

# Train protection ETCS system ETCS 2

## ETCS System Compatibility Test Description

### Document Management

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**History**

Author	Version	Date	§ Adapted	Reason
T. Destrée	1.1 draft 1	3/06/2020	/	Creation of the document
T. Destrée	1.1 draft 2	17/06/2020		Review comments
T. Destrée	1.1	22/06/2020		Major version
T. Destrée	1.2 draft 1	19/02/2021	4.8	Correct D_NVVALID to D_VALIDNV
		18/05/2021	4.9.1	Update starting condition.
		14/06/2021	4.13	Adapt the installation with the single BG upwards the signal S1.
		21/06/2021	3, 4.8	Check of the scenario ESC_L2FS_9 adapted.
		2/07/2021	Test cases: ESC_TR_13, ESC_TR_16	Adapted for trains not equipped with a TBL1+ STM.
T. Destrée	1.2 draft 2	25/03/2022	<b>Erreur ! Source du renvoi introuvable.</b>	Remark moved from "Starting condition" to "Description".
			<b>Erreur ! Source du renvoi introuvable.</b>	Step 5 splitted in two steps for more clarity (Steps 5.1 and 5.2)
			4.5.1	Step 2 adapted according to the infrastructure at the location of the test.
			4.11.1, 4.12.1, 4.16.1, 4.18.1, 4.19.1	Update Starting conditions
T. Destrée	1.2	28/03/2022		"Known position" replaced by "valid position". Major Version
T. Destrée	1.3	13/07/2023	4.1, 4.2, 4.7, 4.14, 4.15.	Test cases deleted (ESC_L2FS_1 part 1, ESC_L2FS_1 part 2, ESC_L2FS_6, ESC_TR_6, ESC_TR_8).

**Abrogated documents**

Name	Version	Date

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# 1. Introduction

## 1.1 Purpose of the document

The purpose of this document is to define the test scenarios to perform in order to prove the ETCS System Compatibility (ESC) between the trackside ETCS Level 2 and the On-board.

The tests scenarios describe more in detail each “high level” scenarios defined in the ESC test plan [1]. The success of these test scenarios shall prove the technical compatibility between ETCS On-board and the Trackside part ETCS of the CCS subsystems within the ETCS2 area on Infrabel conventional network.

The technical specification for interoperability used inside an ETCS2 area on Infrabel network is the set of specifications 2, B3 MR1 ([2] and [3]).

These test scenarios for ETCS system compatibility do not cover all design rules used in an ETCS2 area. If required, Infrabel can provide additional operational test scenarios performed during the verification that the trackside subsystem complies with the requirement of the TSI.

In case of doubt concerning the ESC of the board with the trackside, the railway undertaking shall take the required action with his supplier and inform Infrabel.

## 1.2 Basic documents

<b>Ref.</b>	<b>Title</b>	<b>Owner</b>
[1]	PSI (TC,ETCSsys,z) ESC TST PLN 1.7	Infrabel

## 1.3 Reference documents

<b>Ref.</b>	<b>Title</b>	<b>Owner</b>
[2]	Commission Decision (EU) 2015/14 of 5 January 2015	UE
[3]	Commission Regulation (EU) 2016/919 of 27 May 2016	UE
[4]	PSI(TP,ETCSsys.L1LS.z) ESC TST DSC 1.6	Infrabel

## 1.4 Annexes

<b>Ref.</b>	<b>Title</b>	<b>Owner</b>
[5]	Document	Owner

## 1.5 Scope

This document is applicable for all trains would run under the protection of ETCS level 2 in an ETCS2 area on the Infrabel conventional network.

## 1.6 Definitions, symbols and abbreviations

2Y	Aspect wo yellow displayed by the signal
CCS	Control Command System
CES	Conditional Emergency Stop
DMI	Driver Machine Interface
ESC	ETCS System Compatibility
ETCS	European Train Control System
LS	Limited Supervision
NR	Not Relevant
OBU	On Board Unit

---

RNP	Aspect Red not permissive displayed by the signal
SBG	Signal Balise Group
SFE	Safe Front End
SoM	Start of Mission
TSI	Technical Specification for Interoperability
UES	Unconditional Emergency Stop

### **1.7 Known imperfections**

No test cases are defined for transitions from and to TVM430 in this version of the document.

## **2. On-board Equipment**

Out of scope of railway manager Infrabel.

### 3. Functionalities

The tested functionalities are described in the table here under:

Test scenario (ref ESC TST PLN [1])	Tested functionality
ESC_ALL_1	Ergonomics in nominal situation
ESC_ALL_2	Braking curves
ESC_L2FS_1	deleted
ESC_L2FS_2	CES accepted
ESC_L2FS_3	UES
ESC_L2FS_4	Reset of confidence interval
ESC_L2FS_5	T_NVCONTACT
ESC_L2FS_6	deleted
ESC_L2FS_7	Change of front
ESC_L2FS_8	Multiple message 18
ESC_L2FS_9	CR958 – Start of mission with unknown position
ESC_L2FS_10	SoM with MaxSFE downstream of a signal
ESC_L2FS_11	Restart in STM after loss of ETCS 2 FS
ESC_L2FS_12	RBC-RBC Handover with a single modem
ESC_L2FS_13	Train categories
ESC_L2FS_14	OS extension
ESC_TR_6	deleted
ESC_TR_8	deleted
ESC_TR_9	Transition ETCS1 FS to ETCS2 FS
ESC_TR_10	Transition ETCS2 FS to ETCS1 FS
ESC_TR_13	Transition ETCS2 to STM
ESC_TR_16	Transition STM to ETCS2

The document will only describe the sequences to perform the scenarios but not all the actions to prepare the execution of the test scenarios.

No specific test scenarios are described for tests ESC\_ALL\_1 and ESC\_ALL\_2. During all train transfer between the scenarios executed during the test campaign, testers must ensure there is no ergonomic issues or unexpected braking interventions.

Transitions to and from ETCS1 Limited supervision (ESC\_TR\_2 and ESC\_TR\_4) are covered in the ESC test DSC for ETCS1 LS program (cf. [4]).

## 4. Test scenarios

### 4.1 Tests ESC\_L2FS\_1 part 1

Test case deleted.

### 4.2 Tests ESC\_L2FS\_1 part 2

Test case deleted.

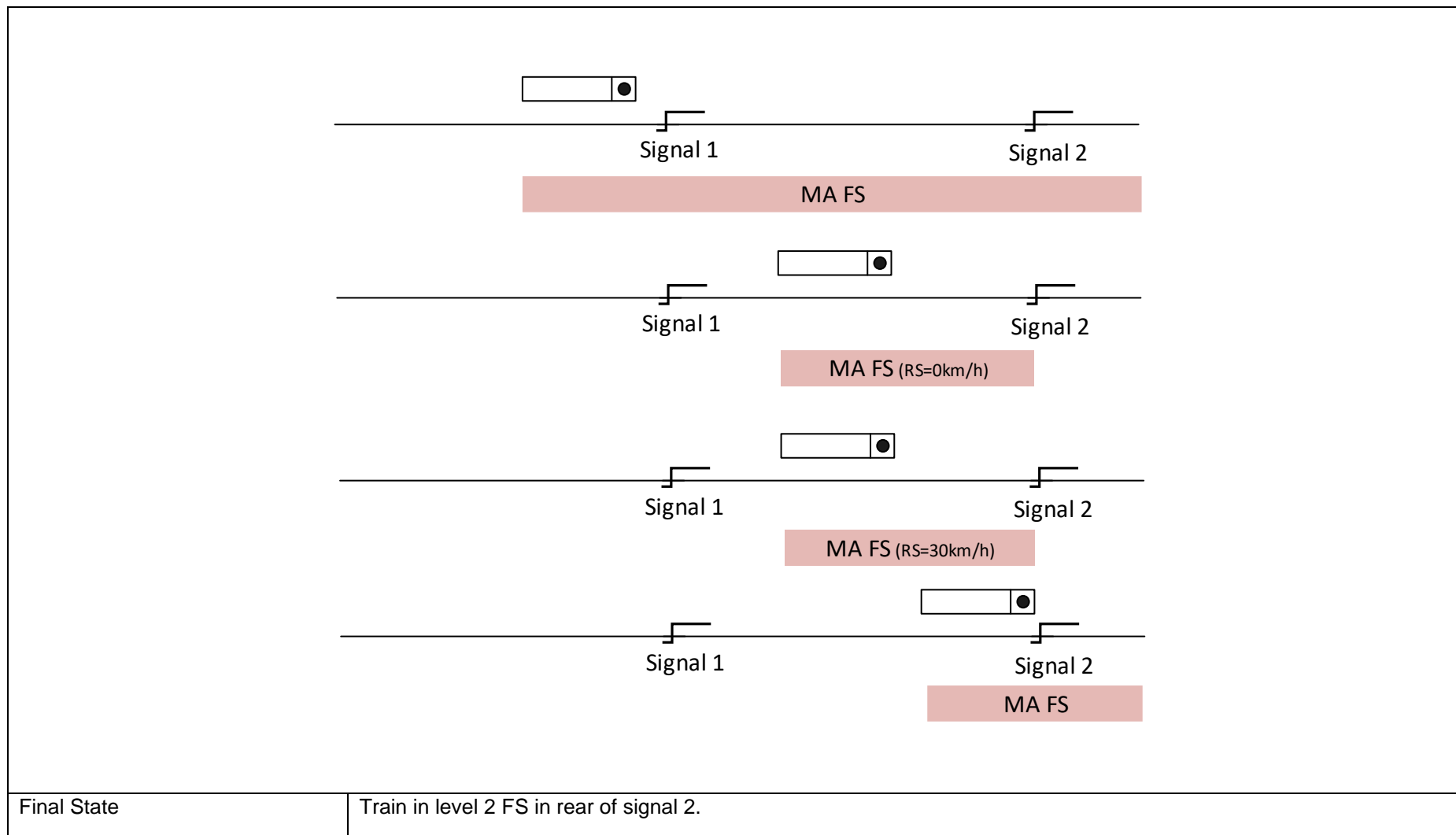


### 4.3 Tests ESC\_L2FS\_2

#### 4.3.1 Description

ID		Date	Location / Line	
ESC_L2FS_2		<dd/mm/yyyy>	<Line>	
Description		Functionalities tested : - ESC_L2FS_2 : CES		
Signal passed				
Name		Trackside datafile in service		
S1 : <Signal name> is open				
S2 : <Signal name> is an open non controlled stop signal				
Test Scenarios				
Starting condition		Train in level 2 FS in rear of signal S1.		
		<b>Be sure all authorisations are filled in before performing the test scenarios</b>		
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	When train passes signal S1, perform CLOSE on signal S2. RBC sends CES to the train (Message 15)	CES is accepted by the train (Release speed = 0km/h and shortened MA).	Pass / Fail	
2	RBC revokes the CES (message 18). Train reports its position and RBC sends a new MA with EoA at signal S2.	Release speed = 30km/h	Pass / Fail	
3	Stop the train beyond signal S2	Train receives an OS MA.	Pass / Fail	
4	Re-open signal S2	Update of the MA with an EoA beyond signal S2	Pass / Fail	
Test scenario finished				

4.3.2 Scenario diagram



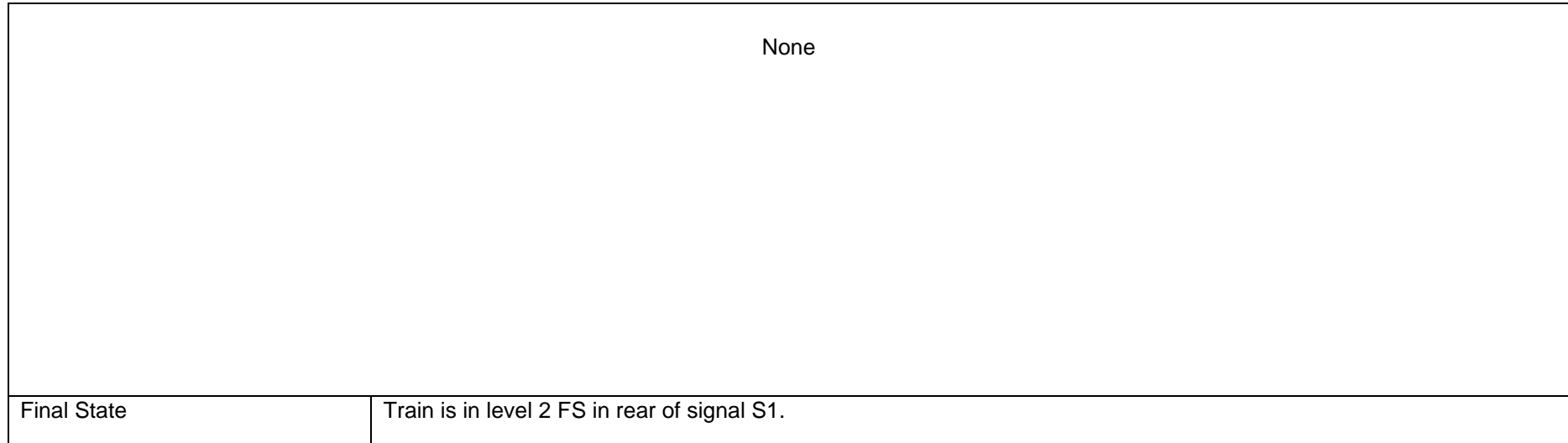
## 4.4 Tests ESC\_L2FS\_3 and ESC\_L2FS\_8

### 4.4.1 Description

ID	Date	Location / Line		
ESC_L2FS_3&8	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : <ul style="list-style-type: none"> <li>ESC_L2FS_3 : UES</li> <li>ESC_L2FS_8 : Multiple message 18</li> </ul>			
Signal passed				
Name		Trackside datafile in service		
S1 : <Signal name> is an open non-controlled main stop signal on track 1.				
Test Scenarios				
Starting condition	Train is :			
	<ul style="list-style-type: none"> <li>in level 2 FS mode</li> <li>at standstill in rear of signal S1.</li> </ul>			
	<p><b>Be sure all authorisations are filled in before performing the test scenarios.</b></p> <p><b>Train should not occupy ZAX for Level Crossings</b></p>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Perform CSTR on track 1, RBC sends UES (Message 16)	Train goes to TRIP.	Pass / Fail	
2	Driver acknowledges the trip	Train goes to Post Trip mode	Pass / Fail	
3	RBC sends revocation of emergency stop for every possible NID_EM (Message 18). Take away CSTR on track 1 and driver select "Start".	Train receives an MA with OS mode profile up to signal S1. Train switches to OS mode.	Pass / Fail	

4	Pass the signal	Train switches to FS.	Pass / Fail	
Test scenario finished				

4.4.2 Scenario diagram

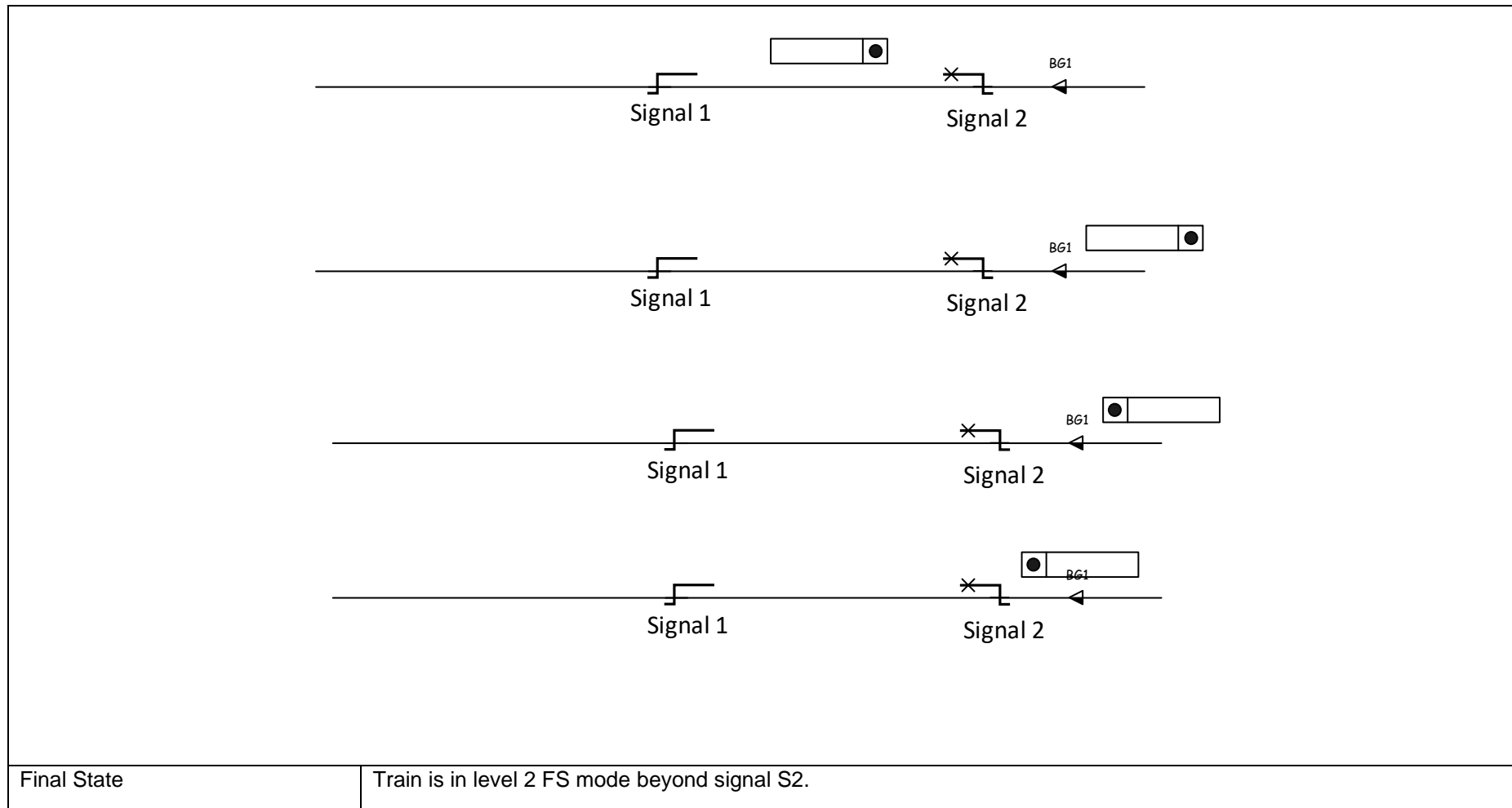


## 4.5 Tests ESC\_L2FS\_4 and ESC\_L2FS\_7

### 4.5.1 Description

ID	Date	Location / Line		
ESC_L2FS_4&7	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : <ul style="list-style-type: none"> <li>ESC_L2FS_4 : Reset of odometry error</li> <li>ECS_L2FS_7 : change of front</li> </ul>			
Signal passed				
Name		Trackside datafile in service		
S1 : <Signal name> is open				
S2 : <Signal name> is closed (S2 is chosen to ensure the train can pass completely BG1 without reading another BG)				
Test Scenarios				
Starting condition		Train is in rear of S1 in level 2 mode FS		
<b>Be sure all authorisations are filled in before performing the test scenarios</b>				
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Train passes S1 and stops after passing completely BG1.	BG1 is the LRBG.	Pass / Fail	
2	Driver changes CAB and performs a SoM.	If BG1 is a single balise group (in a trusted area) : Train receives MA with OS mode up to signal S2. Otherwise: Train is in SR mode.	Pass / Fail	
3	Signal S2 opens and train passes BG1	The odometry error is reset to <5 meters if BG1 is a switchable BG or 8 meters if BG1 is a fixed BG>.	Pass / Fail	
4	Train passes signal S2	Train switches to FS mode.	Pass / Fail	
Test scenario finished				

4.5.2 Scenario diagram



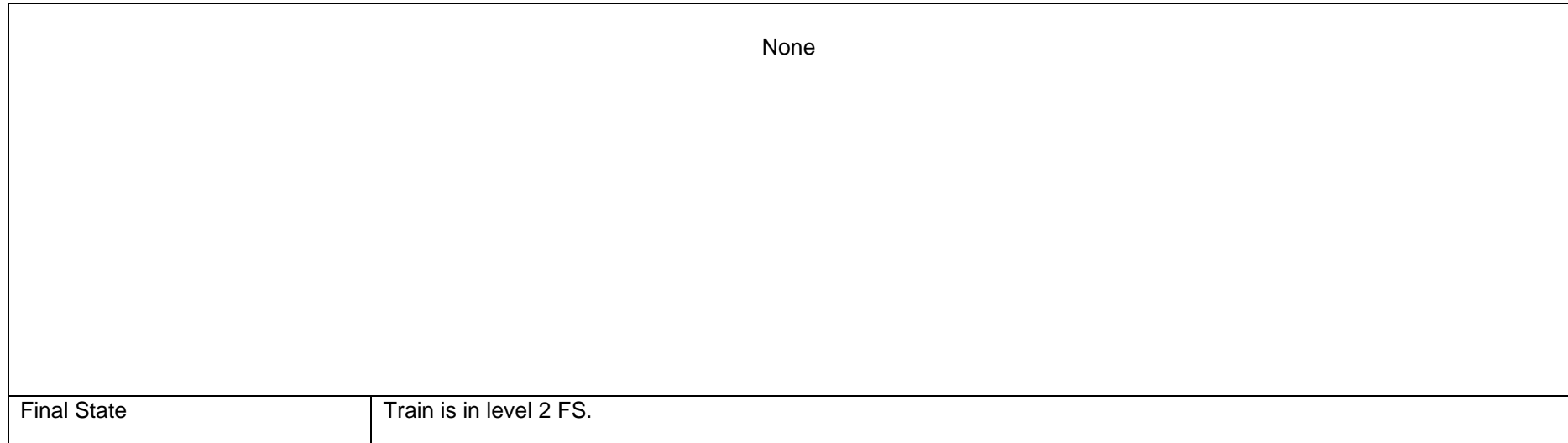
## 4.6 Tests ESC\_L2FS\_5

### 4.6.1 Description

ID	Date	Location / Line		
ESC_L2FS_5	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_L2FS_5 : T_NVCONTACT			
Signal passed				
Name	Trackside datafile in service			
None				
Test Scenarios				
Starting condition	Train is at standstill in Level 2 mode FS.			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Disconnect the OBU from the antenna to cause a loss of connection.	<b>After 40 seconds, train does a Service Brake reaction.</b> MA is shortened to the position of the train.	Pass / Fail	
2	Reconnect the antenna to the OBU.	Train remains in FS mode and MA is extended.	Pass / Fail	
Test scenario finished				



4.6.2 Scenario diagram



#### 4.7 Tests ESC\_L2FS\_6

Test case deleted.

## 4.8 Tests ESC\_L2FS\_9

### 4.8.1 Description

ID	Date	Location / Line		
ESC_L2FS_9	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_L2FS_9 CR958 – Start of mission with unknown position			
Signal passed				
Name	Trackside datafile in service			
<b>S1</b> : <Signal name of a signal in a trusted area > is closed.				
Test Scenarios				
Starting condition	Train is in SB mode without a valid position on-board.			
	Train is in rear of signal S1			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Drivers performs a Start of Mission in Level2.	Train receives national values with D_VALIDNV = 0.	Pass / Fail	
2		Train switches to level 2 mode SR. Remark: The train could send error reports due to the D_VALIDNV = 0.	Pass / Fail	
Test scenario finished				

4.8.2 Scenario diagram

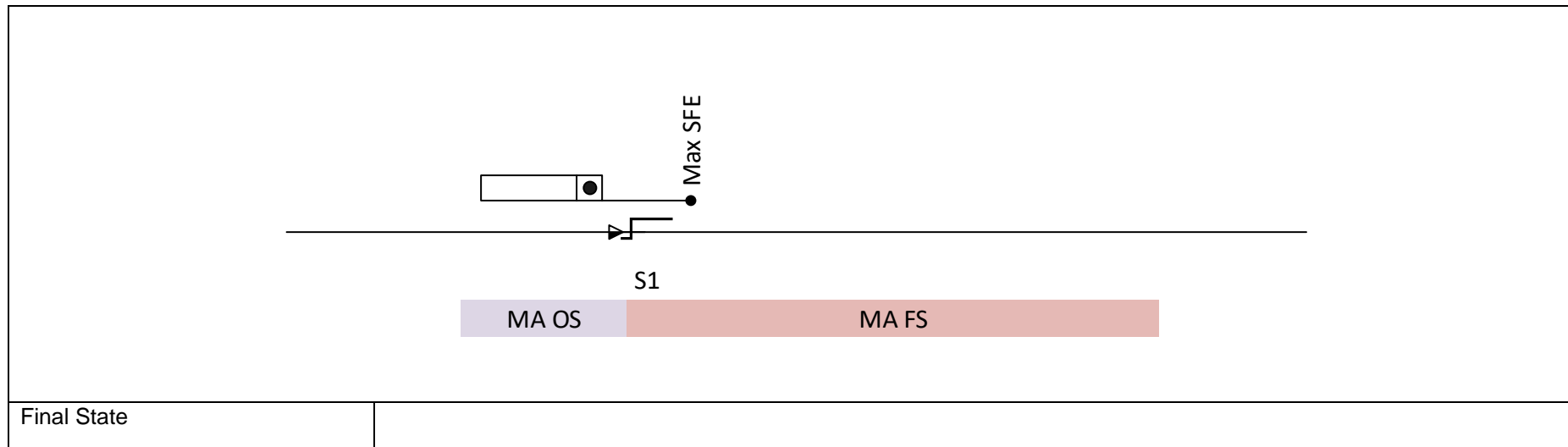
None	
Final State	Train in level 2 mode SR in rear of signal S1.

## 4.9 Tests ESC\_L2FS\_10

### 4.9.1 Description

ID	Date	Location / Line		
ESC_L2FS_10	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_L2FS_10 SoM with MaxSFE downstream of a signal			
Signal passed				
Name	Trackside datafile in service			
<b>S1 : &lt;Signal name&gt; is closed</b>				
Test Scenarios				
Starting condition	Train is located less than 150m in rear of the SBG of signal S1 <b>with a known position</b> .			
	The level and mode must be chosen to allow the train to have a valid position at the Start of Mission of step 1.			
	The odometry error is large enough to have a max safe front end beyond the signal S1			
	Train is on a portion of track defined as a trusted area.			
<b>Be sure all authorisations are filled in before performing the test scenarios</b>				
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Drivers performs a Start of Mission in level 2.	Train is in SR mode.	Pass / Fail	
2	Open signal S1.	Train receives an MA with OS mode profile up to the signal and 30m beyond.	Pass / Fail	
3	Train passes signal S1	Train switches to FS mode about 30m beyond the signal.	Pass / Fail	
Test scenario finished				

### 4.9.2 Scenario diagram

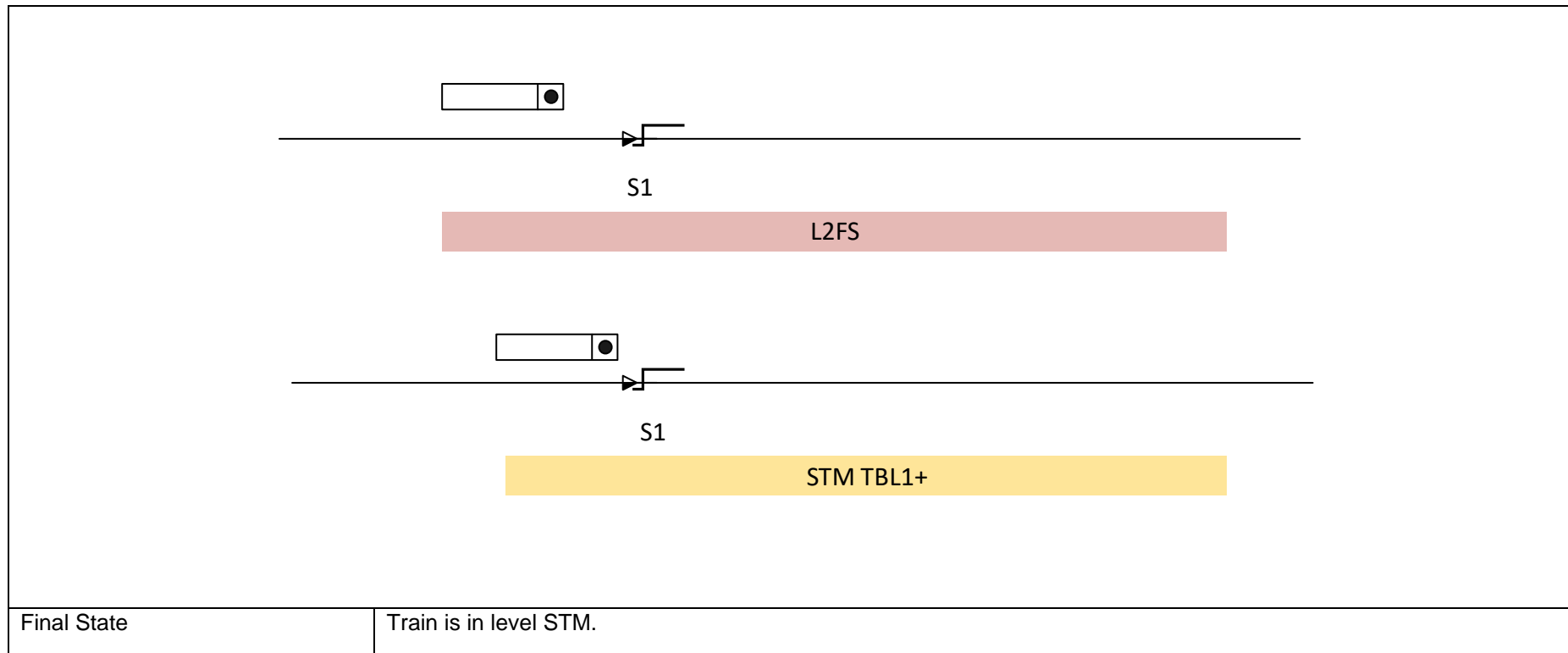


## 4.10 Tests ESC\_L2FS\_11

### 4.10.1 Description

ID	Date	Location / Line		
ESC_L2FS_11	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_L2FS_11 Restart in STM after loss of ETCS 2 FS			
Signal passed				
Name	Trackside datafile in service			
<b>S1</b> : <Signal name> is open with aspect Yellow.				
Test Scenarios				
Starting condition	Train is at standstill in level 2 FS mode in rear of signal S1.			
<b>Be sure all authorisations are filled in before performing the test scenarios</b>				
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Disconnect the OBU from the antenna to cause a loss of connection.	After 40 seconds, train does a Service Brake reaction. MA is shortened to the position of the train.	Pass / Fail	
2	Driver performs a Start of Mission in STM mode and passes signal S1 according to STM TBL1+ procedures.	STM TBL1+ system requests acknowledgement and yellow lamp is switched on.	Pass / Fail	
Test scenario finished				

4.10.2 Scenario diagram



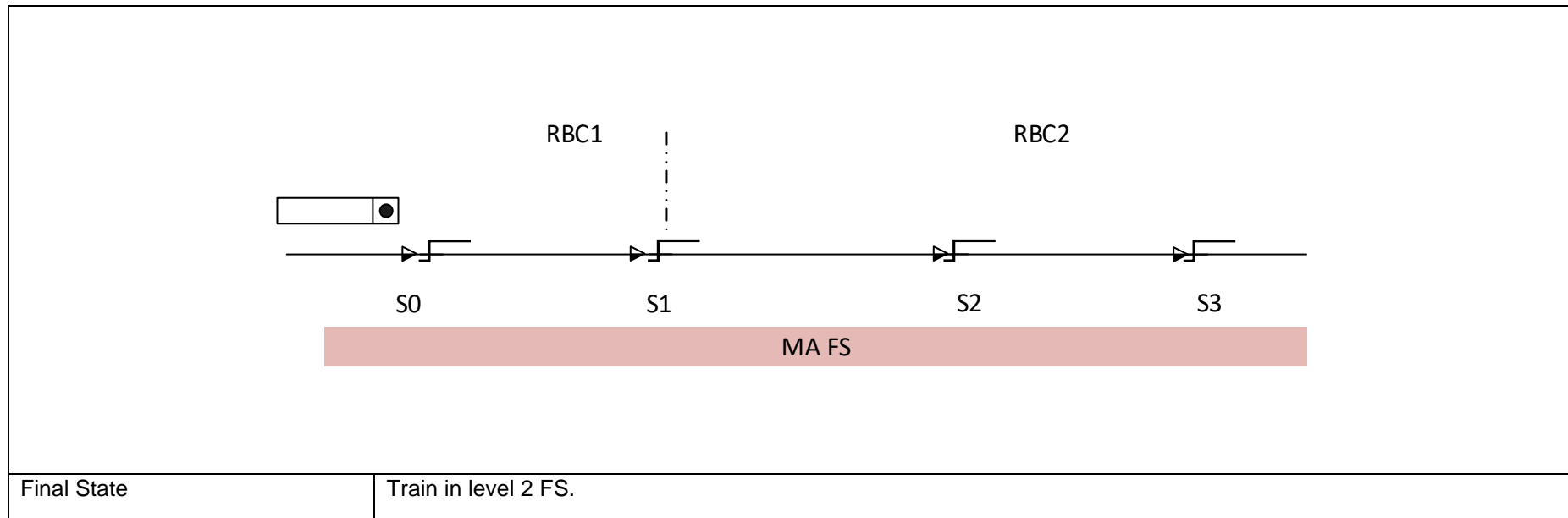


## 4.11 Tests ESC\_L2FS\_12

### 4.11.1 Description

ID	Date	Location / Line		
ESC_L2FS_12	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_L2FS_12 RBC-RBC Handover with a single modem			
Signal passed				
Name	Trackside datafile in service			
<b>S0:</b> <Signal name> is open (area of RBC1)				
<b>S1:</b> <Signal name> is open (area of RBC2)				
<b>S2:</b> <Signal name> is open (area of RBC2)				
<b>S3:</b> <Signal name> is open (area of RBC2)				
Test Scenarios				
Starting condition	Train is in level 2 FS mode.			
	Train is upwards signal S0.			
	Train has only one modem available.			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Train enters announcement distance of the RBC Handover and receives a P131.	-	Pass / Fail	
2	Train passes the SBG of signal S1 and enters the area of RBC2.	Train continues in level 2 FS.	Pass / Fail	
Test scenario finished				

4.11.2 Scenario diagram

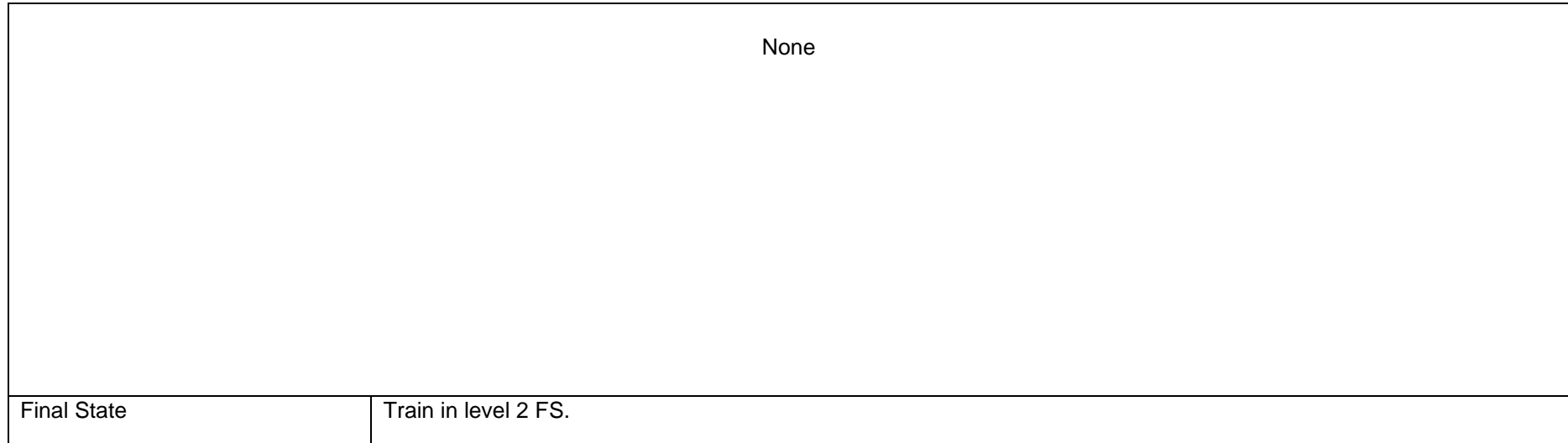


## 4.12 Tests ESC\_L2FS\_13

### 4.12.1 Description

ID		Date		Location / Line	
ESC_L2FS_13		<dd/mm/yyyy>		<Line>	
Description		Functionalities tested : - ESC_L2FS_13 Train categories  <b>This test case must be executed for each train category available on-board.</b>			
Signal passed					
Name			Trackside datafile in service		
NR					
Test Scenarios					
Starting condition		Train is in level 2 mode FS upwards the speed restriction area.			
		<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario					
Step	Step description	Description of what to be tested	Statement	Comment	
1	Train enters the category specific train restriction	The permitted speed is : <ul style="list-style-type: none"> <li>• &lt;Passenger Speed&gt; for passenger train</li> <li>• &lt;Freight P Speed&gt; for freight P train</li> <li>• &lt;Freight G Speed&gt; for freight G train</li> </ul>	Pass / Fail		
Test scenario finished					

**4.12.2 Scenario diagram**

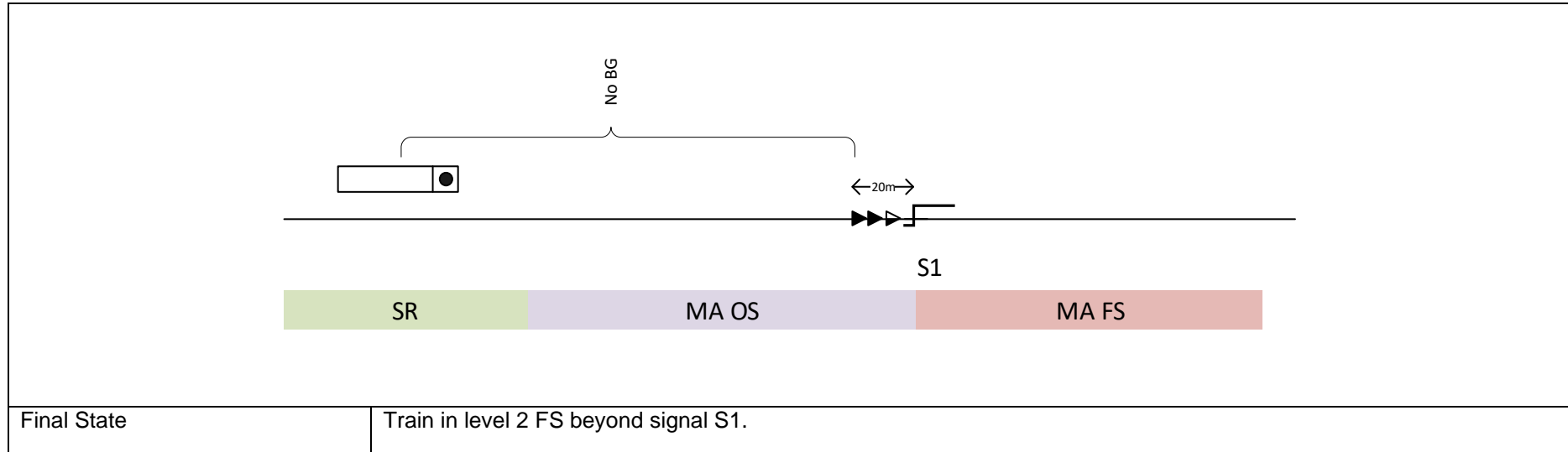


## 4.13 Tests ESC\_L2FS\_14

### 4.13.1 Description

ID		Date	Location / Line	
ESC_L2FS_14		<dd/mm/yyyy>	<Line>	
Description		Functionalities tested : - ESC_L2FS_14 OS extension This test intends to verify that the train does not switch to FS mode before passing the signal.		
Signal passed				
Name		Trackside datafile in service		
S1 : <Signal name>				
Test Scenarios				
Starting condition		Train is in SB mode in rear of signal S1 with a valid position.		
		Train is in a trusted area as far as possible from the signal without BG's between the train and the Single BG of the signal.		
		<b>Be sure all authorisations are filled in before performing the test scenarios</b>		
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Drivers performs a Start of Mission in Level 2.	Train is in SR mode.	Pass / Fail	
2	Signal S1 opens. Train is closer than 150m of the signal	Train receives an MA with mode profile OS.	Pass / Fail	
3	Train passes the signal	Train switches to FS mode after passing the signal S1.	Pass / Fail	
Test scenario finished				

4.13.2 Scenario diagram



#### **4.14 Tests ESC\_TR\_6**

Test case deleted.

#### **4.15 Tests ESC\_TR\_8**

Test case deleted.

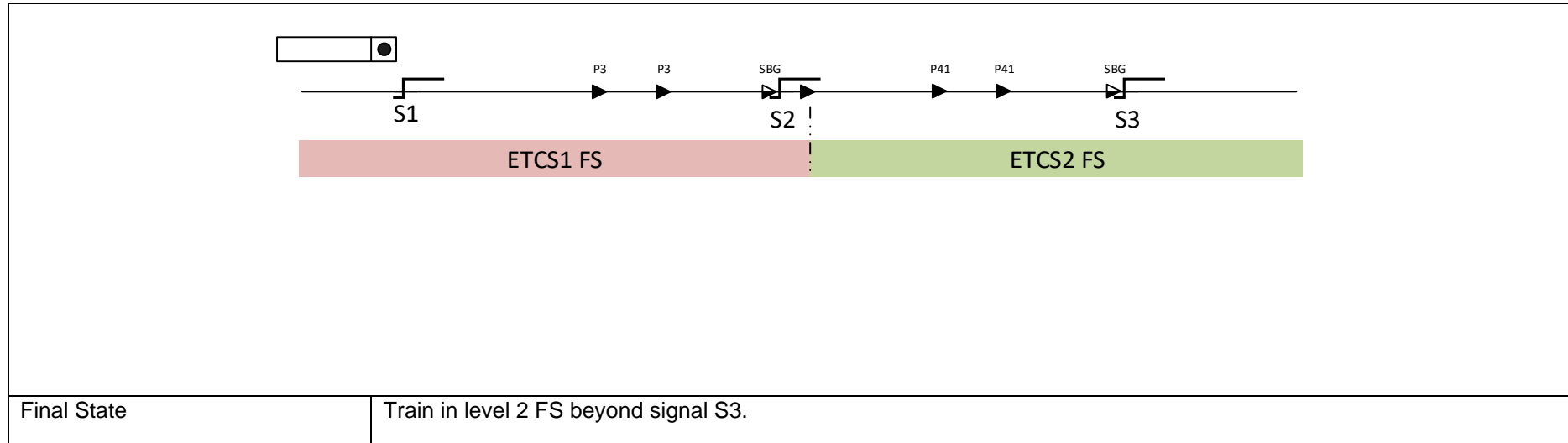
## 4.16 Tests ESC\_TR\_9

### 4.16.1 Description

ID	Date	Location / Line		
ESC_TR_9	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_TR_9 : Transition ETCS1 FS to ETCS2 FS			
Signal passed				
Name	Trackside datafile in service			
<b>S1</b> : <Signal name> is open				
<b>S2</b> : <Signal name> is open. It is the first signal equipped with ETCS2				
<b>S3</b> : <Signal name> is open				
Test Scenarios				
Starting condition	Train is in level 1 mode FS upwards signal S1.			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Train passes signal S1 and approaches signal S2.	Train receives a transition order to level 2. A level transition announcement is displayed on the DMI (no acknowledgment required).	Pass / Fail	
2	Train passes the signal S2.	Transition to level 2 occurs about 60 meters in rear of signal S2.	Pass / Fail	
Test scenario finished				



4.16.2 Scenario diagram

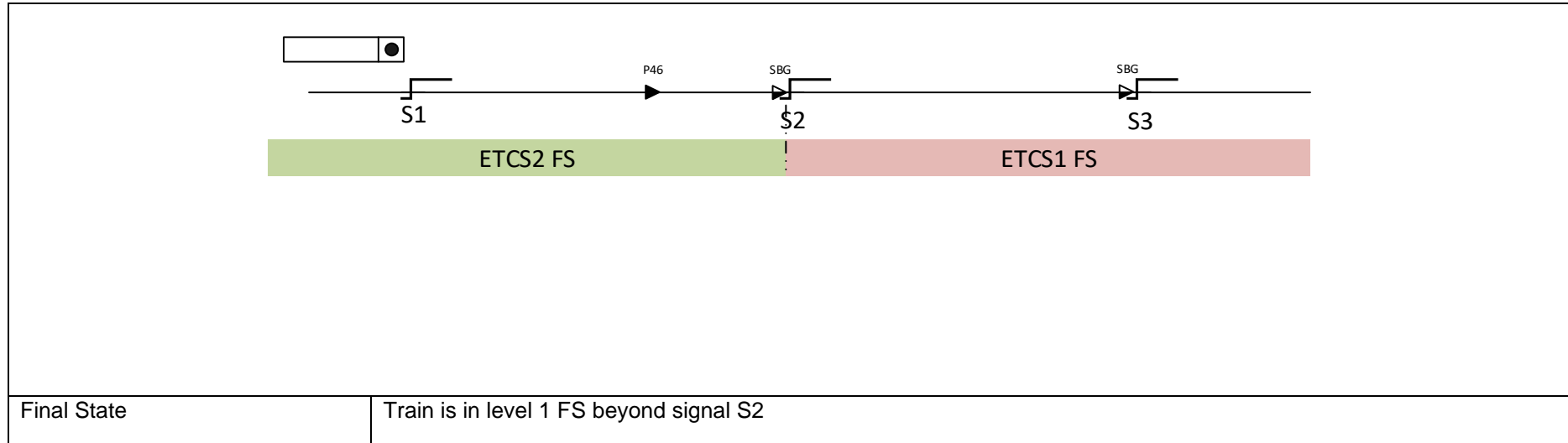


## 4.17 Tests ESC\_TR\_10

### 4.17.1 Description

ID	Date	Location / Line		
ESC_TR_10	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_TR_10 Transition ETCS2 FS to ETCS1 FS			
Signal passed				
Name	Trackside datafile in service			
<b>S1</b> : <Signal name> is open				
<b>S2</b> : <Signal name> is open. It is the first ETCS1 signal				
<b>S3</b> : <Signal name> is open				
Test Scenarios				
Starting condition	Train is in level 2 FS in rear of signal S1.			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Train passes signal S1	Train remains in level 2 FS	Pass / Fail	
2	Train passes signal S2	Train switches to Level 1 FS	Pass / Fail	
Test scenario finished				

4.17.2 Scenario diagram

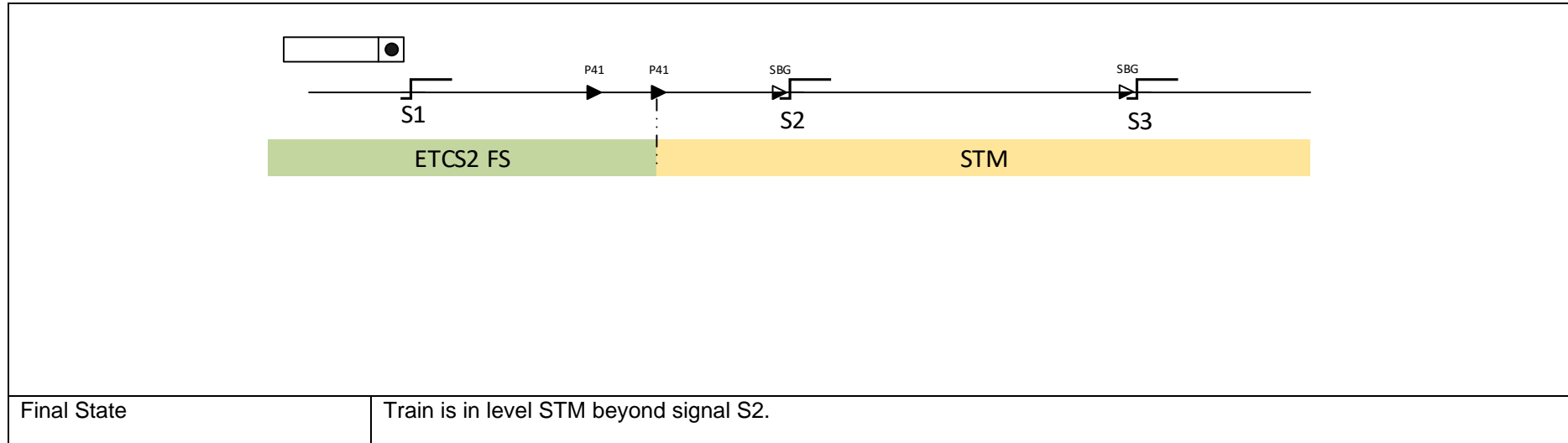


## 4.18 Tests ESC\_TR\_13

### 4.18.1 Description

ID	Date	Location / Line		
ESC_TR_13	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_TR_13 : Transition ETCS2 FS to STM TBL1+			
Signal passed				
Name	Trackside datafile in service			
<b>S1</b> : <Signal name> is open				
<b>S2</b> : <Signal name> is open. It is the first STM signal.				
<b>S3</b> : <Signal name> is open				
Test Scenarios				
Starting condition	Train is in level 2 mode FS upwards signal S1.			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Train passes signal S1 and the first P41 BG.	Train receives a transition order to level STM. A level transition announcement is displayed on the DMI.	Pass / Fail	
2	The drivers acknowledges the level transition and the train passes the second P41 BG.	Train switches to level STM. The possible STM are in descending order of priority: TBL1+, TBL2, TBL1, Memor, KVB	Pass / Fail	
Test scenario finished				

4.18.2 Scenario diagram



## 4.19 Tests ESC\_TR\_16

### 4.19.1 Description

ID	Date	Location / Line		
ESC_TR_16	<dd/mm/yyyy>	<Line>		
Description	Functionalities tested : - ESC_TR_16 Transition STM TBL1+ to ETCS2 FS			
Signal passed				
Name	Trackside datafile in service			
<b>S1</b> : <Signal name> is open				
<b>S2</b> : <Signal name> is open (EoA downwards S3). It is the first ETCS2 signal				
<b>S3</b> : <Signal name> is open				
Test Scenarios				
Starting condition	Train is upwards signal S1 in level STM.			
	The possible STM are in descending order of priority: TBL1+, TBL2, TBL1, Memor, KVB			
	<b>Be sure all authorisations are filled in before performing the test scenarios</b>			
Sequences of the test scenario				
Step	Step description	Description of what to be tested	Statement	Comment
1	Train passes signal S1 and approaches signal S2.	Train receives a transition order to level 2. A level transition announcement is displayed on the DMI.	Pass / Fail	
2	Driver acknowledge the level transition announcement and passes the signal S2.	Transition to level 2 occurs about 60 meters in rear of signal S2.	Pass / Fail	
Test scenario finished				

4.19.2 Scenario diagram

