement Baseline 1 (with improved radio receivers) and will contract GSM-R Baseline 1 products after publication of the revised CCS TSI (specific date to be defined).</p>				
<p>Impact assessment (D. Assessment of impacts)</p>					
<p><i>What are the main benefits and costs of each of the options?</i></p>	<p><u>Option 1 and 2 (incremental impacts compared to the Baseline):</u></p> <p>Suppliers of radio equipment (more specifically suppliers of radio modules and cab radio) have to adapt their products (if not yet done) in order to be compliant with the new set of specifications within GSM-R Baseline 1 for improved radio receivers. The specification of the improved radios is published in ETSI, therefore they should install them when providing new equipment. IMs and RUs are positively impacted as they have a technical/interoperable solution to use in an interoperable way improved interference resistant radios (higher operational performance).</p> <p>The cost for on-board radio modules will not significantly change due to GSM-R Baseline 1 Specifications according to the GSM-R Industry. Therefore, the cost difference between GSM-R Baseline 1 compliant radios compared to GSM-R Baseline 0 radios will not change significantly due to the specifications linked to interference resilient specifications. Some providers will have to introduce some modifications in the existing firmware in order to handle the new radio modules.</p> <p><u>Difference in options 1 and option 2:</u></p> <p>The RUs/ROSCOs are not always familiar with the optional technical functionalities into the CCS TSI legal framework. Therefore, making the GSM-R Baseline 1 mandatory for all new vehicles avoids the risk to RUs/ROSCOs of being limited in operational use by access criteria.</p> <p><u>Summary of options:</u></p> <table border="1" data-bbox="523 1760 1441 2040"> <tr> <td data-bbox="523 1760 743 2040"></td> <td data-bbox="743 1760 906 2040"> <p>Baseline Scenario (GSM-R Baseline 0)</p> </td> <td data-bbox="906 1760 1173 2040"> <p>Option 1 (Improved receivers optional on new/upgraded/renewed vehicles)</p> </td> <td data-bbox="1173 1760 1441 2040"> <p>Option 2 (Improved receivers mandatory for interoperability for new/upgraded/renewed vehicles)</p> </td> </tr> </table>		<p>Baseline Scenario (GSM-R Baseline 0)</p>	<p>Option 1 (Improved receivers optional on new/upgraded/renewed vehicles)</p>	<p>Option 2 (Improved receivers mandatory for interoperability for new/upgraded/renewed vehicles)</p>
	<p>Baseline Scenario (GSM-R Baseline 0)</p>	<p>Option 1 (Improved receivers optional on new/upgraded/renewed vehicles)</p>	<p>Option 2 (Improved receivers mandatory for interoperability for new/upgraded/renewed vehicles)</p>		



	Effectiveness			
	ERTMS Operational Performance	0	0 or + (depending if it is implemented or not)	+
	Interoperability	0	0 or – (specific technical rules could be issued due to the lack of harmonization)	++
	Single EU-market for radio modules and cabradio	0	+	++
	Efficiency			
	Magnitude of benefits/costs at RU-side	0	0 or – (negative impact in case there are technical rules that force an installation of improved radios after the vehicle is fitted with the radios (and authorised to run in some MSs))	0
	Magnitude of benefits/costs at IM-side	0	0	+
<i>What are the main uncertainties (risks) of each of the options?</i>	<p>All options: The main question is what will happen with trains already being equipped with GSM-R Baseline 0. IMs may want to require that RUs retrofit the existing fleet with improved radio receivers. Some Member States may suffer from interferences issues if vehicles are not equipped with GSM-R Baseline 1 radios. Therefore, the question is which solutions these Member States will develop for the existing vehicles equipped with GSM-R Baseline 0. The current framework allows that national approaches may appear to incentivize retrofitting of existing vehicles towards GSM-R Baseline 1. National Safety and/or Economic Railway Regulators should assess if these approaches are non-discriminatory and compliant to the Access Directive 2012/34/EU (e.g. compliant with article 35 ‘performance schemes’).</p>			



Impact assessment (E. Comparison of options)	
<i>Indicate the preferred option(s)</i>	The preferred option is option 2 (mandatory for interoperability requirement) for new/upgraded/renewed vehicles.
<i>What are the main uncertainties related to the preferred option?</i>	The main uncertainty is linked to the potential national approaches of handling the existing vehicles equipped with GSM-R Baseline 0 (see above).
Impact assessment (F. Monitoring and evaluation)	
<i>What are the possible indicators to monitor after implementation of the selected option?</i>	The main indicator to monitor is already part of the ERA railway indicators, in particular railway indicator 3.1 'ERTMS Operational Performance'.



Attachment:

Agency answers to comments received during consultation:

1. Ministère de l'écologie, du développement durable et de l'énergie (FR)
2. RSSB on behalf of GB railways (IMs, RUs, suppliers, NSA)
3. CER
4. EIM
5. UNIFE (UNISIG)
6. SSICF – DVIS (BE NSA)
7. Federal Office of Transport – CH (through OTIF)
8. ORR (UK NSA)
9. Deutsche Bahn AG
10. Notified Body TUV