



## ERTMS/ETCS

### FFFIS STM test cases of Functional Identity 005

#### LEVEL TRANSITIONS STM TO STM

**Total: 31 Test cases**

REF: SUBSET-074-2-05

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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 2004-08-25	All	Document created base on the Test case document Id 3, including Test case 5a.0.0.1.1.1.0.0.0, Test case 5a.0.0.1.1.3.1.0, Test case 5a.0.0.2.2.0.0.0, Test case 5a.0.0.2.3.2, Test case 5a.0.0.1.2.1.0.1.0.0.0, Test case 5a.0.0.1.2.2.2.0.1.0.0.0, Test case 5a.0.0.3.2.1.2.0.0.0, Test case 5b.1.2.1.1.1.1.0, Test case Test case 5b.2.0, Test case 5b.3.0	U. Dräger
0.0.2 2004-09-07		Diagrams included, V-Permit modified, Additional SRS requirements included (SRS 4.8.3.1.1, 4.8.4.2, 4.10.1.3) Additional Test cases for the phase "in between" Test cases 5b.1.2.1.1.1.1.0, 5b.1.1.2.0, 5b.1.2.3.0, 5b.1.2.4.0, 5b.1.2.2.2.0, 5b.1.2.2.1.2.0, 5b.1.2.2.1.3.0	U. Dräger
0.0.3	Test case diagram, new test cases	Including STM packet number and name into the test case description	U. Dräger
0.0.4 2005-01-06	Footer Several Test Cases All Test Cases  Several Test Cases  Several Test Cases	Footer corrected. The selected language shall be "English". Updates of the template included ("Reference Time Data" included in the end conditions, "Odometry Connection" replaced by "Odometry Data" in the end conditions, Connection information for all transmitted PROFIBUS messages added in the Test Cases). Test case 5a.0.0.1.1.1.0.0.0, Test case 5a.0.0.1.2.1.0.1.0.0.0, Test case 5a.0.0.2.2.0.0.0 updated. All test cases where the STM does not follow a state transition order (Test case 5a.0.0.1.1.3.1.0, Test case 5a.0.0.1.2.2.2.0.1.0.0.0, Test case 5a.0.0.2.3.2 and Test case 5a.0.0.3.2.1.2.0.0.0 ) replaced by a reference to the Functional Identities 3 (ETCS -> STM) and 4 (STM -> ETCS), as all the cases regarding an STM that does not follow a state transition order at a level transition announcement or at a level transition border are tested in these Functional Identities and due to the fact that these test cases belong (somehow) to a degraded situation. Test case 5a.0.0.3.1.0.1.0.0.0 added.	P. Lührs (Siemens)
0.0.5 2005-01-20	Several Test Cases	Test case 5a.0.0.1.1.1.0.0.0, Test case 5a.0.0.1.2.1.0.1.0.0.0, Test case 5a.0.0.2.2.0.0.0, and Test case 5a.0.0.3.1.0.1.0.0.0 updated (new feature of the test equipment: parallel time lines, minor mistakes corrected).	P. Lührs (Siemens)

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0.0.6 2005-01-21	Add test diagram + test 5b, 5c & 5c1	Add test diagram update thanks to Alcatel. Modify the test case 5b. create the test case 5c & 5c1	F. Bernaudin (Ansaldo)
0.1.0 2005-01-27		Editorial changes for delivery	F. Bernaudin (Ansaldo)
1.0.0 13.10.2005		Editorial changes for delivery	Invensys Rail
2.9.1  2013-01-30	Test Cases / Diagrams	Updated to be in line with Subset 35 issue 3.0.0 date 2012-02-29 and SRS issue 3.3.0 date 2012-03-07 and DMI specification issue 3.3.0 date 2012-03-01	F. Dönges (Thales)
2.9.2 2013-08-30	All	Updated according to comments from 2nd internal review and from ERA traceability review	F. Dönges Thales
2.9.3 2013-10-31	all test diagrams (5a-5d) updated+ test 5c.5, 5c.8, 5c.9, 5d.1, 5d.2, 5d.3 and 5d.4 updated + test 5c.11, 5d.5 and 5d.6 added	Update according to impact from CR 1173 and CR 1148 and STMWG comments	F. Dönges Thales
2.9.4 28.02.2014	5b.1, 5b.2, 5b.3, 5b.4 and 5c.1  5c.6  5c.7, 5c.8	Update of some TC's because the STM MAX speed cannot be displayed in ETCS mode SN.  No EB applied  NID_BUTPOS is coded on 5 bits	F. Dönges Thales
2.9.5 2014-04-24	Front page	Baseline 3 1 <sup>st</sup> Maintenance pre-release version	Thomas Mandry (Alstom)
3.0.0 2014-05-09	-	Baseline 3 1 <sup>st</sup> Maintenance release version	Philippe Prieels
3.0.1 2015-08-17	2, Diagrams 5a, 5c, 5d, 5e, 5e.1, 5e.2	CR 1278: impact from CRs 1094 & 1242 and from STMWP review: Updated diagrams to cover CR 1242 changes (10.2.1.2c, 10.3.2.7), new diagram 5e added, new test cases 5e.1, 5e.2 added, Supplier specific delays table updated	J. Sukup (AZD)
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 2 <sup>nd</sup> release version	Thomas Mandry (Alstom)
Version 3.1.1	Front page	Update of company list	Thomas Mandry



2022-09-29	Messages	CR1238: "M_MODESTM" changed to "M_MODE"	(Alstom)
Version 3.9.1 25/11/22	-	Formal update for the 2 <sup>nd</sup> consolidation review for Baseline 4 1 <sup>st</sup> release version	Sven Adomeit (Siemens)
Version 3.9.2 2023-02-16	-	Formal update for the 3 <sup>rd</sup> consolidation review for Baseline 4 1 <sup>st</sup> release version	Thomas Mandry (Alstom)
Version 3.9.4 2023-06-20	-	Formal update for the 4 <sup>th</sup> consolidation review for Baseline 4 1 <sup>st</sup> release version	Thomas Mandry (Alstom)
Version 4.0.0 05/07/2023	-	Baseline 4 1 <sup>st</sup> release version	Thomas Mandry (Alstom)



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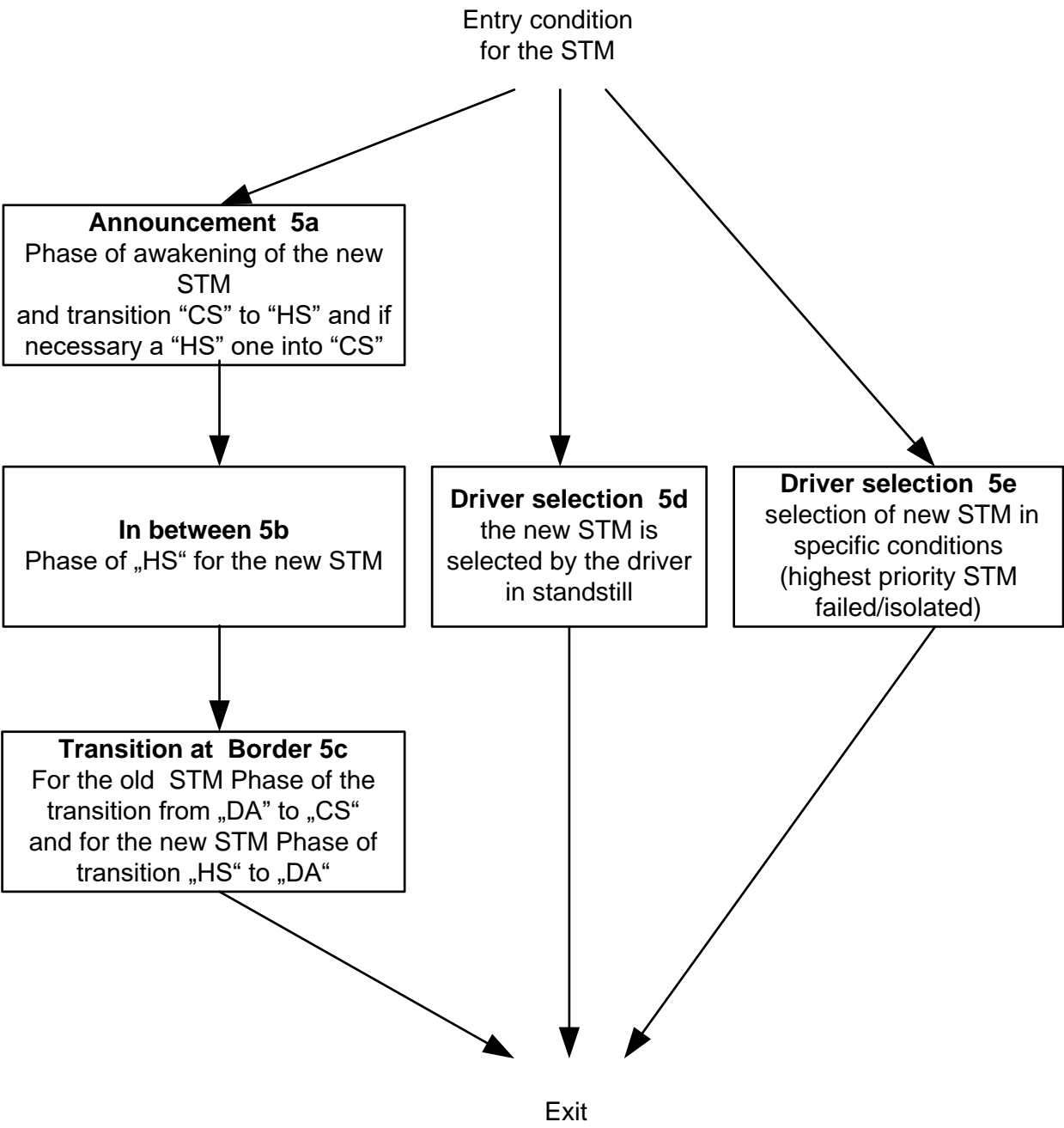
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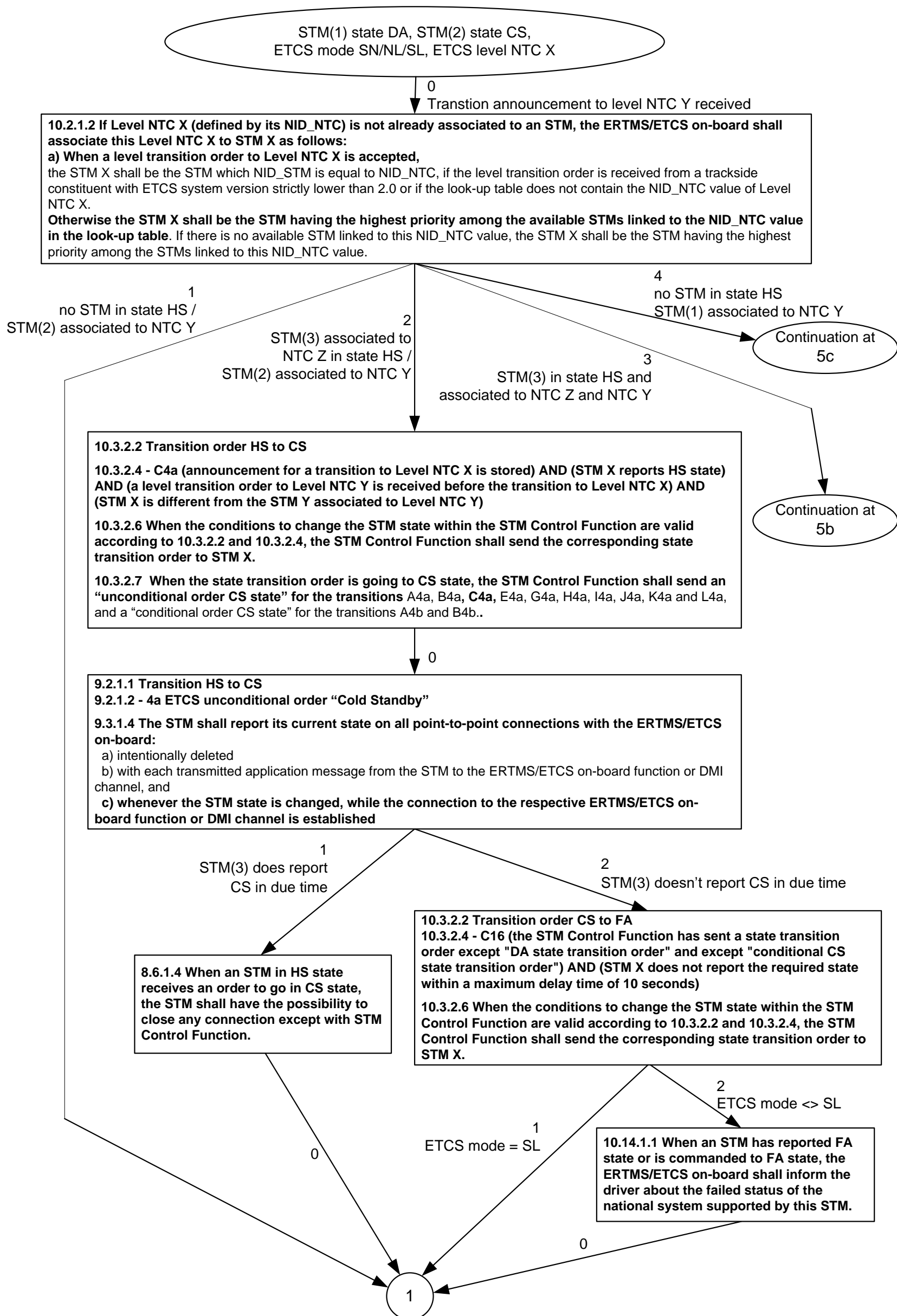
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1. DIAGRAMS

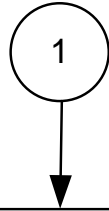
1.1 Overview



## 1.2 Announcement of a Transition STM -> STM 5a



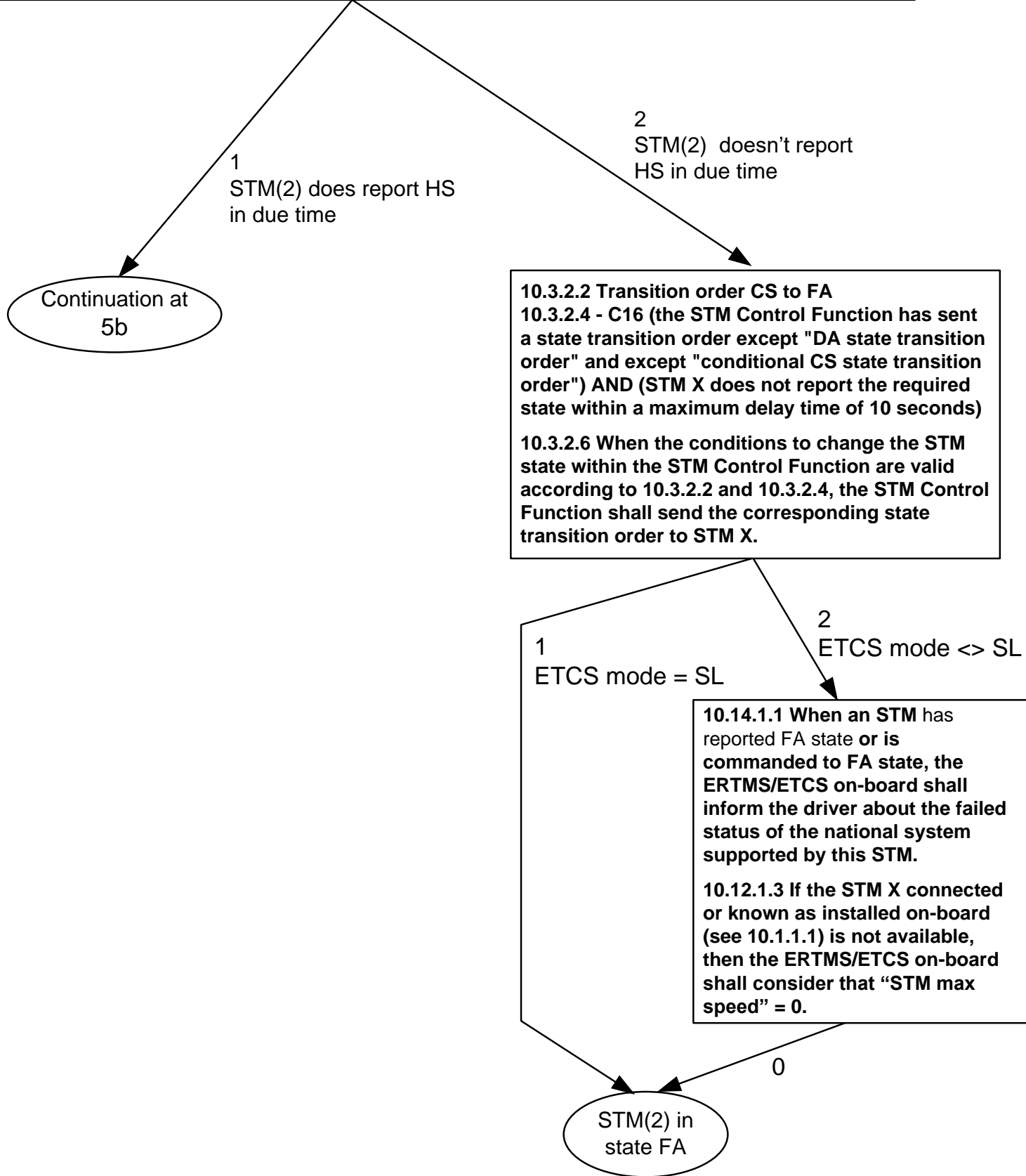




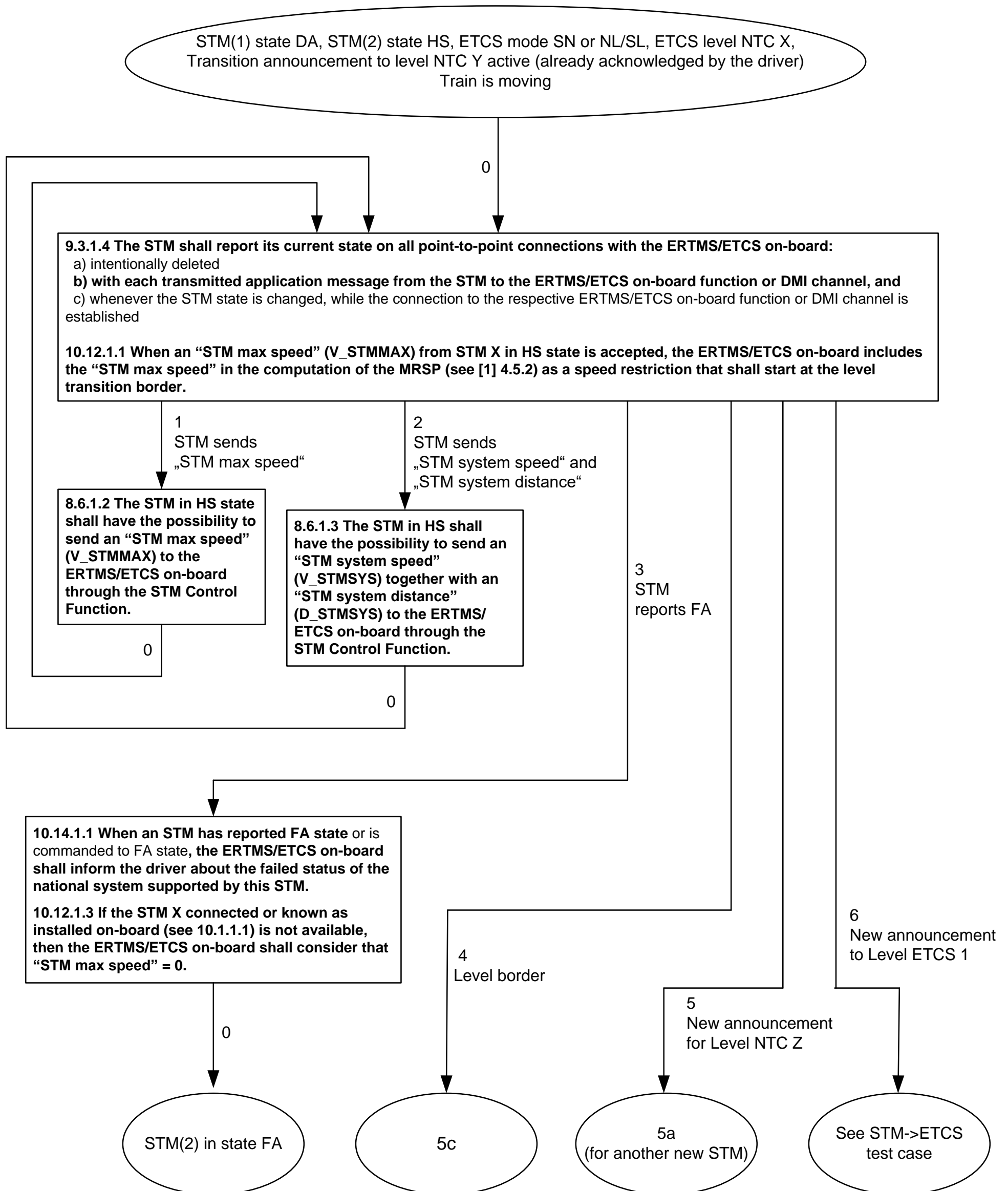
**10.3.2.2 Transition order CS to HS**  
**10.3.2.4 A6** (A transition to Level NTC X for a further location is stored on-board) **AND** (STM X reports CS state) **AND** (no other STM reports HS state)  
**10.3.2.6** When the conditions to change the STM state within the STM Control Function are valid according to 10.3.2.2 and 10.3.2.4, the STM Control Function shall send the corresponding state transition order to STM X.

**9.2.1.1 Transition CS to HS**  
**9.2.1.2 - 6 ETCS order “Hot Standby”**

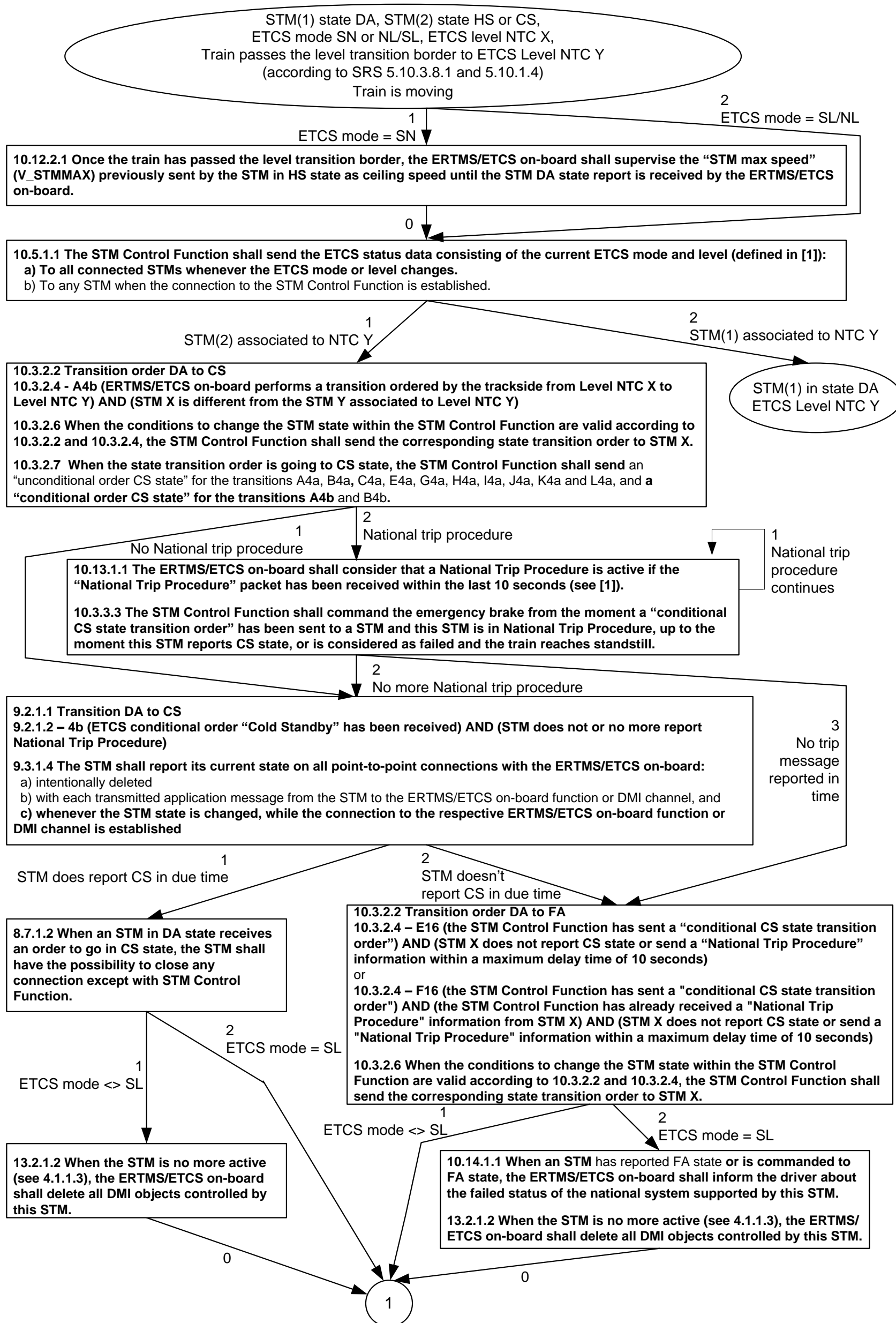
**9.3.1.4 The STM shall report its current state on all point-to-point connections with the ERTMS/ETCS on-board:**  
a) intentionally deleted  
b) with each transmitted application message from the STM to the ERTMS/ETCS on-board function or DMI channel, and  
**c) whenever the STM state is changed, while the connection to the respective ERTMS/ETCS on-board function or DMI channel is established**



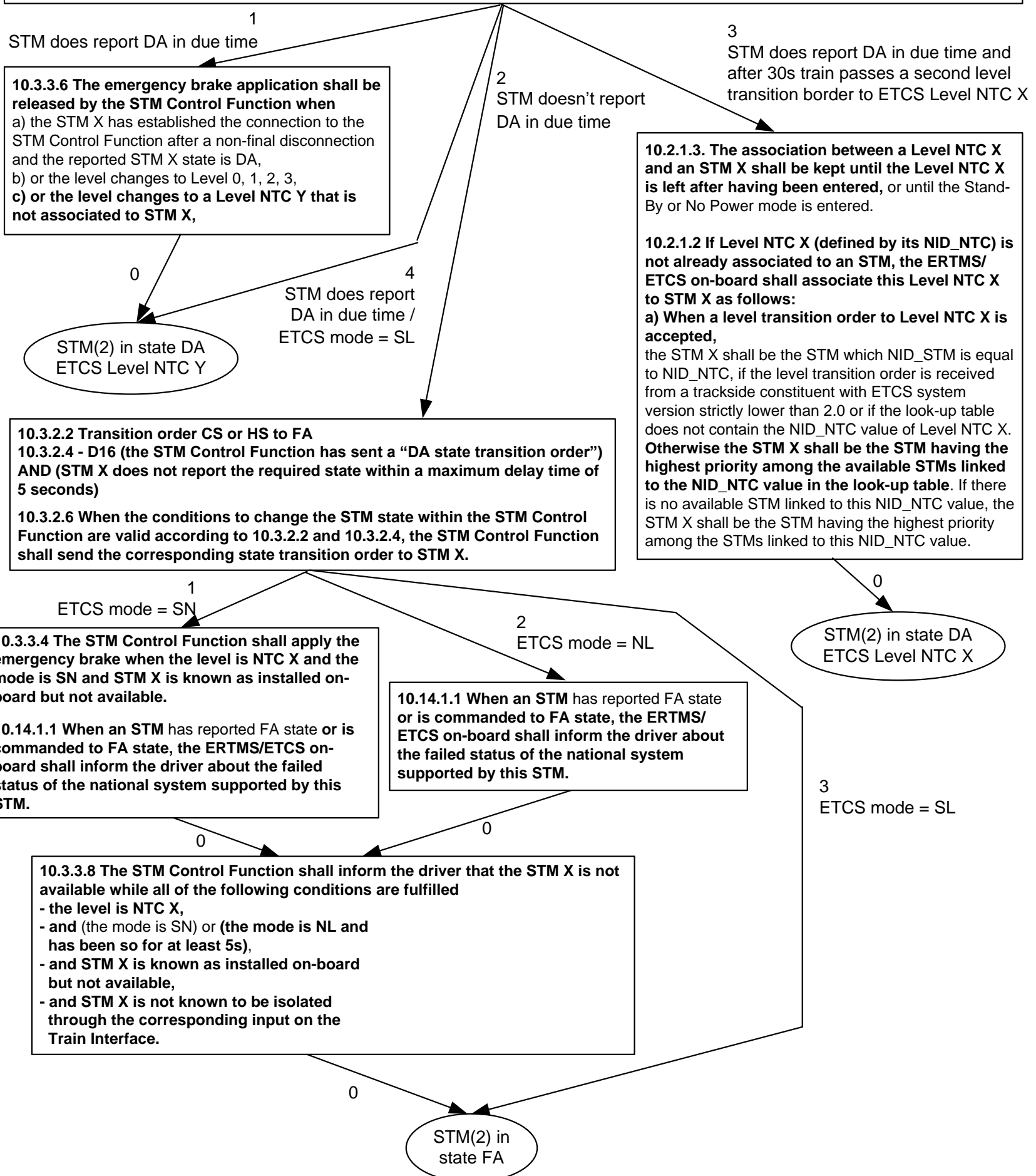
## 1.3 Between Announcement and Transition 5b



## 1.4 Level Transition Border 5c

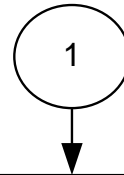


**10.3.2.2 Transition order CS or HS to DA**  
**10.3.2.4 A9 - (level of the ERTMS/ETCS on-board is Level NTC X) AND (STM X reports CS or HS state) AND (no other STM reports DA state) AND (ETCS mode is SN, SL or NL)**  
**10.3.2.6** When the conditions to change the STM state within the STM Control Function are valid according to 10.3.2.2 and 10.3.2.4, the STM Control Function shall send the corresponding state transition order to STM X.  
**9.2.1.1 Transition CS or HS to DA**  
**9.2.1.2 9 - ETCS order “Data Available”**  
**9.3.1.4** The STM shall report its current state on all point-to-point connections with the ERTMS/ETCS on-board:  
 a) intentionally deleted  
 b) with each transmitted application message from the STM to the ERTMS/ETCS on-board function or DMI channel, and  
 c) whenever the STM state is changed, while the connection to the respective ERTMS/ETCS on-board function or DMI channel is established









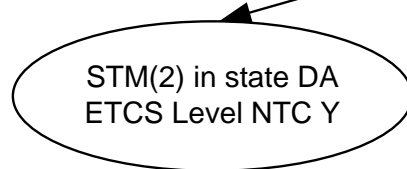
**10.3.2.2 Transition order CS to DA**  
**10.3.2.4 A9** (level of the ERTMS/ETCS on-board is Level NTC X) **AND** (STM X reports CS or HS state) **AND** (no other STM reports DA state) **AND** (ETCS mode is SN, SL or NL)  
**10.3.2.6** When the conditions to change the STM state within the STM Control Function are valid according to 10.3.2.2 and 10.3.2.4, the STM Control Function shall send the corresponding state transition order to STM X.

**9.2.1.1 Transition CS to DA**  
**9.2.1.2 - 9 ETCS order “Data Available”**

**9.3.1.4 The STM shall report its current state on all point-to-point connections with the ERTMS/ETCS on-board:**  
a) intentionally deleted  
b) with each transmitted application message from the STM to the ERTMS/ETCS on-board function or DMI channel, and  
**c) whenever the STM state is changed, while the connection to the respective ERTMS/ETCS on-board function or DMI channel is established.**

1  
STM does report DA in due time

2  
STM doesn't report DA in due time



**10.3.2.2 Transition order CS to FA**  
**10.3.2.4 - D16** (the STM Control Function has sent a “DA state transition order”) **AND** (STM X does not report the required state within a maximum delay time of 5 seconds)  
**10.3.2.6** When the conditions to change the STM state within the STM Control Function are valid according to 10.3.2.2 and 10.3.2.4, the STM Control Function shall send the corresponding state transition order to STM X.

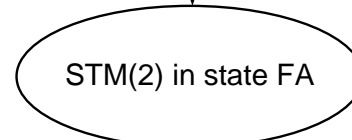
**10.3.3.4 The STM Control Function shall apply the emergency brake when the level is NTC X and the mode is SN and STM X is known as installed on-board but not available.**

**10.14.1.1** When an STM has reported FA state or is commanded to FA state, the ERTMS/ETCS on-board shall inform the driver about the failed status of the national system supported by this STM.

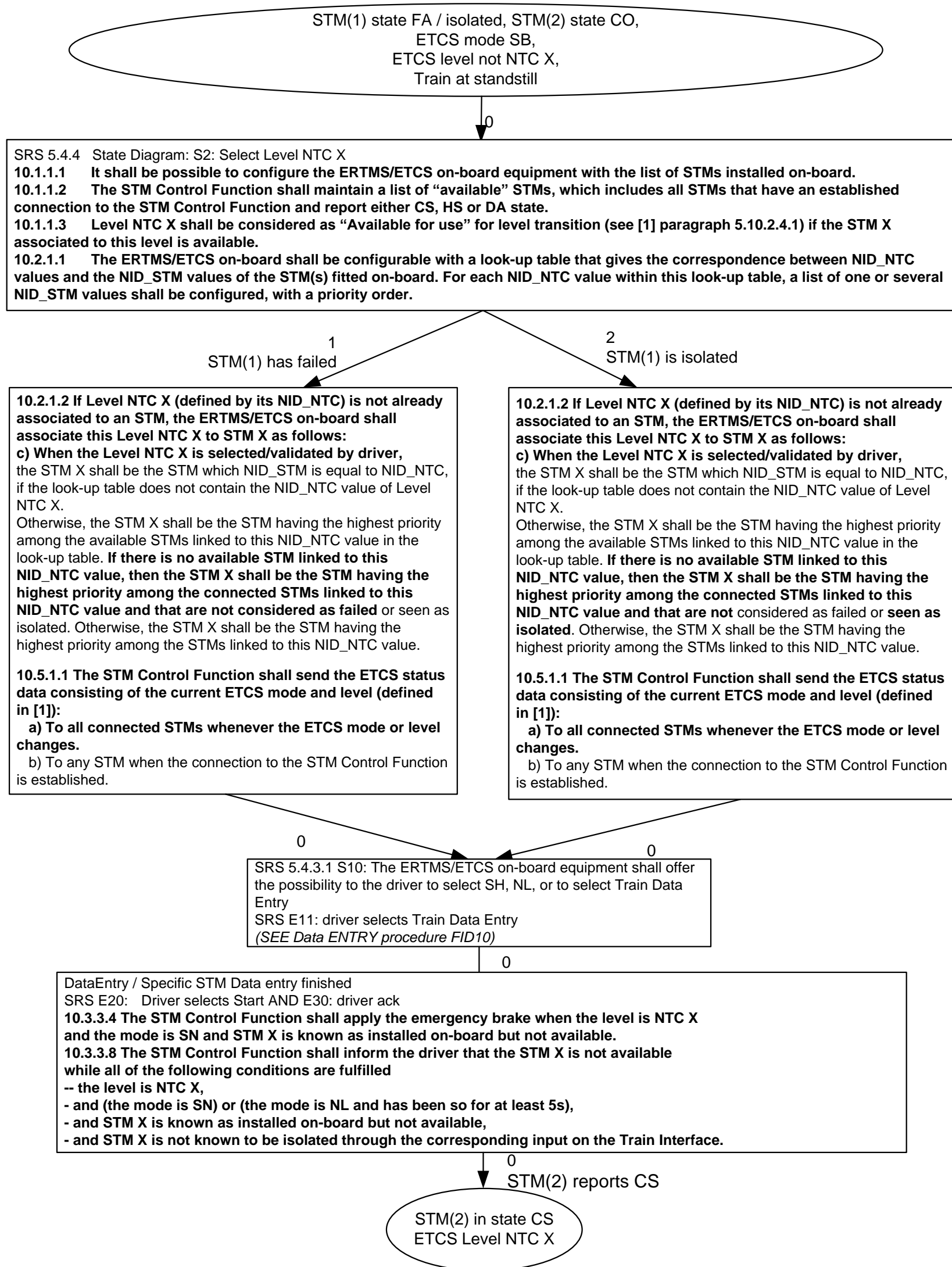
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**10.3.3.8 The STM Control Function shall inform the driver that the STM X is not available while all of the following conditions are fulfilled**  
- the level is NTC X,  
- and (the mode is SN) or (the mode is NL and has been so for at least 5s),  
- and STM X is known as installed on-board but not available,  
- and STM X is not known to be isolated through the corresponding input on the Train Interface.

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## 1.6 Level transition by driver 5e





## 2. SUPPLIER SPECIFIC DELAYS TABLE

#	Supplier of	Start time	End time
Ts3	ETCS	Reference Time of reception of Transition Announcement or Order	Reference Time of indication of the level transition on the DMI
Ts4	STM	Time-stamp of reception of STM_STATE order STM-14 to "DA"	Time-stamp of disconnect BIU function by STM
Ts5	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "CCS" or "CS" +10s	Order to STM <sub>y</sub> if STM <sub>x</sub> not reporting in time: Time-stamp of message including STM-14 "HS" or "DA"
Ts7	ETCS	Time-stamp of reception of STM speed and distance information	Reference Time of indication of the permitted speed on the DMI
Ts8	STM	STM max speed" to be transmitted due to national rules	Time-stamp of message including STM-16
Ts9	STM	STM System speed and distance to be transmitted due to national rules	Time-stamp of message including STM-17
Ts13	ETCS	Reference Time driver selection of a new NTC	Time-stamp of message including STM-14 "CS"
Ts15	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "CCS" or "CS" +10s	Time-stamp of message including STM-14 "FA"
Ts16	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "CCS" or "CS" +10s	Reference Time of STM failure message on DMI
Ts17	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "HS" +10s	Time-stamp of message including STM-14 "FA"
Ts18	ETCS	Reference Time of new level selection by the driver	Reference Time of Emergency Brake Release
Ts19	STM	Time-stamp of reception of State order STM-14 to "CS"	Time-stamp of message including STM-15 "CS" sent to BIU/TIU/DMI/JD
Ts20	STM	Time-stamp of reception of State order STM-14 to "CS"	Time-stamp of SSL disconnect message sent from STM
Ts21	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "HS" +10s	Reference time of driver information display about the failed STM.
Ts22	ETCS	Reference Time of the text message acknowledge by the driver	Reference time of driver information display about the unavailable STM.
Ts23	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "DA" +5s	Time-stamp of message including STM-14 "FA"
Ts24	ETCS	For STM not reporting in time: Time-stamp of State order STM-14 to "DA" +5s	Reference time of driver information display about the failed STM.
Ts25	ETCS	Reference time at which mode or level is changed	Time-stamp of message including STM-5 ETCS status data
Ts26	ETCS	Reference time at which SN mode is acknowledged	Time-stamp of message including STM-5 ETCS Status data SN

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#	Supplier of	Start time	End time
Ts27	ETCS	Reference time at which SN mode is acknowledged by driver	Reference time at which ETCS DMI informs driver that STM X is not available
Ts28	ETCS	Time-stamp of message including STM-13 state request CS state	Time-stamp of message including STM-14 state order CS
Ts29	ETCS	Time-stamp of message STM-15 in which STM reports CS	Reference time at which ETCS DMI no longer informs driver that STM X is not available



### 3. TEST CASES

#### 3.1 Test case 5a.1

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5a.0.1.1
	Check the behaviour of the ERTMS/ETCS on-board in the ETCS Mode SL and the STM at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when no other STM is currently in the state HS and the STM follows the state transition order to state HS in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 a);10.3.2.2 (CS->HS); 10.3.2.4 (A6); 10.3.2.6
STM requirements tested	Subset-035: 9.2.1.1 (CS->HS); 9.2.1.2 6; 9.3.1.4 c)
Packets transmitted via FFFIS STM	STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) is installed on-board</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the new STM (STM(2)) to the state HS when a level transition announcement to the NTC associated to STM(2) is received.</p> <p>The objective of this test is also to check that the STM follows a state transition order to the state HS.</p> <p>STMs involved:</p> <p>STM(2): new STM (in CS at start of test case) for announced level,</p> <p>Test Case is designed for testing when STM in CS has except STM Control Function no other connections (DMI, TIU, BIU and JD) established.</p>



--	--

Starting Conditions	Value	Comments
STM State	STM(2): CS	no other STM in state HS or state DA
ETCS Mode	SL	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
ETCS Train Data	Not Relevant	
Active DMI channel Connection	Not Established	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(2)
BIU Connection	Not Established	STM(2)
JD Connection	Not Established	STM(2)
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	The ERTMS/ETCS on-board receives the announcement of level transition: order announced STM to HS state.	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(2)): Message 1: STM-14 state order to STM (Hot Standby) Time T1
2	STM(2) reports state HS in due time.	PROF	T1 + 5s	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby)	PROF	5s	No FA state order sent from STM control function

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	STM(2) is ordered to state HS and reports in time.	PROF	T0	STM Control Connection (STM(2)): Message 1: STM-14 state order to STM (Hot Standby)	-	10s	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby)

Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked



Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	Hot Standby (HS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 2 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(2): HS	Level NTC Y is associated to STM(2)
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	

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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	



## 3.2 Test case 5a.2

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5a.0.1.1
	Check the behaviour of the ERTMS/ETCS on-board (not in the ETCS technical mode SL) at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when no other STM is currently in the state HS and the STM follows the state transition order to state HS in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 a); 10.3.2.2 (CS->HS); 10.3.2.4 (A6); 10.3.2.6
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) is installed on-board</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the new STM (STM(2)) to the state HS when a level transition announcement to the NTC associated to STM(2) is received.</p> <p>The objective of this test is also to check that the STM follows a state transition order to the state HS.</p> <p>STMs involved:</p> <p>STM(2): new STM (in CS at start of test case) for announced level,</p> <p>Test Case is designed for testing when STM in CS has except STM Control Function no other connections (DMI, TIU, BIU and JD) established.</p>





Starting Conditions	Value	Comments
STM State	STM(2): CS	no other STM in state HS or state DA
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	Not Established	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(2)
BIU Connection	Not Established	STM(2)
JD Connection	Not Established	STM(2)
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 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 : display the announcement to the driver.	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	DMI	Ts3	Indication to the driver about the selected level transition
-	STM(2) mapped to the requested NTC Y is associated this NTC and is ordered by ERTMS/ETCS on-board to state HS.	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 1: STM-14 state order to STM (Hot Standby) Time T1
3	STM(2) reports state HS in due time.	PROF	T1 + 5s	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby)	PROF	5s	No FA state order sent from STM control function

## STM Test Case

Same messages than for TEST CASE 5a.1

Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order

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Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	Hot Standby (HS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 2 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby(HS)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(2): HS	Level NTC Y is associated to STM(2)
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	

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BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

### 3.3 Test case 5a.3

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5a.0.2.0.1.0.1
	Check the behaviour of the ERTMS/ETCS on-board (not in the ETCS technical mode SL) and the STMs at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when another STM associated to NTC Z and not mapped to NTC Y by the look-up table is in the state HS and the STMs follow the state transition orders in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.6.1.4; 10.2.1.2 a); 10.3.2.2 (HS->CS, CS->HS); 10.3.2.4 (C4a, A6); 10.3.2.6; 10.3.2.7 (C4a);
STM requirements tested	Subset-035: 9.2.1.1 (HS->CS, CS->HS); 9.2.1.2 (4a, 6); 9.3.1.4 c)
Packets transmitted via FFFIS STM	STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) and STM(3) are installed on-board</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> <li>- STM(3) is associated to NTC Z</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the new STM (STM(2)) to the state HS after any other STM (STM(3)) in state HS was ordered to the state CS when a level transition announcement to the new STM has been received.</p> <p>The objective of this test is also to check that the new STM (STM(2)) follows a state transition order to the state HS.</p> <p>STMs involved:</p> <p>STM(2): new STM (in CS at start of test case) for announced level,</p>



STM(3): standby STM (in HS at start of test case) for a previously announced level.

Starting Conditions	Value	Comments
STM State	STM(2): CS STM(3): HS	Level NTC Z is associated to STM(3)
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	Not relevant	STM(2)
	Established	STM(3)
Other DMI channels Connections	Not relevant	
TIU Connection	Not relevant	STM(2)
	Established	STM(3)
BIU Connection	Not relevant	STM(2)
	Established	STM(3)
JD Connection	Not relevant	STM(2)
	Established	STM(3)
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	



Starting Conditions	Value	Comments
TIU Cab Status	Cab A 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 .The announcement is displayed to the driver and	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	DMI	Ts3	Indication to the driver about the selected level transition
-	The STM(3) is ordered by ERTMS/ETCS on-board to state CS.	-	-	-	PROF	5s	STM Control Connection (STM(3)): Message-1: STM-14 state order to STM (Unconditional Cold Standby) Time T1
2	STM(3) reports state CS in due time and STM(2) is ordered to state HS.	PROF	T1 + 5s	STM Control Connection (STM(3)): Message 2 STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 3 STM-14 state order to STM (Hot Standby) Time T2



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	STM(3) reports it new state CS to any connected ERTMS/ETCS on-board function  <i>This step is optional if the STM closes the connection on change to CS.</i>	PROF	T3=T 1+6s	BIU Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby) JD connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby)	-		-
4	The STM(3) closes any active connection but not the STM Control Function connection.	PROF	T3+5s	The STM(3) 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(3) to the STM control function
5	STM(2) reports state HS in due time.	PROF	T2 + 8s	STM Control Connection (STM(2)): Message 4: STM-15 State Report from STM (Hot Standby)	PROF	5s	No FA state order sent from STM control function

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(3) (standby STM)</i>							





Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	STM(3) is ordered to state CS.	PROF	T0	STM Control Connection (STM(2)): Message 1 STM-14 state order to STM (Unconditional Cold Standby)	PROF	10s	STM Control Connection (STM(3)): Message 2 STM-15 State Report from STM (Cold Standby)
-	STM(3) reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby) JD Connection (STM(3)): Message 2: STM-15 State Report from STM (Cold Standby)
-	STM(3) closes any active connection but not the STM Control Function connection.	-	-	-	PROF	Ts20	The STM(3) 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.
<i>The following steps apply to STM(2) (new STM)</i>							
1	STM(2) is ordered to state HS and reports in time.	PROF	T0	STM Control Connection (STM(2)): Message 3: STM-14 state order to STM (Hot Standby)	PROF	10s	STM Control Connection (STM(2)): Message 4: STM-15 State Report from STM (Hot Standby)



Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

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Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(3)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	Unconditional Cold Standby (U-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(3)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	Hot Standby (HS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)

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Message 4 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(2): HS STM(3): CS	Level NTC Y is associated to STM(2)
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
ETCS Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	STM(2)
	Not Established	STM(3)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	STM(2)
	Not Established	STM(3)
BIU Connection	Not Relevant	STM(2)
	Not Established	STM(3)
JD Connection	Not Relevant	STM(2)
	Not Established	STM(3)
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	

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BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

### 3.4 Test case 5a.4

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5a.0.2.0.2.2.0.2.2.0
	Check the behaviour of the ERTMS/ETCS on-board (not in the ETCS technical mode SL) at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when another STM associated to Level NTC Z and not mapped to NTC Y by the look-up table is in the state HS and the STMs do not follow the state transition orders in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 a); 10.3.2.2 (HS->CS, CS->HS, HS->FA, CS->FA); 10.3.2.4 (A6, C4a, C16); 10.3.2.6; 10.3.2.7 (C4a); 10.12.1.3; 10.14.1.1
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-14
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) and STM(3) are installed on-board</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> <li>- STM(3) is associated to NTC Z</li> </ul>
Comments and constraints	<p>The test case applies only to ERTMS/ETCS on-board because from the STM point of view this is a degraded situation.</p> <p>STMs involved:</p> <p>STM(2): new STM (in CS at start of test case) for announced level,</p> <p>STM(3): standby STM (in HS at start of test case) for a previously announced level.</p>



The selected language shall be any language supported by ERTMS/ETCS on-board and STM

Starting Conditions	Value	Comments
STM State	STM(2): CS STM(3): HS	Level NTC Z is associated to STM(3)
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	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	Forward	
TIU Cab Status	Cab A 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 : display the announcement to the driver and orders the STM(3) to CS state.	BTM	T0	Telegram-B1 (41 Level Transition Order) Telegram-B2	DMI	Ts3	Indication to the driver about the selected level transition
-	The STM(3) is ordered by ERTMS/ETCS on-board to state CS.	-	-	-	PROF	5s	STM Control Connection (STM(3)): Message 1: STM-14 state order to STM (unconditional CS order) Time T1
2	Timeout after 10 seconds . The ERTMS/ETCS on-board orders the STM(3) to go in FA state and orders the STM(2) to go in HS state.	-	T1		PROF	10s+Ts1 5	STM Control Connection (STM(3)): Message 2: STM-14 state order to STM (Failure)
-	Information "NTC failed" for the STM(3) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	10s+Ts1 6	indication to the driver about the failed STM(3)
-	The STM(2) is ordered by ERTMS/ETCS on-board to state HS.	-	-	-	PROF	10s+Ts5	STM Control Connection (STM(2)): Message 3: STM-14 state order to STM (HS order). Time T2
3	Timeout after 10 seconds . The ERTMS/ETCS on-board orders the STM(2) to go in FA state.	-	T2		PROF	10s+Ts1 7	STM Control Connection (STM(2)): Message-4: STM-14 state order to STM (Failure) Time T3
-	Information "NTC failed" for the STM(2) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	10s+Ts2 1	indication to the driver about the failed STM(2)



## STM Test Case

Not applicable because is a degraded behaviour.

Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	0	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group

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Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(3)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	Unconditional Cold Standby (U-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-14) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(3)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	Hot Standby (HS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(2): FA STM(3): FA	STM state of old STM unchanged
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
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	Unchanged	
TIU Cab Status	Unchanged	

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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	

### 3.5 Test case 5a.5

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5a.0.2.0.2.1.2.1
	Check the behaviour of the ERTMS/ETCS on-board (is in the ETCS technical mode SL) at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when another STM associated to Level NTC Z and not mapped to NTC Y by the look-up table is in the state HS and the STMs do not follow the state transition orders in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 a); 10.3.2.2 (HS->CS, CS->HS, CS->FA, HS->FA); 10.3.2.4 (C4a, C16, A6); 10.3.2.6; 10.3.2.7 (C4a);
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-14
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) and STM(3) are installed on-board</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> <li>- STM(3) is associated to NTC Z</li> </ul>
Comments and constraints	<p>The test case applies only to ERTMS/ETCS on-board because from the STM point of view this is a degraded situation.</p> <p>STMs involved:</p> <p>STM(2): new STM (in CS at start of test case) for announced level,</p> <p>STM(3): standby STM (in HS at start of test case) for a previously announced level.</p>



The selected language shall be any language supported by ERTMS/ETCS on-board and STM

Starting Conditions	Value	Comments
STM State	STM(2): CS STM(3): HS	Level NTC Z is associated to STM(3)
ETCS Mode	SL	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
ETCS Train Data	Not Relevant	
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	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	

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## 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 : order announced STM to HS state	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(3)): Message 1: STM-14 state order to STM (unconditional CS order) Time T1
3	The ERTMS/ETCS on-board orders the STM(3) to go in FA state.	-	T1	-	PROF	10s+Ts1 5	STM Control Connection (STM(3)): Message 2: STM-14 state order to STM (FA order)
-	The ERTMS/ETCS on-board orders the STM(2) to go in HS state	-	-	-	PROF	10s+Ts5	STM Control Connection (STM(2)): Message 3: STM-14 state order to STM (HS order). Time T2
4	The ERTMS/ETCS on-board orders the STM(3) to go in FA state.	-	T2	-	PROF	10s+Ts1 7	STM Control Connection (STM(2)): Message 4: STM-14 state order to STM (FA order)

## STM Test Case

Not applicable because is a degraded behaviour.

Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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

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Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_LINK	1	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(3)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	Unconditional Cold Standby (U-CS)



Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(3)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	Hot Standby (HS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(2): FA STM(3): FA	

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ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
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	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	

### 3.6 Test case 5a.6

TEST CASE HEADER	
Test case identification	Level Transition STM to STM





	5a.0.3
	Check the behaviour of the ERTMS/ETCS on-board (not in the ETCS technical mode SL) and the STMs at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when another STM in HS state associated to Level NTC Z and mapped to NTC Y by the look-up table.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035: 10.2.1.2 a)
<b>STM requirements tested</b>	Subset-035: None
<b>Packets transmitted via FFFIS STM</b>	
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) and STM(3) are installed on-board</li> <li>- STM(1) is associated to NTC X</li> <li>- STM(3) is associated to NTC Z and is mapped to NTC Y by the look-up table</li> </ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) does not order the STM (STM(3)) (in the state HS for a previously announced level.NTC Z) to CS because according to the look-up table STM (STM(3)) is also mapped to new announced Level NTC Y.</p> <p>STMs involved:</p> <p>STM(1): active STM</p> <p>STM(3): standby STM in HS for a previously announced Level NTC Z.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(3): HS	Level NTC Z is associated to STM(3)
ETCS Mode	SN	



Starting Conditions	Value	Comments
ETCS Level	NTC X	Level NTC X is associated to STM(1)
Train State	Moving	
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	Forward	
TIU Cab Status	Cab A 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 <b>and does not send a state order to STM(3)</b> .The announcement is displayed to the driver.	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	DMI	Ts3	Indication to the driver about the selected level transition
-	-	-	-	-	PROF	10s	No state order is send to STM(3)

## STM Test Case

Not applicable

Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC Y

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Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Y
L_ACKLEVELTR	15	0	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

End Conditions	Value	Comments
STM State	STM(1): DA STM(3): HS	Level NTC Z and NTC Y is associated to STM(3)
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
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	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	

### 3.7 Test case 5a.7

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5a.0.3
	Check the behaviour of the ERTMS/ETCS on-board (not in the ETCS technical mode SL) and the STMs at a level transition announcement for an Level NTC X to Level NTC Y transition (announced by balise group), when no another STM is in HS state and STM(1) is mapped to NTC Y by the look-up table.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 a)



<b>STM requirements tested</b>	Subset-035: None
<b>Packets transmitted via FFFIS STM</b>	
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X and mapped to NTC Y by the look-up table (higher priority)</li> <li>- STM(2) is mapped to NTC Y by the look-up table (lower priority)</li> </ul>
<b>Comments and constraints</b>	STMs involved: STM(1): active STM STM(2): standby STM in CS

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)
Train State	Moving	
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	



Starting Conditions	Value	Comments
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 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 does not send a state order to any STM .The announcement is displayed to the driver	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	DMI	Ts3	Indication to the driver about the selected level transition
-	The ERTMS/ETCS on-board does not send a state order to STM(1) nor STM(2).	-	-	-	PROF	10s	State order is neither send to STM(1) nor to STM(2).

### STM Test Case

Not applicable



Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

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End Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	Level NTC Y is associated to STM(1)
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
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	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	



### 3.8 Test case 5b.1

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5b.0.1.0.2.0.3.0
	Check of handling of the STM max speed and STM system speed / distance within the ERTMS/ETCS on-board (STM Control Function) during a level transition STM to STM. The STM is finally kept as failed.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.6.1.2; 8.6.1.3; 10.12.1.1; 10.12.1.3; 10.14.1.1
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-15, STM-16, STM-17, STM-43
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) installed on-board</li> <li>- STM(2) associated to NTC Y</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) is able to receive from a new STM in state HS during the approach of a level transition STM to STM:</p> <ul style="list-style-type: none"> <li>• STM max speed is repeatedly included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.</li> <li>• STM system speed / distance without any further processing</li> </ul> <p>Due to the failed STM the STM max speed will be set to 0 at the end of the test case.</p> <p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p>



Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	Forward	
TIU Cab Status	Cab A 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	Display information from the STM(1) in DA	PROF	T0	DMI Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-43 Speed and distance supervision information	DMI	Ts7	The indication of the permitted speed and the target speed is "160 km/h".
-	Move 100m	-	-	-	-	-	-
2	"STM max speed" (120 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T1 = 100m/Train_speed	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed is unchanged.
3	"STM system speed and distance" (140 km/h, 5000m) is received and not processed (supervised) by the ERTMS/ETCS on-board.	PROF	T1+0, 5s	STM Control Connection (STM(2)): Message 3: STM-15 State Report from STM (Hot Standby) STM-17 - Transition variables STM system speed and distance	DMI		The indication of the permitted speed is unchanged.
-	Move 100m	-	-	-	-	-	-
4	The STM failed	PROF	T2 = T1+(100m/Train_speed)	STM Control Connection (STM(2)): Message 4: STM-15 State report from STM (Failure)	DMI	-	A message about the failed STM(2) is displayed on ETCS DMI



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
5	At transition location: The ERTMS/ETCS on-board receives the level transition order.	BTM	T3 = T2+( move ment to transit ion locati on)	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 5: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)
-	The "STM max speed = 0 " is taken into account at the level transition.	-	-	-	TIU	5s	STM control function commands the emergency brake (The brake intervention is done as ceiling speed.)

## STM Test Case

Not applicable because is a degraded behaviour.

Telegram-B4 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)

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Telegram-B4 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	43	Speed and distance supervision information
L_PAKET	13	COMPUTED	Packet length
Q_SCALE	2	1	1 m scale
V_PERMIT	10	160	Permitted speed 160 km/h
V_TARGET	7	32	Target speed 160 km/h
V_RELEASE	10	1023	Unknown value/Not displayed



Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
V_INTERV	10	165	Intervention speed 165 km/h
D_TARGET	15	5000	Target distance 5 km
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 2 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	24	STM max speed 120 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-15, STM-17) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM(STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS



Message 3 (Packet STM-15, STM-17) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	17	Transition variables STM system speed and distance from new STM (STM-17)
L_PACKET	13	COMPUTED	packet length
V_STMSYS	7	28	140 km/h
D_STMSYS	15	500	5000 m (i.e.STM System distance before border already passed)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): FA	
ETCS Mode	Unchanged	

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End Conditions	Value	Comments
ETCS Level	NTC Y	
Train State	Unchanged	
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	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	

### 3.9 Test case 5b.2

TEST CASE HEADER	
Test case identification	Level Transition STM to STM



	5b.0.1.0.2.0.1.0.2.4
	Check of handling of the STM max speed and STM system speed and distance within the ERTMS/ETCS on-board (STM Control Function) and within the STM with one modification by a STM during a level transition STM to STM.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset035: 8.6.1.2; 8.6.1.3; 10.12.1.1
<b>STM requirements tested</b>	Subset-035: 9.3.1.4 b)
<b>Packets transmitted via FFFIS STM</b>	STM-16, STM-17, STM-43
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(2) installed on-board</li> <li>- STM(2) associated to NTC Y</li> </ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) is able to receive from a new STM in state HS during the approach of a level transition STM to STM:</p> <ul style="list-style-type: none"> <li>• STM max speed is repeatedly included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.</li> <li>• STM system speed and distance repeatedly without any further processing</li> </ul> <p>The STM max speed is set to 60 km/h at end of the test case.</p> <p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)



Starting Conditions	Value	Comments
Train State	Moving	
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	Forward	
TIU Cab Status	Cab A 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	Display information from the STM(1) in DA	PROF	T0	DMI Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-43 Speed and distance supervision information	DMI	Ts7	The indication of the permitted speed and the target speed is "160 km/h"
-	Move 100m	-	-	-	-	-	-
2	"STM max speed" (120 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T1 = T0+(100m/Train_speed)	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed, the target speed and the target distance is unchanged
3	"STM system speed and distance" (140 km/h, 5000m) is received and not processed (supervised) by the ERTMS/ETCS on-board.	PROF	T1+0, 5s	STM Control Connection (STM(2)): Message 3: STM-15 State Report from STM (Hot Standby) STM-17 Transition variables STM system speed and distance	DMI		The indication of the permitted speed, the target speed and the target distance is unchanged
-	Move 100m	-	-	-	-	-	-
4	"STM max speed" (60 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T2 = T1+(100m/Train_speed)	STM Control Connection (STM(2)): Message 4: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed, the target speed and the target distance is unchanged.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
5	"STM System speed and distance" (50 km/h, 5000m) is received and not processed (supervised) by the ERTMS/ETCS on-board.	PROF	T2+0, 5s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Hot Standby) STM-17 Transition variables STM system speed and distance	DMI		The indication of the permitted speed, the target speed and the target distance is unchanged.
6	At transition location: The continuous speed of the train is higher than 67,5km/h and the ERTMS/ETCS on-board receives the level transition order.	BTM	T3=T2+(movement to transition location)	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 6: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T4
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-		PROF	5s	STM Control Connection (STM(2)): Message 7: STM-5 ETCS Status Data
-	The "STM max speed = 60" is taken into account	-	-		TIU	5s	STM control function commands the emergency brake (The brake intervention is done as ceiling speed.)

## STM Test Case

Test cases are only relevant for STMs that uses STM max/system speed functionality

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	STM(2) sends "STM max speed" (120 km/h) after change to HS	-	T0	"STM max speed" defined due to national rules	PROF	Ts8	STM Control Connection (STM(2)): Message 2: STM-16 - Transition variables STM max speed



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
2	STM(2) sends "STM System Speed / Distance" (140 km/h, 5000m) after change to HS	-	T0+0, 5s	"STM System speed and distance" defined due to national rules	PROF	Ts9	STM Control Connection (STM(2)): Message 3: STM-17 - Transition variables STM system speed and distance
-	Move 100m	-			-	-	
3	STM(2) sends "STM max speed" (60 km/h) after change to HS	-	T1 = T0+(1 00m/T rain_speed)	"STM max speed" changed due to national rules	PROF	Ts8	STM Control Connection (STM(2)): Message 4: STM-16 - Transition variables STM max speed
4	STM(2) sends "STM System speed and distance" (50 km/h, 5000m) after change to HS	-	T1+0, 5s	"STM System speed and distance" defined due to national rules-	PROF	Ts9	STM Control Connection (STM(2)): Message 5: STM-17 - Transition variables STM system speed and distance

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Uninked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
M_LEVELTR	3	1	Level NTC, specified by NID_NTC Y

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Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Y
L_ACKLEVELTR	15	0	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	43	Speed and distance supervision information
L_PACKET	13	COMPUTED	Packet length
Q_SCALE	2	1	1 m scale
V_PERMIT	10	160	Permitted speed 160 km/h
V_TARGET	7	32	Target speed 160 km/h
V_RELEASE	10	1023	Unknown value/Not displayed
V_INTERV	10	165	Intervention speed 165 km/h



Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
D_TARGET	15	5000	Target distance 5 km
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 2 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	24	STM max speed 120 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-15, STM-17) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM(STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	17	Transition variables STM system speed and distance from new STM (STM-17)





Message 3 (Packet STM-15, STM-17) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
V_STMSYS	7	28	140 km/h
D_STMSYS	15	500	5000 m (i.e.STM System distance before border already passed)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	12	STM max speed 60 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15, STM-17) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM(STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	17	Transition variables STM system speed and distance from new STM (STM-17)
L_PACKET	13	COMPUTED	packet length
V_STMSYS	7	10	50 km/h
D_STMSYS	15	500	5000 m (i.e.STM System distance before border already passed)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 6 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 7 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): HS	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	
Other DMI channels Connections	Not Relevant	

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End Conditions	Value	Comments
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	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	

### 3.10 Test case 5b.3

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5b.0.1.0.1.0.5
	Check of handling of the STM max speed within the ERTMS/ETCS on-board (STM Control Function) and within the STM with one modification during a level transition STM to STM. ERTMS/ETCS on-board receives a transition order for a new STM before the transition border.



<b>ERTMS/ETCS on-board Requirements tested</b>	Subset-035: 8.6.1.2; 10.12.1.1
<b>STM requirements tested</b>	Subset-035: 9.3.1.4 b)
<b>Packets transmitted via FFFIS STM</b>	STM-14, STM-15, STM-16, STM-43
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(2) installed on-board</li> <li>- STM(2) associated to NTC Y</li> <li>- STM(2) is not mapped to NTC Z by the look-up table</li> </ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) is able to receive from a new STM in state HS during the approach of a level transition STM to STM:</p> <ul style="list-style-type: none"> <li>• “STM max speed” is repeatedly included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.</li> </ul> <p>The STM(2) is ordered to CS at end of the test case.</p> <p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
Train Data	Valid	
Active DMI channel Connection	Not Relevant	
Other DMI channels Connections	Not Relevant	



Starting Conditions	Value	Comments
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 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	Display information from the STM(1) in DA	PROF	T0	DMI Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-43 Speed and distance supervision information	DMI	Ts7	The indication of the permitted speed and the target speed is "160 km/h".
-	Move 100m	-	-		-	-	-
2	"STM max speed" (120 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T1 = T0+(1 00m/T rain_speed)	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed is unchanged.
3	"STM max speed" (60 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T1+0, 5s	STM Control Connection (STM(2)): Message 3: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed is unchanged.
-	Move 100m	-			-		-
4	At transition location: The continuous speed of the train is higher than 67,5km/h and the ERTMS/ETCS on-board receives a new announcement of level transition :order STM(2) to CS state	BTM	T2 = T1+(1 00m/T rain_speed)	Telegram B1 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (unconditional CS order) Time T3
-	The "STM max speed = 60" is not taken into account				TIU	5s	STM control function does not command the emergency brake.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
5	STM(2) reports state CS in due time.	PROF	T3 + 5s	STM Control Connection (STM(2)): Message 5 STM-15 State Report from STM (Cold Standby)	PROF	5s	No FA order to STM received

## STM Test Case

Test cases are only relevant for STMs that uses STM max/system speed functionality

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	STM(2) sends "STM max speed" (120 km/h) after change to HS	-	T0	"STM max speed" defined due to national rules	PROF	Ts8	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed
-	Move 100m	-	-	-	-	-	-
2	STM(2) sends "STM max speed" (60 km/h) after change to HS	-	T1 = T0+(1 00m/T rain_speed)	"STM max speed" defined due to national rules -	PROF	Ts8	STM Control Connection (STM(2)): Message 3: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed
-	Move 100m	-	-	-	-	-	-
3	STM(2) is ordered to state CS and reports in due time.	PROF	T2 = T1+(1 00m/T rain_speed)	STM Control Connection (STM(2)): Message 4 STM-14 State Order to STM (Unconditional Cold Standby)	PROF	10s	STM Control Connection (STM(2)): Message 5 STM-15 State Report from STM (Cold Standby)



Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	2000	2000 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC Z
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Z
L_ACKLEVELTR	15	0	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

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Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	43	Speed and distance supervision information
L_PACKET	13	COMPUTED	Packet length
Q_SCALE	2	1	1 m scale
V_PERMIT	10	160	Permitted speed 160 km/h
V_TARGET	7	32	Target speed 160 km/h
V_RELEASE	10	1023	Unknown value/Not displayed
V_INTERV	10	165	Intervention speed 165 km/h
D_TARGET	15	5000	Target distance 5 km
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 2 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM

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Message 2 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	24	STM max speed 120 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	12	STM max speed 60 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	Unconditional Cold Standby (U-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

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End Conditions	Value	Comments
STM State	STM(1): Unchanged STM(2): CS	
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
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	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	



### 3.11 Test case 5b.4

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5b.0.1.0.1.0.6
	Check of handling of the STM max speed within the ERTMS/ETCS on-board (STM Control Function) with one modification during a level transition STM to STM. ERTMS/ETCS on-board receives a transition order for ETCS Level 1 before the transition border.
ERTMS/ETCS on-board Requirements tested	Subset-035: 8.6.1.2; 10.12.1.1
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-15, STM-16, STM-43
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(2) installed on-board</li> <li>- STM(2) associated to NTC Y</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) is able to receive from a new STM in state HS during the approach of a level transition STM to STM:</p> <ul style="list-style-type: none"> <li>• STM max speed is repeatedly included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.</li> </ul> <p>The STM(2) is order to CS at end of the test case.</p> <p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p>



Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	Forward	
TIU Cab Status	Cab A 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	Display information from the STM(1) in DA	PROF	T0	DMI Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-43 Speed and distance supervision information	DMI	Ts7	The indication of the permitted speed and the target speed is "160 km/h".
-	Move 100m	-	-	-	-	-	-
2	"STM max speed" (120 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T1 = T0+(100m/Train_speed)	STM Control Connection (STM(2)): Message 2: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed is unchanged.
-	Move 100m	-	-	-	-	-	-
3	"STM max speed" (60 km/h) is received and included by the ERTMS/ETCS on-board in the computation of the MRSP as a speed restriction that shall start at the level transition border.	PROF	T2=T1+(100m/Train_speed)	STM Control Connection (STM(2)): Message 3: STM-15 State Report from STM (Hot Standby) STM-16 Transition variables STM max speed	DMI		The indication of the permitted speed is unchanged.
-	Move 100m	-	-	-	-	-	-
4	At transition location: The continuous speed of the train is higher than 67,5km/h and the ERTMS/ETCS on-board receives the announcement of level transition :order announced ETCS Level 1	BTM	T3=T2+(100m/Train_speed)	Telegram B1 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (unconditional CS order) Time T4
-	The "STM max speed = 60" is not taken into account				TIU	5s	STM control function does not command the emergency brake.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
5	STM(2) reports state CS in due time.	PROF	T4 + 5s	STM Control Connection (STM(2)): Message 5 STM-15 State Report from STM (Cold Standby)	PROF	5s	No FA order to STM received

## STM Test Case

Same messages than for TEST CASE 5b.3

Telegram-B1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	2	For Level 1
L_ACKLEVELTR	15	0	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information



Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	43	Speed and distance supervision information
L_PACKET	13	COMPUTED	Packet length
Q_SCALE	2	1	1 m scale
V_PERMIT	10	160	Permitted speed 160 km/h
V_TARGET	7	32	Target speed 160 km/h
V_RELEASE	10	1023	Unknown value/Not displayed
V_INTERV	10	165	Intervention speed 165 km/h
D_TARGET	15	5000	Target distance 5 km
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

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Message 1 (Packet STM-15, STM-43) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
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 2 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	24	STM max speed 120 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from new STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	12	STM max speed 60 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length

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Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	Unconditional Cold Standby (U-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): Unchanged STM(2): CS	
ETCS Mode	Unchanged	
ETCS Level	Unchanged	
Train State	Unchanged	
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	

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End Conditions	Value	Comments
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	

### 3.12 Test case 5c.1

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.1.0.1.1.1.0.1.0
	<p>Check the behaviour of the ERTMS/ETCS on-board and the STM at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SN (STM national) : ERTMS/ETCS on-board orders the old STM to state CS. When the ERTMS/ETCS on-board receives the CS state from the old STM, it orders the new STM to state DA and supervises the “STM max speed”. The STM follows the state transition order to state DA in due time.</p> <p>The stored ‘STM max speed’ at the border is 60km/h &lt;&lt; actual speed of 100 km/h</p>
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2, 10.3.2.2 (DA->CS, HS->DA); 10.3.2.4 (A4b, A9); 10.3.2.6; 10.3.3.6 c); 10.3.2.7 (A4b); 10.5.1.1 a); 10.12.2.1, 13.2.1.2



<b>STM requirements tested</b>	Subset-035: 9.2.1.1 (DA->CS, HS->DA); 9.2.1.2 (4b, 9); 9.3.1.4 c)
<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15, STM-16
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul> <p>Transition has been acknowledged by the driver before the transition border</p>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>Test Case is designed for testing when STM(2) in HS has all connections (DMI, TIU, BIU and JD) established and STM(1) ordered in CS state closes all the connections except STM Control Function connection..</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	train speed shall be 100 km/h
Train Data	Valid	
Active DMI channel Connection	Established	<i>ETCS Test Case</i> - 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	



Starting Conditions	Value	Comments
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 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	Initial Condition: "STM max speed" (60 km/h) is transmitted to the ERTMS/ETCS on-board Note: This message shall be sent directly before the level transition border (see Step 1).	PROF	T0	STM Control Connection: Message 1: STM-15 State Report from STM (Hot Standby), STM-16 transition variables STM max speed from STM)	-	-	-
-	Move 100m	-	-	-	-	-	-



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
2	The ERTMS/ETCS on-board receives the level transition order.	BTM	T0+(1 00m/T rain_speed)	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 2: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
-	The ERTMS/ETCS On-board updates DMI status.	-	-	-	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.
-	-	-	-	-			
-	-	-	-	-	TIU	5s	STM control function commands the Emergency brake (Check on the Train Interface)
3	STM(1) reports state CS in due time and STM(2) is ordered to state DA	PROF	T2=T1+8s	STM Control Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 5: STM-14 State Order to STM (Data Available) Time T3



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
4	<p>The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.</p> <p><i>This step is optional if the STM closes the connection on change to CS..</i></p>	PROF	T2+1s	BIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby)	-	-	-
5	The STM(1) closes any active connection but not the STM Control Function connection.	PROF	Ts2+5s	The STM(1) 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(1) to the STM control function on safety layers.
6	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T4=T3+3s	STM Control Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)	-	-	-
-	Supervision of the “STM max speed” is terminated after the STM(2) reports DA	-	-	-	TIU	-	STM control function commands the Emergency brake release (Check on the Train Interface)
-	-	-	-	-	DMI	-	indication of an emergency brake application removed



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
7	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T4+1s	BIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1) (old STM)</i>							
1	STM(1) is ordered to state CS	PROF	T0	STM Control Connection (STM(1)): Message 2: STM-5 ETCS Status Data STM-14 State Order to STM (Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby)





Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	STM(1) reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) JD Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby)
-	STM(1) closes any active connection but not the STM Control Function connection.	-	-	-	PROF	Ts20	The STM(1) 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.
<i>The following steps apply to STM(2) (new STM)</i>							
1	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function
2	STM(2) is ordered to state DA	PROF	T0+10s	STM Control Connection (STM(2)): Message 5: STM-14 State Order to STM (Data Available)	PROF	5s	STM Control Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	STM(2) reports its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(2)): Message 6: STM-15 State Report from STM (Cold Standby) JD Connection (STM(2)): Message 6: STM-15 State Report from STM (Cold Standby)

Message 1 (Packet STM-15, STM-16) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from new STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	Hot Standby (HS)
NID_PACKET	8	16	Transition variables STM max speed from STM
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	12	60 km/h
PADDING BITS	COMPUTED	NOT RELEVANT	

Telegram-B4 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version

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Telegram-B4 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2 - Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information



Message 2 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): DA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)

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End Conditions	Value	Comments
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	

### 3.13 Test case 5c.2

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.2.1.1.1.2.4
	Check the behaviour of the ERTMS/ETCS on-board and the STM at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SL (Sleeping) and the new STM follows the state transition order to state DA in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2, 10.3.2.2 (DA->CS, HS->DA); 10.3.2.4 (A4b, A9); 10.3.2.6; 10.3.2.7 (A4b), 10.5.1.1 a)



<b>STM requirements tested</b>	Subset-035: 9.2.1.1 (DA->CS, HS->DA); 9.2.1.2 (4b, 9); 9.3.1.4 c)
<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>Test Case is designed for testing when STM in HS has the connections (TIU, BIU and JD) established and STM ordered in CS state closes all the connections except STM Control Function connection.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SL	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
Train Data	Valid	
Active DMI channel Connection	Not Relevant	
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	



Starting Conditions	Value	Comments
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	The ERTMS/ETCS on-board receives the level transition order.	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data





Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
2	STM(1) reports state CS in due time and STM(2) is order to state DA	PROF	T2=T1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T3
3	The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.  <i>This step is optional if the STM closes the connection on change to CS.</i>	PROF	T2+1s	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	-	-	-
4	The STM(1) closes any active connection but not the STM Control Function connection.	PROF	Ts2+5s	The STM(1) 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(1) to the STM control function on safety layers.
5	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T4=T3+3s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	-	-	-



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T4+1s	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

### STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1) (old STM)</i>							
1	STM(1) is ordered to state CS	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	STM(1) reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)
-	STM(1) closes any active connection but not the STM Control Function connection.	-	-	-	PROF	Ts20	The STM(1) 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.
<i>The following steps apply to STM(2) (new STM)</i>							
1	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function
2	STM(2) is ordered to state DA	PROF	T0+10s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available)	PROF	5s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	STM(2) reports its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby) JD Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby)

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Uninked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border

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Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length



Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATE	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): DA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)
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	

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End Conditions	Value	Comments
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	

### 3.14 Test case 5c.3

TEST CASE HEADER	
<b>Test case identification</b>	Level Transition STM to STM
	5c.1.0.1.1.1.1.0.3.0
	Check the behaviour of the ERTMS/ETCS on-board and the STM at a first level transition border (transmitted by balise group) with no announcement of the transition (i.e. new STM in CS) to Level NTC Y and a second level transition border (transmitted by balise group) with no announcement of the transition (i.e. new STM in CS) back to Level NTC X. The ERTMS/ETCS on-board is in the ETCS technical mode SN (STM national) and the STM follows the state transition order in due time.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035: 8.7.1.2; 10.2.1.2 a); 10.2.1.3; 10.3.2.2 (DA->CS, CS->DA); 10.3.2.4 (A4b, A9); 10.3.2.6; 10.3.2.7 (A4b), 10.5.1.1 a); 13.2.1.2
<b>STM requirements tested</b>	Subset-035: 9.2.1.1 (DA->CS, CS->DA); 9.2.1.2 (4b, 9); 9.3.1.4 c)
<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X and mapped to NTC Y by the look-up table (lower priority)</li> <li>- STM(2) is mapped to NTC X and NTC Y by the look-up table (higher priority)</li> </ul>
<b>Comments and constraints</b>	<p>With this kind of ERTMS/ETCS on-board configuration this TC covers both test of:</p> <ul style="list-style-type: none"> <li>- the association "freezing" (STM(1) remains in DA despite STM(2) is available &amp; mapped to the current Level NTC X with an higher priority)</li> <li>- and the association "de-freezing" (STM(1) is not associated again to Level NTC Y or Level NTC X at the level transitions)</li> </ul>





	<p>STMs involved:</p> <p>STM(1): STM in DA at start of test case for active level at start of transition</p> <p>STM(2): STM in CS at start of test case</p> <p>Test Case is designed for testing when STM(2) in CS has all connections (DMI, TIU, BIU and JD) established and STM(1) ordered in CS state closes all the connections except STM Control Function connection.</p> <p>To have at the beginning of the TC STM(1) in DA and STM(2) in CS in Level NTC X despite STM(2) handles NTC X with an higher priority, STM(2) should not be available (e.g. by having a non-final disconnection with STM(2)) when the level NTC X is selected after a first Start of Mission done in another level.</p>
--	---

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
Train Data	Valid	
Active DMI channel Connection	Established	<i>ETCS Test Case</i> - 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	



Starting Conditions	Value	Comments
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A 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 level transition order to Level NTC Y.	BTM	T0	Telegram-B4_1 (41 Level Transition Order) Telegram-B2_1	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2) and STM(3)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
-	The ERTMS/ETCS On-board updates DMI status.	-	-	-	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	STM(1) reports state CS in due time and STM(2) is ordered to state DA	PROF	T2=T1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T3



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	<p>The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.</p> <p><i>This step is optional if the STM closes the connection on change to CS.</i></p>	PROF	T2+1s	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	-	-	-
4	The STM(1) closes any active connection but not the STM Control Function connection.	PROF	Ts2+5s	The STM(1) 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(1) to the STM control function on safety layers.
5	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T4=T3+4s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T4+1s	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)
7	The ERTMS/ETCS on-board receives the level transition order to Level NTC X.	BTM	T4+30s	Telegram-B4_2 (41 Level Transition Order) Telegram-B2_2	PROF	5s	STM Control Connection (STM(1)): Message 6: STM-5 ETCS Status Data
-	-	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 7: STM-5 ETCS Status Data

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1) (old STM)</i>							



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	STM(1) is ordered to state C-CS	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) Time T1
-	STM(1) reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)
-	STM(1) closes any active connection but not the STM Control Function connection.	-	-	-	PROF	Ts20	The STM(1) 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.
2	The ERTMS/ETCS on-board sends new ETCS level to STM(1)	PROF	T1+30s	STM Control Connection (STM(1)): Message 6: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function
The following steps apply to STM(2) (new STM)							



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function
2	STM(2) is ordered to state DA	PROF	T+10s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available)	PROF	5s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)
-	STM(2) reports its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby) JD Connection (STM(2)): Message 5: STM-15 State Report from STM (Cold Standby)
3	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0+40s	STM Control Connection (STM(2)): Message 7: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function

Telegram-B4_1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise

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Telegram-B4_1 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2_1: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information



Telegram-B4_2 - Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	0	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2_2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

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Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM 1
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC X)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 7 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length

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Message 7 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC X)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): DA	
ETCS Mode	Unchanged	
ETCS Level	NTC X	Level NTC X is associated to STM(2)(new STM)
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)
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	

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End Conditions	Value	Comments
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	

### 3.15 Test case 5c.4

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.2.1.1.1.0.2.3
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SL (Sleeping) and the STM does not follow the state transition order to state DA in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2; 10.3.2.2 (DA->CS, HS->FA); 10.3.2.4 (A4b, D16); 10.3.2.6; 10.3.2.7 (A4b), 10.5.1.1 a)
STM requirements tested	Subset-035: 9.2.1.1 (DA->CS); 9.2.1.2 (4b); 9.3.1.4 c)
Packets transmitted via FFFIS STM	STM-5, STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul>
Comments and constraints	STMs involved: STM(1): old STM (in DA at start of test case) for active level at start of transition



STM(2): new STM (in HS at start of test case) for announced level

Test Case is designed for testing when STM(2) in HS has all connections (DMI, TIU, BIU and JD) established and STM(1) ordered in CS state all the connections are kept open.

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SL	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
Train Data	Not Relevant	
Active DMI channel Connection	Not Relevant	
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	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	

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Starting Conditions	Value	Comments
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 level transition order.	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 state order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
2	STM(1) reports state CS in due time and report its new state to any connected ERTMS/ETCS on-board function .	PROF	T2=T 1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 state order to STM (Data Available) Time T3
3	The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	PROF	T2+1s	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	-	-	-
5	The STM(1) does not close any active connection.	PROF	Ts2+5s	-	PROF	10s	idle messages are still issued on all connections on safety layers.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	The ERTMS/ETCS on-board orders the STM(2) to go in FA state because STM(2) does not report state DA in due time.		T3		PROF	5s+Ts23	STM Control Connection (STM(2)): Message 5: STM-14 state order to STM (Failure)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1) (old STM)</i>							
1	STM(1) is ordered to state CS	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)
-	STM(1) reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)
<i>Steps for STM(2) not applicable because is a degraded behaviour</i>							



Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

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Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM 1
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): FA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	
Other DMI channels Connections	Not Relevant	
TIU Connection	Unchanged	STM(1)
	Not Established	STM(2)
BIU Connection	Unchanged	STM(1)
	Not Established	STM(2)
JD Connection	Unchanged	STM(1)
	Not Established	STM(2)
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	

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End Conditions	Value	Comments
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	

### 3.16 Test case 5c.5

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.1.0.1.1.1.1.0.2.1.0.0
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SN (STM National) and the STM(2) does not follow the state transition order to state DA in due time. Check the behaviour of the STM(1), when ERTMS/ETCS on-board in the ETCS technical mode SN (STM National) orders the STM with a C-CS from DA to CS and STM(1) follows the order in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2; 10.3.2.2 (DA->CS, HS->DA, HS->FA); 10.3.2.4 (A4b, A9, D16); 10.3.2.6; 10.3.2.7 (A4b); 10.3.3.4; 10.3.3.8; 10.5.1.1 a); 10.14.1.1; 13.2.1.2



<b>STM requirements tested</b>	Subset-035: 9.2.1.1 (DA->CS); 9.2.1.2 (4b); 9.3.1.4 c)
<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>Test Case is designed for testing when STM(2) in HS has all connections (DMI, TIU, BIU and JD) established and STM(1) ordered in CS state closes all the connections except STM Control Function connection.</p> <p>Hint for Step 6: The information 'STM failed' will hide the Information 'STM not available' as long as it is not acknowledged.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	



Starting Conditions	Value	Comments
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 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
	Initial Condition: "STM max speed" not sent by the STM in HS or with speed lower than current transmitted speed.						
1	The ERTMS/ETCS on-board receives the level transition order.	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
-	The ERTMS/ETCS On-board updates DMI status.	-	-	-	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	STM(1) reports state CS in due time and report its new state to any connected ERTMS/ETCS on-board function .	PROF	T2=T1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-14 State Order to STM (Data Available) Time T3
3	The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.  <i>This step is optional if the STM closes the connection on change to CS.</i>	PROF	T2+1s	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	-	-	-
4	The STM(1) closes any active connection but not the STM Control Function connection.	PROF	Ts2+5s	The STM(1) 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(1) to the STM control function on safety layers.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
5	The ERTMS/ETCS on-board orders the STM(2) to go in FA state because STM(2) does not report state DA in due time.		T3		PROF	5s+Ts23	STM Control Connection (STM(2)): Message 4: STM-14 state order to STM (Failure)
-	Information "NTC failed" for the STM(2) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	5s+Ts24	indication to the driver about the failed STM(2)
-	-	-	-	-	TIU	5s	STM control function commands the Emergency brake (Check on the Train Interface)
6	Information "NTC not available" for the STM(2) is shown, if the information about the failed STM is acknowledged by the driver.	DMI	T3+10s	ACK by the driver	DMI	Ts22	indication to the driver about the unavailable STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1) (old STM)</i>							
1	STM(1) is ordered to state C-CS	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	STM(1) reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)
-	STM(1) closes any active connection but not the STM Control Function connection.	-	-	-	PROF	Ts20	The STM(1) 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.
<i>Steps for STM(2) not applicable because is a degraded behaviour</i>							

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group





Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)



Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM(1)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): FA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
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	



End Conditions	Value	Comments
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	

### 3.17 Test case 5c.6

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.1.0.1.1.2.2.0.4
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SN, the old STM does not follow the state transition order to state CS in due time and the new STM follows the state transition order to state DA in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.3.2.2 (DA->FA, HS->DA); 10.3.2.4 (E16, A9); 10.3.2.6; 10.5.1.1 a); 10.14.1.1, 13.2.1.2
STM requirements tested	Subset-035: 9.2.1.1 (HS->DA); 9.2.1.2 (9); 9.3.1.4 c)
Packets transmitted via	STM-5, STM-14, STM-15

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<b>FFFIS STM</b>	
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul>
<b>Comments and constraints</b>	STMs involved: STM(1): old STM (in DA at start of test case) for active level at start of transition, STM(2): new STM (in HS at start of test case) for announced level

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	



Starting Conditions	Value	Comments
TIU Cab Status	Cab A 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
	Initial Condition: "STM max speed" not sent by the STM in HS or with speed lower than current transmitted speed.						
1	The ERTMS/ETCS on-board receives the level transition order.	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 2: STM-5 ETCS Status Data
2	STM(1) does not report state CS in due time	PROF	T1		PROF	10s+Ts1 5	STM Control Connection (STM(1)): Message 3: STM-14 State Order to STM (Failure)
-	Information "NTC failed" for the STM(1) is displayed by the ETCS/ERTMS on-board.  The ERTMS/ETCS On-board updates DMI status.	-	-	-	DMI	10s+Ts1 6	indication to the driver about the failed STM(1)  All STM objects (including buttons, indicators, text messages, supervision information and sounds) previously displayed should be deleted and new technical mode and level displayed.

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Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
	The ERTMS/ETCS on-board orders the STM(2) to go in DA state	-	-	-	PROF	10s+Ts5	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T2
3	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T3=T2+4s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	-	-	-
4	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T3+1s	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>Steps for STM(1) not applicable because is a degraded behaviour</i>							
<i>The following steps apply to STM(2) (new STM)</i>							
1	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0	STM Control Connection (STM(2)): Message 2: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function
2	STM(2) is ordered to state DA	PROF	T0+1 0s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available)	PROF	5s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)
-	STM(2) reports its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise





Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises 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	0	Uninked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information



Message 1 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): FA STM(2): DA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)

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End Conditions	Value	Comments
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	

### 3.18 Test case 5c.7

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.1.0.1.2.1.2.1.1.0.1.0
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SN and the old STM is in trip mode. The old STM sends 1 trip message after conditional order to CS and the new STM follows the DA order in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.3.2.2 (DA->CS, HS->DA); 10.3.2.4 (A4b, A9); 10.3.2.6; 10.3.2.7 (A4b); 10.3.3.3; 10.5.1.1 a); 10.12.2.1; 10.13.1.1; 13.2.1.2



<b>STM requirements tested</b>	Subset-035: None
<b>Packets Transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15, STM-18, STM-32, STM-35, STM-38, STM-128
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) associated to NTC Y.</li> <li>- Unified DMI (no configuration)</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS all the connections are kept open.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	



Starting Conditions	Value	Comments
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 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
-	Initial Condition: "National Trip Procedure" starts at the transition border						
1	The ERTMS/ETCS on-board receives the level transition order.	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 2: STM-5 ETCS Status Data
2	National Trip Procedure reported by the old STM	PROF	T2=T 1+9s	STM Control Connection (STM(1)): Message 3: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure			
3	The STM issues a "Emergency brake" command to apply the Emergency Brake	PROF	T2	Connection (STM(1)): Message 4: STM-15 State Report from STM (Data Available) STM-128 brake command to brake	TIU	-	Brakes applied by ERTMS/ETCS on-board as commanded by STM.
4	STM requests the ERTMS/ETCS On-board DMI function to display buttons, indicators, text message.	PROF	T2+1s	DMI Connection (STM(1)): Message 5: STM-15 State Report from STM (Data Available) STM-32 button request, STM-35 indicator request, STM-38 text message	DMI	-	Button, indicator and text message from STM displayed
5	STM(1) reports state CS in due time and report its new state to any connected ERTMS/ETCS on-board function .	PROF	T2+9s	STM Control Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby)	TIU		STM control function commands the Emergency brake release (Check on the Train Interface)
					DMI	-	Button, indicator and text message from STM removed from DMI.  Brake application no more indicated on DMI.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	PROF	T2+10s	BIU Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby)	-	-	-
7	The ERTMS/ETCS on-board orders the STM(2) to go in DA state				PROF	5s	STM Control Connection (STM(2)): Message 7: STM-14 State Order to STM (Data Available) Time T3
8	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T4=T3+3s	STM Control Connection (STM(2)): Message 8: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function





Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
9	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T4+1s	BIU Connection (STM(2)): Message 8: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 8: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 8: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 8: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case

Test case not relevant for testing STM.

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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

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Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_LINK	1	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC



Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-15, STM-18) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	packet length
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-15, STM-128) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length

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Message 4 (Packet STM-15, STM-128) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	128	Brake Command from STM (STM-128)
L_PACKET	13	COMPUTED	packet length
M_BIEB_CMD	2	01b	Command to apply EB
M_BISB_CMD	2	01b	Command to apply SB
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15, STM-32, STM-35, STM-38): STM → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	32	Button Request
L_PACKET	13	COMPUTED	packet length
N_ITER	7	1	request for 1 button
NID_BUTTON(1)	8	1	
NID_BUTPOS(1)	5	1	
NID_ICON(1)	8	0	
M_BUT_ATTRIB(1)	10	1000000001b	white text on black background, not flashing
L_CAPTION(1)	7	2	
X_CAPTION(1,1)	8	'G'	
X_CAPTION(1,2)	8	'O'	
NID_PACKET	8	35	Indicator Request
L_PACKET	13	COMPUTED	packet length
N_ITER	7	1	request for 1 indicator
NID_INDICATOR(1)	8	1	
NID_INDPOS(1)	7	1	
NID_ICON(1)	8	0	
M_IND_ATTRIB(1)	10	1001001000b	black text on white background, slow flashing
L_CAPTION(1)	7	4	

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Message 5 (Packet STM-15, STM-32, STM-35, STM-38): STM → ETCS

VARIABLE	Length	VALUE	COMMENTS
X_CAPTION(1,1)	8	'T'	
X_CAPTION(1,2)	8	'R'	
X_CAPTION(1,3)	8	'I'	
X_CAPTION(1,4)	8	'P'	
NID_PACKET	8	38	Text Message
L_PACKET	13	COMPUTED	packet length
NID_XMESSAGE	8	2	
M_XATTRIBUTE	10	1000000001b	white text on black background, not flashing
Q_ACK	1	0	No acknowledgement required
L_TEXT	8	9	
X_TEXT(1)	8	'A'	
X_TEXT(2)	8	'c'	
X_TEXT(3)	8	'k'	
X_TEXT(4)	8	'"	
X_TEXT(5)	8	'T'	
X_TEXT(6)	8	'R'	
X_TEXT(7)	8	'I'	
X_TEXT(8)	8	'P'	
X_TEXT(9)	8	'I'	
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-15): STM → ETCS

VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 7 (Packet STM-5, STM-14) ETCS → STM

VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)

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Message 7 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 8 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): DA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Unchanged	
Other DMI channels Connections	Not Relevant	
TIU Connection	Unchanged	
BIU Connection	Unchanged	
JD Connection	Unchanged	

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End Conditions	Value	Comments
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	

### 3.19 Test case 5c.8

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.1.0.1.2.1.1.2.1.1.0.2.1.0.0
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SN and the old STM is in trip mode. The old STM sends 1 trip message before and 2 trip messages after conditional order to CS and the new STM does not follow the DA order in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.3.2.2 (DA->CS, HS->DA, HS->FA); 10.3.2.4 (A4b, A9, D16); 10.3.2.6; 10.3.2.7 (A4b); 10.3.3.3; 10.3.3.4; 10.3.3.8; 10.5.1.1 a); 10.13.1.1; 10.14.1.1; 13.2.1.2



<b>STM requirements tested</b>	Subset-035: None
<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15, STM-18, STM-32, STM-35, STM-38, STM-128
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) associated to NTC Y</li> <li>- Unified DMI (no configuration)</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS all the connections are kept open.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	





Starting Conditions	Value	Comments
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 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	National Trip Procedure reported by the old STM	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure			
2	The ERTMS/ETCS on-board passes the transition border and receives the level transition order.	BTM	T1=T0+5s	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 2: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
-	-	-	-	-	TIU		STM control function commands the Emergency brake (Check on the Train Interface)
3	National Trip Procedure reported by the old STM	PROF	T2=T 1+4s	STM Control Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure			
4	The STM issues a "Emergency brake" command to apply the Emergency Brake (Emergency brake is already applied by the ERTMS/ETCS on-board)	PROF	T2	BIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Data Available) STM-128 brake command to brake			
5	National Trip Procedure reported by the old STM	PROF	T3=T 2+9s	STM Control Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure			
6	STM requests the ERTMS/ETCS On-board DMI function to display buttons, indicators, text message.	PROF	T3	DMI Connection (STM(1)): Message 5: STM-15 State Report from STM (Data Available) STM-32 button request, STM-35 indicator request, STM-38 text message	DMI		Button, indicator and text message from STM displayed



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
7	STM-1 reports state CS in due time and report its new state to any connected ERTMS/ETCS on-board function . The ERTMS/ETCS on-board orders the STM(2) to go in DA state	PROF	T3+9s	STM Control Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 7: STM-14 State Order to STM (Data Available) Time T4
					TIU		STM control function commands the Emergency brake release (Check on the Train Interface)
					DMI	-	Button, indicator and text message from STM removed from DMI.  Brake application no more indicated on DMI.
8	The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	PROF	T3+10s	BIU Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 6: STM-15 State Report from STM (Cold Standby)	-	-	-
9	The ERTMS/ETCS on-board orders the STM(2) to go in FA state because STM(2) does not report state DA in due time.		T4		PROF	5s+Ts23	STM Control Connection (STM(2)): Message 8: STM-14 State Order to STM (Failure)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
	Information "NTC failed" for the STM(2) is displayed by the ETCS/ERTMS on-board.				DMI	5s+Ts24	indication to the driver about the failed STM(2)
					TIU		ERTMS/ETCS on-board commands the Emergency Brake
10	Information "NTC not available" for the STM(2) is shown, if the information about the failed STM is acknowledged by the driver.	DMI	T4+10s	ACK by the driver	DMI	Ts22	indication to the driver about the unavailable STM(2)

## STM Test Case

Test case not relevant for testing STM.

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
M_LEVELTR	3	1	Level NTC, specified by NID_NTC Y

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Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Y
L_ACKLEVELTR	15	0	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

Message 1 (Packet STM-15, STM-18) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	packet length
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)

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Message 2 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-15, STM-128) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-1)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	128	Brake Command from STM (STM-128)
L_PACKET	13	COMPUTED	packet length
M_BIEB_CMD	2	01b	Command to apply EB
M_BISB_CMD	2	01b	Command to apply SB



Message 4 (Packet STM-15, STM-128) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (STM-15, STM-32, STM-35, STM-38): STM → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	32	Button Request
L_PACKET	13	COMPUTED	packet length
N_ITER	7	1	request for 1 button
NID_BUTTON(1)	8	1	
NID_BUTPOS(1)	5	1	
NID_ICON(1)	8	0	
M_BUT_ATTRIB(1)	10	100000001b	white text on black background, not flashing
L_CAPTION(1)	7	2	
X_CAPTION(1,1)	8	'G'	
X_CAPTION(1,2)	8	'O'	
NID_PACKET	8	35	Indicator Request
L_PACKET	13	COMPUTED	packet length
N_ITER	7	1	request for 1 indicator
NID_INDICATOR(1)	8	1	
NID_INDPOS(1)	7	1	
NID_ICON(1)	8	0	
M_IND_ATTRIB(1)	10	1001001000b	black text on white background, slow flashing
L_CAPTION(1)	7	4	
X_CAPTION(1,1)	8	'T'	
X_CAPTION(1,2)	8	'R'	
X_CAPTION(1,3)	8	'I'	
X_CAPTION(1,4)	8	'P'	
NID_PACKET	8	38	Text Message
L_PACKET	13	COMPUTED	packet length
NID_XMESSAGE	8	2	

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Message 5 (STM-15, STM-32, STM-35, STM-38): STM → ETCS			
VARIABLE	Length	VALUE	COMMENTS
M_XATTRIBUTE	10	1000000001b	white text on black background, not flashing
Q_ACK	1	0	No acknowledgement required
L_TEXT	8	9	
X_TEXT(1)	8	'A'	
X_TEXT(2)	8	'c'	
X_TEXT(3)	8	'k'	
X_TEXT(4)	8	"	
X_TEXT(5)	8	'T'	
X_TEXT(6)	8	'R'	
X_TEXT(7)	8	'I'	
X_TEXT(8)	8	'P'	
X_TEXT(9)	8	'I'	
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 7 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	





Message 8 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): FA	
ETCS Mode	NTC Y	Level NTC Y is associated to STM(2)(new STM)
ETCS Level	Unchanged	
Train State	Standstill	
Train Data	Unchanged	
Active DMI channel Connection	Unchanged	STM(1)
	Not Established	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Unchanged	STM(1)
	Not Established	STM(2)
BIU Connection	Unchanged	STM(1)
	Not Established	STM(2)
JD Connection	Unchanged	STM(1)
	Not Established	STM(2)
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	



End Conditions	Value	Comments
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	

### 3.20 Test case 5c.9

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.1.0.1.2.3.2.0.1.0
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SN. The STM sends 1 trip message but no further message after conditional order to CS.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.3.2.2 (DA->FA, CS->DA); 10.3.2.4 (F16, A9); 10.3.2.6; 10.3.3.3; 10.3.3.6 c); 10.5.1.1 a); 10.13.1.1; 10.14.1.1, 13.2.1.2
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-5, STM-14, STM-15, STM-18
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul>



<b>Comments and constraints</b>	<p>Odometer speed shall be 36 km/h.</p> <p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS all the connections are kept open.</p>
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Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
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	



Starting Conditions	Value	Comments
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A 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	National Trip Procedure reported by the old STM	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure			
2	The ERTMS/ETCS on-board passes the transition border and receives the level transition order.	BTM	T1=T0+5s	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 2: STM-5 ETCS Status Data STM-14 state order to STM (Conditional Cold Standby)
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
-	-	-	-	-	TIU		STM control function commands the Emergency brake (Check on the Train Interface)
3	STM(1) does neither report state CS nor National Trip Procedure in due time.		T1		PROF	10s+Ts1 5	STM Control Connection (STM(1)): Message 4: STM-14 state order to STM (Failure)



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.	-	-	-	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.
-	Information "NTC failed" for the STM(1) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	10s+Ts16	indication to the driver about the failed STM(1)
-	The ERTMS/ETCS on-board orders the STM(2) to go in DA state	-	-	-	PROF	10s+Ts5	STM Control Connection (STM(2)): Message 5: STM-14 state order to STM (Data Available) Time T2
4	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T2+4s	STM Control Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order shall be send to STM
5	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T2+5s	BIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)
6	Brakes applied and train reaches standstill	TIU	T1+20s		ODO	10s	Train reaches standstill (Deceleration 0.5 m/s2)

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Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
					TIU	10s	STM control function commands the Emergency brake release (Check on the Train Interface)

## STM Test Case

Steps for STM(1) not applicable because is a degraded behaviour and steps for STM(1) not relevant for testing STM.

Message 1 (Packet STM-15, STM-18) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_NTC	8	FINITE VALUE	NID_NTC of the old STM
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	packet length
PADDING BITS	COMPUTED	NOT RELEVANT	

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order



Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message 2 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)



Message 2 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

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Message 6 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): FA STM(2): DA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Standstill	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)
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	

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End Conditions	Value	Comments
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	

### 3.21 Test case 5c.10

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.2.2
	Check the behaviour of the ERTMS/ETCS on-board and the STM at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode SL (Sleeping) and the active STM is associated to the new ETCS Level NTC Y.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.5.1.1 a)
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-5
ERTMS/ETCS on-board	- STM(1) is associated to NTC X and NTC Y



<b>configuration</b>	- STM(2) is mapped to NTC Y by the look-up table (lower priority)
<b>Comments and constraints</b>	STMs involved: STM(1): old STM (in DA at start of test case) for active level at start of transition STM(2): new STM (in CS at start of test case) for announced level

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	Level NTC X and Level NTC Y is associated to STM(1)
ETCS Mode	SL	
ETCS Level	NTC X	
Train State	Moving	
Train Data	Not Relevant	
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	Neutral	



Starting Conditions	Value	Comments
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	The ERTMS/ETCS on-board receives the level transition order and sends new ETCS level to STM(1).	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 1: STM-5 ETCS Status Data
-	The ERTMS/ETCS on-board does not send a state order to STM(1) nor STM(2).	-	-	-	PROF	10s	State order is neither send to STM(1) nor STM(2).

### STM Test Case

Not applicable.

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise

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Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises 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	0	Uninked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information



Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(1)(old STM)
Train State	Unchanged	
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	

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End Conditions	Value	Comments
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	

### 3.22 Test case 5c.11

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5c.2.1.1.1.1.0.2.2.0.0
	Check the behaviour of the ERTMS/ETCS on-board at a level transition border (announced by balise group), when the ERTMS/ETCS on-board is in the ETCS technical mode NL (Non Leading) and the STM(2) does not follow the state transition order to state DA in due time. Check the behaviour of the STM(1), when ERTMS/ETCS on-board in the ETCS technical mode LN (Non Leading) orders the STM with a C-CS from DA to CS and STM(1) follows the order in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2; 10.3.2.2 (DA->CS, HS->DA, HS->FA); 10.3.2.4 (A4b, A9, D16); 10.3.2.6; 10.3.2.7 (A4b); 10.3.3.8; 10.5.1.1 a); 10.14.1.1; 13.2.1.2
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-5, STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(1) is associated to NTC X</li> <li>- STM(2) is associated to NTC Y</li> </ul>
Comments and	



<b>constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in HS at start of test case) for announced level</p> <p>Test Case is designed for testing when STM(2) in HS has all connections (DMI, TIU, BIU and JD) established and STM(1) ordered in CS state closes all the connections except the STM Control Function connection.</p>
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Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): HS	
ETCS Mode	NL	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Moving	
Train Data	Not Relevant	
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 active	
BIU Emergency Brake Command	Not Relevant	





Starting Conditions	Value	Comments
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 level transition order.	BTM	T0	Telegram-B4 (41 Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
2	STM(1) reports state CS in due time and report its new state to any connected ERTMS/ETCS on-board function .	PROF	T2=T1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-14 State Order to STM (Data Available) Time T3
-	The ERTMS/ETCS On-board updates DMI status.	-	-	-	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.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	<p>The STM(1) shall report its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.</p> <p><i>This step is optional if the STM closes the connection on change to CS.</i></p>	PROF	T2+1s	BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	-	-	-
4	The STM(1) closes any active connection but not the STM Control Function connection.	PROF	Ts2+5s	The STM(1) 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(1) to the STM control function on safety layers.
5	The ERTMS/ETCS on-board orders the STM(2) to go in FA state because STM(2) does not report state DA in due time.		T3		PROF	5s+Ts23	STM Control Connection (STM(2)): Message 4: STM-14 state order to STM (Failure)
-	Information "NTC failed" for the STM(2) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	5s+Ts24	indication to the driver about the failed STM(2)
-	-	-	-	-	TIU	5s	ERTMS/ETCS on-board does not apply Emergency Brake though STM(2) is not available because ETCS mode is NL.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	Information "NTC not available" for the STM(2) is shown, if the information about the failed STM is acknowledged by the driver.	DMI	T3+1 0s	ACK by the driver	DMI	Ts22	indication to the driver about the unavailable STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>Steps for STM(1) are the same as in TC 5c.3</i>							
<i>Steps for STM(2) not applicable because is a degraded behaviour</i>							

Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	Nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	now (the level transition is performed upon receipt of the order)

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Telegram-B4- Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
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	acknowledgement area starts at the level transition border
N_ITER	5	0	no mixed level area
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	uplink
M_VERSION	7	0100000b	SRS version
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises 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	0	Unlinked
NID_PACKET	8	1111111b	Packet 255 – End of information

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	11	NL (Non Leading)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM(1)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	11	NL (Non Leading)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM

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Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): FA	
ETCS Mode	Unchanged	
ETCS Level	NTC Y	Level NTC Y is associated to STM(2)(new STM)
Train State	Unchanged	
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	Unchanged	
TIU Cab Status	Unchanged	
BIU Emergency Brake Command	Not Relevant	
BIU Service Brake Command	Not Relevant	
BIU Emergency Brake Status	Not Relevant	

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End Conditions	Value	Comments
BIU Service Brake Status	Not Relevant	
NTC isolation status	Unchanged	



### 3.23 Test case 5d.1

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5d.0.1.1.1.0.1
	Check the behaviour of the ERTMS/ETCS on-board and the STM, when the driver manually selects a level transition from NTC X to NTC Y on the DMI. The ERTMS/ETCS on-board orders the STM(1) from DA to CS state and STM(2) in from CS to DA state. Both STMs reports the new state in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2; 10.2.1.2 c); 10.3.2.2 (DA->CS, CS->DA); 10.3.2.4 (B4b, A9); 10.3.2.6; 10.3.2.7 (B4b); 10.5.1.1 a); 13.2.1.2
STM requirements tested	Subset-035: 9.2.1.1 (DA->CS, CS->DA); 9.2.1.2 (4b, 9); 9.3.1.4 c)
Packets transmitted via FFFIS STM	STM-5; STM-14, STM-15,
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
Comments and constraints	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in CS at start of test case) for announced level</p> <p>The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS closes all the connections except STM Control Function connection. The STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Function connection. or keep all connections active.</p>





Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Standstill	
Train Data	Valid	
Active DMI channel Connection	Established	applies to both STMs
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	applies to both STMs
BIU Connection	Established	applies to both STMs
JD Connection	Established	applies to both STMs
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 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 driver changes the level on DMI and the ERTMS/ETCS on-board orders the active STM(1) to C-CS state	PROF	T0	Driver manually selects Level NTC Y on DMI	PROF	Ts13	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
2	STM(1) report state CS in due time and the ERTMS/ETCS on-board orders the STM(2) to go in DA state	PROF	T1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T2
-	The ERTMS/ETCS on-board updates DMI status	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	STM(1) reports it new state CS to any connected ERTMS/ETCS on-board function	PROF	T3=T1+6s	BIU Connection: Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection: Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection: Message 2: STM-15 State Report from STM (Cold Standby) JD connection: Message 2: STM-15 State Report from STM (Cold Standby)	-		-
4	The ERTMS/ETCS on-board receives STM(1) request to close any active connection but not the STM Control Function connection	PROF	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
5	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T2+3s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order shall be send to STM



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T2+4s	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1)</i>							
1	STM(1) is ordered to state CS.	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 state order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 2 STM-15 State Report from STM (Cold Standby)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	<p>The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.</p> <p><i>This step is optional if the STM closes the connection on change to CS.</i></p>	-	-	-	PROF	Ts19	<p>BIU Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)</p> <p>TIU Connection(STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)</p> <p>DMI Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)</p> <p>JD Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)</p>
-	<p>The STM closes any active connection but not the STM Control Function connection.</p> <p><i>This step is optional because the STM can keep active all the connections</i></p>	-	-	-	PROF	Ts20	<p>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.</p>
The following steps apply to STM(2)							
1	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function
2	STM(2) is ordered to state DA and reports in time.	PROF	T0+10s	STM Control Connection (STM(2)): Message 4: STM-14 state order to STM (Data Available)	PROF	5s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	STM(2) reports its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.	-	-	-	PROF	Ts19	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM

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Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): DA	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(2) is associated to NTC Y
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)
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	

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End Conditions	Value	Comments
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	

### 3.24 Test case 5d.2

TEST CASE HEADER	
<b>Test case identification</b>	Level Transition STM to STM
	5d.0.1.1.1.0.2.0.0
	Check the behaviour of the ERTMS/ETCS on-board and the STM, when the driver manually selects a level transition from NTC X to NTC Y on the DMI. The ERTMS/ETCS on-board orders the STM(1) from DA to CS state and STM(2) from CS to DA state. STM(1) reports the new state in due time but STM(2) doesn't.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035: 8.7.1.2; 10.2.1.2 c); 10.3.2.2 (DA->CS, CS->DA; CS->FA); 10.3.2.4 (B4b, A9, D16); 10.3.2.6; 10.3.2.7 (B4b); 10.3.3.4; 10.3.3.8; 10.5.1.1 a); 10.14.1.1, 13.2.1.2
<b>STM requirements tested</b>	Subset-035: 9.2.1.1 (DA->CS); 9.2.1.2 (4b); 9.3.1.4 c)
<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14, STM-15,
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
<b>Comments and constraints</b>	STMs involved: STM(1): old STM (in DA at start of test case) for active level at start of transition



STM(2): new STM (in CS at start of test case)

The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS closes all the connections except STM Control Function connection.. The STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Function connection or keep all connections active.

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Standstill	
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 active	
BIU Emergency Brake Command	Not Relevant	



Starting Conditions	Value	Comments
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 driver changes the level on DMI and the ERTMS/ETCS on-board orders the active STM(1) to C-CS state	PROF	T0	Driver manually selects Level NTC Y on DMI	PROF	Ts13	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data
2	STM(1) report state CS in due time and the ERTMS/ETCS on-board orders the STM(2) to go in DA state	PROF	T2=T1+8s	STM Control Connection (STM(1)): Message 2: STM-15 State Report from STM (Cold Standby)	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T3
-	The ERTMS/ETCS on-board updates DMI status	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	STM(1) reports it new state CS to any connected ERTMS/ETCS on-board function	PROF	T2+1s	BIU Connection: Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection: Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection: Message 2: STM-15 State Report from STM (Cold Standby) JD connection: Message 2: STM-15 State Report from STM (Cold Standby)	-		-
4	The ERTMS/ETCS on-board receives STM request to close any active connection but not the STM Control Function connection	PROF	T2+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
5	STM(2) doesn't report state DA in due time and is ordered to FA state.	PROF	T3	-	PROF	5+Ts23	STM Control Connection (STM(2)): Message 5: STM-14 State Order to STM (Failure)
-	Information "NTC failed" for the STM(2) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	5s+Ts24	indication to the driver about the failed STM(2)
		-	-	-	TIU	5s	STM control function commands the Emergency brake (Check on the Train Interface)
6	Information "NTC not available" for the STM(2) is shown, if the information about the failed STM is acknowledged by the driver.	DMI	T3+10s	ACK by the driver	DMI	Ts22	indication to the driver about the unavailable STM(2)



## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1)</i>							
1	STM(1) is ordered to state CS.	PROF	T0	STM Control Connection (STM(1)): Message 1 STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(3)): Message 2 STM-15 State Report from STM (Cold Standby)
-	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 if the STM closes the connection on change to CS.	-	-		PROF	Ts19	BIU Connection: Message 2: STM-15 State Report from STM (Cold Standby) TIU Connection: Message 2: STM-15 State Report from STM (Cold Standby) DMI Connection: Message 2: STM-15 State Report from STM (Cold Standby) JD Connection: Message 2: STM-15 State Report from STM (Cold Standby)
-	The STM closes any active connection but not the STM Control Function connection.  <i>This step is optional because the STM can keep active all the connections</i>	-	-	-	PROF	Ts20	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.
<i>The following steps apply to STM(2)</i>							



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
1	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	PROF	T0	STM Control Connection (STM(2)): Message 3: STM-5 ETCS Status Data	PROF	5s	No FA state report sent to STM control function

*The further steps for STM(2) not applicable because degraded situation*

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)

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Message 3 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): FA	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(2) is associated to NTC Y
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)

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End Conditions	Value	Comments
	Not Relevant	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Not Relevant	STM(2)
BIU Connection	Not Established	STM(1)
	Not Relevant	STM(2)
JD Connection	Not Established	STM(1)
	Not Relevant	STM(2)
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	





### 3.25 Test case 5d.3

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5d.0.1.1.2.0.1
	Check the behaviour of the ERTMS/ETCS on-board, when the driver manually selects a level transition from NTC X to NTC Y on the DMI. The ERTMS/ETCS on-board orders the STM(1) in from DA to CS state and STM(2) from CS to DA state. STM(2) does report the new state in due time but STM(1) doesn't and also does not sends a message for an active National Trip Procedure.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 c); 10.3.2.2 (DA->CS, DA->FA, CS->DA); 10.3.2.4 (A9, E16, B4b); 10.3.2.6; 10.3.2.7 (B4b); 10.5.1.1 a); 10.14.1.1; 13.2.1.2
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-5, STM-14, STM-15,
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
Comments and constraints	STMs involved: STM(1): old STM (in DA at start of test case) for active level at start of transition STM(2): new STM (in CS at start of test case)

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	

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Starting Conditions	Value	Comments
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Standstill	
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 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 driver changes the level on DMI and the ERTMS/ETCS on-board orders the active STM(1) to C-CS state	PROF	T0	Driver manually selects Level NTC Y on DMI	PROF	Ts13	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 2: STM-5-ETCS Status Data
2	STM(1) doesn't report state CS in due time and is ordered to FA	-	T1	-	PROF	10s+Ts 15	STM Control Connection (STM(1)): Message 3: STM-14 State Order to STM (Failure) Time T2
-	The ERTMS/ETCS on-board updates DMI status	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.
-	Information "NTC failed" for the STM(1) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	10s+Ts 16	indication to the driver about the failed STM(1)
-	The ERTMS/ETCS on-board orders the active STM(2) to DA state	-	-	-	PROF	10s+Ts 5	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T3
3	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T3+3s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order shall be send to STM



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
4	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T3+4s	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The steps for STM(1) not applicable because degraded situation</i>							
<i>The steps for STM(2) are the same as for 5d.1</i>							

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)

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Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)

End Conditions	Value	Comments
STM State	STM(1): FA STM(2): DA	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(2) is associated to NTC Y
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Relevant	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Relevant	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Relevant	STM(1)
	Unchanged	STM(2)
JD Connection	Not Relevant	STM(1)
	Unchanged	STM(2)
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	
TIU Eddy Current Brake Command for Emergency Brake	Not Relevant	



End Conditions	Value	Comments
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	

### 3.26 Test case 5d.4

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5d.0.1.1.2.0.2.0.0
	Check the behaviour of the ERTMS/ETCS on-board when the driver manually selects a level transition from NTC X to NTC Y on the DMI. The ERTMS/ETCS on-board orders the STM(1) from DA to CS state and STM(2) from CS to DA state. The STM(1) does neither report CS state in due time nor sends a message for an active National Trip Procedure. The STM(2) also does not report the new state in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 c); 10.3.2.2 (DA->CS, DA->FA, CS->FA); 10.3.2.4 (B4b, E16, D16); 10.3.2.6; 10.3.2.7 (B4b); 10.3.3.4; 10.3.3.8; 10.5.1.1 a); 10.14.1.1; 13.2.1.2
STM requirements tested	Subset-035: None



<b>Packets transmitted via FFFIS STM</b>	STM-5, STM-14
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in CS at start of test case)</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Standstill	
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	





Starting Conditions	Value	Comments
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 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 driver changes the level on DMI and the ERTMS/ETCS on-board orders the active STM(1) to C-CS state	PROF	T0	Driver manually selects Level NTC Y on DMI	PROF	Ts13	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	-	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 2: STM-5 ETCS Status Data
2	STM(1) doesn't report state CS in due time and is ordered to state FA	-	T1	-	PROF	10s+Ts15	STM Control Connection (STM(1)): Message 3: STM-14 State Order to STM (Failure) Time T2
-	The ERTMS/ETCS on-board updates DMI status	-	-	-	DMI	5s	All STM objects (including buttons, indicators, text message, supervision information and sound) previously displayed should be deleted and new technical mode and level displayed.



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
-	Information "NTC failed" for the STM(1) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	10s+Ts 16	indication to the driver about the failed STM(1)
-	The ERTMS/ETCS on-board orders the active STM(2) to DA state	-	-	-	PROF	10s+Ts 5	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T3
3	STM(2) doesn't report state DA in due time and is ordered to state FA	PROF	T3		PROF	5s+Ts2 3	STM Control Connection (STM(2)): Message 5: STM-14 State Order to STM (Failure)
-	Information "NTC failed" for the STM(2) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	5s+Ts2 4	indication to the driver about the failed STM(2)
		-	-	-	TIU	5s	STM control function commands the Emergency brake (Check on the Train Interface)
4	Information "NTC not available" for the STM(2) is shown, if the information about the failed STM is acknowledged by the driver.	DMI	T3+1 0s	ACK by the driver	DMI	Ts22	indication to the driver about the unavailable STM(2)

## STM Test Case

Not applicable because is a degraded behaviour.

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length

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Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM



Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): FA STM(2): FA	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(2) is associated to NTC Y
Train State	Unchanged	
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	



End Conditions	Value	Comments
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	

### 3.27 Test case 5d.5

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5d.0.2
	Check the behaviour of the ERTMS/ETCS on-board and the STM, when the driver manually selects a level transition from Level NTC X to Level NTC Y on the DMI and STM(1) is mapped by the look-up table to Level NTC Y.
ERTMS/ETCS on-board requirements tested	Subset-035: 10.2.1.2 c); 10.5.1.1 a)
STM requirements tested	Subset-035: None
Packets transmitted via FFFIS STM	STM-5
ERTMS/ETCS on-board	- STM(1) associated to NTC X and is mapped to NTC Y by the look-up table (higher priority)



<b>configuration</b>	- STM(2) is mapped to NTC Y by the look-up table (lower priority)
<b>Comments and constraints</b>	STMs involved: STM(1): STM in DA at start of test case for active level at start of transition STM(2): STM in CS at start of test case

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)
Train State	Standstill	
Train Data	Valid	
Active DMI channel Connection	Established	<i>ETCS test case</i>
	Not Relevant	<i>STM test case</i>
Other DMI channels Connections	Not Relevant	
TIU Connection	Established	<i>ETCS test case</i>
	Not Relevant	<i>STM test case</i>
BIU Connection	Established	<i>ETCS test case</i>
	Not Relevant	<i>STM test case</i>
JD Connection	Established	<i>ETCS test case</i>
	Not Relevant	<i>STM test case</i>
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	



Starting Conditions	Value	Comments
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A 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 changes the level through driver selection on DMI	PROF	T0	Driver manually selects Level NTC Y on DMI	-		-
-	The ERTMS/ETCS on-board sends the new ETCS Level to the active STM(1)	-	-	-	PROF	5s	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 1: STM-5 ETCS Status Data
-	The ERTMS/ETCS on-board does not send a state order to STM(1) nor STM(2).	-	-	-	PROF	10s	State order is neither send to STM(1) nor STM(2).

### STM Test Case

Not applicable



Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
- NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

End Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(1) is associated to NTC Y
Train State	Unchanged	
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	

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End Conditions	Value	Comments
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	

### 3.28 Test case 5d.6

TEST CASE HEADER	
Test case identification	Level Transition STM to STM
	5d.0.1.2.1.2.1.0.1
	Check the behaviour of the ERTMS/ETCS on-board and the STM, when STM(1) has stopped the train due to an national trip situation and the driver manually selects a level transition from NTC X to NTC Y on the DMI, while the national trip procedure of STM(1) is still active. The ERTMS/ETCS on-board orders the STM(1) from DA to CS state and STM(2) from CS to DA state, when the national trip procedure of STM(1) is deactivated and STM(1) has followed the CS order. Both STM(2) reports the new state in due time.
ERTMS/ETCS on-board requirements tested	Subset-035: 8.7.1.2; 10.2.1.2 c); 10.3.2.2 (DA->CS, CS->DA); 10.3.2.4 (B4b, A9); 10.3.2.6; 10.3.2.7 (B4b); 10.3.3.3, 10.5.1.1 a); 10.13.1.1; 13.2.1.2
STM requirements tested	Subset-035: 9.2.1.1 (DA->CS); 9.2.1.2 (4b); 9.3.1.4 b), c)
Packets transmitted via FFFIS STM	STM-5; STM-14, STM-15, STM-18



<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in CS at start of test case) for announced level</p> <p>The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS closes all the connections except STM Control Function. The STM test case is designed for STMs that, when ordered in CS, closes all the connections except STM Control Function connection or keep all connections active.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)
Train State	Standstill	
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	



Starting Conditions	Value	Comments
TIU Traction Cut Off Command	Not Relevant	
TIU Traction Status	Not Relevant	
TIU Direction Controller Position Status	Forward	
TIU Cab Status	Cab A 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
-	Initial Condition: Train has been stop due to a national trip situation of STM(1)	-	-	-	-	-	Brakes applied by ERTMS/ETCS on-board as commanded by STM before.
1	The driver changes the level on DMI and the ERTMS/ETCS on-board orders the active STM(1) to C-CS state	PROF	T0	Driver manually selects Level NTC Y on DMI	PROF	Ts13	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 2: STM-5 ETCS Status Data
2	National Trip Procedure reported by the old STM	PROF	T1+4s	STM Control Connection (STM(1)): Message 3: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure			



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	STM(1) report state CS in due time (National Trip Procedure no longer active)	PROF	T1+1 2s	STM Control Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby)	TIU	5s	STM control function commands the Emergency brake release (Check on the Train Interface)
-	-	-	-	-	DMI	-	Button, indicator and text message from STM removed from DMI.  Brake application no more indicated on DMI.
-	The ERTMS/ETCS on-board orders the STM(2) to go in DA state				PROF	5s	STM Control Connection (STM(2)): Message 5: STM-14 State Order to STM (Data Available) Time T2
4	STM(1) reports it new state CS to any connected ERTMS/ETCS on-board function	PROF	T1+1 3s	BIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) TIU Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) DMI Connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby) JD connection (STM(1)): Message 4: STM-15 State Report from STM (Cold Standby)	-		-
5	The ERTMS/ETCS on-board receives STM(1) request to close any active connection but not the STM Control Function connection	PROF	T1+1 4s	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



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
6	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T2+3s	STM Control Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)
7	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T2+4s	BIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 6: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>The following steps apply to STM(1)</i>							
1	STM(1) in national trip situation is ordered to state CS.	PROF	T0	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 state order to STM (Conditional Cold Standby)	PROF	10s	STM Control Connection (STM(1)): Message 3: STM-15 State Report from STM (Data Available) STM-18 National Trip Procedure



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
2	STM(1) in national trip situation is no longer active.	-	T0+4s	-	PROF	10s	STM Control Connection (STM(1)): Message 4 STM-15 State Report from STM (Cold Standby)
-	The STM reports its new state CS to any connected ERTMS/ETCS on-board Function whenever the STM state is changed.  <i>This step is optional if the STM closes the connection on change to CS.</i>	-	-	-	PROF	Ts19	BIU Connection: Message 4: STM-15 State Report from STM (Cold Standby) TIU Connection: Message 4: STM-15 State Report from STM (Cold Standby) DMI Connection: Message 4: STM-15 State Report from STM (Cold Standby) JD Connection: Message 2: STM-15 State Report from STM (Cold Standby)
-	The STM closes any active connection but not the STM Control Function connection.  <i>This step is optional because the STM can keep active all the connections</i>	-	-	-	PROF	Ts20	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.

Steps for STM(2) are the same as in 5d.1

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
- NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length

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Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-15, STM-18) STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM (STM(1))
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)
NID_PACKET	8	18	National Trip Procedure
L_PACKET	13	COMPUTED	packet length
PADDING BITS	COMPUTED	NOT RELEVANT	



Message 4 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	Cold Standby (CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)

End Conditions	Value	Comments
STM State	STM(1): CS STM(2): DA	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(2) is associated to NTC Y
Train State	Unchanged	

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End Conditions	Value	Comments
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)
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	

### 3.29 Test case 5d.7

#### TEST CASE HEADER

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<b>Test case identification</b>	Level Transition STM to STM
	5d.0.1.2.3.0.1
	Check the behaviour of the ERTMS/ETCS on-board, when STM(1) has stopped the train due to an national trip situation and the driver manually selects a level transition from NTC X to NTC Y on the DMI, while the national trip procedure of STM(1) is still active. The ERTMS/ETCS on-board orders the STM(1) from DA to CS state. STM(1) does not report the "National Trip Procedure" in due time and is ordered to FA state. Afterwards the ERTMS/ETCS on-board orders STM(2) from CS to DA state and STM(2) reports the new state in due time.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035: 10.2.1.2 c); 10.3.2.2 (DA->CS, DA->FA, CS->DA); 10.3.2.4 (B4b, F16, A9); 10.3.2.6; 10.3.2.7 (B4b); 10.3.3.3, 10.5.1.1 a); 10.13.1.1; 10.14.1.1, 13.2.1.2
<b>STM requirements tested</b>	Subset-035: None
<b>Packets transmitted via FFFIS STM</b>	STM-5; STM-14, STM-15
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM(1) associated to NTC X</li> <li>- STM(2) is mapped to NTC Y by the look-up table</li> </ul>
<b>Comments and constraints</b>	<p>STMs involved:</p> <p>STM(1): old STM (in DA at start of test case) for active level at start of transition</p> <p>STM(2): new STM (in CS at start of test case) for announced level</p> <p>The ERTMS/ETCS on-board Test Case is designed for testing ERTMS/ETCS on-board when STM ordered in CS closes all the connections except STM Control Function connection. The STM test case is designed for both STMs that, when ordered in CS, close all the connections except STM Control Function connection or keep all connections active.</p>

Starting Conditions	Value	Comments
STM State	STM(1): DA STM(2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	Level NTC X is associated to STM(1)(old STM)



Starting Conditions	Value	Comments
Train State	Standstill	
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 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
-	Initial Condition: Train has been stop due to a national trip situation of STM(1)	-	-	-	-	-	Brakes applied by ERTMS/ETCS on-board as commanded by STM before.
1	The driver changes the level on DMI and the ERTMS/ETCS on-board orders the active STM(1) to C-CS state	PROF	T0	Driver manually selects Level NTC Y on DMI	PROF	Ts13	STM Control Connection (STM(1)): Message 1: STM-5 ETCS Status Data STM-14 State Order to STM (Conditional Cold Standby) Time T1
-	The ERTMS/ETCS on-board sends new ETCS level to STM(2)	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 2: STM-5 ETCS Status Data
2	STM(1) does neither report state CS nor National Trip Procedure in due time.	-	T1	-	PROF	10s+Ts15	STM Control Connection (STM(1)): Message 3: STM-14 state order to STM (Failure)
-	Information "NTC failed" for the STM(1) is displayed by the ETCS/ERTMS on-board.	-	-	-	DMI	10s+Ts16	indication to the driver about the failed STM(1)  Button, indicator and text message from STM removed from DMI.  Brake application no more indicated on DMI.
-	-	-	-	-	TIU	5s	STM control function commands the Emergency brake release (Check on the Train Interface)
-	The ERTMS/ETCS on-board orders the STM(2) to go in DA state	-	-	-	PROF	5s	STM Control Connection (STM(2)): Message 4: STM-14 State Order to STM (Data Available) Time T2



Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
3	STM(2) reports state DA in due time and report its new state to any connected ERTMS/ETCS on-board function.	PROF	T2+3s	STM Control Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)
4	The STM(2) shall report its new state DA to any connected ERTMS/ETCS on-board Function whenever the STM state is changed	PROF	T2+4s	BIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) TIU Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) DMI Connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available) JD connection (STM(2)): Message 5: STM-15 State Report from STM (Data Available)	PROF	5s	No FA state order sent from STM control function for STM(2)

## STM Test Case

Step	Description/Comments	Input I/F	Input time	Input Action	Output I/F	Output time limit	Output action
<i>Steps for STM(1) not applicable because is a degraded behaviour</i>							
<i>Steps for STM(2) are the same as in 5d.1</i>							

Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
- NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length

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Message 1 (Packet STM-5, STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	5	Conditional Cold Standby (C-CS)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-5) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (NTC Y)
M_MODE	4	13	SN (STM National)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(1)
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	Failure (FA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)

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Message 4 (Packet STM-14) ETCS -> STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	Data Available (DA)
PADDING BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-15): STM -> ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM of the STM(2)
L_MESSAGE	8	COMPUTED	Message length
NID_PACKET	8	15	State report from STM
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	Data Available (DA)

End Conditions	Value	Comments
STM State	STM(1): FA STM(2): DA	
ETCS Mode	SN	
ETCS Level	NTC Y	STM(2) is associated to NTC Y
Train State	Unchanged	
Train Data	Unchanged	
Active DMI channel Connection	Not Established	STM(1)
	Unchanged	STM(2)
Other DMI channels Connections	Not Relevant	
TIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
BIU Connection	Not Established	STM(1)
	Unchanged	STM(2)
JD Connection	Not Established	STM(1)
	Unchanged	STM(2)
TIU Regenerative Brake Command	Not Relevant	
TIU Magnetic Shoes Brake Command	Not Relevant	



End Conditions	Value	Comments
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	

### 3.30 Test case 5e.1

TEST CASE HEADER	
Test case Identification	Level Transition STM to STM
	5e.0.1.0.0.0
	The driver selects ETCS Level = NTC x (in look-up table, STM (1) has higher priority than STM (2) both configured for NTC X) but STM (1) has failed, the ETCS mode is SB. The driver selects Train Data Entry, test continues in another TC (from FID 10), driver validates train data and this other TC ends. The driver then selects Start and acknowledges SN mode. The STM (2) is still in CO and ETCS displays “STM (2) not available” to the driver. When the STM (2) requests CS mode, it is ordered to CS and the message “STM (2) not available” is removed.





<b>ERTMS/ETCS on-board Requirements Tested</b>	Subset-035: 10.1.1.1; 10.1.1.2; 10.1.1.3; 10.2.1.1; 10.2.1.2c; 10.3.3.4; 10.3.3.8; 10.5.1.1;
<b>STM Requirements Tested</b>	-
<b>Packets Transmitted via FFFIS STM</b>	STM-5; STM-13; STM-14; STM-15;
<b>ERTMS/ETCS on-board Configuration</b>	<ul style="list-style-type: none"><li>- STM (1) associated to NTC X with look-up table (higher priority)</li><li>- STM (2) associated to NTC X with look-up table (lower priority)</li></ul>
<b>Comments and constraints</b>	The end state (CS) is not stable, ETCS will request DA immediately, but transition to DA is not subject of this test.



Starting Conditions	Value	Comments
STM State	STM (1): FA STM (2): CO	
ETCS Mode	SB	
ETCS Level	Not NTC X	
Train State	Standstill	
ETCS Train Data	Not Valid	
Active DMI channel Connection	Established	
Other DMI channel 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 (Desk Status)	Cab A or 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 displays a list of levels including Level NTC X to the driver for selecting/revalidating Level/ NTC (and the corresponding STM)	DMI	T = 0	Driver selects Level NTC X	DMI	2s	Level selection window closed.
					PROF	Ts25	STM (2) Control Connection: Message 3 Sent packet STM-5 ETCS status data
	<i>Driver selects Train Data Entry and re-validates Train Data in FID 10 TC 10a.1 with the last step 12 of that test case "STM sends the "END of Specific NTC Data Entry", ETCS stops the Specific NTC Data entry procedure."</i>						
2	Driver selects Start and acknowledges SN mode,	DMI	5s	Driver acknowledges SN mode	PROF	Ts26	STM (2) Control Connection: Message 5 Sent packet STM-5 ETCS status data
	ETCS displays warning to driver				DMI	Ts27	ETCS displays "STM (2) not available"
-	-	-	-	-	TIU	5s	STM control function commands the Emergency brake (Check on the Train Interface)
3	STM requests CS	PROF	15s	STM (2) sent message 1 Packet STM-13 state request CS	PROF	Ts28	ETCS sends message 6 Packet STM-14 state order CS. Time T1
4	STM reports CS, ETCS removes warning	PROF	T1 + 3s	STM (2) sends message 2 Packet STM-15 state report CS	DMI	Ts29	ETCS no longer displays "STM (2) not available"

## STM Test Case

Not applicable



Message 1 (Packet STM-13, STM-15) STM → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	13	STM State request
L_PACKET	13	COMPUTED	Packet length
NID_STMSTATEREQUEST	4	4	Request CS
NID_PACKET	8	15	State report from the STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	2	Configuration
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15) STM → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver.
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State report from the STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	Cold StandBy
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 3 (Packet STM-5) ETCS → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
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	The NID_NTC selected by the driver
M_MODE	4	6	SB
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 5: ETCS → STM(Packet STM-5)			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
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	The NID_NTC selected by the driver
M_MODE	4	13	SN
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-14) ETCS → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Order Unconditional CS State



PADDING_BITS	COMPUTED	NOT RELEVANT	
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End Conditions	Value	Comments
STM State	STM (1): FA STM (2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Standstill	
ETCS Train Data	Valid	
Active DMI channel Connection	Not relevant	
Other DMI channel Connections	Not relevant	
TIU Connection	Not relevant	
BIU Connection	Not relevant	
JD Connection	Not relevant	
TIU Regenerative Brake Command	Unchanged	
TIU Magnetic Shoes Brake Command	Unchanged	
TIU Eddy Current Brake Command for Emergency Brake	Unchanged	
TIU Eddy Current Brake Command for Service Brake	Unchanged	
TIU Pantograph Command	Unchanged	
TIU Air Tightness Command	Unchanged	
TIU Main Switch / Circuit Breaker Command	Unchanged	
TIU Traction Cut Off Command	Unchanged	
TIU Traction Status	Unchanged	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status (Desk Status)	Unchanged	
BIU Emergency Brake Command	Unchanged	
BIU Service Brake Command	Unchanged	
BIU Emergency Brake Status	Unchanged	
BIU Service Brake Status	Unchanged	
NTC isolation status	Not Isolated	



### 3.31 Test case 5e.2

TEST CASE HEADER	
Test case Identification	Level Transition STM to STM
	5e.0.2.0.0.0
	The driver selects ETCS Level = NTC x (in look-up table, STM (1) has higher priority than STM (2) both configured for NTC X) but STM (1) is isolated, the ETCS mode is SB. The driver selects Train Data Entry, test continues in another TC (from FID 10), driver validates train data and this other TC ends. The driver then selects Start and acknowledges SN mode. The STM (2) is still in CO and ETCS displays “STM (2) not available” to the driver. When the STM (2) requests CS mode, it is ordered to CS and the message “STM (2) not available” is removed.
ERTMS/ETCS on-board Requirements Tested	Subset-035 10.1.1.1; 10.1.1.2; 10.1.1.3; 10.2.1.1; 10.2.1.2c; 10.3.3.4; 10.3.3.8; 10.5.1.1;
STM Requirements Tested	-
Packets Transmitted via FFFIS STM	STM-5; STM-13; STM-14; STM-15;
ERTMS/ETCS on-board Configuration	<ul style="list-style-type: none"><li>- STM (1) associated to NTC X with look-up table (higher priority)</li><li>- STM (2) associated to NTC X with look-up table (lower priority)</li></ul>
Comments and constraints	The end state (CS) is not stable, ETCS will request DA immediately, but transition to DA is not subject of this test.





Starting Conditions	Value	Comments
STM State	STM (1): NP STM (2): CO	
ETCS Mode	SB	
ETCS Level	Not NTC X	
Train State	Standstill	
ETCS Train Data	Not Valid	
Active DMI channel Connection	Established	
Other DMI channel 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 (Desk Status)	Cab A or 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	STM (1) is 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 displays a list of levels including Level NTC X to the driver for selecting/revalidating Level/ NTC (and the corresponding STM)	DMI	T = 0	Driver selects Level NTC X	DMI	2s	Level selection window closed.
					PROF	Ts25	STM (2) Control Connection: Message 3 Sent packet STM-5 ETCS status data
	<i>Driver selects Train Data Entry and re-validates Train Data in FID 10 TC 10a.1 with the last step 12 of that test case "STM sends the "END of Specific NTC Data Entry", ETCS stops the Specific NTC Data entry procedure."</i>						
2	Driver selects Start and acknowledges SN mode,	DMI	5s	Driver acknowledges SN mode	PROF	Ts26	STM Control Connection: Message 5 Sent packet STM-5 ETCS status data
	ETCS displays warning to driver				DMI	Ts27	ETCS displays "STM (2) not available"
-	-	-	-	-	TIU	5s	STM control function commands the Emergency brake (Check on the Train Interface)
3	STM requests CS	PROF	15s	STM (2) sent message 1 Packet STM-13 state request CS	PROF	Ts28	ETCS sends message 6 Packet STM-14 state order CS. Time T1
4	STM reports CS, ETCS removes warning	PROF	T1 + 3s	STM (2) sends message 2 Packet STM-15 state report CS	DMI	Ts29	ETCS no longer displays "STM (2) not available"

## STM Test Case

Not applicable

Message 1 (Packet STM-13, STM-15) STM → ETCS



VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	13	STM State request
L_PACKET	13	COMPUTED	Packet length
NID_STMSTATEREQUEST	4	4	Request CS
NID_PACKET	8	15	State report from the STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	2	Configuration
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 2 (Packet STM-15) STM → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	15	State report from the STM
L_PACKET	13	COMPUTED	
NID_STMSTATE	4	4	Cold StandBy
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 3 ETCS → STM(Packet STM-5)			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
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	The NID_NTC selected by the driver
M_MODE	4	6	SB
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 5 (Packet STM-5) ETCS → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
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	The NID_NTC selected by the driver
M_MODE	4	13	SN
PADDING_BITS	COMPUTED	NOT RELEVANT	

Message 6 (Packet STM-14) ETCS → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	The NID_STM associated to NTC selected by driver
L_MESSAGE	8	COMPUTED	
NID_PACKET	8	14	State order to STM
L_PACKET	13	COMPUTED	
NID_STMSTATEORDER	4	4	Order Unconditional CS State



PADDING_BITS	COMPUTED	NOT RELEVANT	
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End Conditions	Value	Comments
STM State	STM (1): NP STM (2): CS	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Standstill	
ETCS Train Data	Valid	
Active DMI channel Connection	Not relevant	
Other DMI channel Connections	Not relevant	
TIU Connection	Not relevant	
BIU Connection	Not relevant	
JD Connection	Not relevant	
TIU Regenerative Brake Command	Unchanged	
TIU Magnetic Shoes Brake Command	Unchanged	
TIU Eddy Current Brake Command for Emergency Brake	Unchanged	
TIU Eddy Current Brake Command for Service Brake	Unchanged	
TIU Pantograph Command	Unchanged	
TIU Air Tightness Command	Unchanged	
TIU Main Switch / Circuit Breaker Command	Unchanged	
TIU Traction Cut Off Command	Unchanged	
TIU Traction Status	Unchanged	
TIU Direction Controller Position Status	Unchanged	
TIU Cab Status (Desk Status)	Unchanged	
BIU Emergency Brake Command	Unchanged	
BIU Service Brake Command	Unchanged	
BIU Emergency Brake Status	Unchanged	
BIU Service Brake Status	Unchanged	
NTC isolation status	STM (1) is isolated	