UNISIG

ERTMS/ETCS

FFFIS STM test cases of Functional Identity 004

LEVEL TRANSITIONS STM TO ETCS

Total: 14 Test cases

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Company	Technical Approval	Management approval
ALSTOM		
AZD		
CAF		
HITACHI RAIL STS		
MERMEC		
SIEMENS		
THALES		

Modification History

Issue Number Date	Section Number	Modification / Description	Author
0.0.1 28/10/2004	All	First version after joining the files for the diagram and the test case	AS (ALSTOM)
0.0.2 17/11/2004	All	Reviewed on 17-11-2004	AS (ALSTOM)
0.0.3 29/11/2004	All	Reviewed on 29-11-2004 in Bruxelles	AS (ALSTOM)
0.0.4 10/12/2004	All	Reviewed on 10-12-2004	AS (ALSTOM)
0.0.5 15/12/2004	All	Reviewed on 15-12-04 in Madrid	AS (ALSTOM)
0.0.6 26/01/2005	All	Reviewed on 26-01-05 in Paris	AS (ALSTOM)
0.1.0 27/01/2005	All	Editorial changes	AS (ALSTOM)
1.0.0 13/10/2005	All	Editorial changes for delivery	INVENSIS RAIL
1.0.1 06.06.2007	Diagrams	Modification of Subset 35 version 2.1.6	Axel Schoevaerts (ALSTOM)
2.9.1 30/01/2013	All	Updated to be in line with Subset 35 issue 3.0.0 date 2010-02-29, SRS issue 3.3.0 date 2012-03-07 and ETCS DMI specification issue 3.3.0 date 2012-03-01	Giuseppe Pagliarulo (MER MEC)
2.9.2 30/08/2013	All	Reviewed after STM WG internal verification process	Giuseppe Pagliarulo (MER MEC)
2.9.3 31/10/2013	Diagrams and TC 4a.3, 4c.2, 4e.2	Updated according to CR 1158 (considering impact from CR 1173): - updated req. 9.3.1.4 and 10.3.2.7 in diagrams 4a, 4b, 4c, 4d and 4e - condition DA→FA of req. 10.3.2.2 mentioned in diagrams 4a, 4c, 4e and in test cases 4a.3, 4c.2 and 4e.2	Giuseppe Pagliarulo (MER MEC)
2.9.4 28/02/2014	Preliminary Test Case	NID_BUTPOS is coded on 5 bits.	Thomas Mandry (ALSTOM)
2.9.5 2014-04-24	Front page	Baseline 3 1st Maintenance pre-release version	Thomas Mandry (Alstom)

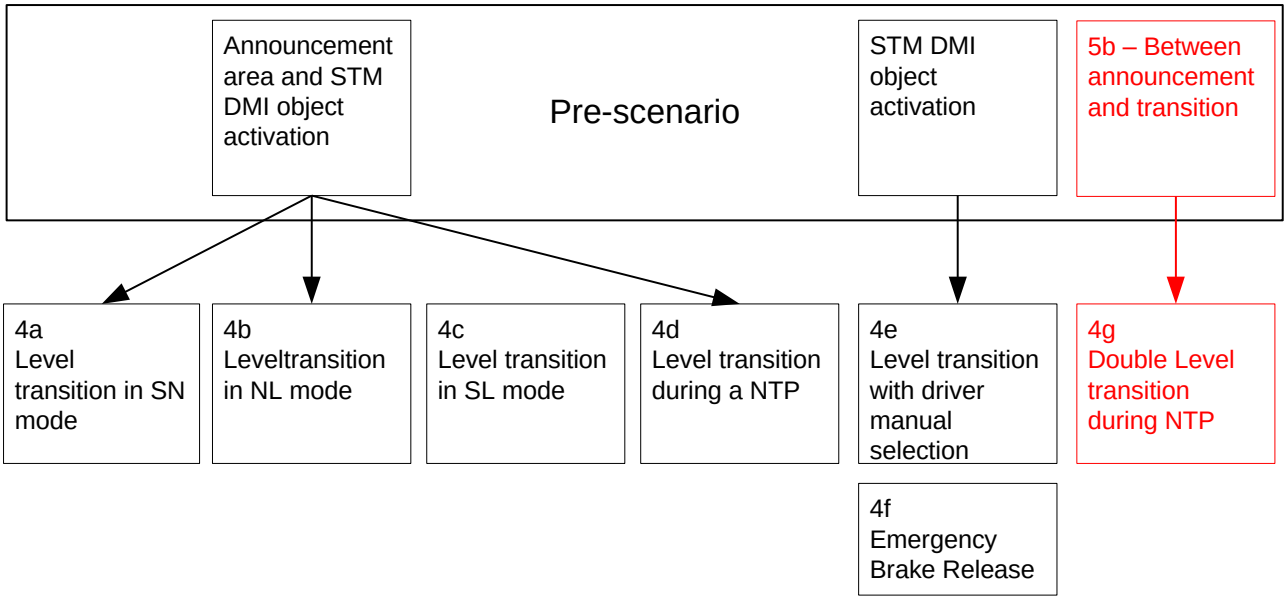
Issue Number Date	Section Number	Modification / Description	Author
3.0.0 2014-05-09	-	Baseline 3 1st Maintenance release version	Philippe Prieels
3.0.1 2015-08-17	Diagrams, Supplier Specific delays Table, test cases	CR 1278: impact from CRs 1094 & 1242 and from STMWP review: updated the number of test cases and diagrams in overview section, defined two new supplier specific delays, updated text of requirements in existing diagrams, new diagram 4g, new test cases 4g.1	Giuseppe Pagliarulo (MER MEC)
3.0.2 2015-10-19	No change to this part of the Subset	CR 1278: Updated according to SUBSET-074v301ERAreview	Thomas Mandry (Alstom)
3.1.0 2015-12-16	-	Baseline 3 2nd release version	Thomas Mandry (Alstom)
Version 3.1.1 2022-09-29	Front page Messages Messages Diagrams Test cases	Update of company list CR1238: "M_MODESTM" changed to "M_MODE" CR1338: "airgap" changed to "trackside" CR1342: "Level 2/3" changed to "Level R"	Thomas Mandry (Alstom)
Version 3.9.1 25/11/22	-	Formal update for the 2nd consolidation review for Baseline 4 1st release version	Sven Adomeit (Siemens)
Version 3.9.2 2023-02-16	-	Formal update for the 3rd consolidation review for Baseline 4 1st release version	Thomas Mandry (Alstom)
Version 3.9.4 2023-06-20	Diagrams Test cases	CR1342: "Level R" changed to "Level 2" Formal update for the 3rd consolidation review for Baseline 4 1st release version	Thomas Mandry (Alstom)
Version 4.0.0 05/07/2023	-	Baseline 4 1st release version	Thomas Mandry (Alstom)

Table of Contents

TEST CASE DIAGRAMS

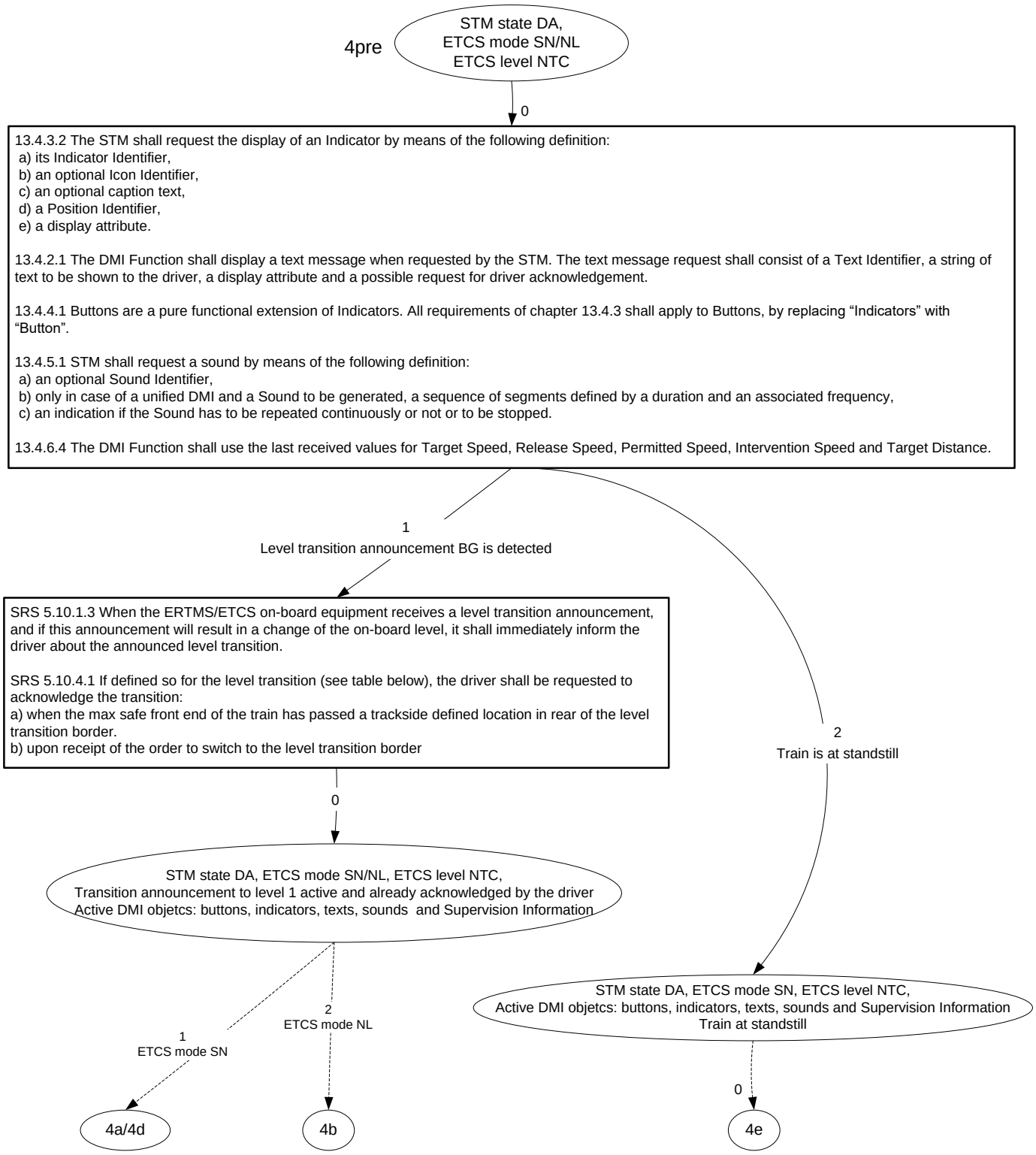
Overview

For testing of the Functional Identity “Level Transition STM to ETCS” 7 Test Case Diagrams and 12 Test Cases have been defined. One additional diagram has been defined and two additional preliminary test cases can be executed for setting of the relevant starting conditions (level transition announcement, request of DMI objects from STM to ETCS DMI function, etc.). Requirements coverage is out of the scope of these preliminary test cases.
Exception: for the test group 4g (Double Level Transition during NTP transition), the preliminary conditions can be set at the end of the sequence 5b.0.4 (level border) (defined in Subset 074-2-5 “Functional Identity 005 Level Transitions STM to STM”).

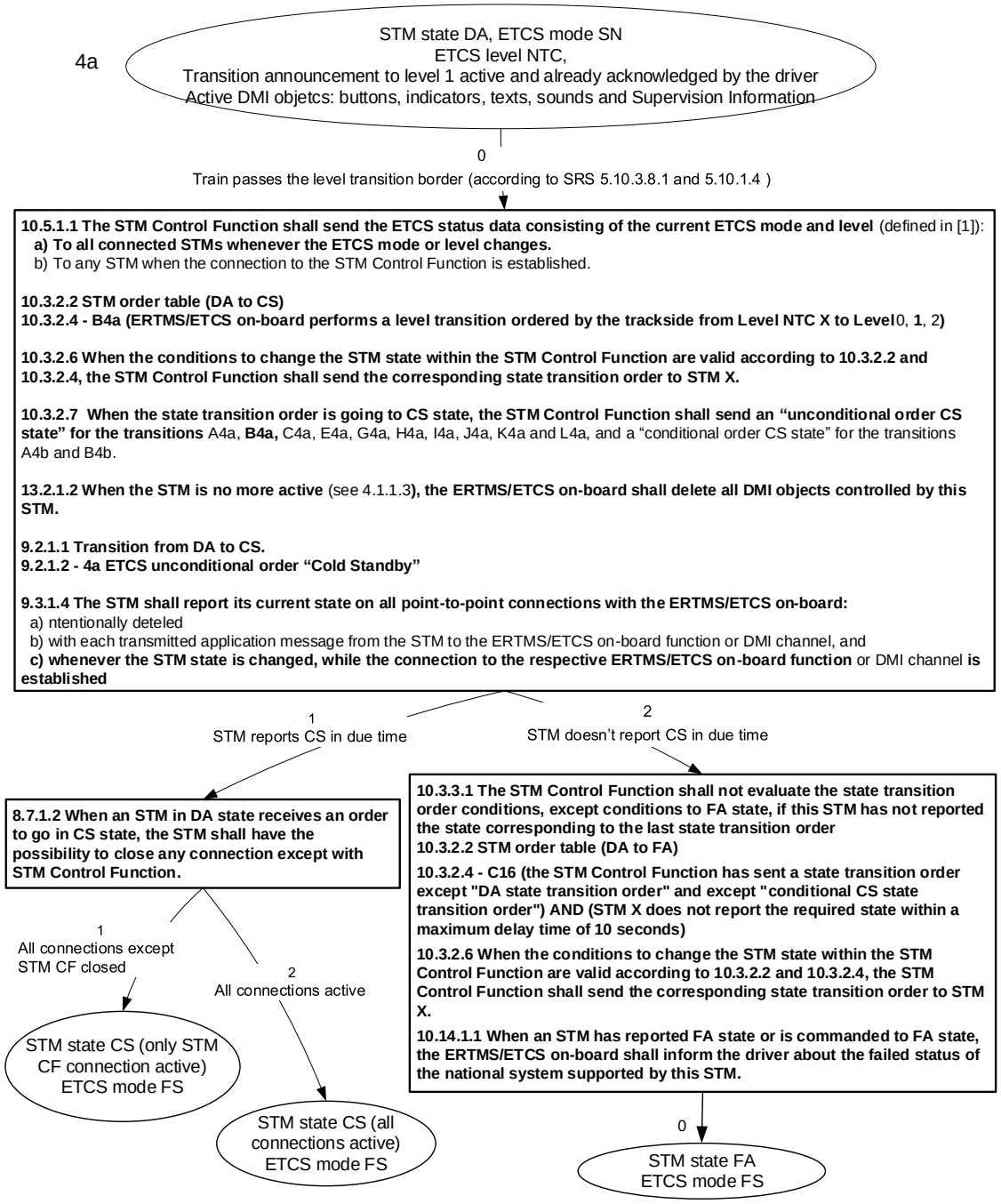


In the test case descriptions all “optional” actions, conditions or input/outputs related to specific STM and ETCS configurations are remarked allowing a correct test results analysis.

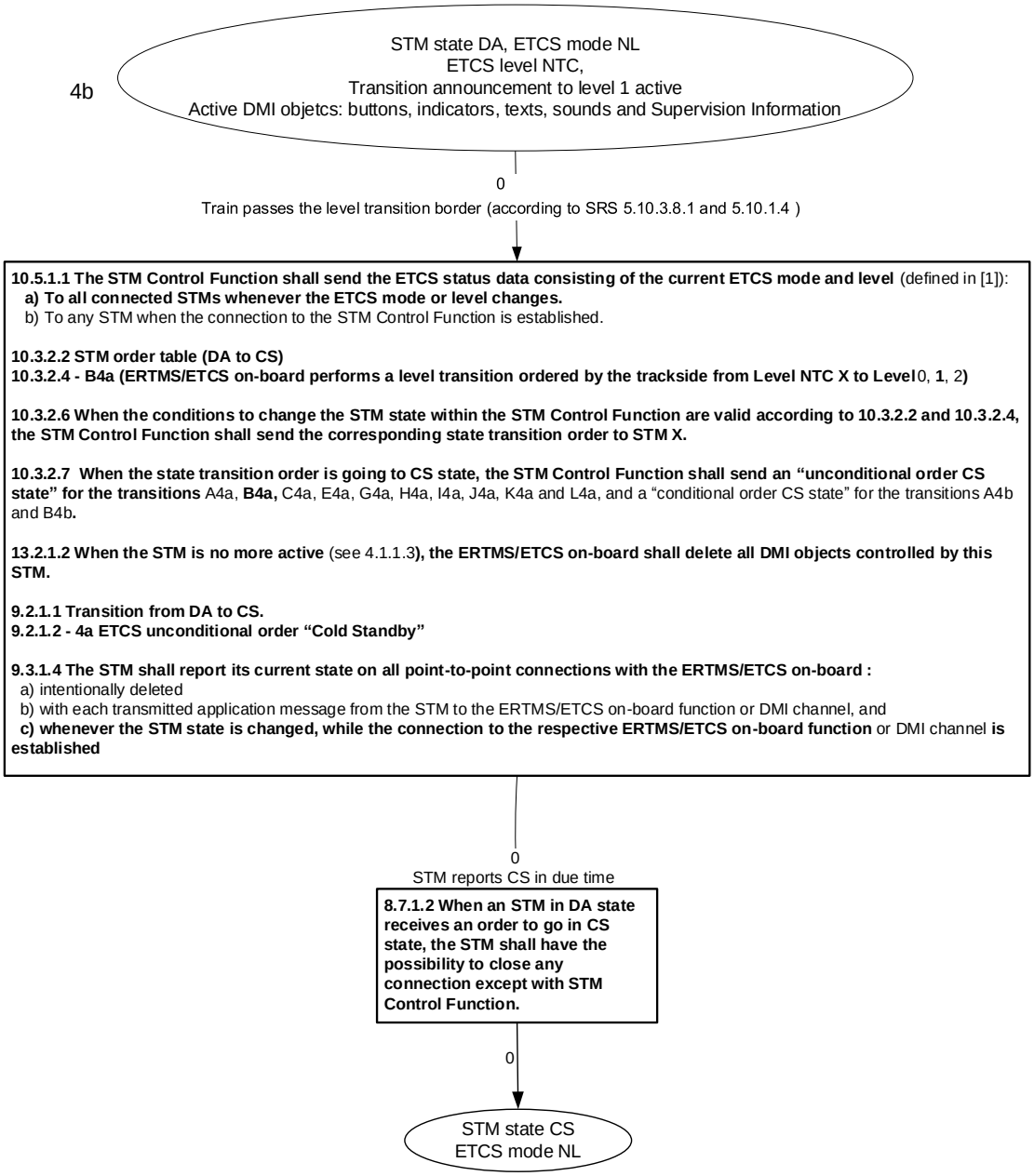
Preliminary test cases diagram



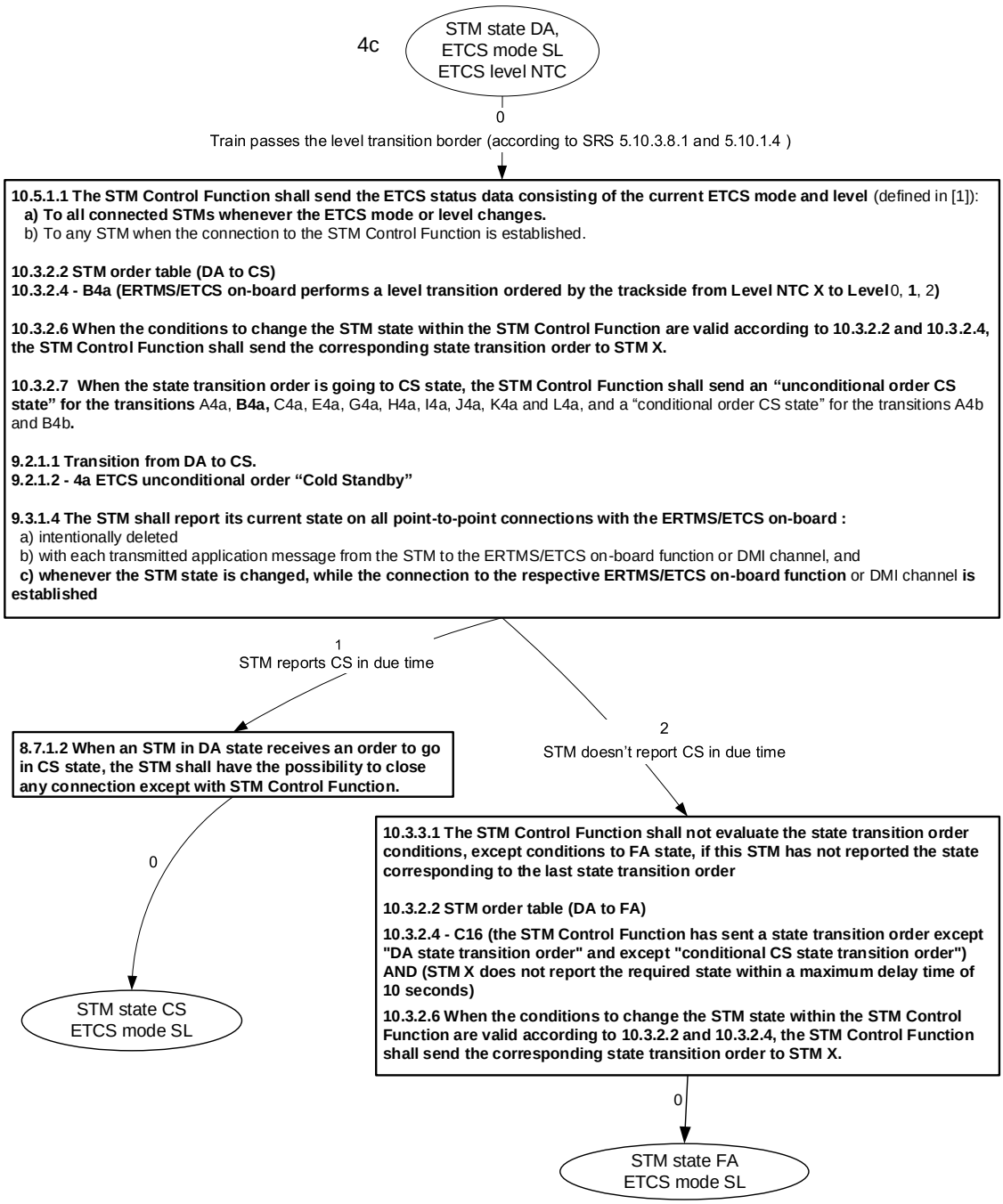
STM -> ETCS (4a): Transition NTC to ETCS (ETCS in SN mode)



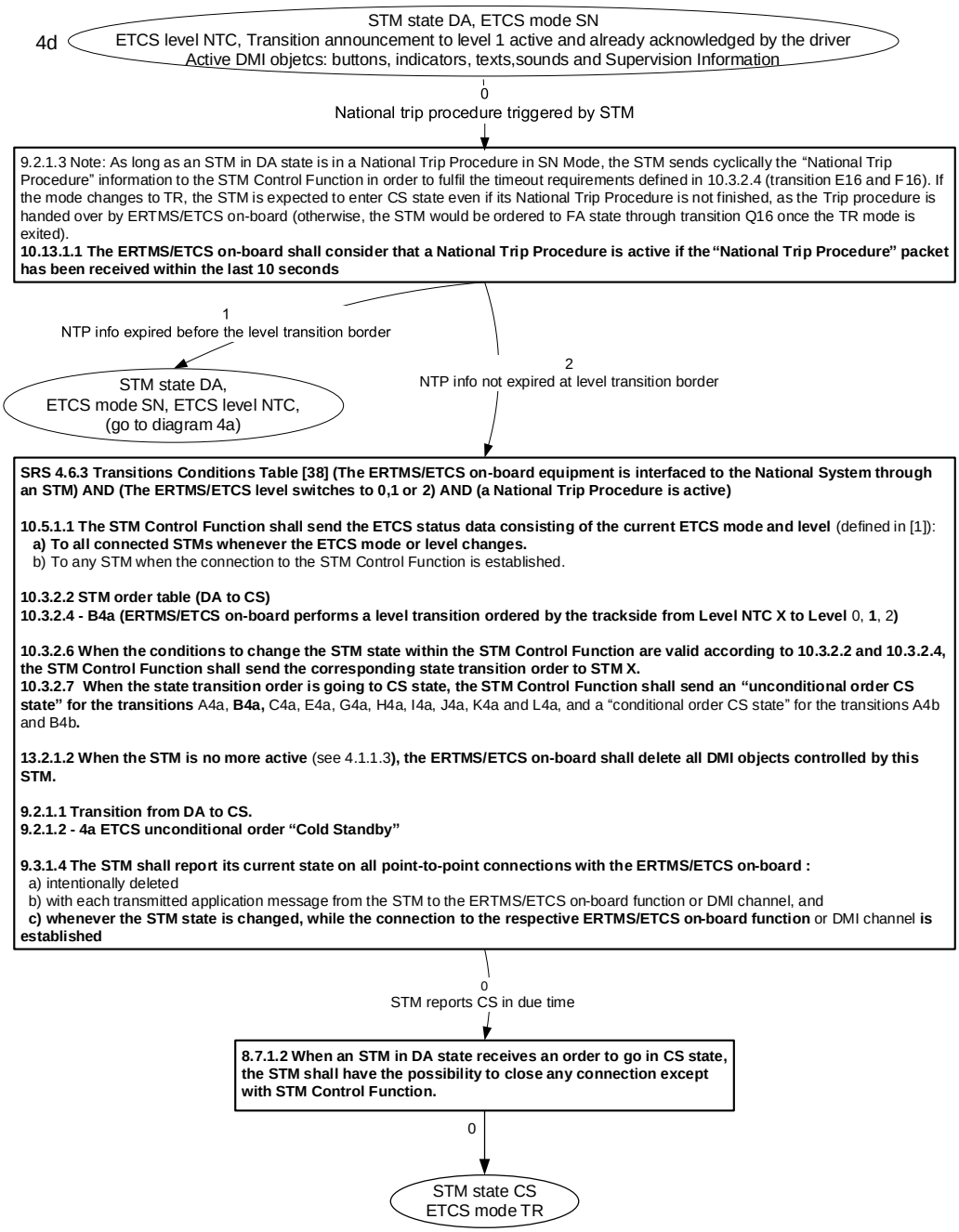
STM -> ETCS (4b): Transition NTC to ETCS (ETCS in NL mode)



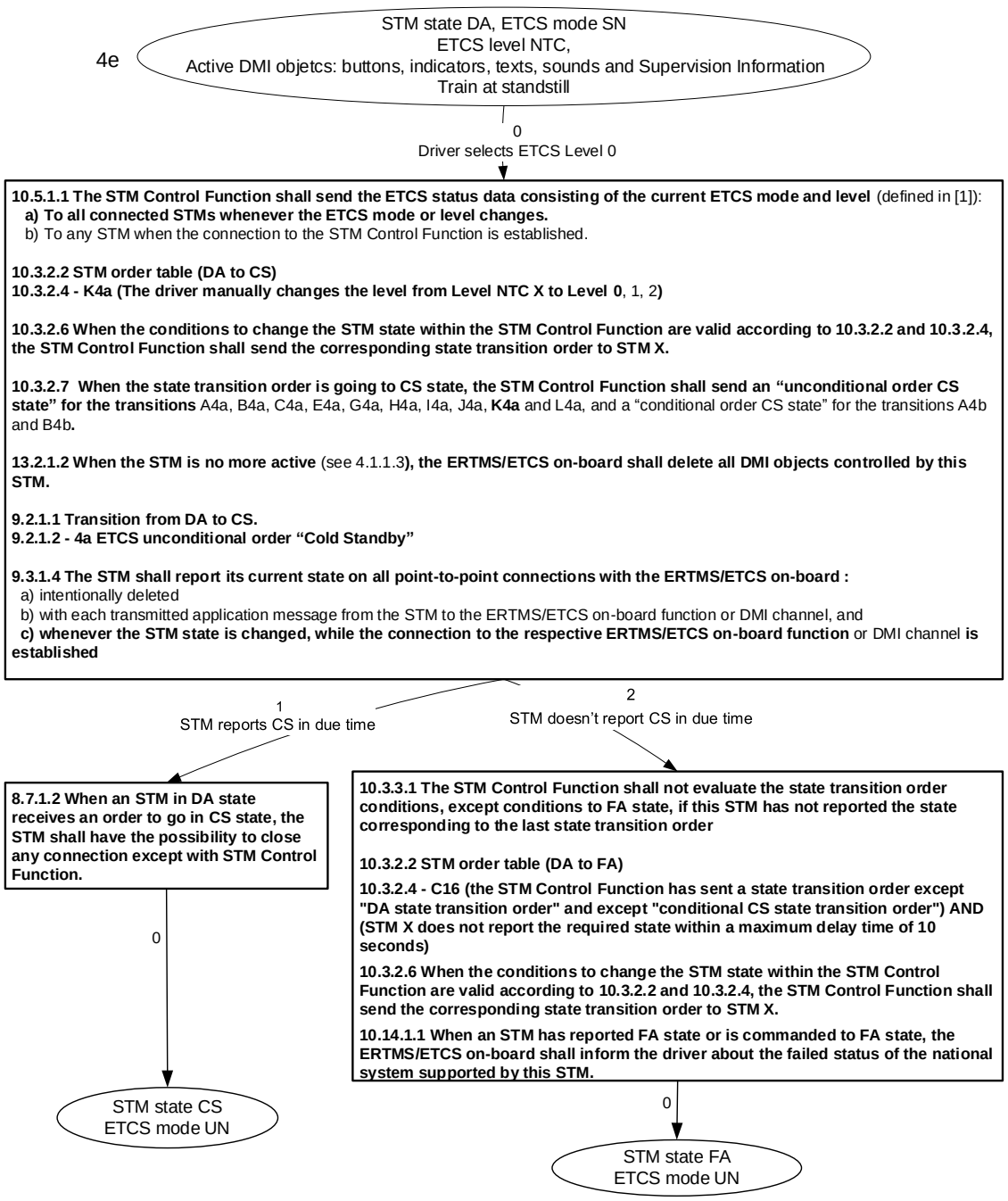
STM -> ETCS (4c): Transition NTC to ETCS (ETCS in SL mode)



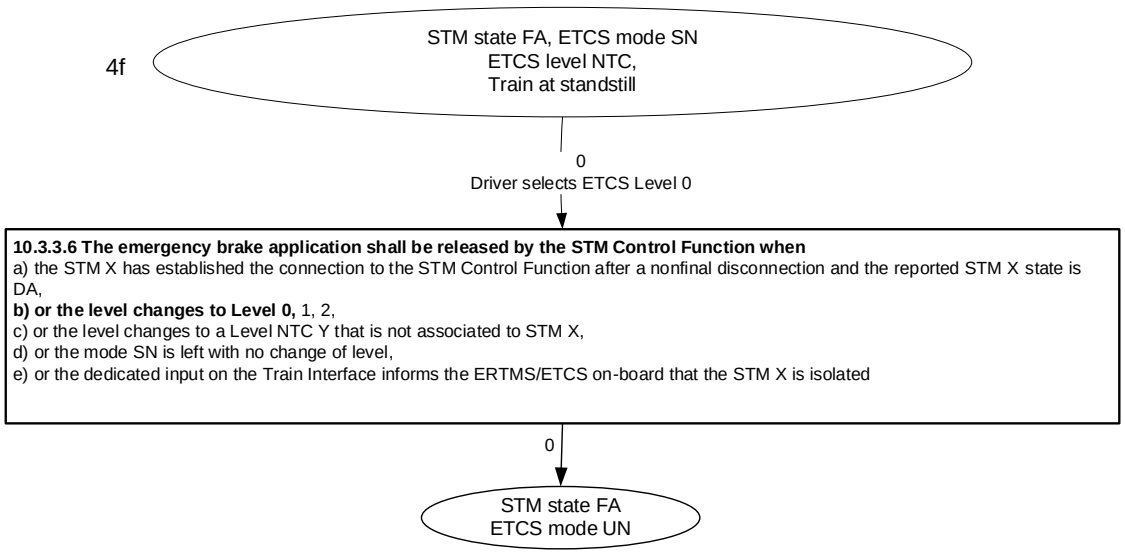
STM -> ETCS (4d): Transition NTC to ETCS (National Trip Procedure)



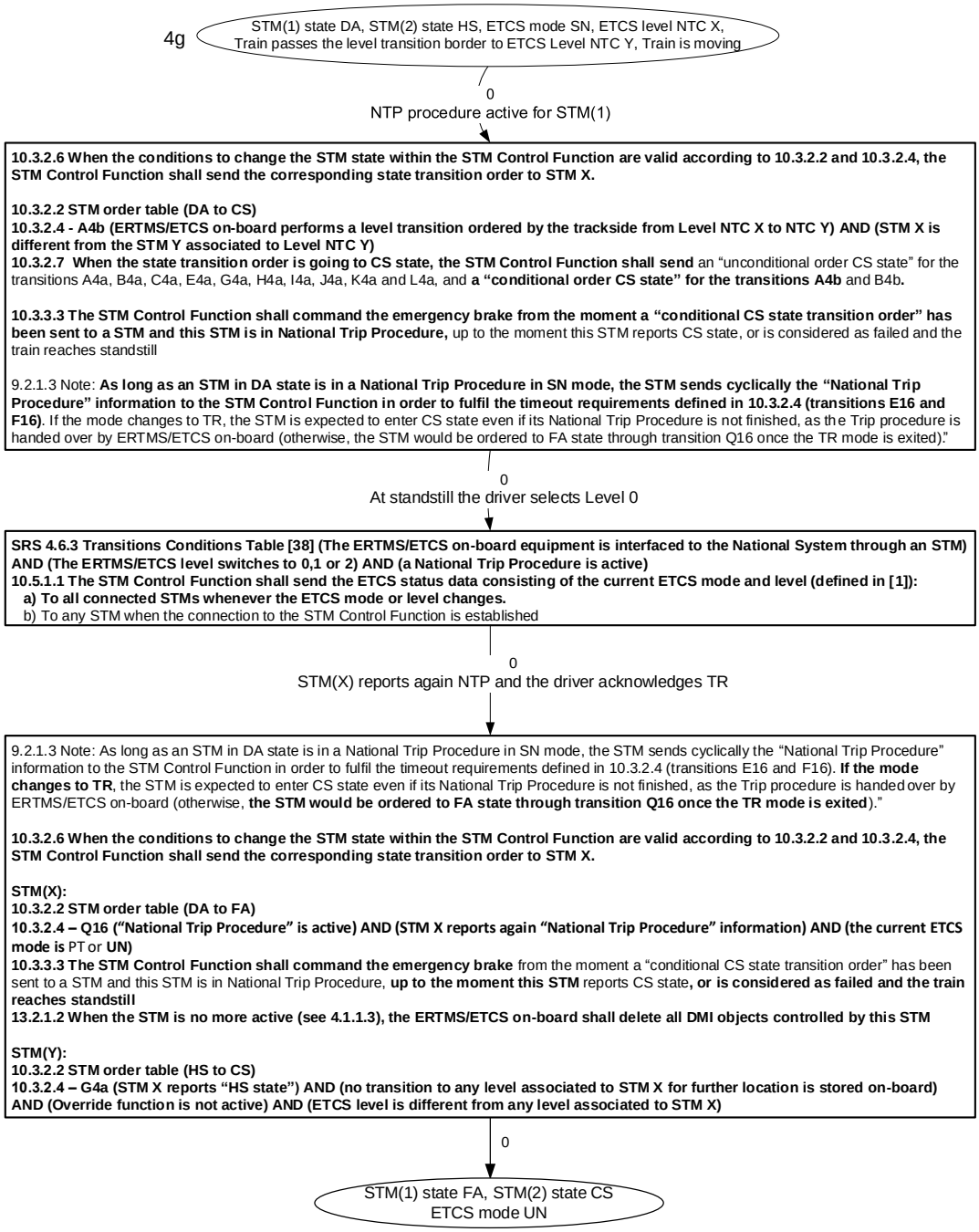
STM -> ETCS (4e): Transition NTC to ETCS (level manually changed by driver)



STM -> ETCS (4f): Transition NTC to ETCS (emergency brake release)



STM -> ETCS (4g): Double Level transition during National Trip Procedure



SUPPLIER SPECIFIC DELAYS TABLE

#	Supplier of	Start time	End time
Ts0	ETCS	Time-stamp of balise telegram (Level Transition Order NTC X / NTC Y)	Time-stamp of message including STM-5 (C-CS) sent to STM (X)
Ts1	ETCS	Reference time of driver selection of a new level during NTP	Reference time of DMI update (activation of TT acknowledgement)
Ts2	ETCS	Timestamp of NTP STM-18	Time-stamp of message including STM-14 "FA" sent to an active STM that has not reported the CS state during a NTP
Ts3	STM	Time-stamp of State order STM-14 to “CS”	Time-stamp of message including STM-15 “CS” sent to BIU/TIU/DMI/JD
Ts4	STM	Time-stamp of State order STM-14 to “CS”	Time-stamp of SSL disconnect message sent from STM
Ts5	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to “CS” +10s	Reference time of STM failure message on DMI
Ts6	STM	Reference time of activation of a National Trip Procedure	Time-stamp of message including STM-18
Ts7	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to “CS” +10s	Time-stamp of message including STM-14 "FA"
Ts8	ETCS	Reference time of driver selection of a new level	Time-stamp of message including STM-14 "CS"
Ts9	ETCS	Reference time of driver selection of a new level	Reference time of DMI update (STM object deleted, new ETCS mode and level displayed)
Ts10	ETCS	Reference time of driver selection of a new level	Reference time of Emergency Brake Release

TEST CASES

Preliminary test case (4a, 4b, 4d)

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4pre.0.1.0
	Transition announcement, STM DMI object request and display, while the ERTMS/ETCS on-board is in mode SN or NL. Scope of the test case is to bring ERTMS/ETCS on-board under test in the initial conditions of test cases 4a, 4b and 4d: - when ERTMS/ETCS on-board receives a level transition announcement from level NTC to ETCS level 1 an ack is requested to the driver; - the STM Control Function creates all DMI objects requested by STM.
ERTMS/ETCS on-board requirements tested	-
STM Requirements Tested	-
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15, STM-32, STM-35, STM-38, STM-43, STM-46 - from ETCS to STM: -
ERTMS/ETCS on-board configuration	- Unified DMI (no configuration) - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state.
Comments and constraints	-

Starting Conditions	Value	Comments
STM_state	DA	
ETCS Mode	SN or NL	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	
BIU Connection	Established	
JD Connection	Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	The ERTMS/ETCS On-board receives the announcement of level transition and displays the announcement to the driver.	BTM	T0	Message 1 - Level transition announcement: Telegram “B1”: Packet SRS-41 Level Transition Order Telegram “B2”:	DMI	5s	Level transition is announced to the driver.
2.	When the train, moving at 60km/h, reaches the acknowledgement area, the ERTMS/ETCS On-board shall request driver acknowledgement of level transition.	ODO	T1=T0+30 s	ACK area is reached by the ERTMS/ETCS on-board	DMI	5s	Request for ACK is displayed to the driver. Note: no ack request displayed in NL mode
3.	The driver acknowledges the level transition. Note: this step is not applicable to ERTMS/ETCS on-board in NL mode	DMI	T2= T1+6s	Driver ACK the level transition	DMI	5s	ACK request is removed.
4.	STM requests the ERTMS/ETCS On-board DMI function to display buttons, indicators, text message.	PROF	T3=T2+6s	DMI Connection: Message 2: Packet STM-15: STM state report Packet STM-32: Button Request Message 3: Packet STM-15: STM state report Packet STM-35: Indicator request Message 4: Packet STM-15: STM state report Packet STM-38: Text message	DMI	5s	Buttons, Indicators and Text are displayed.

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
5.	STM requests the ERTMS/ETCS On-board DMI function to display text message to be ACK, supervision information and sounds.	PROF	T4=T3+10 s	DMI Connection: Message 5: Packet STM-15: STM state report Packet STM-38: Text message to be ACK Packet STM-43: Speed and distance supervision information Message 6: Packet STM-15: STM state report Packet STM-46: Sound command	DMI	5s	Text to be ACK, Supervision Info are displayed, Sounds are generated.
6.	Driver acknowledges the text message	DMI	T5=T4+7s	Driver acknowledges the text message	DMI	5s	ack request removed

STM Test Case

Not applicable because no preliminary test case is necessary for all the STM tests in this document.

Message 1: Trackside Telegram B1 (Level Transition Order - Announcement)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	1000	Level transition at 1000m
M_LEVELTR	3	2	Level 1
L_ACKLEVELTR	15	500	ACK request window starting at 500m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2nd Balise
N_TOTAL	3	1	2 balise in group
M_DUP	2	0	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	1	linked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2: Profibus message: (STM->ETCS DMI function): Packet STM-32 Button request			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	DA
NID_PACKET	8	32	Button Request
L_PACKET	13	COMPUTED	
N_ITER	5	5	
NID_BUTTON(1)	8	1	
NID_BUTPOS(1)	5	1	
NID_ICON(1)	8	0	
M_BUT_ATTRIB(1)	10	1000000001b	White text on a dark blue background
L_CAPTION(1)	6	6	
X_CAPTION(1,1)	8	“T”	
X_CAPTION(1,2)	8	“e”	
X_CAPTION(1,3)	8	“s”	
X_CAPTION(1,4)	8	“t”	
X_CAPTION(1,5)	8	“B“	
X_CAPTION(1,6)	8	“1”	
NID_BUTTON(2)	8	2	
NID_BUTPOS(2)	5	2	
NID_ICON(2)	8	0	
M_BUT_ATTRIB(2)	10	1001001010b	Red text on a white background, normal slow flashing
L_CAPTION(2)	6	6	
X_CAPTION(2.1)	8	“T”	
X_CAPTION(2,2)	8	“e”	
X_CAPTION(2,3)	8	“s”	
X_CAPTION(2,4)	8	“t”	

Message 2: Profibus message: (STM->ETCS DMI function): Packet STM-32 Button request			
VARIABLE	Length	VALUE	COMMENTS
X_CAPTION(2,5)	8	“B“	
X_CAPTION(2,6)	8	“2”	
NID_BUTTON(3)	8	3	
NID_BUTPOS(3)	5	3	
NID_ICON(3)	8	0	
M_BUT_ATTRIB(3)	10	1110010000b	Black text on a red background, fast flashing in counterphase
L_CAPTION(3)	6	6	
X_CAPTION(3,1)	8	“T”	
X_CAPTION(3,2)	8	“e”	
X_CAPTION(3,3)	8	“s”	
X_CAPTION(3,4)	8	“t”	
X_CAPTION(3,5)	8	“B“	
X_CAPTION(3,6)	8	“3”	
NID_BUTTON(4)	8	4	
NID_BUTPOS(4)	5	4	
NID_ICON(4)	8	0	
M_BUT_ATTRIB(4)	10	1000100101b	Yellow text on a green background
L_CAPTION(4)	6	6	
X_CAPTION(4,1)	8	“T”	
X_CAPTION(4,2)	8	“e”	
X_CAPTION(4,3)	8	“s”	
X_CAPTION(4,4)	8	“t”	
X_CAPTION(4,5)	8	“B“	
X_CAPTION(4,6)	8	“4”	
NID_BUTTON(5)	8	5	
NID_BUTPOS(5)	5	5	
NID_ICON(5)	8	0	

Message 2: Profibus message: (STM->ETCS DMI function): Packet STM-32 Button request			
VARIABLE	Length	VALUE	COMMENTS
M_BUT_ATTRIB(5)	10	1000110111b	Light green text on a light red background
L_CAPTION(5)	6	6	
X_CAPTION(5,1)	8	“T”	
X_CAPTION(5,2)	8	“e”	
X_CAPTION(5,3)	8	“s”	
X_CAPTION(5,4)	8	“t”	
X_CAPTION(5,5)	8	“B“	
X_CAPTION(5,6)	8	“5”	
Padding bits	COMPUTED	NOT RELEVANT	

Message 3: Profibus message: (STM => ETCS DMI function): Packet STM 35: Indicator request			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	DA
NID_PACKET	8	35	Indicator request
L_PACKET	13	COMPUTED	
N_ITER	5	10	
NID_INDICATOR(1)	8	1	
NID_INDPOS(1)	5	1	
NID_ICON(1)	8	0	
M_IND_ATTRIB(1)	10	1000000001b	White text on a dark blue background
L_CAPTION(1)	6	6	
X_CAPTION(1,1)	8	“T”	
X_CAPTION(1,2)	8	“e”	
X_CAPTION(1,3)	8	“s”	
X_CAPTION(1,4)	8	“t”	
X_CAPTION(1,5)	8	“ “	
X_CAPTION(1,6)	8	“1”	
NID_INDICATOR(2)	8	2	
NID_INDPOS(2)	5	2	
NID_ICON(2)	8	0	
M_IND_ATTRIB(2)	10	1000000001b	White text on a dark blue background
L_CAPTION(2)	6	6	
X_CAPTION(2,1)	8	“T”	
X_CAPTION(2,2)	8	“e”	
X_CAPTION(2,3)	8	“s”	
X_CAPTION(2,4)	8	“t”	

Message 3: Profibus message: (STM => ETCS DMI function): Packet STM 35: Indicator request			
VARIABLE	Length	VALUE	COMMENTS
X_CAPTION(2,5)	8	“ “	
X_CAPTION(2,6)	8	“2”	
NID_INDICATOR(3)	8	3	
NID_INDPOS(3)	5	3	
NID_ICON(3)	8	0	
M_IND_ATTRIB(3)	10	1000000001b	White text on a dark blue background
L_CAPTION(3)	6	6	
X_CAPTION(3,1)	8	“T”	
X_CAPTION(3,2)	8	“e”	
X_CAPTION(3,3)	8	“s”	
X_CAPTION(3,4)	8	“t”	
X_CAPTION(3,5)	8	“ “	
X_CAPTION(3,6)	8	“3”	
NID_INDICATOR(4)	8	4	
NID_INDPOS(4)	5	4	
NID_ICON(4)	8	0	
M_IND_ATTRIB(4)	10	1000000001b	White text on a dark blue background
L_CAPTION(4)	6	6	
X_CAPTION(4,1)	8	“T”	
X_CAPTION(4,2)	8	“e”	
X_CAPTION(4,3)	8	“s”	
X_CAPTION(4,4)	8	“t”	
X_CAPTION(4,5)	8	“ “	
X_CAPTION(4,6)	8	“4”	
NID_INDICATOR(5)	8	5	
NID_INDPOS(5)	5	5	
NID_ICON(5)	8	0	

Message 3: Profibus message: (STM => ETCS DMI function): Packet STM 35: Indicator request			
VARIABLE	Length	VALUE	COMMENTS
M_IND_ATTRIB(5)	10	1000000001b	White text on a dark blue background
L_CAPTION(5)	6	6	
X_CAPTION(5,1)	8	“T”	
X_CAPTION(5,2)	8	“e”	
X_CAPTION(5,3)	8	“s”	
X_CAPTION(5,4)	8	“t”	
X_CAPTION(5,5)	8	“ “	
X_CAPTION(5,6)	8	“5”	
NID_INDICATOR(6)	8	6	
NID_INDPOS(6)	5	6	
NID_ICON(6)	8	0	
M_IND_ATTRIB(6)	10	1000000001b	White text on a dark blue background
L_CAPTION(6)	6	6	
X_CAPTION(6,1)	8	“T”	
X_CAPTION(6,2)	8	“e”	
X_CAPTION(6,3)	8	“s”	
X_CAPTION(6,4)	8	“t”	
X_CAPTION(6,5)	8	“ “	
X_CAPTION(6,6)	8	“6”	
NID_INDICATOR(7)	8	7	
NID_INDPOS(7)	5	7	
NID_ICON(7)	8	0	
M_IND_ATTRIB(7)	10	1000000001b	White text on a dark blue background
L_CAPTION(7)	6	6	
X_CAPTION(7,1)	8	“T”	
X_CAPTION(7,2)	8	“e”	
X_CAPTION(7,3)	8	“s”	

Message 3: Profibus message: (STM => ETCS DMI function): Packet STM 35: Indicator request			
VARIABLE	Length	VALUE	COMMENTS
X_CAPTION(7,4)	8	“t”	
X_CAPTION(7,5)	8	“ “	
X_CAPTION(7,6)	8	“7”	
NID_INDICATOR(8)	8	8	
NID_INDPOS(8)	5	8	
NID_ICON(8)	8	0	
M_IND_ATTRIB(8)	10	1000000001b	White text on a dark blue background
L_CAPTION(8)	6	6	
X_CAPTION(8,1)	8	“T”	
X_CAPTION(8,2)	8	“e”	
X_CAPTION(8,3)	8	“s”	
X_CAPTION(8,4)	8	“t”	
X_CAPTION(8,5)	8	“ “	
X_CAPTION(8,6)	8	“8”	
NID_INDICATOR(9)	8	9	
NID_INDPOS(9)	5	9	
NID_ICON(9)	8	0	
M_IND_ATTRIB(9)	10	1000000001b	White text on a dark blue background
L_CAPTION(9)	6	6	
X_CAPTION(9,1)	8	“T”	
X_CAPTION(9,2)	8	“e”	
X_CAPTION(9,3)	8	“s”	
X_CAPTION(9,4)	8	“t”	
X_CAPTION(9,5)	8	“ “	
X_CAPTION(9,6)	8	“9”	
NID_INDICATOR(10)	8	10	
NID_INDPOS(10)	5	10	

Message 3: Profibus message: (STM => ETCS DMI function): Packet STM 35: Indicator request			
VARIABLE	Length	VALUE	COMMENTS
NID_ICON(10)	8	0	
M_IND_ATTRIB(10)	10	1000000001b	White text on a dark blue background
L_CAPTION(10)	6	6	
X_CAPTION(10,1j)	8	“T”	
X_CAPTION(10,2)	8	“e”	
X_CAPTION(10,3)	8	“s”	
X_CAPTION(10,4)	8	“t”	
X_CAPTION(10,5)	8	“ “	
X_CAPTION(10,6)	8	“A”	
Padding bits	COMPUTED	NOT RELEVANT	

Message 4: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	DA
NID_PACKET	8	38	Text message
L_PACKET	13	COMPUTED	
NID_XMESSAGE	8	1	Text message number 1
M_XATTRIBUTE	10	1000001000b	Black text on a white background to be displayed in group 2
Q_ACK	1	0	
L_TEXT	8	20	
X_TEXT(1)	8	“T”	
X_TEXT(2)	8	“E”	
X_TEXT(3)	8	“S”	
X_TEXT(4)	8	“T”	
X_TEXT(5)	8	“ “	
X_TEXT(6)	8	“T”	
X_TEXT(7)	8	“E”	
X_TEXT(8)	8	“X”	
X_TEXT(9)	8	“T”	
X_TEXT(10)	8	“ “	
X_TEXT(11)	8	“M”	
X_TEXT(12)	8	“E”	
X_TEXT(13)	8	“S”	
X_TEXT(14)	8	“S”	
X_TEXT(15)	8	“A”	
X_TEXT(16)	8	“G”	
X_TEXT(17)	8	“E”	

Message 4: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message			
VARIABLE	Length	VALUE	COMMENTS
X_TEXT(18)	8	“-“	
X_TEXT(19)	8	“>“	
X_TEXT(20)	8	“1”	
NID_PACKET	8	38	Text message
L_PACKET	13	COMPUTED	
NID_XMESSAGE	8	2	Text message number 2
M_XATTRIBUTE	10	0001000001b	White text on a dark blue background, normal slow flashing, to be displayed in group 1
Q_ACK	1	0	
L_TEXT	8	20	
X_TEXT(1)	8	“T”	
X_TEXT(2)	8	“E”	
X_TEXT(3)	8	“S”	
X_TEXT(4)	8	“T”	
X_TEXT(5)	8	“ “	
X_TEXT(6)	8	“T”	
X_TEXT(7)	8	“E”	
X_TEXT(8)	8	“X”	
X_TEXT(9)	8	“T”	
X_TEXT(10)	8	“ “	
X_TEXT(11)	8	“M”	
X_TEXT(12)	8	“E”	
X_TEXT(13)	8	“S”	
X_TEXT(14)	8	“S”	
X_TEXT(15)	8	“A”	
X_TEXT(16)	8	“G”	
X_TEXT(17)	8	“E”	
X_TEXT(18)	8	“-“	

Message 4: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message			
VARIABLE	Length	VALUE	COMMENTS
X_TEXT(19)	8	“>“	
X_TEXT(20)	8	“2”	
NID_PACKET	8	38	Text message
L_PACKET	13	COMPUTED	
NID_XMESSAGE	8	3	Text message number 3
M_XATTRIBUTE	10	0110011010b	Red text on a blue background, fast flashing in counterphase, to be displayed in group 1
Q_ACK	1	0	
L_TEXT	8	20	
X_TEXT(1)	8	“T”	
X_TEXT(2)	8	“E”	
X_TEXT(3)	8	“S”	
X_TEXT(4)	8	“T”	
X_TEXT(5)	8	“ “	
X_TEXT(6)	8	“T”	
X_TEXT(7)	8	“E”	
X_TEXT(8)	8	“X”	
X_TEXT(9)	8	“T”	
X_TEXT(10)	8	“ “	
X_TEXT(11)	8	“M”	
X_TEXT(12)	8	“E”	
X_TEXT(13)	8	“S”	
X_TEXT(14)	8	“S”	
X_TEXT(15)	8	“A”	
X_TEXT(16)	8	“G”	
X_TEXT(17)	8	“E”	
X_TEXT(18)	8	“-“	
X_TEXT(19)	8	“>“	

Message 4: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message			
VARIABLE	Length	VALUE	COMMENTS
X_TEXT(20)	8	“3”	
NID_PACKET	8	38	Text message
L_PACKET	13	COMPUTED	
NID_XMESSAGE	8	4	Text message number 4
M_XATTRIBUTE	10	0000010011b	Blue text on a red background, to be displayed in group 1
Q_ACK	1	0	
L_TEXT	8	20	
X_TEXT(1)	8	“T”	
X_TEXT(2)	8	“E”	
X_TEXT(3)	8	“S”	
X_TEXT(4)	8	“T”	
X_TEXT(5)	8	“ “	
X_TEXT(6)	8	“T”	
X_TEXT(7)	8	“E”	
X_TEXT(8)	8	“X”	
X_TEXT(9)	8	“T”	
X_TEXT(10)	8	“ “	
X_TEXT(11)	8	“M”	
X_TEXT(12)	8	“E”	
X_TEXT(13)	8	“S”	
X_TEXT(14)	8	“S”	
X_TEXT(15)	8	“A”	
X_TEXT(16)	8	“G”	
X_TEXT(17)	8	“E”	
X_TEXT(18)	8	“-“	
X_TEXT(19)	8	“>“	
X_TEXT(20)	8	“4”	

Message 4: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	38	Text message
L_PACKET	13	COMPUTED	
NID_XMESSAGE	8	5	Text message number 5
M_XATTRIBUTE	10	0000101100b	Green text on a yellow background, to be displayed in group 1
Q_ACK	1	0	
L_TEXT	8	20	
X_TEXT(1)	8	“T”	
X_TEXT(2)	8	“E”	
X_TEXT(3)	8	“S”	
X_TEXT(4)	8	“T”	
X_TEXT(5)	8	“ “	
X_TEXT(6)	8	“T”	
X_TEXT(7)	8	“E”	
X_TEXT(8)	8	“X”	
X_TEXT(9)	8	“T”	
X_TEXT(10)	8	“ “	
X_TEXT(11)	8	“M”	
X_TEXT(12)	8	“E”	
X_TEXT(13)	8	“S”	
X_TEXT(14)	8	“S”	
X_TEXT(15)	8	“A”	
X_TEXT(16)	8	“G”	
X_TEXT(17)	8	“E”	
X_TEXT(18)	8	“-“	
X_TEXT(19)	8	“>“	
X_TEXT(20)	8	“5”	
Padding bits	COMPUTED	NOT RELEVANT	

Message 5: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message to be ACK, Packet STM-43 Speed and distance supervision information			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	The State is DA
NID_PACKET	8	38	Text message
L_PACKET	13	COMPUTED	
NID_XMESSAGE	8	6	Text message number 6
M_XATTRIBUTE	10	0001100101b	Yellow text (slow and normal flashing) on a green background to be displayed in group 1
Q_ACK	1	1	Text message to be ACK
L_TEXT	8	20	
X_TEXT(1)	8	“T”	
X_TEXT(2)	8	“E”	
X_TEXT(3)	8	“S”	
X_TEXT(4)	8	“T”	
X_TEXT(5)	8	“ “	
X_TEXT(6)	8	“T”	
X_TEXT(7)	8	“E”	
X_TEXT(8)	8	“X”	
X_TEXT(9)	8	“T”	
X_TEXT(10)	8	“ “	
X_TEXT(11)	8	“M”	
X_TEXT(12)	8	“E”	
X_TEXT(13)	8	“S”	
X_TEXT(14)	8	“S”	
X_TEXT(15)	8	“A”	
X_TEXT(16)	8	“G”	

Message 4: Profibus message (STM => ETCS DMI function): Packet STM-38: Text message			
VARIABLE	Length	VALUE	COMMENTS
X_TEXT(17)	8	“E”	
X_TEXT(18)	8	“-“	
X_TEXT(19)	8	“>“	
X_TEXT(20)	8	“6”	
NID_PACKET	8	43	Speed and Distance supervision information
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m scale
V_PERMIT	10	130	130 Km/h
V_TARGET	7	16	80 Km/h
V_RELEASE	10	25	25 Km/h
V_INTERV	10	135	135 Km/h
D_TARGET	15	320	3200 m
M_COLOUR_SP	3	1	grey
M_COLOUR_PS	3	0	white
Q_DISPLAY_PS	2	01	Hook only displayed
M_COLOUR_TS	3	0	white
Q_DISPLAY_TS	2	00	no display
M_COLOUR_RS	3	0	white
Q_DISPLAY_RS	2	00	no display
M_COLOUR_IS	3	0	white
Q_DISPLAY_IS	2	00	no display
Q_DISPLAY_TD	2	00	no display
Padding bits	COMPUTED	NOT RELEVANT	

Message 6 : Profibus message (STM => ETCS DMI function): Packet STM-46 Sound command			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	The State is DA
NID_PACKET	8	46	Sound Command
L_PACKET	13	COMPUTED	
N_ITER	5	1	
NID_SOUND(1)	8	0	*to be ignored by Customisable DMI*
Q_SOUND(1)	2	2	Continuous sound
N_ITER(1)	5	1	
M_FREQ(1,1)	8	40	1280Hz
T_SOUND(1,1)	8	100	10sec. (to be repeated as it is a continuous sound).
Padding bits	COMPUTED	NOT RELEVANT	

Note: each different packet is identified through a change of the table background colour. This rule is applied to the whole document, for STM or ETCS messages on the bus and also for eurobalise messages

End Conditions	Value	Comments
STM_STATE	Unchanged	
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Unchanged	
Other DMI channels Connections	Not Relevant	
TIU Connection	Unchanged	
BIU Connection	Unchanged	
JD Connection	Unchanged	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Preliminary test case (4e)

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4pre.0.2
	STM DMI object request and display Scope of the test case is to bring ERTMS/ETCS on-board under test in the initial conditions of test cases 4e: - the STM Control Function creates all DMI objects requested by STM.
ERTMS/ETCS on-board requirements tested	-
STM Requirements Tested	-
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15, STM-32, STM-35, STM-38, STM-43, STM-46 - from ETCS to STM: -
ERTMS/ETCS on-board configuration	- Same than in Preliminary Test Case (4a, 4b, 4d)
Comments and constraints	-

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Standstill	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	
BIU Connection	Established	
JD Connection	Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Neutral	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	STM requests the ERTMS/ETCS On-board DMI function to display buttons, indicators, text message.	PROF	T0	DMI Connection: Message 1: (same than message 2 in preliminary test case for 4a, 4b,4d) Message 2: (same than message 3 in preliminary test case for 4a, 4b,4d) Message 3: (same than message 4 in preliminary test case for 4a, 4b,4d)	DMI	5s	Buttons, Indicators and Text are generated.
2.	STM requests the ERTMS/ETCS On-board DMI function to display text message to be ACK, supervision information and sounds.	PROF	T1=T0+ 10s	DMI Connection: Message 4: (same than message 5 in preliminary test case for 4a, 4b,4d) Message 5: (same than message 6 in preliminary test case for 4a, 4b,4d)	DMI	5s	Text to be ACK, Supervision Info are displayed and sounds are generated.
3.	Driver acknowledges the text message	DMI	T2=T1+ 7s	Driver acknowledges the text message	DMI	5s	ack request removed

STM Test Case

Not applicable because no preliminary test case is necessary for all the STM tests in this document.

End Conditions	Value	Comments
STM_STATE	Unchanged	
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Unchanged	
Other DMI channels Connections	Not Relevant	
TIU Connection	Unchanged	
BIU Connection	Unchanged	
JD Connection	Unchanged	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4a.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4a.0.1.1
	Transition from level NTC to ETCS level 1 while ERTMS/ETCS on-board is in mode SN and the STM reports CS in due time (all STM connections closed except STM Control Function in CS state) Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SN mode executes a level transition from NTC to ETCS level 1, STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - after reporting CS in due time, STM can close the active connections except STM Control Function one.
ERTMS/ETCS on-board requirements tested	Subset 035: 8.7.1.2, 10.3.2.2 (DA→CS), 10.3.2.4 (B4a), 10.3.2.6, 10.3.2.7 (B4a), 10.5.1.1(a), 13.2.1.2,
STM Requirements Tested	Subset 035: 8.7.1.2, 9.2.1.1 (DA→CS), 9.2.1.2 (4a), 9.3.1.4(c)
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15 - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4a, 4b, 4d) to be executed as precondition - only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - test case designed for testing ETCS when STM in CS state closes all the connections except STM Control Functions.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	*ETCS Test Case.* The DMI displays active STM's objects.
	Not relevant	*STM Test Case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	*ETCS Test Case*
	Not relevant	*STM Test Case*
BIU Connection	Established	*ETCS Test Case*
	Not relevant	*STM Test Case*
JD Connection	Established	*ETCS Test Case*
	Not relevant	*STM Test Case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the train crosses the level transition location and receives the level transition message with complete MA data from the BG at the border, the ETCS mode changes to SN and ETCS level changes to Level 1	BTM	T0	Message 1: Telegram B1: Immediate Level Tran.Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function shall report the new ETCS technical mode and level to all connected STM's (10.5.1.1) and shall order the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order). Time: T1>T0
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text messages, supervision information and sounds) previously displayed should be deleted and new technical mode and level displayed.
2.	The STM reports its new state CS to the STM Control Function in due time (within 10sec.) (9.3.1.4)	PROF	T2= T1+8s	STM Control Connection: Message 3: Packet STM-15 State Report	PROF	5s	No FA order is sent by the STM Control Function

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3.	The STM shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T3=T2+1s	BIU Connection: Message 4: Packet STM-15 State Report TIU Connection: Message 5: Packet STM-15 State Report DMI Connection: Message 6: Packet STM-15 State Report JD connection: Message 7: Packet STM-15 State Report	-	-	-
4.	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection (8.7.1.2)	PROF	T4=T3+5s	The STM closes the connection on safety layer level	PROF	10s	No more idle messages are issued on the connections. Idle message are still exchanged from the STM to the STM control function on safety layers.

STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the ERTMS/ETCS On-board sends the new level and mode to the active STM (10.5.1.1) and the order to go in CS state (10.3.2.6, 10.3.2.7) then the STM shall report its new state CS (packet STM-15) to the STM control function in due time. (9.3.1.4)	PROF	T0	STM Control Connection: Message 2: Packet STM-5 ETCS Status Data Packet STM-14 State Order to STM (unconditional order to go to CS)	PROF	10s	STM Control Connection: Message 3: Packet STM-15 State Report
-	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed. *This step is optional because the STM can close the connections without sending the CS state report to TIU, BIU, DMI and JD interfaces*	-	-	-	PROF	Ts3	BIU Connection: Message 4: Packet STM-15 State Report TIU Connection: Message 5: Packet STM-15 State Report DMI Connection: Message 6: Packet STM-15 State Report JD Connection: Message 7: Packet STM-15 State Report
-	The STM closes any active connection but not the STM Control Function connection. (8.7.1.2)	-	-	-	PROF	Ts4	The STM closes the connection on safety layer level. No more idle messages are issued on the closed connections. Idle message are still exchanged from the STM to the STM Control Function on safety layers.

Message 1: Trackside Telegram B1(Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority

Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 : Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	0	Full supervision
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3, 4, 5, 6, 7: Profibus message (STM => ETCS STM control function or TIU or BIU or DMI or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	FS	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	unchanged	
Active DMI channel Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
JD Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Not Relevant	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4a.2

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4a.0.1.2
	Transition from level NTC to ETCS level 1 while the ERTMS/ETCS on-board is in mode SN and the STM reports CS in due time (all STM connections kept active). Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SN mode executes a level transition from NTC to ETCS level 1, STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - if STM reports CS state in due time, it can keep active all connections.
ERTMS/ETCS on-board requirements tested	Subset 035: 10.3.2.2 (DA→CS), 10.3.2.4 (B4a), 10.3.2.6, 10.3.2.7(B4a), 10.5.1.1(a), 13.2.1.2,
STM Requirements Tested	Subset 035: 8.7.1.2, 9.2.1.1 (DA→CS), 9.2.1.2 (4a), 9.3.1.4(c)
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15 - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4a, 4b, 4d) to be executed as precondition - only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - test case designed for testing ETCS when STM does not close any connection when ordered in CS.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	*ETCS Test Case* The DMI displays active STM's objects.
	Not Relevant	*STM Test Case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	*ETCS Test Case*
	Not Relevant	*STM Test Case*
BIU Connection	Established	*ETCS Test Case*
	Not Relevant	*STM Test Case*
JD Connection	Established	*ETCS Test Case*
	Not Relevant	*STM Test Case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the train crosses the level transition location and receives the level transition message with complete MA data from the BG at the border, the ETCS mode changes to FS and ETCS level changes to Level 1	BTM	T0	Message 1: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function shall report the new ETCS technical mode and level to all connected STM's (10.5.1.1) and it orders the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order). Time: T1>T0
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-		-	DMI	5s	All STM objects (including buttons, indicators, text message, text message to be ACK, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.
2.	the STM reports its new state CS to the STM Control Function in due time (within 10sec.) (9.3.1.4)	PROF	T2=T1+8s	STM Control Connection: Message 3: Packet STM-15 State Report	PROF	5s	No FA order is sent by the STM Control Function

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3.	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T3=T2+1s	BIU Connection: Message 4: Packet STM-15 State Report TIU Connection: Message 5: Packet STM-15 State Report DMI Connection: Message 6: Packet STM-15 State Report JD connection: Message 7: Packet STM-15 State Report	-	-	-

STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the ERTMS/ETCS On-board sends the new level and mode to the active STM (10.5.1.1) and orders to the active STM to go in CS state (10.3.2.6, 10.3.2.7) then the STM shall report its new state CS to the STM control function in due time (ETCS shall receive the message STM-15 within 10sec from the transmission of the state order). (9.3.1.4)	PROF	T0	STM Control Connection: Message 2: Packet STM-5 ETCS Status Data Packet STM-14 State Order to STM (unconditional order to go to CS)	PROF	10s	STM Control Connection: Message 3: Packet STM-15 State Report
-	The STM shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	-	-	-	PROF	Ts3	BIU Connection: Message 4: Packet STM-15 State Report TIU Connection: Message 5: Packet STM-15 State Report DMI Connection: Message 6: Packet STM-15 State Report JD Connection: Message 7: Packet STM-15 State Report

Message 1: Trackside Telegram B1(Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority

Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 : Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	0	Full supervision
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3,4,5,6,7: Profibus message (STM => ETCS STM control function or TIU or BIU or DMI or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	FS	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Unchanged	*ETCS Test Case*
	Not Relevant	*STM Test Case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Unchanged	*ETCS Test Case*
	Not Relevant	*STM Test Case*
BIU Connection	Unchanged	*ETCS Test Case*
	Not Relevant	*STM Test Case*
JD Connection	Unchanged	*ETCS Test Case*
	Not Relevant	*STM Test Case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Not Relevant	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4a.3

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4a.0.2.0
	Transition from level NTC to ETCS level 1 while the ERTMS/ETCS on-board is in mode SN and the STM does not report CS in due time Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SN mode executes a level transition from NTC to ETCS level 1, the STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - if STM doesn't report CS state in due time, STM Control Function orders FA state and informs the driver that the STM has failed.
ERTMS/ETCS on-board requirements tested	Subset 035: 10.3.2.2 (DA→CS and DA→FA), 10.3.2.4 (B4a and C16), 10.3.2.6, 10.3.2.7(B4a), 10.3.3.1, 10.5.1.1(a), 10.14.1.1, 13.2.1.2
STM Requirements Tested	-
Packets transmitted via FFFIS STM	- from STM to ETCS: - - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4a, 4b, 4d) to be executed as precondition - Only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - The test case applies only to ERTMS/ETCS on-board because from the STM point of view this is a degraded situation.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	The DMI displays active STM's objects
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	
BIU Connection	Not Relevant	
JD Connection	Not Relevant	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the train crosses the level transition location and receives the level transition message with complete MA data from the BG at the border, the ETCS mode changes to FS and ETCS level changes to Level 1	BTM	T0	Message 1: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function reports the new ETCS technical mode and level to all connected STM's (10.5.1.1) and orders the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order) Time T1>T0
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, text message to be ACK, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.
2.	When 10sec. timeout for CS state order expires, the ERTMS/ETCS on-board orders the active STM to go in FA state (10.3.2.2, 10.3.2.4, 10.3.2.6)	-	T1	-	PROF	10s+Ts7	STM Control Connection: Message 3: Packet STM-14 State order to STM (FA order) No more messages are exchanged on the bus.
-	STM failure info on DMI	-	-	-	DMI	10s+Ts5	A message about the failed STM is displayed on ETCS DMI

STM Test Case

Not applicable because is a degraded behaviour.

Message 1: Trackside Telegram B1(Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority

Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 : Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	0	Full supervision
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3: Profibus message (STM => ETCS STM control function): Packet STM-14: State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	8	Failure (FA)
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	FA	
ETCS Mode	FS	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	ETCS displays a message about the failed STM
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	
BIU Connection	Not Relevant	
JD Connection	Not Relevant	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Not Relevant	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4b.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4b.0.0.0
	Transition from level NTC to ETCS level 1 while the ERTMS/ETCS on-board is in mode NL and the STM reports CS in due time Scope of the test case is to verify that: - when ERTMS/ETCS on-board in NL mode executes a level transition from NTC to ETCS level 1, STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - if STM reports CS state in due time, it can close all active connections except STM Control Function one.
ERTMS/ETCS on-board requirements tested	Subset 035: 8.7.1.2, 10.3.2.2 (DA→CS), 10.3.2.4 (B4a), 10.3.2.6, 10.3.2.7(B4a), 10.5.1.1(a), 13.2.1.2
STM Requirements Tested	Subset 035: 8.7.1.2, 9.2.1.1 (DA→CS), 9.2.1.2 (4a), 9.3.1.4(c)
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15, - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4a, 4b, 4d) to be executed as precondition - only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - ETCS test case is designed for testing ETCS when STM, ordered in CS, closes all the connections except STM Control Function one; - STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Functions or keep all connections active;

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	NL	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	*ETCS Test Case.* The DMI displays active STM's objects.
	Not relevant	*STM Test Case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	*ETCS Test Case*
	Not relevant	*STM Test Case*
BIU Connection	Established	*ETCS Test Case*
	Not relevant	*STM Test Case*
JD Connection	Established	*ETCS Test Case*
	Not relevant	*STM Test Case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the train crosses the level transition location and receives the level transition message with complete MA data from the BG at the border, the ETCS level changes to Level 1	BTM	T0	Message 1: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function reports the new ETCS technical level to all connected STM's (10.5.1.1) and orders the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order). Time: T1>T0
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, text message to be ACK, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.
2.	The STM reports its new state CS to the STM Control Function in due time (within 10sec.) (9.3.1.4)	PROF	T2=T1+8s	STM Control Connection: Message 3: Packet STM-15 State Report	PROF	5s	No FA order is sent by the STM Control Function

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3.	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T3=T2+1s	BIU Connection: Message 4: Packet STM-15 State Report TIU Connection: Message 5: Packet STM-15 State Report DMI Connection: Message 6: Packet STM-15 State Report JD connection: Message 7: Packet STM-15 State Report	-	-	-
4.	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection (8.7.1.2)	PROF	T4=T3+5s	The STM closes the connection on safety layer leve (see the specific DUT design for the exact list of connection to shut down)	PROF	10s	No more idle messages are issued on the connections. Idle message are still exchanged from the STM to the STM control function on safety layers.

STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the ERTMS/ETCS On-board sends the new level to the active STM (10.5.1.1) and orders to the active STM to go in CS state.(10.3.2.6, 10.3.2.7) then the STM shall report its new state CS to the STM control function in due time (ETCS shall receive the message STM-15 within 10sec from the transmission of the state order). (9.3.1.4)	PROF	T0	STM Control Connection: Message 2: Packet STM-5 ETCS Status Data Packet STM-14 State Order to STM (unconditional order to go to CS)	PROF	10s	STM Control Connection: Message 3: Packet STM-15 State Report
-	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed. *This step is optional because the STM can close the connections without sending the CS state report to TIU, BIU, DMI and JD interfaces*	-	-	-	PROF	Ts3	BIU Connection: Message 4: Packet STM-15 State Report TIU Connection: Message 5: Packet STM-15 State Report DMI Connection: Message 6: Packet STM-15 State Report JD Connection: Message 7: Packet STM-15 State Report
-	The STM closes any active connection but not the STM Control Function connection. (8.7.1.2) *This step is optional because the STM can keep active all the connections*	-	-	-	PROF	Ts4	The STM closes the connection on safety layer level. No more idle messages are issued on the closed connections. Idle message are still exchanged from the STM to the STM Control Function on safety layers.

Message 1: Trackside Telegram B1(Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority

Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 : Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, STM-14 State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	11	Non leading
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3,4,5,6,7: Profibus message (STM => ETCS STM control function or TIU or BIU or DMI or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	NL	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
Other DMI channels Connections	Unchanged	
TIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
JD Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4c.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4c.0.1.0
	Transition from level NTC to ETCS level 1 while the ERTMS/ETCS on-board is in mode SL and the STM reports CS in due time Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SL mode executes a level transition from NTC to ETCS level 1, STM Control Function orders the STM in CS state and, - if STM reports CS state in due time, it can close the active connections except the STM Control Function one.
ERTMS/ETCS on-board requirements tested	Subset 035: 8.7.1.2, 10.3.2.2 (DA→CS), 10.3.2.4 (B4a), 10.3.2.6, 10.3.2.7(B4a), 10.5.1.1(a)
STM Requirements Tested	Subset 035: 8.7.1.2, 9.2.1.1 (DA→CS), 9.2.1.2 (4a), 9.3.1.4(c)
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15 - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - ETCS test case is designed for STMs that close all the connections except STM Control Function when ordered in CS - STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Functions or keep all connections active.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SL	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Not Valid	
Active DMI channel Connection	Not Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Not Established	
JD Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Neutral	
TIU Cab Status	No Cab active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the train crosses the level transition location and receives the level transition message with complete MA data from the BG at the border, the ETCS level changes to Level 1	BTM	T0	Message 1: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function shall report the new ETCS technical level to all connected STM's. (10.5.1.1) and shall order the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order) Time: T1>T0
2.	The STM reports its new state CS to the STM Control Function in due time (within 10sec.) (9.3.1.4)	PROF	T2= T1+8s	STM Control Connection: Message 3: Packet STM-15 State Report	PROF	10s	No FA order is sent by the STM Control Function
3.	The STM shall report its new state CS to any connected ERTMS/ETCS on-board function whenever the STM state is changed	PROF	T3=T2+1s	TIU Connection: Message 4: Packet STM-15 State Report JD connection: Message 5: Packet STM-15 State Report	-	-	-

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
4.	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection (8.7.1.2)	PROF	T4=T3+5s	The STM closes the connection on safety layer level (see the specific DUT design for the exact list of connection to shut down)	PROF	10s	No more idle messages are issued on the connections. Idle message are still exchanged from the STM to the STM control function on safety layers

STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the ERTMS/ETCS On-board sends the new level and mode to the active STM (10.5.1.1) and the order to go in CS state.(10.3.2.6, 10.3.2.7) then the STM shall report its new state CS (packet STM-15) to the STM control function in due time. (9.3.1.4)	PROF	T0	STM Control Connection: Message 2: Packet STM-5 ETCS Status Data Packet STM-14 State Order to STM (unconditional order to go to CS)	PROF	10s	STM Control Connection: Message 3: Packet STM-15 State Report
-	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed. *This step is optional because the STM can close the connections without sending the CS state report to TIU and JD interfaces*	-		-	PROF	Ts3	TIU Connection: Message 4: Packet STM-15 State Report JD Connection: Message 5: Packet STM-15 State Report

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The STM closes any active connection but not the STM Control Function connection. (8.7.1.2) *This step is optional because the STM can keep active all the connections*	-	-	-	PROF	Ts4	The STM closes the connection on safety layer level. No more idle messages are issued on the closed connections. Idle message are still exchanged from the STM to the STM Control Function on safety layers.

Message 1: Trackside Telegram B1(Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority

Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 : Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	5	Sleeping
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3,4, 5: Profibus message (STM => ETCS STM control function or TIU or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	SL	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Unchanged	
Other DMI channels Connections	Not relevant	
TIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Unchanged	
JD Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4c.2

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4c.0.2.0
	Transition from level NTC to ETCS level 1 while the ERTMS/ETCS on-board is in mode SL and the STM does not report CS in due time Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SL mode executes a level transition from NTC to ETCS level 1, STM Control Function orders the STM in CS state and, - if STM doesn't report CS state in due time, STM Control Function orders STM in FA.
ERTMS/ETCS on-board requirements tested	Subset 035: 10.3.2.2 (DA→CS and DA→FA), 10.3.2.4 (B4a and C16), 10.3.2.6, 10.3.2.7, 10.3.3.1, 10.5.1.1(a)
STM Requirements Tested	-
Packets transmitted via FFFIS STM	- from STM to ETCS: - - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - The test case applies only to ERTMS/ETCS on-board because from the STM point of view this is a degraded situation.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SL	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Not Valid	
Active DMI channel Connection	Not Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	
BIU Connection	Not Established	
JD Connection	Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Neutral	
TIU Cab Status	No Cab active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When the train crosses the level transition location and receives the level transition message with complete MA and track profile data from the BG at the border, the ETCS level changes to Level 1	BTM	T0	Message 1: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function shall report the new ETCS technical level to all connected STM's (10.5.1.1) and shall order the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order) Time: T1>T0
-	The ERTMS/ETCS on-board orders the active STM to go in FA state (10.3.2.2, 10.3.2.4, 10.3.2.6)	-	T1	-	PROF	10s+Ts7	STM Control Connection: Message 3: Packet STM-14 State order to STM (FA order) No more messages are exchanged on the bus.

STM Test Case

Not applicable because is a degraded behaviour.

Message 1: Trackside Telegram B1(Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority

Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 : Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	5	Sleeping
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3: Profibus message (ETCS STM control function => STM): Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	8	Failure (FA)
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	FA	
ETCS Mode	SL	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Unchanged	
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	
BIU Connection	Unchanged	
JD Connection	Not Relevant	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4d.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4d.0.1
	Validity of National Trip Procedure Scope of the test case is to verify that: - ERTMS/ETCS on-board considers a National Trip Procedure active for 10 seconds after the reception of packet STM-18 and, - when NTP has been considered released the test case 4a.1 is applicable without any difference
ERTMS/ETCS on-board requirements tested	Subset 035: 8.7.1.2, 10.13.1.1
STM Requirements Tested	-
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15, STM-18, - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4a, 4b, 4d) to be executed as precondition - Only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - Test Case designed for testing ETCS when STM ordered in CS closes all the connections except STM Control Function. - STM Test case is not relevant.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	
BIU Connection	Established	
JD Connection	Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	STM activates National Trip Procedure (transmission of a single packet NTP)	PROF	T0	Message 1: Packet STM-18 NTP, Packet STM-15 State Report	-	-	-
2.	The train crosses the level transition location; on-board system receives the level transition message with complete MA data from the BG at the border, the ETCS mode changes to FS and ETCS level changes to Level 1	BTM	T1=T0+11s	Message 2: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function reports the new ETCS technical mode and level to all connected STM's (10.5.1.1) and it orders the active STM to go in CS state.(10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 3: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order). Time: T2>T1
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-		-	DMI	5s	All STM objects (including buttons, indicators, text messages, supervision information and sounds) previously displayed should be deleted and new technical mode and level displayed.
3.	the STM reports its new state CS to the STM Control Function in due time (within 10sec.) (9.3.1.4)	PROF	T3=T2+8s	STM Control Connection: Message 4: Packet STM-15 State Report	PROF	10s	No FA order is sent by the STM Control Function

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
4.	The STM shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T4=T3+1s	BIU Connection: Message 5: Packet STM-15 State Report TIU Connection: Message 6: Packet STM-15 State Report DMI Connection: Message 7: Packet STM-15 State Report JD connection: Message 8: Packet STM-15 State Report	-	-	-
5.	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection (8.7.1.2)	PROF	T5=T4+5s	The STM closes the connection on safety layer leve	PROF	10s	No more idle messages are issued on the connections. Idle message are still exchanged from the STM to the STM control function on safety layers

STM Test Case

Test case not relevant for testing STM.

Message 1 : Profibus message (STM => ETCS STM Control Function): Packet STM-18 National Trip Procedure			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	DA
Padding bits	COMPUTED	NOT RELEVANT	

Message 2: Trackside Telegram B1 (Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)			
VARIABLE	Length	VALUE	COMMENTS

Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_STATIC	15	0	Starting from 0m

V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 3: Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	0	Full supervision
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 4,5,6,7,8: Profibus message (STM => ETCS STM control function or TIU or BIU or DMI or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM previously in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	FS	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	
BIU Connection	Not Established	
JD Connection	Not Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4d.2

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4d.0.2.0.0
	Transition from STM to ETCS while the STM is in National Trip Procedure and the STM reports CS in due time. Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SN mode executes a level transition from NTC (during an active National Trip Procedure) to ETCS level 1, STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - if STM reports CS state in due time, it can close the active connections except the STM Control Function one.
ERTMS/ETCS on-board requirements tested	Subset 035: 8.7.1.2, 10.3.2.2 (DA→CS), 10.3.2.4 (B4a), 10.3.2.6, 10.3.2.7(B4a), 10.5.1.1(a), 10.13.1.1, 13.2.1.2, Subset 026: 4.6.3 [38]
STM Requirements Tested	Subset 035: 8.7.1.2, 9.2.1.1 (DA→CS), 9.2.1.2 (4a), 9.3.1.4(c)
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-18, STM-15 - from ETCS to STM: STM-5, STM-14,
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4a, 4b, 4d) to be executed as precondition - Only level 1 transition is tested because there is no difference with transitions to level 0 or 2 at FFFIS STM interface level; - In STM Test case NTP shall be triggered according to the specific constraints and procedures of STM under test. - ETCS Test Case designed for testing ETCS when STM ordered in CS closes all the connections except STM Control Function; - STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Functions or keep all connections active; - STM test case is designed only for STMs that use NTP procedures.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	*ETCS test case* The DMI displays active STM's objects
	Not Relevant	*STM test case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
JD Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	STM activates National Trip Procedure (starts cyclic transmission of National Trip Procedure)	PROF	T0	Message 1: Packet STM-15 State report, Packet STM-18 NTP	-	-	-
2.	The train crosses the level transition location; on-board system receives the level transition message with complete MA data from the BG at the border, the ETCS mode changes to TR and ETCS level changes to Level 1.	BTM	T1=T0+3s	Message 2: Telegram B1: Immediate Level Transition Order Packet SRS-41 Telegram B2: MA+SSP+gradient profile Packet SRS-12 Level 1 MA Packet SRS-21 Gradient profile Packet SRS-27 International SSP	-	-	-
-	The STM Control Function shall report the new ETCS technical mode (TRIP) and level to all connected STMs (10.5.1.1) and it orders the active STM to go in CS state (10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	5s	STM Control Connection: Message 3: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order) Time: T2>T1
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, supervision information and sounds) previously displayed should be deleted and new technical mode and level displayed.
3.	The STM reports its new state CS to the STM Control Function in due time (within 10sec.) (9.3.1.4)	PROF	T3=T2+8s	STM Control Connection: Message 4: Packet STM-15 State Report	PROF	5s	No FA order is sent by the STM Control Function

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
4.	The STM shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T4=T3+1s	BIU Connection: Message 5: Packet STM-15 State Report TIU Connection: Message 6: Packet STM-15 State Report DMI Connection: Message 7: Packet STM-15 State Report JD connection: Message 8: Packet STM-15 State Report	-	-	-
5.	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection (8.7.1.2)	PROF	T5=T4+5s	The STM closes the connection on safety layer leve (see the specific DUT design for the exact list of connection to shut down)	PROF	10s	No more idle messages are issued on the connections. Idle message are still exchanged from the STM to the STM control function on safety layers.

STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	NTP is triggered before the level border (STM starts cyclic transmission of STM-18)	NTS	T0	National Trip Procedure command from track adapter	PROF.	Ts6	STM Control Connection: Message 1: Packet STM-15 State Report Packet STM-18 NTP Time: T1>T0
2.	When ERTMS/ETCS On-board sends the new level and mode to the active STM (10.5.1.1) and the order to go in CS state.(10.3.2.6, 10.3.2.7) then the STM shall report its new state CS (packet STM-15) to the STM control function in due time. (9.3.1.4)	PROF	T2=T1+8s	STM Control Connection: Message 3: Packet STM-5 ETCS Status Data Packet STM-14 State Order to STM (unconditional order to go to CS)	PROF	10s	STM Control Connection: Message 4: Packet STM-15 State Report
-	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed. *This step is optional because the STM can close the connections without sending the CS state report to TIU, BIU, DMI and JD interfaces*	-	-	-	PROF	Ts3	BIU Connection: Message 5: Packet STM-15 State Report TIU Connection: Message 6: Packet STM-15 State Report DMI Connection: Message 7: Packet STM-15 State Report JD Connection: Message 8: Packet STM-15 State Report

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The STM closes any active connection but not the STM Control Function connection. (8.7.1.2) *This step is optional because the STM can keep active all the connections*	-	-	-	PROF	Ts4	The STM closes the connection on safety layer level. No more idle messages are issued on the closed connections. Idle message are still exchanged from the STM to the STM Control Function on safety layers.

Message 1 : Profibus message (STM => ETCS STM Control Function): Packet STM-18 National Trip Procedure, Packet STM-15 State Report			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	
Padding bits	COMPUTED	NOT RELEVANT	

Message 2: Trackside Telegram B1 (Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	2	For level 1
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2: Trackside Telegram B2 (L1 Movement Authority, Gradient Profile, International Static Speed Profile)

VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	12	L1 Movement Authority
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10m scale
V_MAIN	7	40	200Km/h
V_LOA	7	0	0Km/h ->EOA
T_LOA	10	1023	No time out: infinite value
N_ITER	5	0	Only one section within the MA.
L_ENDSECTION	15	640	6.4 Km
Q_SECTIONTIMER	1	0	No section timer information
Q_ENDTIMER	1	0	No End section timer information
Q_DANGERPOINT	1	0	No danger point information
Q_OVERLAP	1	0	No overlap information
NID_PACKET	8	21	Gradient Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_GRADIENT	15	0	Starting from 0m
Q_GDIR	1	1	Uphill
G_A	8	1	1‰
N_ITER	5	0	
NID_PACKET	8	27	International Static Speed Profile
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale

D_STATIC	15	0	Starting from 0m
V_STATIC	7	44	220km/h
Q_FRONT	1	1	No train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 3: Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	2	Level 1
M_MODE	4	7	Trip
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 4,5,6,7,8: Profibus message (STM => ETCS STM control function or TIU or BIU or DMI or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	TR	
ETCS Level	1	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case: it depends on STM system*
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	
	Not Relevant	*It depends on STM system*
BIU Connection	Not Established	
	Not Relevant	*It depends on STM system*
JD Connection	Not Established	
	Not Relevant	*It depends on STM system*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	*EB is applied by ERTMS/ETCS on-board in TR mode*
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4e.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4e.0.1.0
	Driver selects ETCS level 0 while the ERTMS/ETCS on-board is in mode SN and the STM reports CS in due time Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SN mode executes a level transition from NTC to ETCS level 0 cause of driver selection on DMI, STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - if STM reports CS state in due time, it can close active connections except STM Control Function one.
ERTMS/ETCS on-board requirements tested	Subset 035: 8.7.1.2, 10.3.2.2 (DA→CS), 10.3.2.4 (K4a), 10.3.2.6, 10.3.2.7(K4a), 10.5.1.1(a), 13.2.1.2
STM Requirements Tested	Subset 035: 8.7.1.2, 9.2.1.1 (DA→CS), 9.2.1.2 (4a), 9.3.1.4(c)
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15, - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4e) to be executed as precondition - Only level 0 transition is tested because there is no difference with transitions to level 1 or 2 at FFFIS STM interface level; - ETCS Test Case designed for testing ETCS when STM ordered in CS closes all the connections except STM Control Function; - STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Functions or keep all connections active.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Standstill	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	*ETCS test case* The DMI displays active STM's objects
	Not Relevant	*STM test case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
JD Connection	Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	ETCS changes the level through driver selection on DMI	DMI	T0	Driver manually selects Level 0 on DMI	-		-
2.	The STM Control Function reports the new ETCS technical mode and level to all connected STM's. (10.5.1.1) and it orders the active STM to go in CS state.(10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	Ts8	STM Control Connection: Message 1: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order). Time: T1>T0
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	Ts9	All STM objects (including buttons, indicators, text message, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed. *Ts9 may be greater than T2*
3.	the STM reports its new state CS to the STM Control Function in due time (ETCS shall receive the message STM-15 within 10sec from the transmission of the state order). (9.3.1.4)	PROF	T2= T1+8s	STM Control Connection: Message 2: Packet STM-15 State Report	PROF	5s	No FA order is sent by the STM Control Function

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
4.	The STM shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T3=T2+1s	BIU Connection: Message 3: Packet STM-15 State Report TIU Connection: Message 4: Packet STM-15 State Report DMI Connection: Message 5: Packet STM-15 State Report JD connection: Message 6: Packet STM-15 State Report	-	-	-
5.	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection (8.7.1.2)	PROF	T4=T3+5s	The STM closes the connection on safety layer level	PROF	10s	No more idle messages are issued on the connections. Idle message are still exchanged from the STM to the STM control function on safety layers.

STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	When ERTMS/ETCS On-board sends the new level and mode to the active STM (10.5.1.1) and the order to go in CS state (10.3.2.6, 10.3.2.7) then the STM shall report its new state CS (packet STM-15) to the STM control function in due time (9.3.1.4)	PROF	T0	STM Control Connection: Message 1: Packet STM-5 ETCS Status Data Packet STM-14 State Order to STM (unconditional order to go to CS)	PROF	10s	STM Control Connection: Message 2: Packet STM-15 State Report
-	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed. *This step is optional because the STM can close the connections without sending the CS state report to TIU, BIU, DMI and JD interfaces*	-	-	-	PROF	Ts3	BIU Connection: Message 3: Packet STM-15 State Report TIU Connection: Message 4: Packet STM-15 State Report DMI Connection: Message 5: Packet STM-15 State Report JD Connection: Message 6: Packet STM-15 State Report
-	The STM closes any active connection but not the STM Control Function connection. (8.7.1.2) *This step is optional because the STM can keep active all the connections*	-	-	-	PROF	Ts4	The STM closes the connection on safety layer level. No more idle messages are issued on the closed connections. Idle message are still exchanged from the STM to the STM Control Function on safety layers.

Message 1: Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	0	Level 0
M_MODE	4	4	Unfitted
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 2,3,4,5,6: Profibus message (STM => ETCS STM control function or TIU or BIU or DMI or JD): Packet STM-15: State report from STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Should be replaced by STM ID when testing STM. When testing ERTMS/ETCS On-board the value of the STM previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	CS	
ETCS Mode	UN	
ETCS Level	0	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
BIU Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
JD Connection	Not Established	*ETCS test case*
	Not Relevant	*STM test case*
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Not Relevant	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4e.2

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4e.0.1.0
	Driver selects ETCS level 0 while the ERTMS/ETCS on-board is in mode SN and the STM does not report CS in due time Scope of the test case is to verify that: - when ERTMS/ETCS on-board in SN mode executes a level transition from NTC to ETCS level 0 cause of driver selection on DMI, STM Control Function orders the STM in CS state and, - STM Control Function deletes all DMI objects after CS order and, - if STM doesn't report CS state in due time, the STM Control Function orders STM in FA state and informs the driver that the STM has failed.
ERTMS/ETCS on-board requirements tested	Subset 035: 10.3.2.2 (DA→CS and DA→FA), 10.3.2.4 (K4a and C16), 10.3.2.6, 10.3.2.7(K4a), 10.3.3.1, 10.5.1.1(a), 10.14.1.1, 13.2.1.2
STM Requirements Tested	-
Packets transmitted via FFFIS STM	- from STM to ETCS: -, - from ETCS to STM: STM-5, STM-14
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Preliminary Test Case (4e) to be executed as precondition - Only level 0 transition is tested because there is no difference with transitions to level 1 or 2 at FFFIS STM interface level; - The test case applies only to ERTMS/ETCS on-board because from STM point of view this is a degraded situation.

Starting Conditions	Value	Comments
STM_STATE	DA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Standstill	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	The DMI displays active STM's objects
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	
BIU Connection	Established	
JD Connection	Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Not Relevant	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	ETCS changes the level through driver selection on DMI	DMI	T0	Driver manually selects Level 0 on DMI	-		-
2.	The STM Control Function reports the new ETCS technical mode and level to all connected STM's. (10.5.1.1) and it orders the active STM to go in CS state.(10.3.2.2, 10.3.2.4, 10.3.2.6, 10.3.2.7)	-	-	-	PROF	Ts8	STM Control Connection: Message 1: Packet STM-5 ETCS status data Packet STM-14 State order to STM (unconditional CS order). Time: T1>T0
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	Ts9	All STM objects (including buttons, indicators, text message, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed. *Ts9may be greater than T1+10 s*
-	When 10sec. timeout for CS state order expires, the ERTMS/ETCS on-board orders the active STM to go in FA state (10.3.2.2, 10.3.2.4, 10.3.2.6)	-	T1	-	PROF	10s+Ts7	STM Control Connection: Message 3: Packet STM-14 State order to STM (FA order) No more messages are exchanged on the bus.
-	STM failure info on DMI		-	-	DMI	10s+Ts5	A messages about the failed STM is displayed on ETCS DMI

STM Test Case

Not applicable because is a degraded behaviour.

Message 1: Profibus message (ETCS STM Control Function => STM): Packet STM-5 ETCS Status data.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	0	Level 0
M_MODE	4	4	Unfitted
Padding bits	COMPUTED	NOT RELEVANT	

Message 2: Profibus message (ETCS STM control function => STM): Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3: Profibus message (ETCS STM control function => STM): Packet STM-14: State order to STM.			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	value of the STM in DA
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	8	FA (Failure)
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	FA	
ETCS Mode	UN	
ETCS Level	0	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	ETCS displays a message about the failed STM
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	
BIU Connection	Not Relevant	
JD Connection	Not Relevant	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Not Relevant	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4f.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4f.0. 0
	STM Control Function releases emergency brake when level changes from NTC to 0 Scope of the test case is to verify that: - STM Control Function releases the emergency brake application when ERTMS/ETCS on-board in SN mode executes a level transition from NTC to ETCS level 0 (Level transition executed through driver selection on DMI)
ERTMS/ETCS on-board requirements tested	Subset 035: 10.3.3.6 (b)
STM Requirements Tested	-
Packets transmitted via FFFIS STM	-
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - the number of STMs configured on (and connected to) the ETCS is not relevant: only one STM can be in DA state
Comments and constraints	- Only level 0 transition is tested because there is no difference with transitions to level 1 or 2 at FFFIS STM interface level; - The test case applies only to ERTMS/ETCS on-board because from STM point of view this is a degraded situation. - This test could be executed after the test case 4a.3 (STM in FA state and Emergency brake commanded by the STM Control Function)

Starting Conditions	Value	Comments
STM_STATE	FA	
ETCS Mode	SN	
ETCS Level	NTC	
Train State	Standstill	
ETCS Train Data	Valid	
Active DMI channel Connection	Not Relevant	
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	
BIU Connection	Not Relevant	
JD Connection	Not Relevant	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Not Relevant	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	ETCS changes the level through driver selection on DMI (brake release)	DMI	T0	Driver manually selects Level 0 on DMI	TIU	Ts10	STM control function commands the Emergency brake release

STM Test Case

Not applicable because is a degraded behaviour.

End Conditions	Value	Comments
STM_STATE	FA	
ETCS Mode	UN	
ETCS Level	0	
Train State	Not Relevant	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	
BIU Connection	Not Relevant	
JD Connection	Not Relevant	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Not Relevant	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

Test case 4g.1

TEST CASE HEADER	
Test case Identification	Level transitions STM to ETCS
	4g.0.0.0.0
	Transition from STM to ETCS: National Trip Procedure maintained after a second level transition. Scope of the test case is to verify that: - After a level transition of the STM (X) from Level NTC (X) to Level NTC (Y) , when the ERTMS/ETCS on-board in SN mode executes a transition from Level NTC (Y) to ETCS Level 0 (or Level 1 or 2), if the STM(X) reports again the National Trip Procedure, the STM Control Function orders the STM(X) in FA state.
ERTMS/ETCS on-board requirements tested	Subset 035: 10.3.2.2 (DA→CS, DA→FA, HS→CS), 10.3.2.4 (A4b, Q16, G4a) 10.3.2.6, 10.3.2.7(A4b, G4a), 10.3.3.3, 10.5.1.1(a), 13.2.1.2, Subset 026: 4.6.3 [38, 62]
STM Requirements Tested	Subset 035: - Subset 026: -
Packets transmitted via FFFIS STM	- from STM to ETCS: STM-15, STM-18 - from ETCS to STM: STM-5, STM-14,
ERTMS/ETCS on-board configuration	- No DMI configuration for active STM: Unified DMI shall be used for the test - At least 2 STMs have to be configured on (and connected to) the ERTMS/ETCS on board: - STM(1) associated to NTC X - STM(2) associated to NTC Y
Comments and constraints	- Only level 0 transition is tested because there is no difference with transitions to level 1 or 2 at FFFIS STM interface level; - No STM max speed has been received (starting conditions)

Starting Conditions	Value	Comments
STM_STATE	STM(X): DA STM(Y): HS	X = 1, Y = 2
ETCS Mode	SN	
ETCS Level	NTC (X)	Level NTC (X) is associated to STM(1) (old STM)
Train State	Moving	
ETCS Train Data	Valid	
Active DMI channel Connection	Established	The DMI displays active STM's objects
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	
BIU Connection	Established	
JD Connection	Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A or Cab B active	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Not isolated	

ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1.	The ERTMS/ETCS on-board system receives the level transition order at the Level NTC Y transition location. (SRS 5.10.1.4)	BTM	T0	Message 1: Telegram B1: Immediate Level Transition Order (Packet SRS-41) Telegram B2	-	-	-
-	The STM Control Function shall order the STM(1) to CS state (Conditional) and sends new ETCS level to all connected STMs (10.3.2.2 (DA→CS), 10.3.2.4 (A4b), 10.3.2.6, 10.3.2.7(A4b)) (10.5.1.1a)	-	-	-	PROF	Ts0 5s	STM Control Connection (STM(1)): Message 2: Packet STM-5 ETCS status data Packet STM-14 State order to STM (Conditional CS order) Time: T1 > T0 STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
2.	STM (1) activates National Trip Procedure (starts cyclic transmission of National Trip Procedure) before reporting the CS state Note: NTP Cycle = 2 sec.	PROF	T2 = T1 + 1s	STM Control Connection (STM(1)): Message 4: STM-15 State report (DA) STM-18 NTP	TIU	1s	Brakes applied by ERTMS/ETCS on-board (10.3.3.3). Time T3
3.	At standstill the ERTMS/ETCS on-board changes the level through driver selection on DMI and enters in TR mode (SRS 4.6.3 [38)]	DMI	T4 = T3 + 2s	Driver manually selects Level 0 on DMI	DMI	Ts1	DMI requests the driver to acknowledge the Train Trip Time T5

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The STM Control Function sends new ETCS mode (TR) and Level 0 to both STMs and orders to STM(2) to go in CS (10.5.1.1a) (10.3.2.2 (HS→CS), 10.3.2.4 (G4a), 10.3.2.6, 10.3.2.7(G4a))	-	-	-	PROF	5s	STM Control Connection (STM(1)): Message 5: Packet STM-5 ETCS status data STM Control Connection (STM(2)): Message 6: STM-5 ETCS Status Data STM-14 14 State order to STM (Unconditional CS order) Time T6
4.	The ERTMS/ETCS on-board receives the CS status reports from STM(2)	PROF	T7 = T6+1s	STM Control Connection (STM(2)): Message 7: STM-15 State report (CS)	-	-	-
5.	The driver acknowledges the TR mode and ERTMS/ETCS on-board goes in UN mode. (SRS 4.6.3 [62]) The STM Control Function sends new ETCS mode (UN) to both STMs (10.5.1.1a)	DMI	T8= T5 + 2s	Driver acknowledges Train Trip *(T7may be greater than T8)*	PROF	5s	STM Control Connection (STM(1)): Message 8: Packet STM-5 ETCS status data STM Control Connection (STM(2)): Message 8: STM-5 ETCS Status Data
6.	STM (1) sends again National Trip Procedure Note: cyclic transmission after T2	PROF	T9	STM Control Connection (STM(1)): Message 4: STM-15 State report (DA) STM-18 NTP	-	-	-
-	The ERTMS/ETCS on-board orders the active STM (1) to go in FA state (10.3.2.2 (Q16), 10.3.2.4 (Q16), 10.3.2.6)	-	-	-	PROF	5s	STM Control Connection (STM(1)): Message 9: Packet STM-14 State order to STM (FA) No more messages are exchanged on the bus.

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The ERTMS/ETCS On-board updates DMI status (13.2.1.2).	-	-	-	DMI	5s	All STM(1) objects (including buttons, indicators, text message, supervision information and sounds) previously displayed should be deleted. A messages about the failed STM(1) is also displayed on ETCS DMI
-	The ERTMS/ETCS on-board releases the Emergency Brake (10.3.3.3)	-	-	-	TIU	5s	The Emergency Brake is released

STM Test Case

Test case not relevant for testing STM.

Message 1: Trackside Telegram B1 (Level Transition Border)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	balise
N_PIG	3	0	1st balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	linked
NID_PACKET	8	41	Level Transition Order
Q_DIR	2	1	Nominal
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1m scale
D_LEVELTR	15	32767	Level transition now
M_LEVELTR	3	1	Level NTC, specified by NID_NTC Y
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Y
L_ACKLEVELTR	15	0	ACK request window starting at 0m from the border.
N_ITER	5	0	
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1: Trackside Telegram B2			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	*0100000b*	ETCS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2nd balise
N_TOTAL	3	1	2 balise in BG
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of BG at the border
Q_LINK	1	1	Linked

NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2: Profibus message (ETCS STM Control Function => STM(X)): Packet STM-5 ETCS Status data, Packet STM-14: State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM (1) previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	5	Conditional order CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 3: Profibus message (ETCS STM Control Function => STM(Y)): Packet STM-5 ETCS Status data			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM(2) previously in HS state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN
Padding bits	COMPUTED	NOT RELEVANT	

Message 4 : Profibus message (STM(X) => ETCS STM Control Function): Packet STM-15 State Report , Packet STM-18 National Trip Procedure			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM(1) in DA shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	
Padding bits	COMPUTED	NOT RELEVANT	

Message 5: Profibus message (ETCS STM Control Function => STM(X): Packet STM-5 ETCS Status data			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM(2) previously in HS state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	0	Level 0
M_MODE	4	7	TR
Padding bits	COMPUTED	NOT RELEVANT	
Message 6: Profibus message (ETCS STM Control Function => STM(Y): Packet STM-5 ETCS Status data, Packet STM-14 State Order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM(2) previously in HS state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	0	Level 0
M_MODE	4	7	TR
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Unconditional CS
Padding bits	COMPUTED	NOT RELEVANT	

Message 7 : Profibus message (STM(Y) => ETCS STM Control Function): Packet STM-15 State Report			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM(2) shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State Report from STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	Cold Standby (CS)

Message 8: Profibus message (ETCS STM Control Function => STM(X and Y): Packet STM-5 ETCS Status data			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	For STM(X) value of the STM(1) previously in DA state shall be used. For STM(Y) value of the STM(2) previously in HS state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	5	ETCS Status data
L_PACKET	13	COMPUTED	
M_LEVEL	3	0	Level 0
M_MODE	4	4	UN
Padding bits	COMPUTED	NOT RELEVANT	

Message 9: Profibus message (ETCS STM Control Function => STM(X)): Packet STM-14: State order to STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Value of the STM (1) previously in DA state shall be used.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	8	Failure
Padding bits	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM_STATE	STM(1): FA STM(2): CS	X = 1, Y = 2
ETCS Mode	UN	
ETCS Level	0	
Train State	Standstill	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Established	
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	
BIU Connection	Not Established	
JD Connection	Not Established	
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	
TIU Eddy Current Brake Command for Service Brake	Not Relevant	
TIU Pantograph Command	Not Relevant	
TIU Air Tightness Command	Not Relevant	
TIU Main Switch / Circuit Breaker Command	Not Relevant	
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Released	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	