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DEMONSTRATION OF RSC COMPATIBILITY ON SNCF NETWORK

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5	27/04/2023	OTA Test deleted Including BPL and CNM HSL

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PREAMBLE

This document aims to describe the processes in order to show the on-board radio (CAB and EDOR) equipment's capacity to circulate on the French Railways Network. The experience showed to SNCF Réseau that the high number of combinations Manufacturer/software's level/hardware's level/set of parameters does not allow guaranteeing the on-board equipment's correct behaviour, if tests are performed only in another environment than French one.

RSC Tests described in this document are not for product conformity testing. On board equipment for which RSC is being tested shall be compliant to the TSI CCS.

DEFINITIONS

Balise: A passive or active device normally mounted in proximity to the track for communications with passing trains. A standard for passive balises has been devised within the EUROBALISE project.

Cab radio: The radio and associated user and other interfaces installed in the cab of a locomotive and for use principally by the locomotive driver.

EDOR: ETCS data only radio. The radio equipment dedicated to support the ETCS train control application data transmission requirements. This equipment includes at least two radio transceivers and their enclosure.

FTS: Fixed Terminal Subsystem.

High speed line: A section of route forming part of the European High Speed Rail Network and any additional routes specified as such by national administrations.

OTA: Over the Air.

REC/eREC: Railway Emergency Call / enhanced Railway Emergency Call.

Enhanced Railway emergency call: eREC provides an additional set of functionalities to enhance the operation of railway emergency calls so as to define these areas to include or exclude joining, crossing and parallel tracks and shunting areas. eREC allows to achieve.

LDA: Location Dependent Addressing.

NoBo: Notified Body. Means a body that has been notified by a Member State to be responsible for assessing the conformity or suitability for use of the interoperability constituents or for appraising the 'EC' procedure for verification of the subsystems.

REFERENCES

- [1] 0-3001: ERA web page application guide documents (https://www.era.europa.eu/sites/default/files/filesystem/ertms/ccs_tsi_application_guide_-_informative_specifications/set_of_specifications_3_etcs_b3_r2_gsm-r_b1/index062_-_o-3001-4_v100.zip)

- [2] FRS/SRS 8/16: ERA web page annex A documents (https://www.era.europa.eu/sites/default/files/filesystem/ertms/ccs_tsi_annex_a_-_mandatory_specifications/set_of_specifications_3_etcs_b3_r2_gsm-r_b1/index032_-_eirene_frs_v800.pdf & https://www.era.europa.eu/sites/default/files/filesystem/ertms/ccs_tsi_annex_a_-_mandatory_specifications/set_of_specifications_3_etcs_b3_r2_gsm-r_b1/index033_-_eirene_srs_v1600.pdf)

- [3] ETSI 102 610 : ERA web page annex A documents (https://www.era.europa.eu/sites/default/files/filesystem/ertms/ccs_tsi_annex_a_-_mandatory_specifications/set_of_specifications_3_etcs_b3_r2_gsm-r_b1/index068_-_ts102610_v130.pdf)

- [4] eLDA FRS : UIC public web page (https://uic.org/spip.php?action=telecharger&arg=1663)

- [5] O-3152 1-1 1-2: UIC public web page (https://uic.org/spip.php?action=telecharger&arg=1665 & https://uic.org/spip.php?action=telecharger&arg=1666)

TESTS DESCRIPTION

1. OBJECTIVES

Tests described hereafter aim to describe the processes in order to show the on-board radio (CAB and EDOR) equipment's capacity to circulate on the French Railways Network.

These tests are in addition to tests certified by the NoBo, in order to ensure the followings:

- On board radio equipment's compatibility with the set of parameters deployed on the French GSM-R network ;
- On board radio equipment's compatibility with the French GSM-R network's software level ;
- On board radio equipment's compatibility with the specific configurations, for example the GSM-R dual coverage deployed on High Speed lines;
- On board radio equipment's compatibility with the French FTS (CTFU, PGDG, TFNG…) ;
- On board radio equipment's behaviour in high speed conditions (320 km/h) ;
- On board radio equipment's compatibility with French specific functions, at least to ensure that these specificities do not trigger a regression.

2. GEOGRAPHICAL SCOPE

This document applies on the French lines covered by the GSM-R, including the high-Speed Line Bretagne Pays de Loire, (BPL), Contournement ferroviaire Nîmes-Montpellier (CNM) and except the following:

- The French part of the line Perpignan-Figueras, which is covered by the Spanish network;
- The high-Speed Line Tour Bordeaux SEA (Sud Europe Atlantique), managed by LISEA;
- The French part of Eurotunnel.

3. TEST PROCESS

The tests can be performed by the SNCF Réseau engineering service: DGII-RCB. In this case, the applicant does address its request directly to DGII-RCB.

The applicant can be:

- The CAB supplier ;
- The EDOR supplier ;
- The train supplier ;
- The Railway Operator.

4. TEST ENVIRONMENTS

Tests must be performed in two different environments:

4.1. STATIC TESTS:

Duration: 5 to 8 days
Preparation: 2 days

Static tests are mainly passed in laboratory. For some tests, an additional BTS is linked to the live network in order to performed static tests which cannot be performed on the lab: e.g. SIM cards tests in roaming.

The laboratory presents a test's network with a hardware and software level identical to the live network. Before to be passed on the live network, tests are performed – if possible – in the laboratory:

- In order to limit expensive dynamic tests ;
- In order to perform tests which cannot be passed on the live network, because they may disturb the traffic regulation: e.g. REC tests.

The laboratory includes the following items:

- 1 NSS;
- 2 BSC;
- 3 BTS;
- 1 additional BTS linked to the live network;
- 1 CTFU with associated screen (FTS);
- 1 PGDG (FTS);
- 1 balise simulator;
- 1 protocol analyser.

The applicant shall provide:

- The On Board equipment to be tested including MMI, power supply, cables …;
- The full documentation (in French or English), including:
- The user manual;
- A document describing the equipment, with the different configurations;
- The delivery notes/software version;
- The compliancy agreement against FRS/SRS Eirene standards;
- A EC certification;
- A SIM card allowed to register on the French GSM-R network for live network tests;
- An internal trace tool;
- A test bench;

- Simulators (for balise, intercom…) if necessary.

4.2. DYNAMIC TESTS:

Duration: 2 days
Preparation: 1 day

Dynamic tests are performed on the live network. They allow performing several basic tests in a limited period. They are also the only way to ensure the on-board equipment good behaviour on high speed lines. Dynamic tests are performed in a testing high speed train (IRIS320), moving on both high speed lines and classic lines. Tests can be done anywhere on the French Railway Network. They will be done on both classic and high speed line no matter the type of line the train intends to run on because what is tested is the IC.

The tests train is equipped with:

- Power supply;
- Dedicated antennas;
- GPS.

In addition, it is possible to access to the network traces if necessary.

Dynamic tests focus mainly on following items

- Functional registering;
- Reselections;
- Point to point calls ;
- Group calls (except REC) ;
- Hand-overs;
- Behaviour under double coverage (High Speed Lines);
- Behaviour under high speed (320 km/h) ;
- Behaviour on classic lines.

Nota : If the applicant cannot provide the Interoperability Constituent and wishes only to test the Subsystem, the same tests as detailed in chapter 5 have to be taken at vehicle level under GSM-R F.

5. TEST DESCRIPTION

The tests are listed in the following table:

CabRadio	*Test Id.*	*Family test*	*Test description*	*Comments*	*Static tests*	*Dynamic tests*
		Power on / Power off functions	**o 3001-1 [1] §4.1**			
	1	*Saving numbers at power-off only CT2 and CT3 call*	*o 3001-1 [1] §4.1.6*	*Communication with the FTS (CTFU)*	*Yes*	*No*
		Network related features	**o 3001-1 [1] §4.4**			
	2	*Manual network selection – idle mode*	*o 3001-1 [1] §4.4.1*	*Registration on GSM-R F network Checking on the CTFU (NUTRA, NULOC and eREC if this option is activated)*	*Yes*	*No*
	3	*Numbering plan only CT2 and CT3 and GID 200*	*o 3001-1 [1] §4.4.5*	*Communication with the FTS (CTFU)*	*Yes*	*No*
	4	*Location Dependent Addressing*	*o 3001-1 [1] §4.4.6*	*Communication with the FTS (CTFU)*	*Yes*	*No*
		Entry of train data	**o 3001-1 [1] §4.6**			
	5	*Registration of train data*	*o 3001-1 [1] §4.6.1*	*USSD message verification Checking of optional tags*	*Yes*	*No*

	6	*Correction of train data*	*o 3001-1 [1] §4.6.2*	*USSD message verification* *Checking of optional tags*	*Yes*	*No*
	7	*Re-registration after changing networks*	*o 3001-1 [1] §4.6.3*	*Registration procedure verification* *Checking on the CTFU (NUTRA, NULOC and eREC if this option is activated)*	*Yes*	*No*
	8	*Registration of functional address to other driver (non-leading driver)*	*o 3001-1 [1] §4.6.4*	*Registration procedure verification* *Checking on the CTFU (NUTRA, NULOC and eREC if this option is activated)*	*Yes*	*No*
	9	*Deregistration of train number*	*o 3001-1 [1] §4.6.6*	*Registration procedure verification* *Checking on the CTFU (NUTRA, NULOC and eREC if this option is activated)*	*Yes*	*No*
	10	*Forced deregistration*	*o 3001-1 [1] §4.6.8*	*Registration procedure verification* *Checking on the CTFU (NUTRA, NULOC and eREC if this option is activated)*	*Yes*	*No*
	11	*Follow-me service control sequences*	*o 3001-1 [1] §4.6.9*	*Registration procedure verification* *Checking on the CTFU (NUTRA, NULOC and eREC if this option is activated)*	*Yes*	*No*
		Point-to-Point calls	**o 3001-1 [1] §4.8**			
	12	*Outgoing PTP call – controller*	*o 3001-1 [1] §4.8.8*	*Communication with the FTS (CTFU)*	*Yes*	*No*
		Conference calls	**o 3001-1 [1] §4.10**			

	13	*Multi-driver communication – controller*	*o 3001-1 [1] §4.10.4*	*Communication with the FTS (CTFU)*	*Yes*	*No*
		Railway emergency calls	**o 3001-1 [1] §4.12**			
	14	*Incoming railway emergency call*	*o 3001-1 [1] §4.12.1*	*Communication with the FTS (CTFU)*	*Yes*	*No*
	15	*Outgoing railway emergency call*	*o 3001-1 [1] §4.12.2*	*Communication with the FTS (CTFU)*	*Yes*	*No*
		Call confirmation	**o 3001-1 [1] §4.14**			
	16	*Emergency call confirmation only cases c and d*	*o 3001-1 [1] §4.14.1*	*USSD message checks* *Checking of optional tags*	*Yes*	*No*
		Public Address	**o 3001-1 [1] §5.1**			
	17	*Public Address – incoming call*	*o 3001-1 [1] §5.1.1*	*Communication with the FTS (CTFU)*	*Yes*	*No*
		Intercom	**o 3001-1 [1] §5.2**			
	18	*Intercom system - incoming*	*o 3001-1 [1] §5.2.1*	*Communication with the FTS (CTFU)*	*Yes*	*No*
	19	*DSD*	*FRS 8.0.0* [2] *§ 5.7* *SRS 16.0.0* [2] *§5.13* *The DSD is simulated by closing a dedicated contact.* *Pass criteria: the short code 1700 is sent.*	*(Optional) Only if the feature is present*	*Yes*	*No*

	20	*UUIE conformity*	*ETSI TS 102 610* [3] *Verification of the TAG of the messages USSD by checking the network traces.* *Pass criteria : check the expected TAG is on the message user to user.*		*Yes*	*No*
	21	*eLDA XY*	*eLDA FRS v4.0* [4] *(MMI method for SDC coding)* *Enter a virtual canal on the MMI.* *Pass criteria: checking the expected changes in the shortcodes 12XY, 13XY, 14XY.*	*(Optional) Only if the feature is present*	*Yes*	*No*
	22	*eLDA GPS*	*eLDA* [4] *FRS v4.0* *Verification of the TAG 6 of the messages USSD by checking the network traces.* *Pass criteria: check the expected TAG 6 is on the message user to user.*	*(Optional) Only if the feature is present*	*Yes*	*No*
	23	*System change and canal change by balise*	*Perform a system change by balise using a specific interface* *Perform a canal change by balise using a specific interface* *Performing of system and canal change with simulators that reproduce the change of system (GSMr F to a foreign GSMr network) and canal at a border.* *Pass criteria : the system and canal are changed as expected.*	*(Optional) Only if the feature is present*	*Yes*	*No*

	24	*Check CabRadio's behaviour in high speed and under double coverage*	*Perform reselection/handover in idle mode, point to point call and group call Reselection in Idle Mode: Checking of cell reselection N, N+1, N+2 … in Idle Mode (no ongoing call). Pass criteria : the radio goes on the expected GSMR cell Handover in point to point call: Checking of cell handover N, N+1, N+2 … during a point to point call. Pass criteria : the radio goes on the expected GSMR cell*		*No*	*Yes Vehicle used is "IRIS320"*
	25	*Check CabRadio's behaviour on classical lines*	*Perform reselection/handover in idle mode, point to point call and group call Reselection in Idle Mode: Checking of cell reselection N, N+1, N+2 … in Idle Mode (no ongoing call). Pass criteria : the radio goes on the expected GSMR cell Handover in point to point call: Checking of cell handover N, N+1, N+2 … during a point to point call. Pass criteria : the radio goes on the expected GSMR cell*		*No*	*Yes Vehicle used is "IRIS320"*

	Test Id.	***Family test***	*Yes*		***Static tests***	***Dynamic tests***
EDOR or CabRadio equipped with a data modem	*26*	*EIRENE requirements for ETCS Data Only Radio*	*o 3001-2 [1] §6*		*Yes*	*No*
	27	*Check EDOR's behaviour (or CabRadio's behaviour) in high speed and under double coverage*	*Perform reselection/handover in idle mode, point to point call and group call Reselection in Idle Mode: Checking of cell reselection N, N+1, N+2 … in Idle Mode (no ongoing call). Pass criteria : the radio goes on the expected GSMR cell Handover in point to point call: Checking of cell handover N, N+1, N+2 … during a point to point call. Pass criteria : the radio goes on the expected GSMR cell*		*No*	*Yes Vehicle used is "IRIS320"*
	28	*Check EDOR's behaviour (or CabRadio's behaviour) on classical line*	*Perform reselection/handover in idle mode, point to point call and group call Reselection in Idle Mode: Checking of cell reselection N, N+1, N+2 … in Idle Mode (no ongoing call). Pass criteria : the radio goes on the expected GSMR cell Handover in point to point call: Checking of cell handover N, N+1, N+2 … during a point to point call. Pass criteria : the radio goes on the expected GSMR cell*		*No*	*Yes Vehicle used is "IRIS320"*

6. DELIVERABLES

At the end of the test campaign, **a « technical advice »** is delivered. For each issue detected, a corresponding reserve is raised with a classification:

- Minor: no impact on railway security or railway traffic regulation.
- Major: potential impact on railway traffic regulation, but no impact on railway security. Such an issue may imply a usage limitation, depending of the impact;
- Critical: impact on railway security.

7. RSC CATEGORIES & RSC TYPES

In accordance to the test process, the network can be divided in 3 categories:

- No GSM-R
- GSM-R for voice calls only: Cab radio test #1 to #25 in table chapter 5 are mandatory: Associated RSC type is RSC-FR-01-V
- GSM-R for voice and data:
  - Cab radio test #1 to #25 in table chapter 5 are mandatory: Associated RSC type is RSC-FR-01-V.
  - EDOR or CAB radio equipped with a data modem test #26 to #28 in table chapter 5 are mandatory: Associated RSC type is RSC-FR-01-D.

ADDRESSES AND CONTACTS

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