SatLabs Terminal certification Test Plan

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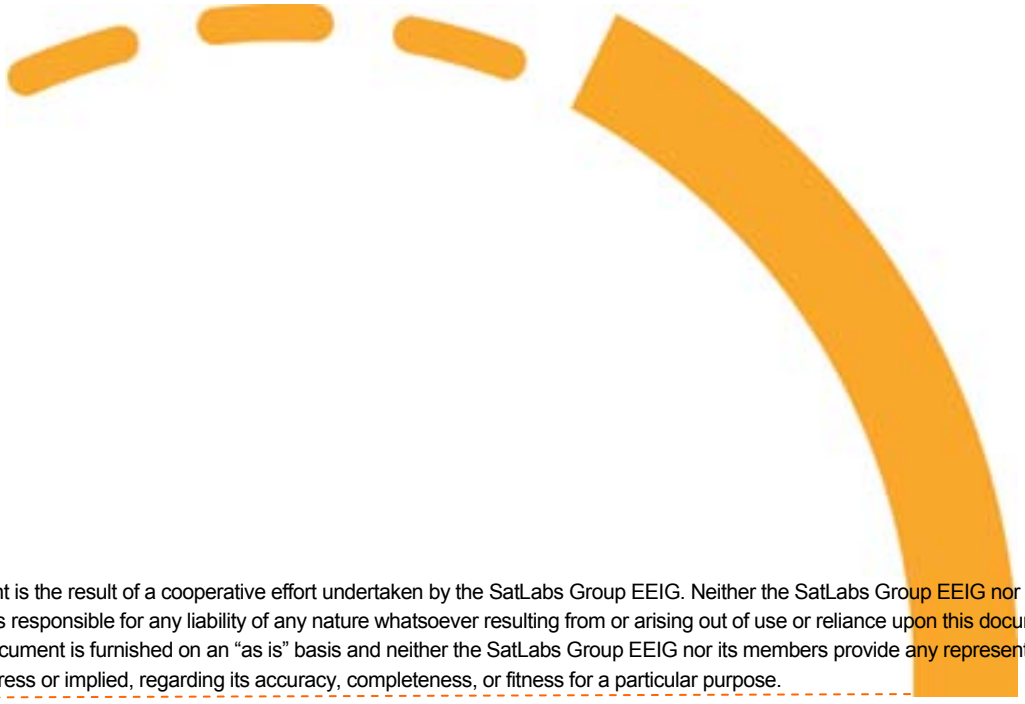

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Document history

Version	Date	Description
6.0	01/09/2008	New version of SatLabs STTP covering the phase 2 of SatLabs Qualification Program. It defines SatLabs v1.3 and v2 profiles. Previous version of the STTP (v5.1) is referenced under sl_395.
6.1	21/09/2009	Editorial changes and changes related to enabling execution of applicable test cases without M&C support for SSR v.1.3 and with M&C support for SSR.2.1. Clarifications on ACM and Capacity request test cases.
7.0	18/11/2010	Reduced set of test cases, restructuring of QoS test cases, removal of redundant and marginal test cases

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1 Acronyms

For the purposes of the present document, the following abbreviations apply:

8PSK	8-ary Phase Shift Keying
16APSK	16-ary Amplitude and Phase Shift Keying
32APSK	32-ary Amplitude and Phase Shift Keying
ACM	Adaptive Coding and Modulation
ACQ	Acquisition burst
AF	Assured Forwarding
ATM	Asynchronous Transfer Mode
AVBDC	Absolute Volume Based Dynamic Capacity
BE	Best Effor
CCM	Constant Coding and Modulation
CD	Critical Data
CMT	Correction Message Table
CRA	Continuous Rate Assignment
CRC	Cyclic Redundancy Check
CSC	Common Signalling Channel
CTB	Common Test Bed for DVB-RCS Terminals
DVB	Digital Video Broadcast
DVB-S	Digital Video Broadcast via Satellite as specified in EN 300 421
DVB-S2	Digital Video Broadcast via Satellite, 2nd Generation, as specified in EN 302 307
EF	Expedited Forwarding
EN	European Norm
FCT	Frame Composition Table
FEC	Forward Error Correction
FTP	File Transfer Protocol
HTTP	HyperText Transfer Protocol
ICMP	Internet Control Message Protocol
ID	IDentifier
IDU	Indoor Unit
IF	Intermediate Frequency
IP	Internet Protocol
I-PEP	interoperable Performance Enhancement Proxy
ISI	Input Stream Identifier
M&C	Management and Control
MAC	Medium Access Control
MF-TDMA	Multi Frequency Time Division Multiple Access
MIB	Management Information Base
MMT	Multicast PID Mapping Table
MPAF	MPEG Adaptation Field
MPE	Multi-Protocol Encapsulation
MPEG	Motion Pictures Expert Group
NCR	Network Clock Reference
NIT	Network Information Table
OID	Object IDentifier
ODU	Outdoor Unit
PAT	Program Association Table
PEP	Performance Enhancement Proxy

PCR	Program Clock Reference
PHB	Per Hop Behaviour
PICS	Protocol Implementation Conformance Statements
PID	Packet Identifier
PIXIT	Protocol Implementation Extra Information for Testing
PL	Physical Layer
PMT	Program Map Table
QoS	Quality of Service
QPSK	Quadrature Phase Shift Keying
RBDC	Rate-Based Dynamic Capacity
RC	Request Class
RCS	Return Channel via Satellite
RCST	Return Channel via Satellite Terminal
RFC	Request For Comments
RMT	RCS Map Table
RO	Roll-Off
RT	Real-Time
RTT	Round –Trip Time
Rx	Reception
SAC	Satellite Access Control
SCT	Superframe Composition Table
SI	Service Information
SNMP	Simple Network Management Protocol
SOF	Start Of Frame
SPT	Satellite Position Table
SSR	SatLabs System Recommendations
SYNC	Synchronization
S/W	SoftWare
TBTP	Terminal Burst Time Plan
TCT	Time-slot Composition table
TDM	Time Division Multiplex
TDMA	Time Division Multiple Access
TFTP	Trivial File Transfer Protocol
TIM	Terminal Information Message
TIM-U	TIM-Unicast
TIM-B	TIM-Broadcast
TMST	Transmission Mode Support Table
TRF	Traffic
TS	Transport Stream
Tx	Transmission
VBDC	Volume-Based Dynamic Capacity
VCM	Variable Coding and Modulation

2 Introduction

Beginning of 2004 the first version of the SatLabs Terminal certification Test Plan (STTP) was published by the SatLabs Group. On basis of that STTP the Common Test Bed (CTB) was developed and has been used to perform the SatLabs Qualification Testing in Phase 1. This Phase 1 Qualification Program refers to Version 1 of the SatLabs System Recommendations, defining basic compliance for DVB-RCS terminals. The STTP for Phase 1 can be found in document 'SatLabs Compliance/Interoperability Test Plan' (SatLabs reference sl_395).

In 2007 SatLabs decided to launch the Phase 2 of the SatLabs Qualification Program for enhanced compliance of DVB-RCS terminals. Phase 2 therefore covers additional functionality compared to Phase 1: DVB-S2, Quality of Service (QoS), Management and Control (M&C) and Performance Enhancement Proxy (PEP).

The test plan contained in this document is the basis for the SatLabs Qualification Testing in Phase 2, defining SatLabs v1.3 and v2 profiles. It is based on the following documents:

- ETSI EN 301 790 v1.5.1 (2009-05)
- ETSI TR 101 790 v1.2.1 (2003-01)
- SatLabs System Recommendation (SSR) v1.3, defining SatLabs v1.3 profile
- SatLabs System Recommendation (SSR) v2.1, defining SatLabs v2 profile
- SatLabs System Recommendations - Quality of Service specifications (SSR QoS), defining the harmonised QoS functionality (MAC and IP layers). It is referenced by both SSR v1.3 and v2.1.
- SatLabs System Recommendations - Management and Control Planes Specifications (SSR M&C), defining the harmonised management functionality. It is referenced by SSR v2.1 only.
- DVB-RCS Management Information Base (MIB) file, which is an annex to the SSR M&C.

In this document the test cases for terminal qualification are given. The first main section includes the 'basic test cases' which correspond to the basic functionality already covered in Phase 1. Following sections include test cases corresponding to the new functionality covered in Phase 2: DVB-S2, QoS, M&C and PEP.

The mandatory and optional functionalities applicable for version 1.3 and 2.1 certification testing are defined in SSR v.1.3 and v.2.1 respectively and are not listed in this document.

3 Definitions

3.1 Compliance Testing

The general definition of compliance is as follows:

"Conformance/Compliance is exclusively considered in relation to a specific requirement or requirement document (e.g. specification, standard, guideline). Conformance/Compliance is the fact that a system or component meets the requirement(s) of a specification, standard or similar document.
Conformance/Compliance testing is the process of verifying that an implementation performs in accordance with a particular standard or specification. Conformance testing is exclusively concerned with the external behaviour of an implementation. Service and functional behaviour is tested in order to find logical errors and with this to ensure the prerequisites for interoperability.
Conformance/Compliance testing is not intended to be exhaustive, and a successfully passed test suite does not imply a 100-percent guarantee. But it does ensure, with a reasonable degree of confidence, that the implementation is consistent with its specification, and it does increase the probability that implementations will interwork."

Based on the general definition above, the SatLabs definition of DVB-RCS compliance is as follows:

Compliance to Version 1 guarantees that a terminal can logon to the DVB-RCS network, maintain its synchronisation, make capacity requests as well as use the corresponding capacity allocations. Compliance also covers IP encapsulation, on both forward and return links, which means that the transport of IP datagrams to and from terminals is enabled.

Compliance to Version 1.3 further covers Quality of Service support. DVB-S2 related profiles are also supported. Optionally it also covers I-PEP.

Compliance to Version 2 further covers harmonised terminal management (HM&C).

The present STTP is intended to be used for testing compliance to Version 1.3 and Version 2.

SSR v1.3 compliance testing

For SSR v1.3 compliance testing, the following tests have to be performed:

Part _1) all mandatory test cases from the pool of the basic test cases

- For terminals which are only supporting DVB-S (PICS: DVBS) all test cases for the basic profile shall be performed using DVB-S in the forward channel.
- For terminals which are only supporting DVB-S2 (PICS: DVBS2) all test cases for the basic profile shall be performed using DVB-S2 in the forward channel.
- For terminals which are supporting both DVB-S and DVB-S2 (PICS: DVBSS2) most test cases shall be performed using DVB-S2 in the forward channel. A random selection of the basic test cases shall be performed using DVB-S in the forward channel.

Part _2) all mandatory test cases from the pool of the QoS test cases

- The v1.3 testing shall be performed without using HM&C functionality. The manufacturer has to provide the necessary tools.

Part_3) optional the RCST may support one of the DVB-S2 profiles (ACM, CCM)

- When supporting the CCM profile all the mandatory CCM tests from the pool of the DVB-S2 test cases have to be performed.
- When supporting the ACM profile all the mandatory CCM and ACM tests from the pool of the DVB-S2 test cases have to be performed.

Part_4) IPEP tests are optional. When supporting IPEP functionality, all the mandatory IPEP tests that are described within this STTP have to be performed.

All optional test cases (options) dealing with Part_1 to Part_4 of the above described test plan can be found in table 7-3 of the SSR 1.3.

SSR v2 compliance testing

In addition to the tests for v1.3, v2 also includes all mandatory test cases from the pool of the M&C test cases.
The testing for QoS shall be performed using HM&C functionality.

3.2 Compliance Test Plan

The compliance test plan is the collection of all the test cases which are reasonably assessed as relevant with respect to the compliance of DVB-RCS terminals. With the information on the implementation of functionalities in the terminal under test (PICS) the applicable test cases can be selected from this test plan.

3.3 PICS

A standard usually contains a huge amount of requirements. Often several options are raised in a standard. This leads to a situation where there are requirements which certainly do apply, further requirements which might apply and even requirements which do not apply to a specific device. The path through that labyrinth is given by a device itself – or in better words: by the information on the features which are implemented. This information is usually given in so-called “Implementation Compliance Statements” (ICS), or if specifically protocols are of interest in so-called “Protocol Implementation Conformance Statements” (PICS).

The PICS can be seen as a compliance list, in which for each feature of the standard an answer on its implementation is given. Each field of the PICS is linked with certain test cases. This means for instance, that if the compliance list says that “turbo coding” is implemented, all test cases dealing with turbo coding are to be tested.

In this document the link between PICS and applicable test cases is given in the test case definition, where the line “Applicability / PICS” can be found. Where that information field is left blank, the test case is obligatory.

PICSs are defined separately in the different sections of this document, meaning for each implementation feature (which might be optional) a more detailed PICS is defined if necessary.

3.4 PIXIT

As soon as it has been defined which test case is to be tested (based on the PICS) one can have a closer look into the test cases. Nearly all test cases require specific input parameters which might be different from device to device. Good examples for such parameters are “Population ID”, “MAC address”, etc. Other parameters are expected to be constant from device to device (e.g. NCR_min_period).

All parameters which are required to perform a test are collected and communicated in form of a "**P**rotocol **I**mplementation **E**xtra **I**nformation for **T**esting" (PIXIT). PIXIT is also a list of parameters. While the parameters and their syntax is well-defined, the value can vary within certain limits from case to case.

PIXITs are defined separately in the different sections of this document, meaning for each implementation feature (which might be optional) more detailed PIXITs are defined if necessary.

4 Basic Test Cases (independent of DVB-S / DVB-S2 support)

This section contains the test cases which apply for the basic SatLabs functionality for DVB-RCS terminals. It is based on the SatLabs Terminal certification Test Plan for the SatLabs Qualification Program Phase 1, but it is enhanced to the extent, that it is also applicable for DVB-S2 implementations. Furthermore, there are separate sections for the different types of implementations (e.g. optional features) which shall apply as soon as such feature is supported. Among these sections there is one describing additional test cases which shall be performed beside the basic ones as soon as DVB-S2 is supported by the RCST.

4.1 Protocol Implementation Conformance Statement (PICS)

The following Table forms a template to collect Protocol Implementation Conformance Statement (PICS) for a DVB-RCS terminal. Each of the fields given in the table must be filled in to create a specific testing profile. The information given in the filled PICS is the basis for the selection of relevant test cases from the certification Test Plan.

For certain PICS IDs there is a recommendation given by the SatLabs group

- whether it is recommended to implement this feature – marked by the word “true” followed by a exclamation-mark (“true!”)
- whether it is recommended not to implement this feature – marked by the word “false” followed by an exclamation-mark (“false!”)

For those PICS IDs which are not marked by “true!” or “false!” it is under the discretion of the manufacturer whether the feature is implemented or not.

PICS Table

PICS ID	PICS/Explanation	PICS
DVBS	True, if the RCST supports DVB-S only in the Forward Link	
DVBS2	True, if the RCST supports DVB-S2 only in the Forward Link	
DVBSS2	True, if the RCST supports both DVBS and DVBS2 in the Forward Link	
ACM	True, if the RCST supports DVB-S2 (profiles DVBS2 and DVBSS2) and if the RCST also supports ACM	

	and VCM	
ATM_TRF	True if ATM TRF burst formatting is implemented	TRUE!
MPEG_TRF	True if MPEG TRF burst formatting is implemented	
TURBO	True if Turbo coding is implemented	TRUE!
COARSE_SYNC	True if Coarse Synchronization is supported	
FINE_SYNC	True if Fine Synchronization is supported	TRUE!
WAKE_UP	True if the RSCT supports “wake up”	TRUE!
WIDE_HOPP	True if the RCST burst to burst frequency hopping range is 120 MHz	
FAST_HOPP	True if the RCST supports frequency hopping between adjacent time slots	
VBDC	True if the RCST supports VBDC capacity request class	TRUE!
RBDC	True if the RCST supports RBDC capacity request class	TRUE!
AVBDC	True if the RCST supports AVBDC capacity request class	TRUE!
CRC_SYNC	True if the RCST sends the SYNC burst with CRC	TRUE!
DYNAMIC_MF_TDMA	True, if dynamic MF-TDMA is implemented	
SECTION_PACKING	True, if an RCST supports DSM-CC section packing (on the forward link for all terminals, on the return link if the terminal supports MPEG_TRF)	TRUE!
NCR_PAYLOAD	True, if an RCST supports the optional payload field in the NCR table	TRUE!
CONTENTION_SYNC	True, if an RCST supports the use of the contention SYNC slots	
MMT	True, if an RCST supports the Multicast Map Table signalling method	V1.3: optional V2.1: TRUE!
QOS	True, if the RCST is to be tested acc. to the QoS requirements of the SatLabs System Recommendations Applicable Test Cases: see section 6	TRUE!
HM&C	True, if the RCST supports the management and control interface and MIB as described in the	V1.3: N/A

	SatLabs System Recommendations Applicable Test Cases: see section 7	V2.1: TRUE!
PEP	True, if the RCST supports a Protocol Enhancements Proxy (PEP) in form of the TCP acceleration or the HTTP-Prefetching. Applicable Test Cases: see section 8	

4.2 Protocol Implementation Extra Information for Testing (PIXIT)

The following Table forms a template to collect Protocol Implementation Extra Information for Testing (PIXIT) for a DVB-RCS terminal. Each of the fields given in the table must be filled in to create a specific test setup. The information given in the filled PIXIT is required by the CTB to perform a specific test case. This information is to be provided by the manufacturer of an RCST before the testing for the SatLabs Qualification Program starts. Most of the initially defined PIXIT values (see first version of STTP) have been jointly defined in SatLabs Testing Parameter Ranges. Information to these values are only required if the RCST implementation deviates from the specified parameter ranges.

Preliminary PIXIT Table

PIXIT_ID	PIXIT	Value
MAC_ADDR	MAC address of the RCST	
RCST_CAP_FIELD	24 bit field “RCST capability” in CSC burst	
INITIAL_IP_ADDR	IP address for the device management access (e.g. for accessing web page based management)	
LCT_PARAM	Parameters to access the device management console using a key based terminal application (e.g. Hyperterminal or similar)	
ACCESS_ACCOUNTS	Default Access Accounts to the device management. All usernames and passwords to configure the settings for the SatLabs Testing must be made available (e.g. installer account, network management account, admin user account, plain user account, etc.)	

4.3 Test Case Selection Matrix – Basic Test Cases (Basic Profile)

Following table provides an overview on the applicable test cases when SatLabs basic profile is supported. All these tests should be performed using the SatLabs definition for the basic profile (ATM).

4.3.1 DVB-S/DVB-S2 Support

- DVB-S2 feature is optional according to the SatLabs Qualification Program Phase 2. However, as this is currently the industry standard, DVB-S2 is the baseline for the forward link configuration: For terminals which are only supporting DVB-S2 (PICS: DVBS2) all test cases for the basic profile shall be performed using DVB-S2 in the forward channel. This is the default configuration
- For terminals which are only supporting DVB-S (PICS: DVBS) all test cases for the basic profile shall be performed using DVB-S in the forward channel.
- For terminals which are supporting both DVB-S and DVB-S2 (PICS: DVBSS2) most test cases shall be performed using DVB-S2 in the forward channel. A random selection of 5 of the basic test cases shall be performed using DVB-S in the forward channel.

All tests in this test plan are to be performed with the default set of parameters. DVB-S2 pilots are off, except when testing pilots (PILOTS_001 test case). Variation of DVB-S2 specific parameters will only be done in the optional DVB-S2 part of the test plan.

4.3.2 Overview of Version 1,3 Mandatory Test Cases

Test Case ID	Test Case Name	Comment
FLA_005_01	Population_ID missing	
FLA_006_01	Transponder change 1	
NCR_001_01	Variable NCR period	
NCR_003_01	NCR Loss	
LOGON_007_01	Logon – no response c)	
LOGON_009_01	Wake up	
FSYNC_003_01	Correction > Fine Sync threshold b)	
FSYNC_005_01	No CMT response b)	
MSYNC_002_01	Correction > Fine Sync threshold	
MSYNC_004_01	No CMT response b)	
LOGOFF_001_01	Hub initiated Logoff	
HOLD_004_01	Transmit Disable, remain in Hold, release Hold	
SCT_003_01	Changes in SCT, superframe_duration	
FCT_002_01	Change in FCT, total_timeslot_count, change in SF frequency, throughput test	
TCT_012_01	Change in TCT, timeslot_payload_type, one ATM cell	
TCT_013_01	Change in TCT, timeslot_payload_type, two ATM cells	

Test Case ID	Test Case Name	Comment
TCT_014_01	Change in TCT, timeslot_payload_type, four ATM cells	
TCT_022_01	Change in TCT, variations of ATM TRF lengths	
TCT_024_01	Change in TCT, Code Rate, Turbo Code, TRF	
TCT_025_01	Change in TCT, symbol_rate and preamble in CSC/SYNC/TRF	
FHOP_001_01	Change in TBTP; slow hopping; TRF	
FHOP_003_01	Change in TBTP; narrow hopping range; TRF	
SPT_001_01	Change in SPT; satellite coordinates	
APP_002_01	FTP File Transfer	
TIME_REF_001_01	Variation in FL, correct delay compensation	
SEC_PACK_001_01	DSM-CC; Section Packing, Forward Link only	
NCR-Payload_001_01	NCR-Payload	
QOS_001	QoS - BE PHB	
QOS_002	RBDC Requests	
QOS_003	A/VBDC Requests	

4.3.3 Overview of Version 2.1 Mandatory Test Cases

Test Case ID	Test Case Name	Comment
FLA_005_01	Population_ID missing	
FLA_006_01	Transponder change 1	
NCR_001_01	Variable NCR period	
NCR_003_01	NCR Loss	
LOGON_007_01	Logon – no response c)	
LOGON_009_01	Wake up	
FSYNC_003_01	Correction > Fine Sync threshold b)	
FSYNC_005_01	No CMT response b)	
MSYNC_002_01	Correction > Fine Sync threshold	
MSYNC_004_01	No CMT response b)	
LOGOFF_001_01	Hub initiated Logoff	
HOLD_004_01	Transmit Disable, remain in Hold, release Hold	
SCT_003_01	Changes in SCT, superframe_duration	
FCT_002_01	Change in FCT, total_timeslot_count, SF frame centre frequency, throughput test	
TCT_012_01	Change in TCT, timeslot_payload_type, one ATM cell	
TCT_013_01	Change in TCT, timeslot_payload_type, two ATM cells	
TCT_014_01	Change in TCT, timeslot_payload_type, four ATM cells	
TCT_022_01	Change in TCT, variations of ATM TRF lengths	
TCT_024_01	Change in TCT, Code Rate, Turbo Code, TRF	

Test Case ID	Test Case Name	Comment
TCT_025_01	Change in TCT, symbol_rate and preamble in CSC/SYNC/TRF	
FHOP_001_01	Change in TBTP; slow hopping; TRF	
FHOP_003_01	Change in TBTP; narrow hopping range; TRF	
SPT_001_01	Change in SPT; satellite coordinates	
APP_002_01	FTP File Transfer	
TIME_REF_001_01	Variation in FL, correct delay compensation	Should be executed for both DVB-S and DVB-S2 if the RCST supports both
SEC_PACK_001_01	DSM-CC; Section Packing, Forward Link only	
NCR-Payload_001_01	NCR-Payload	
MMT_001_01	Multicast IP	
QOS_001	QoS - BE PHB	
QOS_002	RBDC Requests	
QOS_003	A/VBDC Requests	

4.4 Test Case Selection Matrix – Basic Test Cases (SatLabs Options)

Following table provides an overview on the applicable test cases when SatLabs recommended options are supported. All these tests, except the tests foreseen for MPEG_TRF option, should be performed using ATM as traffic burst type.

Test Case ID	Test Case Name	Applicable for following options
SCT_001_01	Changes in SCT, superframe_centre_frequency	MPEG_TRF
FCT_001_01	Change in FCT, frame_duration	MPEG_TRF
TCT_024_01	Change in TCT, Code Rate, Turbo Code, CSC/SYNC/TRF	MPEG_TRF
TCT_025_01	Change in TCT, symbol_rate and preamble in CSC/SYNC/TRF	MPEG_TRF
APP_002_01	FTP File Transfer	MPEG_TRF
SEC_PACK_002	DSM-CC; Section Packing, RL only	MPEG_TRF
DISP_QOS_004	Dispatching (4)	MPEG_TRF
CSYNC_001_01	Enter Fine sync state	COARSE_SYNC
CSYNC_003_01	Correction > Coarse Sync threshold b)	COARSE_SYNC
CSYNC_005_01	No ACQ response b)	COARSE_SYNC
WIDE_HOPP_001_01	Wide Hopping Range (120MHz)	WIDE_HOPP
FHOP_002_01	Change in TBTP; fast hopping; TRF	FAST_HOPP
DYNAMIC_MF_TDMA_001_01	Dynamic MF-TDMA	DYNAMIC_MF_TDMA
CONTENTION_SYNC_001_02	Contention Sync	CONTENTION_SYNC
MMT_001	Multicast IP	MMT *

***: This testcase is optional only when testing for version 1.3. In version 2.1 this testcase is mandatory.**

4.5 Test Plan for DVB-RCS Compliance

The test plan which is described in this section is based on the requirements which are defined in EN 301 790. With respect to the compliance definition as given in Chapter 3, a set of test cases has been chosen to form this compliance test plan. The test plan is structured in several sections, each dealing with a specific functionality.

Structure of the test plan

Test Section	Number of Test Cases in Section
Forward Link Acquisition	**2**
Acquiring NCR Lock	**2**
Logon Procedure	**2**
Coarse Synchronization Procedure	**3 optional**
Fine Synchronization Procedure	**2**
Synchronization Maintenance Procedure	**2**
Logoff	**1**
HOLD State	**1**
SI Tables	**8**
Frequency Hopping	**2**
Satellite Position Table	**1**
Basic Application Testing	**1**
Wide Hopping	**1 optional**
Dynamic MF-TDMA	**1 optional**
Contention Sync	**1 optional**
Section Packing	**1**
Timing reference	**1**
NCR-Payload	**1**
MMT Multicast IP	**1 (optional for v1.3)**

Total: **34 (7 optional)**

4.5.1 Test Group – Forward Link Acquisition

The tests in this section investigate the proper acquisition of the forward link, when a terminal is connected to the network. By passing these tests it is ensured that the terminal does not send any signal to the network unless all required information has been derived from the forward link. Furthermore, it is verified that the terminal is capable of acquiring the forward link even if it is forced to change transponders for collecting all required information.

Test Case ID	FLA_005_01	
Test Case Name	Population_ID missing	
EN 301790 Reference	8.5.5.11	
Objective / Test Purpose	Verify that the RCST does not acquire the forward link when its population_ID is not covered by the relevant linkage descriptor of the RMT.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	CTB transmits all SI tables necessary to acquire the forward link are correctly distributed, but the RMT which is provided does not contain the population_ID that is configured in the RCST.
	2	Initiate RCST Logon procedure
	3	CTB verifies RCST activities and monitors return link activities
PASS/FAIL Criteria	• RCST does not proceed with Logon procedure. • RCST does not transmit any burst.	
Remarks	The list of population_IDs is covered by the linkage descriptor and distributed as part of the RMT Reaction as provided by the terminal to be noted.	

Test Case ID	FLA_006_01	
Test Case Name	Transponder change 1	
EN 301790 Reference	8.5.5.11	
Objective / Test Purpose	Verify that the RCST is able to acquire the forward link even if the satellite delivery descriptor, transmitted in the NIT, forces the RCST to change the transponder (retune) to receive the RMT.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	CTB distributes NIT including the satellite_delivery_descriptor which identifies the frequency where the transponder is located that carries the RMT.
	2	CTB issues default value for frequency in satellite_delivery_descriptor as specified in step 1
	3	The CTB is not issuing a second stream (carrying the RMT) on the frequency as signalled with help of the satellite_delivery_descriptor within the NIT
	4	Start RCST logon procedure
	5	Verify that the RCST is not proceeding with the logon procedure (sending CSC bursts) caused by the missing RMT
	6	Reboot the RCST
	7	Change frequency which identifies the location of the transponder that carries the RMT in the satellite_delivery_descriptor
	8	Proceed with step 3 until procedure is done for lowest and highest value for the frequency described in step 7
	9	End
PASS/FAIL Criteria	• Test procedure is fulfilled.	
Remarks	The values for forward link frequencies is given by FL_FREQ in SSR.	

4.5.2 Test Group – Acquiring NCR Lock

The tests in this section verify that the terminal is capable of handling various NCR events without causing problems in the network. The terminal may be impacted by various NCR periods or NCR packet losses. These test cases investigate the proper reaction of the terminal specifically on NCR impacts.

Test Case ID	NCR_001_01 (fine Synchronisation)	
Test Case Name	Variable NCR period	
EN 301790 Reference	7.7.3, 8.3.5	
Objective / Test Purpose	Verify that the RCST is capable of handling various NCR update rates (200 times up to 10 times per second), the RCST shall not loose NCR synchronization.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Fine Sync state	
Test Method	Step	Description
	1	timer_value = (10 minutes)
	2	CTB issues the NCR with an update rate of 200 times/second
	3	Initiate IP traffic from RCST
	4	Preset timer with timer_value, start timer
	5	CTB verifies RCST`s transmit activities.
	6	RCST should transmit in allocated TRF slots
	7	Repeat step 5 to step 6 until timer expires
	8	Cancel IP traffic from RCST
	9	Update rate for the NCR is reduced in the CTB down to 50 times/second
	10	Initiate IP traffic from RCST
	11	Preset timer with timer_value, start timer
	12	CTB verifies RCST's transmit activities.
	13	RCST should transmit in allocated TRF slots
	14	Repeat step 12 to step 13 until timer expires
	15	Cancel IP traffic from RCST
	16	Update rate for the NCR is reduced in the CTB down to 50 times/second
	17	Initiate IP traffic from RCST
	18	Preset timer with timer_value, start timer
	19	CTB verifies RCST's transmit activities.
	20	RCST should transmit in allocated TRF slots
	21	Repeat step 12 to step 13 until timer expires
	22	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST does not leave fine sync state in step 5, in step 12 or in step 19. • RCST transmits IP traffic in allocated TRF slots.	
Remarks	The test has to be performed with max. value for symbol_rate (see SYMB_RA_TRF in SSR). The test has to be performed with 200 times/second, 50 times/second and 10 times/second as update rate for NCR.	

Test Case ID	NCR_003_01	
Test Case Name	NCR Loss	
EN 301790 Reference	7.7.3	
Objective / Test Purpose	Verify that the RCST ceases transmission after loss of NCR for several consecutive seconds.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	timer_value=(NCR_MAX_LOSS)
	2	Initiate IP traffic from Host PC at RCST side
	3	Hub issues the NCR with an update rate of 200 times/second
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is transmitting in allocated timeslots.
	5	Preset timer with timer value
	6	Start timer
	7	CTB ceases transmission of NCR. Until the CTB supports this feature, the test engineer must disconnect the forward link from the device under test manually.
	8	Wait until timer has expired
	9	CTB verifies that the RCST does not transmit any bursts
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST has achieved fine sync state in step 4. • RCST has set fine sync achieved flag in M&C message of the SAC field in step 4. • RCST has ceased transmission 4 – 6 seconds after the NCR has been lost.	
Remarks	The test has to be performed with default value for symbol_rate (FL_SYMBOL as defined in the SSR). The value for NCR_MAX_LOSS is defined in the SSR.	

4.5.3 Test Group – Logon Procedure

The tests in this section verify that the terminal properly logs on the DVB-RCS network, including CSC burst validation. Beside the reception of unicast TIMs (TIM-U) it is checked whether the terminal reacts in the expected way to the specific logon information contained in TIM-U.

Test Case ID	LOGON_007_01	
Test Case Name	Logon – no response c)	
EN 301790 Reference	7.3	
Objective / Test Purpose	Verify that the RCST starts sending CSC bursts after timeout of CSC_MAX_TIME_RETRY (timeout after unsuccessful Logon procedure).	
Initial RCST State	Receive sync state	
Expected Final RCST State	Receive sync state	
Test Method	Step	Description
	1	Initiate Logon procedure at RCST side
	2	RCST sends CSC burst
	3	CTB verifies correct formatting and content of CSC burst
	4	Wait for CSC_RESP_TIMEOUT No TIM-U is returned
	5	Repeat step 2 to 4 until CSC_MAX_LOSSES has exceeded
	6	CTB verifies that the RCST transmits no CSC burst
	7	Wait for timeout of CSC_MAX_TIME_RETRY
	8	RCST sends CSC burst
	9	CTB verifies correct formatting and content of CSC burst
PASS/FAIL Criteria	• Correct CSC burst in step 3 and 9 • No CSC burst in step 6	
Remarks	The values for CSC_RESP_TIMEOUT, CSC_MAX_LOSSES and CSC_MAX_TIME_RETRY are defined in the SSR and broadcast in the Contention Control descriptor (TIM-B)	

Test Case ID	LOGON_009_01	
Test Case Name	Wake up	
EN 301790 Reference	7.3, 8.5.5.8	
Objective / Test Purpose	To show that the RCST when in “Receive sync” state and receiving a TIM-U message containing information “wake_up” initiates Logon procedure.	
Initial RCST State	Receive sync state	
Expected Final RCST State	Ready for fine sync state	
Test Method	Step	Description
	1	CTB transmits SI Tables and TIM-B
	2	RCST acquires forward link but is forced not to log on
	3	CTB waits for 60 second checking that no CSC burst is received.
	4	CTB sends TIM-U containing the RCST status “wake-up”
	5	RCST sends CSC burst to acquire the return link
	6	CTB verifies correct formatting and content of CSC burst
	7	CTB returns a TIM-U permitting logon
	8	CTB verifies that the RCST transmits SYNC bursts (and optionally ACQ).
PASS/FAIL Criteria	• Correct CSC burst in step 5 • Correct SYNC bursts in step 8	
Remarks	Manufacturer of the RCST is expected to provide the procedure to let the RCST acquire the Forward Link but to keep it from automatically acquiring the Return Link.	

4.5.4 Test Group – Coarse Synchronization Procedure

The tests in this section verify that the Coarse Synchronization Procedure is implemented properly. The terminal is forced into all defined stages of the flow chart which is specified in EN 301 790.

Test Case ID	CSYNC_001_01	
Test Case Name	Enter Fine sync state	
EN 301790 Reference	7.4	
Objective / Test Purpose	Verify that the RCST enters the “Ready for Fine sync“ state on receipt of a CMT “correction < Coarse Sync threshold“ (value specified in ACQ Assign descriptor)	
Initial RCST State	Ready for Coarse Sync	
Expected Final RCST State	Ready for Fine Sync	
Test Method	Step	Description
	1	RCST is in “ready for coarse sync” state and is sending ACQ bursts
	2	CTB returns a CMT with time and frequency correction values < ACQ_Achieved threshold values (ACQ_ACH_TIME_THR and ACQ_ACH_FREQ_THR, values specified in ACQ Assign descriptor)
	3	CTB verifies that the RCST stops sending ACQ bursts and transmits SYNC bursts
	4	CTB verifies that the bursts transmitted by the RCST remain in the expected burst limits (SYNC_Achieved_thresholds: SYNC_ACH_TIME_THR and SYNC_ACH_FREQ_THR, values specified in SYNC Assign descriptor).
	5	Verify that the correction values that are observed by the CTB are smaller than the SYNC_Achieved_thresholds.
PASS/FAIL Criteria	• SYNC bursts in step 3 • Expected time and frequency position of the bursts (within thresholds) in step 5	
Remarks	Applicable to COARSE_SYNC only. The values for ACQ_ACH_TIME_THR, ACQ_ACH_FREQ_THR , SYNC_ACH_TIME_THR and SYNCH_ACH_FREQ_THR are defined in the SSR and transmitted in the ACQ Assign and the SYNC Assign descriptors of the unicast TIM	

Test Case ID	CSYNC_003_01	
Test Case Name	Correction > Coarse Sync threshold b)	
EN 301790 Reference	7.4	
Objective / Test Purpose	Verify that the RCST enters the “Off /Stand-by” state on receipt of a CMT “correction > Coarse Sync threshold” and ACQ_MAX_TRIES has been exceeded.	
Initial RCST State	Ready for Coarse Sync	
Expected Final RCST State	Wait_in_standby_mode	
Test Method	Step	Description
	1	Initiate Logon procedure at RCST side
	2	RCST sends CSC burst
	3	CTB returns a TIM-U with time and frequency correction values > ACQ_Achieved threshold values (ACQ_ACH_TIME_THR and ACQ_ACH_FREQ_THR)
	4	CTB verifies that the RCST transmits an ACQ burst
	5	CTB verifies that the ACQ burst received is within the expected burst window (within the ACQ_Achieved thresholds)
	6	CTB returns a CMT with time and frequency correction values > ACQ_Achieved threshold values
	7	CTB verifies that the RCST keeps on sending ACQ bursts.
	8	CTB verifies that the RCST corrects the burst timing and frequency in way that it falls into the expected burst window (within the ACQ_Achieved thresholds)
	9	Repeat step 6 to step 8 until ACQ_MAX_TRIES has been exceeded
	10	Verify with Return Link analyser that the RCST transmits no bursts within the configured “wait in standby mode” timer.
PASS/FAIL Criteria	• ACQ burst in step 4 an 7 • Burst reception within the ACQ_Achieved thresholds in step 5 and 8. • No ACQ burst in step 9 in “Wait_in_standby_mode”	
Remarks	Applicable to COARSE_SYNC only. The values for ACQ_ACH_TIME_THR, ACQ_ACH_FREQ_THR and ACQ_MAX_TRIES are defined in the SSR and are transmitted in the ACQ Assign descriptor of the TIM-U. The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.	

<table>
<tr><td>Test Case ID</td><td colspan="2">CSYNC_005_01</td></tr>
<tr><td>Test Case Name</td><td colspan="2">No ACQ response b)</td></tr>
<tr><td>EN 301790 Reference</td><td colspan="2">7.4</td></tr>
<tr><td>Objective / Test Purpose</td><td colspan="2">Verify that the RCST enters the “Off /Stand-by” state if ACQ_RESP_TIMEOUT has expired and no CMT has been received and ACQ_MAX_LOSSES has been exceeded.</td></tr>
<tr><td>Initial RCST State</td><td colspan="2">Ready for Coarse Sync</td></tr>
<tr><td>Expected Final RCST State</td><td colspan="2">Wait_in_standby_mode</td></tr>
<tr><td>Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td></td><td>1</td><td>Initiate Logon procedure at RCST side</td></tr>
<tr><td></td><td>2</td><td>RCST sends CSC burst</td></tr>
<tr><td></td><td>3</td><td>CTB returns a TIM-U with time and frequency correction values > ACQ_Achieved threshold values (ACQ_ACH_TIME_THR and ACQ_ACH_FREQ_THR)</td></tr>
<tr><td></td><td>4</td><td>CTB verifies that the RCST transmits an ACQ burst</td></tr>
<tr><td></td><td>5</td><td>CTB verifies that the ACQ burst received is within the expected burst window (within the ACQ_Achieved thresholds)</td></tr>
<tr><td></td><td>6</td><td>Wait for ACQ_RESP_TIMEOUT. No CMT is returned by the CTB</td></tr>
<tr><td></td><td>7</td><td>CTB verifies that the RCST retransmits ACQ bursts</td></tr>
<tr><td></td><td>8</td><td>Repeat step 5 to step 7 until ACQ_MAX_LOSSES has been exceeded</td></tr>
<tr><td></td><td>10</td><td>CTB verifies that the RCST transmits no bursts during the configured “wait in standby mode” timer.</td></tr>
<tr><td>PASS/FAIL Criteria</td><td colspan="2">• ACQ bursts in step 4 and 7
• No ACQ burst in step 10 in “Wait_in_standby_mode”
• Correct time and frequency correction in step 6
• Bursts received within the ACQ_Achieved thresholds in step 5.</td></tr>
<tr><td>Remarks</td><td colspan="2">Applicable to COARSE_SYNC only.

The values for ACQ_ACH_TIME_THR, ACQ_ACH_FREQ_THR and ACQ_MAX_TRIES are transmitted in the ACQ Assign descriptor of the TIM-U. ACQ_RESP_TIMEOUT and ACQ_MAX_LOSSES are distributed in Correction Control descriptor.

The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.</td></tr>
</table>

4.5.5 Test Group – Fine Synchronization Procedure

The tests in this section verify that the Fine Synchronization Procedure is implemented properly. The terminal is forced into all defined stages of the flow chart which is specified in EN 301 790.

Test Case ID	FSYNC_003_01	
Test Case Name	Correction > Fine Sync threshold b)	
EN 301790 Reference	7.5	
Objective / Test Purpose	Verify that the RCST enters the Off / Stand-by state on receipt of a CMT with “correction > Fine Sync threshold“ and SYNC_MAX_TRIES has been exceeded.	
Initial RCST State	Ready for Fine Sync	
Expected Final RCST State	Wait_in_standby_mode	
Test Method	Step	Description
	1	RCST sends SYNC burst
	2	CTB returns a CMT with time and frequency correction values > SYNC_Achieved threshold values (SYNC_ACH_TIME_THR and SYNCH_ACH_FREQ_THR)
	3	CTB verifies that the RCST re-transmits the SYNC burst containing a SAC field with the Fine_SYNC_Achieved_Flag set to zero.
	4	CTB verifies that the SYNC burst received is within the expected burst window (within the SYNC_Achieved thresholds)
	5	CTB returns a CMT with time and frequency correction values > SYNC_Achieved threshold values
	6	CTB verifies that the RCST keeps on sending SYNC bursts containing a SAC field with the Fine_Sync_Achieved_Flag set to zero.
	7	CTB verifies that the RCST corrects the burst timing and frequency in way that it falls into the expected burst window (within the SYNC_Achieved thresholds)
	8	Repeat step 5 to 7 until SYNC_MAX_TRIES has been exceeded
	9	CTB verifies that no bursts are sent by the RCST during the configured “wait in standby mode” timer.
PASS/FAIL Criteria	• SYNC burst with Fine Sync flag set to 0 in step 3 and 6 • Bursts received within the SYNC_Achieved thresholds in step 4 and 7. • No burst in step 6 in “Wait_in_standby_mode”	
Remarks	The values for SYNC_ACH_TIME_THR, SYNCH_ACH_FREQ_THR and SYNC_MAX_TRIES are defined in the SSR and are transmitted in the SYNC Assign descriptor of the TIM-U. The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.	

Test Case ID	FSYNC_005_01	
Test Case Name	No CMT response b)	
EN 301790 Reference	7.5	
Objective / Test Purpose	Verify that the RCST enters the “Off /Stand-by” state if SYNC_RESP_TIMEOUT has expired and no CMT has been received and SYNC_MAX_LOSSES has been exceeded.	
Initial RCST State	Ready for Fine Sync	
Expected Final RCST State	Wait_in_standby_mode	
Test Method	Step	Description
	1	RCST transmits SYNC burst
	2	Wait for SYNC_RESP_TIMEOUT. No CMT is returned by the CTB
	3	CTB verifies that the RCST retransmits the SYNC burst
	4	Repeat step 1 to 3 until SYNC_MAX_LOSSES has been exceeded
	5	CTB verifies that the RCST transmits no burst during the configured “wait in standby mode” timer
PASS/FAIL Criteria	• SYNC burst in step 3 • No burst in step 5 in “Wait_in_standby_mode”	
Remarks	The values for SYNC_RESP_TIMEOUT and SYNC_MAX_LOSSES are defined in the SSR and are broadcast in the Correction Control descriptor (TIM-B). The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.	

4.5.6 Test Group – Synchronization Maintenance Procedure

The tests in this section verify that the terminal maintains synchronisation after achieving sync state. The terminal is forced into all defined stages of the flow chart which is specified in EN 301 790.

Test Case ID	MSYNC_002_01	
Test Case Name	Correction > Fine Sync threshold	
EN 301790 Reference	7.6	
Objective / Test Purpose	Verify that the RCST enters the Off / Stand-by state on receipt of a CMT “correction > Fine Sync thresholds“.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Wait_in_standby_mode	
Test Method	Step	Description
	1	CTB returns a CMT with time and frequency correction values > Fine sync threshold values
	2	CTB verifies that the RCST transmits no burst within the configured “wait in standby mode” timer
PASS/FAIL Criteria	• No burst in step 2 in “Wait_in_standby_mode”	
Remarks	The values for SYNC_ACH_TIME_THR and SYNCH_ACH_FREQ_THR are defined in the SSR and are transmitted in the SYNC Assign descriptor of the TIM-U. The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.	

Test Case ID	MSYNC_004_01	
Test Case Name	No CMT response b)	
EN 301790 Reference	7.6	
Objective / Test Purpose	Verify that the RCST enters the “Off /Stand-by” state if SYNC_RESP_TIMEOUT has expired and no CMT has been received and SYNC_MAX_LOSSES has been exceeded.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Wait_in_standby_mode	
Test Method	Step	Description
	1	RCST transmits SYNC burst
	2	Wait for SYNC_RESP_TIMEOUT. No CMT is returned by the CTB
	3	CTB verifies that the RCST retransmits the SYNC burst
	4	Repeat step 1 to 3 until SYNC_MAX_LOSSES has been exceeded
	5	CTB verifies that the RCST transmits no burst during the configured “wait in standby mode” timer
PASS/FAIL Criteria	• SYNC burst in step 3 • No burst in step 5 in “Wait_in_standby_mode”	
Remarks	The values for SYNC_RESP_TIMEOUT and SYNC_MAX_LOSSES are defined in the SSR and are broadcast in the Correction Control descriptor (TIM-B). The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.	

4.5.7 Test Group – Logoff

The test in this section ensure that a terminal is capable of logging off from the DVB-RCS network after reception of a log-off request from the HUB.

Test Case ID	LOGOFF_001_01	
Test Case Name	Hub initiated Logoff	
EN 301790 Reference	8.5.5.8	
Objective / Test Purpose	Verify correct RCST behaviour (ceasing burst transmission) when receiving a TIM-U with information “Logoff”.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Off / Standby	
Test Method	Step	Description
	1	CTB transmits a TIM-U with information “Logoff” (RCST Status)
	2	RCST ceases burst transmission
	3	CTB verifies that the RCST transmits no TRF burst and no SYNC burst during the configured “wait in standby mode”.
PASS/FAIL Criteria	• No TRF or SYNC bursts in step 3 • The RCST may re initiate logon by sending CSC bursts after the timer “wait in standby mode” expired.	
Remarks	The manufacturer of the RCST is expected to provide the appropriate commands to configure the “wait in standby mode” timer.	

4.5.8 Test Group – HOLD State

The test in this section verifies whether the terminal can be forced to cease transmission by sending a TIM with the "transmit_disable" flag set to 1. Furthermore, it is verified whether the terminal remains in this status until receiving a "transmit_disable" flag set to 0, even if meanwhile the power is switched off and on in HOLD state.

Test Case ID	HOLD_004_01	
Test Case Name	Transmit Disable, Remaining in HOLD state, and transmit Enable again	
EN 301790 Reference	7.1, 8.5.5.8	
Objective / Test Purpose	Verify that the RCST transitions to the Hold State upon receiving TIM with 'transmit_disable' flag set to '1'. Verify that the RCST being in HOLD state and after power-off and power-on remains in this state and does not send any burst. Verify that the RCST being in HOLD state returns to the Receive Sync state upon receiving TIM with 'transmit_disable' flag set to '0'.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Receive Sync state	
Test Method	Step	Description
	1	CTB transmits a TIM-U with 'transmit_disable' flag set to '1'
	2	RCST shall enter the Hold state
	3	Initiate Logon procedure RCST side
	4	CTB verifies no RCST burst transmission
	5	Initiate RCST power off and power on
	6	Initiate Logon procedure at RCST side
	7	CTB verifies no RCST burst transmission
	8	CTB transmits a TIM-U with 'transmit_disable' flag set to '0'
	9	Initiate Logon procedure at RCST side
	10	CTB verifies that RCST starts CSC burst transmission
PASS/FAIL Criteria	• No RCST bursts in step 4 and 7 • CSC bursts in step 10	
Remarks	The operator shall note the reaction of the terminal (e.g. message in the management system) For the case that this test case would fail (the terminal would not return to normal operation anymore) the manufacturer shall provide measures to re-activate the terminal.	

4.5.9 Test Group – SI Tables

The SI tables are of very specific interest in DVB-RCS networks as the complete return channel is organised via these tables.

In this section variations of the various tables (SCT, FCT, TCT) and the impact of these variations to the terminal are tested.

Note 1: Between each parameter change the RCST shall establish a new session. Even a reboot between changes shall be allowed (e.g. no dynamical change of the frame structure).

Test Case ID	SCT_001_01	
Test Case Name	Changes in SCT, superframe_centre_frequency	
EN 301790 Reference	8.3.1.1, 8.5.5.2, 6.1.3	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the SCT the value of "superframe_centre_frequency" has changed from the default value to the upper and lower edge value.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	CTB transmits SCT with default value for superframe_centre_frequency
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies RCST`s transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
	5	CTB initiate RCST logoff
	6	Change superframe_centre_frequency and distribute the new value in SCT
	7	Proceed with step 2 until procedure is done for lowest and highest superframe_centre_frequency
	8	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST has achieved fine sync state in step 4. • Traffic is transported in step 4.	
Remarks	Applicable to MPEG_TRF only.	

Test Case ID	SCT_003_01	
Test Case Name	Changes in SCT, superframe_duration	
EN 301790 Reference	8.3.1.1, 8.5.5.2, 6.1.3	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the SCT the value for SUP_FR_LEN (superframe_duration) has changed from the default value to the upper and lower edge value.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	CTB transmits SCT with default value for SUP_LEN
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
	5	CTB initiates RCST logoff
	6	Change SUP_LEN and distribute the new value in SCT
	7	Proceed with step 2 until procedure is done for lowest and highest specified value for SUP_LEN
	8	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST has achieved fine sync state in step 4. • Traffic is transported in step 4.	
Remarks	The values for SUP_LEN are defined in the SSR.	

Test Case ID	FCT_001_01	
Test Case Name	Change in FCT, frame_duration	
EN 301790 Reference	8.3.1.2, 8.5.5.3, 6.1.3	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the FCT the value of “frame_duration” has changed from the default value to the upper and lower edge value.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	CTB transmits FCT with default value for frame_duration
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies RCST`s transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
	5	CTB initiates RCST logoff
	6	Change frame_duration and distribute the new value in FCT
	7	Proceed with step 2 until procedure is done for lowest and highest specified value for frame_duration
	8	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST has achieved fine sync state in step 4. • Traffic is transported in step 4.	
Remarks	Applicable to MPEG_TRF only.	

Test Case ID	FCT_002_02	
Test Case Name	Change in FCT, total_timeslot_count	
EN 301790 Reference	8.3.1.2, 8.5.5.3, 6.1.3	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the FCT the value of NUM_TS_FR (total_timeslot_count) has changed from the default value to the upper and lower edge value.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	CTB transmits FCT with default value for NUM_TS_FR
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
	5	CTB initiates RCST logoff
	6	Change NUM_TS_FR and distribute the new value in FCT
	7	Proceed with step 2 until procedure is done for lowest and highest specified value for NUM_TS_FR
	8	For the highest specified value for NUM_TS_FR (i.e. last loop), initiate IP traffic at maximum possible data rate from RCST side
	9	CTB allocates all TRF timeslots for the terminal to transmit at maximum possible rate of user data (net rate)
	10	Check error free reception of IP traffic on the server side
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST has achieved fine sync state in step 4. • Traffic is transported in step 4.	
Remarks	The values for NUM_TS_FR are defined in the SSR.	

Test Case ID	TCT_012_01	
Test Case Name	Change in TCT, timeslot_payload_type, one ATM cell	
EN 301790 Reference	8.3.1.3, 8.5.5.4	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when ATM traffic with one ATM cell is signalled via “timeslot_payload_type” in TCT for TRF bursts.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	CTB is signalling TRF with one ATM cell in TCT. Timeslot type value 0x01
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies correct RCST’s TRF burst composition. CTB verifies RCST’s transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST is correctly assembling TRF slots in step 4 • (one ATM cell).	
Remarks		

Test Case ID	TCT_013_01	
Test Case Name	Change in TCT, timeslot_payload_type, two ATM cells	
EN 301790 Reference	8.3.1.3, 8.5.5.4	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when ATM traffic with two ATM cells is signalled via “timeslot_payload_type” in TCT for TRF bursts.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	CTB is signalling TRF with two ATM cells in TCT. Timeslot type value 0x02
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies correct RCST’s TRF burst composition CTB verifies RCST’s transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST is correctly assembling TRF slots in step 4 • (two ATM cells).	
Remarks		

Test Case ID	TCT_014_01	
Test Case Name	Change in TCT, timeslot_payload_type, four ATM cells	
EN 301790 Reference	8.3.1.3, 8.5.5.4	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when ATM traffic with four ATM cells is signalled via “timeslot_payload_type” in TCT for TRF bursts.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	CTB is signalling TRF with four ATM cells in TCT. Timeslot type value 0x04
	2	Start RCST logon procedure
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies correct RCST’s TRF burst composition CTB verifies RCST’s transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST is correctly assembling TRF slots in step 4 • (four ATM cells).	
Remarks		

Test Case ID	TCT_022_02	
Test Case Name	Change in TCT, variations of ATM TRF lengths	
EN 301790 Reference	8.5.5.4, 6.4.4.1 table 5	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST ATM TRF bursts with SAC_LEN_TRF 0, 2 and 4	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP traffic from Host PC at RCST side
	3	CTB verifies correct TRF burst composition and IP traffic flow on the return link
	4	CTB initiates RCST logoff
	5	CTB changes composition of the TRF slots w.r.t. the SAC length.
	6	Proceed with step 2 until procedure is done for all three possible ATM TRF SAC lengths (i.e ATM TRF lengths of 53, 55 and 57 bytes)
	7	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST is correctly coding TRF bursts in step 3.	
Remarks	The values for SAC_LEN_TRF are defined in the SSR.	

Test Case ID	TCT_024_01	
Test Case Name	Change in TCT, Code Rate, Turbo Code, CSC, SYNC, TRF	
EN 301790 Reference	8.5.5.4	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the TCT the value of “inner_coding_puncturing” has changed from the default value to the upper and lower edge value for CSC, SYNC and TRF bursts. Turbo code is used as inner code type. The symbol rate should not vary during test.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Fine Sync: Verify CSC and SYNC reception
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies correct RCST TRF coding. CTB verifies RCST’s transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots.
	5	CTB initiates RCST logoff
	6	Change inner_coding_puncturing and distribute the new value in TCT
	7	Proceed with step 2 until procedure is done for all specified settings for the inner_code_puncturing
	8	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST has achieved fine sync state in step 2. • RCST uses correct CSC and SYNC burst coding in step 2. • Traffic is transported in step 4. • RCST uses correct TRF coding in step 4.	
Remarks	Values for “inner_coding_puncturing” are given by the parameters CODE_RA_TRF (for TRF) and CODE_RA_OTH (for SYNC and CSC) as defined in the SSR.	

Test Case ID	TCT_025_01	
Test Case Name	Change in TCT, symbol_rate and preamble composition; CSC, SYNC, TRF	
EN 301790 Reference	6.2.2.1, 6.2.2.2, 6.2.3, 8.3.1.3, 8.5.5.4	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the TCT the value of “symbol_rate” has changed from the default value to the upper and lower edge value for CSC, SYNC and TRF bursts. Verify the correct reception and interpretation of the RCST when in the TCT the value of “preamble_length” and “preamble_symbol” has changed from the default value for CSC, SYNC and TRF bursts.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Verify logon, fine sync state achieved (CSC and SYNC received with correct coding)
	3	Initiate IP traffic from Host PC at RCST side
	4	CTB verifies RCST’s symbol rate for TRF bursts.
	5	CTB initiates RCST logoff
	6	CTB changes symbol_rate and preamble_length and composition of preamble_symbols in TCT
	7	Proceed with step 2 until procedure is done for all values for the symbol_rate, preamble_length and composition of preamble_symbols
	8	End
PASS/FAIL Criteria	• Logon achieved in each loop. • Traffic is transported in step 4 in each loop	
Remarks	Values for “symbol_rate” are given by the parameters SYMB_RA_TRF (for TRF) and SYMB_RA_OTH (for SYNC and CSC), as defined in the SSR. Values for “preamble_length” are given by the parameters PREA_LEN_TRF, PREA_LEN_SYNC and PREA_LEN_CSC, as defined in the SSR. Values for “preamble_symbols” are given by the parameters PREA_SYMB_TRF, PREA_SYMB_SYNC and PREA_SYMB_CSC, as defined in the SSR.	

4.5.10 Test Group – Frequency Hopping

The tests in this section verify that the terminal is capable of performing frequency hopping.. Furthermore it is verified, whether the given frequency hopping ranges are implemented properly.

Test Case ID	FHOP_001_01	
Test Case Name	Change in TBTP; slow hopping; TRF	
EN 301790 Reference	6.2.3; 8.5.5.7; 6.7	
Objective / Test Purpose	CTB allocates TRF slots to RCST with TBTP in a way that there is an additional TRF slot between transmissions on different carrier frequencies. The correct RCST transmission in allocated TRF slots is verified.	
Initial RCST State	Receive sync state	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP traffic from Host PC at RCST side
	3	CTB allocates TRF slots to RCST with TBTP in a way that there is an additional TRF slot between transmissions on different carrier frequencies
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is transmitting in the majority of the allocated timeslots (see Remark).
	5	Repeat step 3 to step 4 for at least 3 minutes.
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST does not leave fine sync state in step 3 or step 4. • Expected time and frequency position of the bursts (within SYNC thresholds) in step 4 • RCST uses the allocated timeslots to a high extent (see Remark)	
Remarks	The terminal is responsible for deciding if it can guarantee enough stability and accuracy to use a certain allocated timeslot. It might occur that a terminal does not use all the allocated slots. However, the test case shall show that a terminal supporting slow hopping (mandatory) is using the majority of the allocated timeslots.	

<table>
<tr><td>Test Case ID</td><td colspan="2">FHOP_002_01</td></tr>
<tr><td>Test Case Name</td><td colspan="2">Change in TBTP; fast hopping; TRF</td></tr>
<tr><td>EN 301790 Reference</td><td colspan="2">6.2.3; 8.5.5.7; 6.7</td></tr>
<tr><td>Objective / Test Purpose</td><td colspan="2">CTB allocates TRF slots to RCST with TBTP in a way that there is no additional TRF slot between transmissions on different carrier frequencies. The correct RCST transmission in allocated TRF slots is verified.</td></tr>
<tr><td>Initial RCST State</td><td colspan="2">Receive sync state</td></tr>
<tr><td>Expected Final RCST State</td><td colspan="2">Fine sync state</td></tr>
<tr><td>Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td></td><td>1</td><td>Start RCST logon procedure</td></tr>
<tr><td></td><td>2</td><td>Initiate IP traffic from Host PC at RCST side</td></tr>
<tr><td></td><td>3</td><td>CTB allocates TRF slots to RCST with TBTP in a way that there is no additional TRF slot between transmissions on different carrier frequencies</td></tr>
<tr><td></td><td>4</td><td>CTB verifies RCST’s transmit activities.
CTB verifies that the RCST is transmitting in the majority of the allocated timeslots (see Remark).</td></tr>
<tr><td></td><td>5</td><td>Repeat step 3 to step 4 for at least 3 minutes.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>PASS/FAIL Criteria</td><td colspan="2">• Test procedure is fulfilled.
• RCST does not leave fine sync state in step 3 or step 4.
• Expected time and frequency position of the bursts (within SYNC thresholds) in step 4
• RCST uses the allocated timeslots to a high extent (see Remark)</td></tr>
<tr><td>Remarks</td><td colspan="2">Applicable to FAST_HOPP only.

The terminal is responsible for deciding if it can guarantee enough stability and accuracy to use a certain allocated timeslot. It might occur that a terminal does not use all the allocated slots. However, the test case shall show that a terminal supporting FAST_HOPP is using the majority of the allocated timeslots.</td></tr>
</table>

Test Case ID	FHOP_003_01	
Test Case Name	Change in TBTP; narrow hopping range; TRF	
EN 301790 Reference	6.2.3; 8.5.5.7; 6.7	
Objective / Test Purpose	CTB allocates TRF slots to RCST with TBTP in a way that the narrow hopping range of 20 MHz is covered. Fast/Slow hopping capability of the RCST should be respected. The correct RCST transmission in allocated TRF slots is verified.	
Initial RCST State	Receive sync state	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP traffic from Host PC at RCST side
	3	CTB allocates timeslots (frequency channels) to the RCST out of the narrow hopping range of 20 MHz. The frequency distribution of these allocated timeslots (frequency channels) should be random.
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is transmitting in the majority of the allocated timeslots
	5	Repeat step 3 to step 4 for 3 minutes.
PASS/FAIL Criteria	• Test procedure is fulfilled. • RCST does not leave fine sync state in step 3 or step 4. • Expected time and frequency position of the bursts (within SYNC thresholds) in step 4 • RCST uses the allocated timeslots to a high extent (see Remark)	
Remarks	The terminal is responsible for deciding if it can guarantee enough stability and accuracy to use a certain allocated timeslot. It might occur that a terminal does not use all the allocated slots. However, the test case shall show that a terminal supporting FAST_HOPP is using the majority of the allocated timeslots.	

4.5.11 Test Group – Satellite Position Table

In this section the RCST´s acceptance to changes in the SPT is verified.

Reason for having this test

All timing of the return channel is dependent on the knowledge where the RCST and the satellite is positioned. A change in the position leads to a change in the signal latency (also seen as a phase shift). To enable a RCST to properly interwork in the network and to prevent any confusion on the return channel signal, RCST must be able to realise changes in its SPT configuration.

Test Case ID	SPT_001_01	
Test Case Name	Change in SPT; satellite coordinates	
EN 301790 Reference	8.3.1.4, 8.5.5.5, 6.1.3	
Objective / Test Purpose	Verify the correct reception and interpretation of the RCST when in the SPT the content of x, y and z coordinates has changed from default value.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Off/Stand-by	
Test Method	Step	Description
	1	Set distance, represented by x,y,z coordinates in SPT table, to min value = distance_min The RCST shall use these coordinates (distances) to calculate the propagation delay between RCST and satellite
	2	CTB transmits SPT with distance_min
	3	Start RCST logon procedure
	4	CTB verifies that the timing of the CSC and SYNC bursts is as expected.
	5	Initiate IP traffic from Host PC at RCST side
	6	CTB verifies RCST's transmit activities. CTB verifies that the propagation delay is calculated correctly by verifying, that the TRF bursts are received in the expected burst window.
	7	CTB initiates RCST logoff
	8	Set x,y,z coordinates (distance) to max value = distance_max
	9	Repeat steps 2 through 7 with the new settings
	10	End
PASS/FAIL Criteria	• Test procedure is fulfilled. • CSC and SYNC bursts are received in the expected burst window in step 4. • RCST has achieved fine sync state in step 4. • TRF bursts are received in the expected burst window in step 6.	
Remarks		

4.5.12 Test Group – Basic Application Testing

In this section the ability of the terminal to correctly encapsulate IP datagrams and to transfer them in both directions is tested.

Test Case ID	APP_002_01	
Test Case Name	FTP File Transfer	
EN 301790 Reference	8.1.1	
Objective / Test Purpose	Verify correct FTP file transfer over TCP/IP in both directions.	
Initial RCST State	Fine Sync state	
Expected Final RCST State	Fine Sync state	
Test Method	Step	Description
	1	Initiate FTP file transfer at RCST side from FTP server at tester side. File size shall be 10 Mbytes.
	2	Verify duration and retransmissions
	3	Initiate FTP file transfer at CTB from FTP server at RCST side. File size shall be 10 Mbytes.
	4	Verify duration and retransmissions
PASS/FAIL Criteria	• In step 2 and 4 duration shall be less than 10 minutes and no retransmissions shall occur	
Remarks	The up- and down-link capacities provided to the terminal will be selected such that the 10 MByte file can be transported within a reasonable time.	

4.5.13 Test Group – Wide Hopping

In this section the RCST behaviour is tested if the extended hopping range of 120MHz is used.

Reason for having this test

This test should verify RCST's behaviour when the hopping range of 120MHz is used and slots (CSC, SYNC, TRF) are allocated in the extended range (120MHz) by the CTB.

Test Case ID	WIDE_HOPP_001_01	
Test Case Name	Wide Hopping Range (120MHz)	
EN 301790 Reference	6.2.3	
Objective / Test Purpose	Verify that a terminal is capable of handling allocated TRF slots that are up to 120 MHz apart from each other.	
Initial RCST State	Receive Sync state	
Expected Final RCST State	Fine Sync state	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP traffic from Host PC at RCST side
	3	CTB allocates TRF slots to the RCST with help of the TBTP. The allocated hopping range is 120MHz
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is transmitting and using the allocated hopping range of 120MHz.
PASS/FAIL Criteria	• Test procedure is fulfilled • TRF slots are used as allocated in the TBTP	
Remarks	Applicable to WIDE_HOPP only. The CTB is not able to decode TRF slots that are more than 20 MHz apart. Transmit activities of the terminal will be assessed in the following way: the TRF bursts are decoded in one channel and in the other channel their existence and correct length are measured.	

4.5.14 Test Group – Dynamic MF-TDMA

In this section the RCST behaviour is tested if the terminal is able to handle different TRF definitions.

Reason for having this test

This test should verify RCST's behaviour when adjacent TRF slots allocated to the terminal are on different frequencies and defined with different symbol and/or code rates.

Test Case ID	DYNAMIC_MF_TDMA_001_01	
Test Case Name	Dynamic MF-TDMA	
EN 301790 Reference	6.7.1.2	
Objective / Test Purpose	Verify that a terminal is capable of handling different TRF definitions (symbol and/or code rates) in adjacent TRF slots allocated on different frequencies.	
Initial RCST State	Receive Sync state	
Expected Final RCST State	Fine Sync state	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP traffic from Host PC at RCST side
	3	CTB allocates TRF slots to the RCST with help of the TBTP. The allocated TRF slots differ in frequency, symbol and/or code rate.
	4	CTB verifies RCST's transmit activities. CTB verifies that the RCST is transmitting and using the allocated slots.
PASS/FAIL Criteria	• Test procedure is fulfilled. • The terminal uses the TRF slots which are allocated to the terminal. • Traffic can be transported while the terminal shall use adjacent TRF slots that are different in definition (frequency, symbol and/or code rates). • RCST transmits TRF bursts at the expected time and frequency position of the allocated TRF slots • RCST is using all allocated TRF slots and only those which are allocated to the terminal (compared to the start slot and assignment count).	
Remarks	Applicable to DYNAMIC_MF_TDMA only. All burst on a given channel (carrier frequency) are transmitted with the same definition (symbol and code rate).	

4.5.15 Test Group – Contention Sync

In this section the RCST behaviour is tested if the Contention Sync functionality is implemented.

Reason for having this test

The reason is to allow terminals to send capacity requests without having to wait for the normal SYNC slot and also in the case where no SAC fields are appended to the traffic slots.

Test Case ID	CONTENTION_SYNC_001_02	
Test Case Name	Contention Sync	
EN 301790 Reference	6.6.4, 8.2	
Objective / Test Purpose	Verify that a terminal is using the contention based mini-slot method in a correct way.	
Initial RCST State	Off/Standby	
Expected Final RCST State	Fine Sync state	
Test Method	Step	Description
	1	CTB transmits SI tables
	2	Start acquiring the forward link
	3	Start logon procedure
	4	Verify CSC bursts transmitted by the RCST
	5	Amongst other information, the CTB transmits the following SI tables: • TIM-U containing: o Definition of repeat period for “normal” SYNC slots via SYNC Assign descriptor, o no prefix (for ATM packets) signalled via Logon Initialize descriptor, o contention based minislot method signalled via Logon Initialize descriptor • TCT containing: o “normal” SYNC slots which should not have a request field (“normal” SYNC slots are allocated via SYNC Assign descriptor in TIM-U), o Contention SYNC slots with request field, o ATM slots without request field
	6	CTB verifies transmission of “normal” SYNC bursts
	7	CTB allocates contention SYNC slots via TBTP by using the broadcast Logon_ID 0XFFFF
	8	Initiate IP traffic from Host PC at RCST side

	9	Verify that the RCST uses the Contention SYNC slots to request for capacity
PASS/FAIL Criteria	• Test procedure is fulfilled • Terminal uses Contention SYNC slots beside the regular allocated Sync slots via Sync Assign Descriptor	
Remarks	Applicable to CONTENTION_SYNC only. This test case has not yet been validated (counterpart (terminal) not available).	

4.5.16 Test Group – Section Packing

Section packing allows for multiple DSM-CC sections to be packed in a single MPEG packet. This entails the termination of one DSM-CC section followed immediately by the start of a second DSM-CC section. Alternatively, several short DSM-CC sections may be accommodated within a single MPEG packet (for example: 1 section terminates, 1 complete section, the start of another section).

Reason for having these tests

The reason is to verify the RCST's section packing on return link as well as the RCST's behaviour on section packing on the forward link.

Test Case ID	SEC_PACK_001_01	
Test Case Name	DSM-CC; Section Packing on forward link	
EN 301790 Reference	ISO/IEC 13818-1	
Objective / Test Purpose	Verify that the RCST handles section packing on forward link correctly.	
Initial RCST State	Receive sync state	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP transmission from CTB side in a way that section packing on the forward link can be observed (small packet size, high data rates).
	3	Verify quasi error-free IP traffic on the FL
	4	Verify section packing on the FL
PASS/FAIL Criteria	• Test procedure is fulfilled.	
Remarks	The assessment is made by analyzing the structure of transmitted TRF bursts (payload).	

Test Case ID	SEC_PACK_002_01	
Test Case Name	DSM-CC; Section Packing on return link	
EN 301790 Reference	ISO/IEC 13818-1	
Objective / Test Purpose	Verify that the RCST is able to perform section packing on return link	
Initial RCST State	Receive sync state	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	Start RCST logon procedure
	2	Initiate IP transmission from RCST side in a way that section packing on the return link can be observed (small packet size, high data rates)
	3	Verify quasi error-free IP traffic on the RL
	4	Verify section packing on the RL
PASS/FAIL Criteria	• Test procedure is fulfilled.	
Remarks	Applicable to MPEG_TRF only. The assessment is made by analyzing the structure of transmitted TRF bursts (payload).	

4.5.17 Test Group – Timing Reference

SatLabs defined that an RCST shall compensate for additional delay that is to be expected (e.g. DVB-S FL processing). Due to different implementations, an additional static delay (maybe positive or negative) is to be applied to guarantee the same level of compensation in each terminal. SatLabs agreed that this additional static delay may be set at the beginning of the SatLabs Qualification testing. The FL and RL settings and timing tolerances are defined in the SSR.

Reason for having this test

This test shall investigate, if the terminal meets the timing tolerance as specified in the SatLabs System recommendation, once the additional delay is configured.

Test Case ID	TIME_REF_001_01	
Test Case Name	Variation in FL, correct delay compensation	
EN 301790 Reference	SSR v1.3 and v2.1, 6.4.8.3	
Objective / Test Purpose	Verify that the RCST meets the timing tolerance as specified in the SSR, once the additional delay is configured.	
Initial RCST State	Idle	
Expected Final RCST State	Ready for Coarse Sync	
Test Method	Step	Description
	1	CTB provides Reference Settings for the FL
	2	RCST is forced to send CSC bursts
	3	Timing deviation between the received and the expected CSC bursts is measured
	4	RCST is re-configured to compensate for that timing deviation (delay calibration)
	5	CTB provides Reference Settings
	6	RCST is forced to send CSC bursts
	7	CTB verifies the timing deviation being close to zero (plus/minus few PCR)
	8	CTB provides changed FL settings
	9	RCST is forced to send CSC bursts
	10	CTB verifies that the terminal compensates the changed delay on basis of the new FL settings
	11	Steps 8 through step 10 are repeated for several representative FL settings
PASS/FAIL Criteria	• Test procedure is fulfilled. • The terminal sends the CSC bursts within the tolerance as shown in the SSR for various FL settings	

4.5.18 Test Group – NCR Payload

The default NCR reference time plane is defined to be at the satellite used for the return link. The NCR optional payload may offset this time reference. It is a system decision whether or not to use the optional payload. The RCST should determine the presence of the payload and use the appropriate values if found within it. If the optional payload is absent, the RCST should assume zero values for the delays that can be communicated in the optional payload.

Reason for having this test

This test shall investigate, if the terminal is able to handle timing reference points as signalled in the NCR payload field.

Test Case ID	NCR-Payload_001_01	
Test Case Name	NCR-Payload	
Reference	SSR v1.3 and v2.1, 6.4.8.2	
Objective / Test Purpose	Verify that the RCST is able to handle the optional payload field within the NCR.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	CTB transmits the NCR including the optional payload field. The presence of the optional payload is signalled in the PMT. The value within the payload field should signal zero delay.
	2	Start RCST logon procedure
	3	CTB verifies RCST's transmit activities. CTB verifies that the RCST is only transmitting in allocated timeslots at expected time.
	4	CTB initiates RCST logoff
	5	Change delay values in NCR payload field. Proceed with step 2 until procedure is done for several representative delay values in NCR payload field.
PASS/FAIL Criteria	Test procedure is fulfilled. RCST uses correct timeslots and timing even if delay values via the optional payload field have changed	

4.5.19 Test Group – Multicast Mapping Table (MMT)

IP multicast is a bandwidth-conserving technology that reduces traffic by simultaneously delivering a single stream of information to several RCSTs. Applications that take advantage of multicast include videoconferencing, corporate communications, distance learning, and distribution of software, stock quotes, news, etc.

Reason for having this test

The reason is to verify that the multicast IP functionality is correctly implemented on RCST side.

Test Case ID	MMT_001_01	
Test Case Name	Multicast IP	
Reference	SSR v1.3 and v2.1, 6.2.2	
Objective / Test Purpose	Verify that the RCST is able to receive and decode IP traffic according to the IP addresses transmitted in MMT.	
Initial RCST State	Off/Stand-by	
Expected Final RCST State	Fine sync state	
Test Method	Step	Description
	1	The CTB transmits SI tables necessary to acquire the FL. Among other following tables (content) are transmitted: • PAT containing: o PID for (PMT for SI tables, including MMT table) o Prog.-No. for IP/DVB services • (PMT for SI tables) containing: o PID for SI tables, including MMT o Prog-No. for IP/DVB services • RMT containing: o Linkage descriptor with linkage type 0x06 (IP/DVB services) and corresponding Prog.-No. • MMT containing: o Multicast IP addresses
	2	Start RCST logon procedure
	3	Initiate UDP transmission with one of the IP addresses in the MMT on CTB side.
	4	Verify that the RCST receives and forwards the multicast IP traffic correctly. If necessary an IGMP join command should be issued from the local network.
PASS/FAIL Criteria	• Test procedure is fulfilled.	
Remarks	For testing according to v1.3, this is only applicable to MMT.	

5 Additional DVB-S2 Test Cases

5.1 Introduction

This section contains the test cases which need to be performed to ensure the DVB-S2 functionality of DVB-RCS terminals. This document is based on the requirements as stated in

SatLabs System Recommendations (SSR) version 1.3 and 2.1

EN 301 790 V1.4.1

EN 302 307 V1.1.2

If DVB-S2 is supported by the terminal first the basic test cases (or a part of them) must be performed using the DVB-S2 configurations (see section 4 for further details on the basic test cases). The test cases as specified in this section shall be made in addition to the basic test cases to evaluate the DVB-S2 support in more detail.

5.2 Protocol Implementation Conformance Statement (PICS)

The following Table forms a template to collect Protocol Implementation Conformance Statement (PICS) for a DVB-RCS terminal supporting DVB-S2. Each of the fields given in the table must be filled in to create a specific testing profile. The information given in the filled PICS is basis for the selection of relevant test cases from the compliance test plan

PICS Table

PICS ID	PICS/Explanation	PICS
DVBS2	True, if the RCST supports DVB-S2 only in the Forward Link	
DVBSS2	True, if the RCST supports both DVBS and DVBS2 in the Forward Link	
ACM	True, if the RCST supports DVB-S2 (profiles DVBS2 or DVBSS2) and if the RCST also supports CCM, ACM and VCM	
QPSKLOW	True, if the RCST supports the low coding rates 1/4, 1/3, 2/5 Applicable to ACM only	
16APSK	True, if the RCST supports 16-ary Amplitude and Phase Shift Keying (16APSK)	

32APSK	True, if the RCST supports 32-ary Amplitude and Phase Shift Keying (32APSK) Applicable to ACM only	
MULTITS	True, if the RCST supports multiple transport streams (TS) Applicable to ACM only	

5.3 Protocol Implementation Extra Information for Testing (PIXIT)

There are no specific further PIXITs defined so far for the additional test cases for DVB-S2. The PIXITs as given in section 4.2 shall apply. Further details for the PIXIT may be defined at a later stage.

5.4 Test Case Selection Matrix

In the following the test cases foreseen for the profiles CCM and ACM will be presented. For each profile there are test cases that are mandatory, this means, when a particular profile has to be tested the support of such test cases are mandatory and have to be performed. Test cases that are labelled “optional” may be performed depending on the terminal implementations. Test cases marked with “NA” shall not be performed. The ACM Profile itself is optional, however, when testing the optional ACM feature all test cases marked with mandatory for this profile are to be performed.

Test Case ID	CCM profile (mandatory)	ACM profile (optional)
CODE_RATE_FIX_QPSK_001_01	NA	QPSKLOW (CCM operation only)
CODE_RATE_FIX_QPSK_004_01	Mandatory	Mandatory (CCM operation only)
CODE_RATE_FIX_8PSK_001_01	Mandatory	Mandatory (CCM operation only)
CODE_RATE_FIX_16APSK_001_01	16APSK	16APSK (CCM operation only)
CODE_RATE_FIX_32APSK_001_01	NA	32APSK (CCM operation only)
PILOTS_001 01	Mandatory	Mandatory (CCM operation only)
CODE_RATE_VAR_QPSK_001_01	NA	QPSKLOW (ACM operation only)
CODE_RATE_VAR_QPSK_002_01	NA	Mandatory (ACM operation only)
CODE_RATE_VAR_8PSK_001_01	NA	Mandatory (ACM operation only)
CODE_RATE_VAR_16APSK_001_01	NA	16APSK (ACM operation only)
CODE_RATE_VAR_32APSK_001_01	NA	32APSK (ACM operation only)
Modulation_VAR_CR_FIX_001_01	NA	Mandatory (ACM operation only)

Modulation_VAR_CR_FIX_002_01	NA	16APSK AND 32APSK (ACM operation only)
ACM_RCST_FEEDBACK_001_01	NA	Mandatory (ACM operation only)
MULTIPLE_TS_001_01	NA	MULTITS (ACM operation only)

5.5 Test Plan for SatLabs DVB-S2 Compliance

The test plan which is described in this section is based on the requirements which are defined in SSR. With respect to the compliance definition as given in Chapter 3 a set of test cases has been chosen to form this compliance test plan. The test plan is structured in several sections, each dealing with a specific functionality.

Structure of the test plan

	Test Groups	**Number of Test Cases in Section**	
		CCM profile	**ACM profile**
	CCM operation	**6 (3 optional)**	**6 (3 optional)**
	ACM operation		**9 (4 optional)**
	Total:	**6 (3 optional)**	**15 (7 optional)**

5.6 Test Cases for SatLabs DVB-S2 Compliance

5.6.1 Test Group – CCM operation

Test Case ID	CODE_RATE_FIX_QPSK_001_01	
Test Case Name	Fixed Code Rate QPSK (1/4), (1/3), (2/5)	
References	SSR v1.3 and v2.1, table 6-7	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the particular modulation type (QPSK) has been selected. The test has to be performed with the particular code rates (1/4), (1/3) and (2/5). The modulation type as well as the code rate shall be fixed for the duration of the test session. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 64800 bits as only CCM operation is tested.	
Test Method	Step	Description
	1	Ensure that QPSK is selected as modulation type on the FL
	2	Ensure that (1/4) is selected as code rate on the FL
	3	Initiate the RCST logon
	4	Initiate UDP traffic to the RCST on the FL
	5	Check the quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff and reboot the terminal if necessary
	7	Repeat step 3 to step 6 with the code rates (1/3) and (2/5)
PASS/FAIL Criteria	Error-free UDP reception	
Remarks	Applicable to ACM and QPSKLOW only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_FIX_QPSK_004_01	
Test Case Name	Fixed Code Rate QPSK (1/2), (3/5), (2/3), (3/4), (4/5), (5/6), (8/9), (9/10)	
References	SSR v1.3 and v2.1, table 6-7	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the particular modulation type (QPSK) has been selected. The test has to be performed with the particular code rates (1/2), (3/5), (2/3), (3/4), (4/5), (5/6), (8/9) and (9/10). The modulation type as well as the code rate shall be fixed for the duration of the test session. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, as only CCM operation is tested.	
Test Method	Step	Description
	1	Ensure that QPSK is selected as modulation type on the FL
	2	Ensure that (1/2) is selected as code rate on the FL.
	3	Initiate the RCST logon
	4	Initiate UDP traffic to the RCST on the FL
	5	Check the quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff and reboot the terminal if necessary
	7	Repeat step 3 to step 6 with the code rates (3/5), (2/3), (3/4), (4/5), (5/6), (8/9) and (9/10)
PASS/FAIL Criteria	Error-free UDP reception	
Remarks	Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_FIX_8PSK_001_01	
Test Case Name	Fixed Code Rate 8PSK (3/5), (2/3), (3/4), (5/6), (8/9), (9/10)	
References	SSR v1.3 and v2.1, table 6-7	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the particular modulation type (8PSK) is selected. The test has to be performed with the particular code rates (3/5), (2/3), (3/4), (5/6), (8/9) and (9/10). The modulation type as well as the code rate shall be fixed for the duration of the test session. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 64800 bits as only CCM operation is tested.	
Test Method	Step	Description
	1	Ensure that 8PSK is selected as modulation type on the FL
	2	Ensure that (3/5) is selected as code rate on the FL
	3	Initiate the RCST logon
	4	Initiate UDP traffic to the RCST on the FL
	5	Check the quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff and reboot the terminal if necessary
	7	Repeat step 3 to step 6 with the code rates (2/3), (3/4), (5/6), (8/9) and (9/10)
PASS/FAIL Criteria	Error-free UDP reception	
Remarks	Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_FIX_16APSK_001_01	
Test Case Name	Fixed Code Rate 16APSK (2/3), (3/4), (4/5), (5/6), (8/9), (9/10)	
References	SSR v1.3 and v2.1, table 6-7	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the particular modulation type (16APSK) is selected. The test has to be performed with the particular code rates (2/3), (3/4), (4/5), (5/6) and (8/9). The modulation type as well as the code rate shall be fixed for the duration of the test session. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 64800 bits as only CCM operation is tested.	
Test Method	Step	Description
	1	Ensure that 16APSK is selected as modulation type on the FL
	2	Ensure that (2/3) is selected as code rate on the FL
	3	Initiate the RCST logon
	4	Initiate UDP traffic to the RCST on the FL
	5	Check the quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff and reboot the terminal if necessary
	7	Repeat step 3 to step 6 with the code rates (3/4), (4/5), (5/6), (8/9) and (9/10)
PASS/FAIL Criteria	Error-free UDP reception	
Remarks	Applicable to 16APSK only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_FIX_32APSK_001_01	
Test Case Name	Fixed Code Rate 32APSK (3/4), (4/5), (5/6), (8/9), (9/10)	
References	SSR v1.3 and v2.1, table 6-7	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the particular modulation type (32APSK) is selected. The test has to be performed with the particular code rates (3/4), (4/5), (5/6) and (8/9). The modulation type as well as the code rate shall be fixed for the duration of the test session. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 64800 bits as only CCM operation is tested.	
Test Method	Step	Description
	1	Ensure that 32APSK is selected as modulation type on the FL
	2	Ensure that (3/4) is selected as code rate on the FL
	3	Initiate the RCST logon
	4	Initiate UDP traffic to the RCST on the FL
	5	Check the quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff and reboot the terminal if necessary
	7	Repeat step 3 to step 6 with the code rates (4/5), (5/6), (8/9) and (9/10)
PASS/FAIL Criteria	Error-free UDP reception	
Remarks	Applicable to ACM and 32APSK only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	PILOTS_001 01	
Test Case Name	Carrier Recovery using Pilots	
References	SSR v1.3 and v2.1, table 6-7, TR 102 376 V1.1.1, chapter B2	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to recover the carrier using pilots. First (session 1) a forward link is provided with transmission of pilots (on the forward link). UDP packets are transmitted on the forward link. Afterwards (session 2) a forward link is provided without transmission of pilots (on the forward link). UDP packets are transmitted on the forward link.	
Test Method	Step	Description
	1	Ensure that pilots are transmitted on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FI to the RCST
	4	Check quasi error-free UDP reception on the RCST side
	5	Initiate RCST logoff
	6	Repeat step 2 to step 5 without transmission of pilots on the FL
PASS/FAIL Criteria	Error-free UDP reception even if pilots are transmitted on the forward link, this means in session 1 as well as in session 2.	
Remarks	The test shall be performed with 8PSK (2/3). Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

5.6.2 Test Group – ACM operation

Test Case ID	CODE_RATE_VAR_QPSK_001_01	
Test Case Name	Code Rate variation for QPSK modulation (1)	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when QPSK is selected as modulation type and the code rate is varied. The code rate shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the code rates (1/4), (1/3) and (2/5). The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that QPSK is selected as modulation type on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the code rate randomly on the FL ((1/4), (1/3), (2/5))
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected code rates on the forward link.	
Remarks	Applicable to ACM and QPSKLOW only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_VAR_QPSK_002_01	
Test Case Name	Code Rate variation for QPSK modulation (2)	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when QPSK is selected as modulation type and the code rate is varied. The code rate shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the code rates (1/2), (3/5), (2/3), (3/4), (4/5), (5/6) and (8/9). The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed, too, that means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that QPSK is selected as modulation type on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the code rate randomly on the FL ((1/2), (3/5), (2/3), (3/4), (4/5), (5/6), (8/9))
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected code rates on the forward link.	
Remarks	Applicable to ACM only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_VAR_8PSK_001_01	
Test Case Name	Code Rate variation for 8PSK modulation (1)	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when 8PSK is selected as modulation type and the code rate is varied. The code rate shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the code rates (3/5), (2/3), (3/4), (5/6) and (8/9). The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that 8PSK is selected as modulation type on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the code rate randomly on the FL ((3/5), (2/3), (3/4), (5/6), (8/9))
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected code rates on the forward link.	
Remarks	Applicable to ACM only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_VAR_16APSK_001_01	
Test Case Name	Code Rate variation for 16APSK modulation (1)	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when 16APSK is selected as modulation type and the code rate is varied. The code rate shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the code rates (2/3), (3/4), (4/5), (5/6) and (8/9). The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that 16APSK is selected as modulation type on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the code rate randomly on the FL ((2/3), (3/4), (4/5), (5/6), (8/9))
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected code rates on the forward link.	
Remarks	Applicable to ACM and 16APSK only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	CODE_RATE_VAR_32APSK_001_01	
Test Case Name	Code Rate variation for 32APSK modulation (1)	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when 32APSK is selected as modulation type and the code rate is varied. The code rate shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the code rates (3/4), (4/5), (5/6) and (8/9). The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that 32APSK is selected as modulation type on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the code rate randomly on the FL ((3/4), (4/5), (5/6), (8/9))
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected code rates on the forward link.	
Remarks	Applicable to ACM and 32APSK only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	Modulation_VAR_CR_FIX_001_01	
Test Case Name	Modulation variation (QPSK and 8PSK) for code rate 3/4	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the code rate is 3/4 and the modulation type is varied. The modulation type shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the modulation types QPSK and 8PSK. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that the code rate (3/4) is selected on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the modulation type randomly on the FL (QPSK, 8PSK)
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected modulation types on the forward link.	
Remarks	Applicable to ACM only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

Test Case ID	Modulation_VAR_CR_FIX_002_01	
Test Case Name	Modulation variation (16APSK and 32APSK) for code rate 3/4	
References	SSR v1.3 and v2.1, table 6-7, EN 302307 V1.1.2, chapter 4.2, EN 301790 V1.4.1, chapter 5	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the code rate is 3/4 and the modulation type is varied. The modulation type shall vary in different FECFRAMEs. In order to verify the correct reception and decoding of the forward link UDP packets are transmitted on the FL. It shall be checked that the RCST decodes all UDP packets. This verification has to be done for the modulation types 16APSK and 32APSK. The selected symbol rate shall be fixed for the duration of the test session. The FECFRAME length shall be fixed too, which means 16200 bits since only ACM operation is tested.	
Test Method	Step	Description
	1	Ensure that the code rate (3/4) is selected on the FL
	2	Initiate the RCST logon
	3	Initiate UDP traffic on the FL to the RCST
	4	Vary the modulation type randomly on the FL (16APSK, 32APSK)
	5	Check quasi error-free UDP reception on the RCST side
	6	Initiate RCST logoff
PASS/FAIL Criteria	Error-free UDP reception for all selected modulation types on the forward link.	
Remarks	Applicable to ACM and 16APSK and 32APSK only. Usual error occurrences as they must be expected in UDP transmission shall not be deemed as fail criteria for the terminal.	

<table>
<tr><td>Test Case ID</td><td colspan="2">ACM_RCST_FEEDBACK_001_01</td></tr>
<tr><td>Test Case Name</td><td colspan="2">ACM feedback</td></tr>
<tr><td>References</td><td colspan="2">SSR v1.3 and v2.1, table 6-7,
EN 302307 V1.1.2, chapter 4.2, chapter D.5
EN 301790 V1.4.1, chapter 5, chapter 6.6.1</td></tr>
<tr><td>Test Purpose / Description</td><td colspan="2">The RCST must transmit the currently measured CNI parameters and the derived MODCOD_RQ parameters each time it gets assigned a time slot containing the ACM sub-field. The purpose of this test is to evaluate that the RCST is able to fulfil these requirements in the correct manner that means transmitting the measured CNI values together with the MODCOD_RQ values back to the gateway via the return link. An unspecified MODCOD_RQ field is also allowed.
In order to verify this procedure the RCST gets assigned SAC fields containing the ACM sub-field. The CTB stepwise (steps of 5 dB) varies the CNI value on the forward link. The change shall be done in a moderate way (not more frequently than several 10´s of seconds per step) to allow the RCST to appropriately react to the applied changes. All these selected CNI values shall be in a reasonable range. The CTB checks the corresponding CNI values the RCST reports through the SAC field.</td></tr>
<tr><td rowspan="8">Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td>1</td><td>Ensure that a small CNI value of the transmitted forward link is selected as start value</td></tr>
<tr><td>2</td><td>Initiate the RCST logon</td></tr>
<tr><td>3</td><td>Check the reported CNI value of the RCST</td></tr>
<tr><td>4</td><td>Increase CNI values stepwise (5dB)</td></tr>
<tr><td>5</td><td>Repeat step 3 to step 4 until the highest CNI values has been reached (meaning the highest CNI values the RCST is able to handle)</td></tr>
<tr><td>6</td><td>Initiate RCST logoff</td></tr>
<tr><td></td><td></td></tr>
<tr><td>PASS/FAIL Criteria</td><td colspan="2">When the input CNI value of the forward link is varied, the reported variation (CNI) is following the input variation in a monotonic way. The tolerance range of the reported CNI value is + 5dB, -3 dB for 5 dB steps in the actual CNI.</td></tr>
<tr><td>Remarks</td><td colspan="2">Applicable to ACM only.</td></tr>
</table>

Test Case ID	MULTIPLE_TS_001_02	
Test Case Name	Multiple Transport Streams	
References	SSR 6.4.17.2	
Test Purpose / Description	The purpose of this test is to evaluate that the RCST is able to receive and decode the forward link correctly when the stream contains multiple transport streams (TS).. • The test configuration shall be: Multi_TS flag enabled • The normal complete FL transport stream is played out with ISI set to a value K and a selected MODCOD A. • 2 dummy streams with different MODCODs B and C are introduced with ISI value L and M. • The terminal is configured to look for ISI K, and the test case shall complete successfully • The same test case is then executed with the terminal ISI set to L. The forward link shall then not be found. • Concurrent reception of ACM ISI/MODCOD as described in the SSR with additional MODCOD/ISIs with two additional MODCOD/ISIs signalled in TMST-2. The main stream is as above with MODCOD A and ISI K. The additional MODCOD/ISIs carry pre-defined ICMP packets. • The terminal shall receive and forward the ICMP packets to the RCST LAN port	
Test Method	Step	Description
	1	Configure the RCST for ISI K
	2	Initiate RCST logon
	3	Check the quasi error free reception of Ping
	4	Initiate the RCST logoff
	5	Change the RCST ISI to L
	6	Initiate RCST logon
	7	Verify that the terminal does not find the FL
	8	Change the RCST ISI to K
	9	Initiate RCST logon
	10	Initiate PING on the application server
	11	The RCST logs on and passes the streams from the 3 MODCOD/ISIs to the RCST LAN
	12	Wireshark is used to validate that all 3 ICMP streams are present on the application client LAN port (received from the RCST)
	13	Logoff RCST
PASS/FAIL Criteria	Steps 3, 7 and 12 passed	
Remarks	Applicable to ACM and MULTITS only.	

6 Test Cases for QoS

This section contains the test cases which need to be performed to ensure the Quality of Service features in DVB-RCS products when following the requirements as specified by the SatLabs Group EEIG. It considers the following documents:

- SSR v1.3
- SSR v2.1
- SSR QoS
- SSR M&C (applicable for SSR v.2.1 testing)

6.1 Protocol Implementation Conformance Statement (PICS)

The following Table forms a template to collect Protocol Implementation Conformance Statement (PICS) for a DVB-RCS terminal. Each of the fields given in the table must be filled in to create a specific testing profile. The information given in the filled PICS is basis for the selection of relevant test cases from the compliance test plan

PICS Table

PICS ID	PICS/Explanation	PICS
DVBS	True, if the RCST supports DVB-S only on the Forward Link	
DVBS2	True, if the RCST supports DVB-S2 only on the Forward Link	
DVBSS2	True, if the RCST supports both DVBS and DVBS2 on the Forward Link	
ENHQOS	True, if RCST supports EF PHB and at least one AF PHB class (AF3) with at least two Drop Precedences. Furthermore, the EF PHB shall be mapped to the Real-Time (RT) RC. The AF PHBs are mapped to the Critical Data (CD) RC. The RCST shall support at least 2 connections (mapping of RCs to VPI/VCI or PID). At least one of these connections shall be dedicated to RT traffic only. The RCST shall support the configuration of CRA parameter for the highest priority mandatory RC (RT>CD>BE).	

CHID_STRICT	True, if the RCST supports a flag, that – when set by the NCC – forces the RCST to strictly follow the RC association when signalled through Channel_ID in the TBTP	
RCST_PARA	True, if the RCST_PARA option is supported by the RCST	
ENHCLASSIFIER	True, if RCST supports enhance traffic classification (protocol type (TCP, UDP), IP source address, IP destination address, source port, destination port)	
PERFORMANCE	True, if RCST supports the performance test case PERF_QOS_001.	

Legend

When describing the features of a terminal the following table should be used. For certain PICS IDs there is a recommendation given by the SatLabs group

- whether it is recommended to implement this feature – marked by the word “true” followed by a exclamation-mark (“true!”)
- whether it is recommended not to implement this feature – marked by the word “false” followed by an exclamation-mark (“false!”)

For those PICS IDs which are not marked by “true!” or “false!” it is under the discretion of the manufacturer whether the feature is implemented or not.

6.2 Protocol Implementation Extra Information for Testing (PIXIT)

The following Table forms a template to collect Protocol Implementation Extra Information for Testing (PIXIT) for a DVB-RCS terminal. Each of the fields given in the table must be filled in to create a specific test setup. The information given in the filled PIXIT is required by the CTB to perform a specific test case. This information is to be provided by the manufacturer of an RCST before the testing for the SatLabs Qualification Program starts. Most of the initially defined PIXIT values (see first version of STTP) have been jointly defined in SatLabs Testing Parameter Ranges. Information to these values are only required if the RCST implementation deviates from the specified parameter ranges.

Preliminary PIXIT Table

Especially the performance test cases still require some further details for the testing on system recommendation basis. Therefore, the following table can not be filled completely at the time being. As the definitions which are required for the performance testing may influence further PIXIT values, this table shall be seen as a preliminary one, which is not complete yet.

PIXIT_ID	PIXIT	Value
M+C_TERM_IP	IP Address under which the terminal is accessible	
M+C_SERV_IP	Default IP Address (if applicable) under which the terminal expects the M&C Server (e.g. for download)	
PERF_MATRIX	Performance matrix which has been evaluated according to SSR QoS, Table 5-4 (required as input for the performance assessment)	

6.3 Test Case Selection Matrix

Following table provides an overview on the applicable test cases when SatLabs QoS tests are to be performed. All these tests should be performed using the SatLabs definition for the basic profile (ATM).

The set of QoS testcases can be run in two modes; with or without M&C support. I.e., if terminal does not have M&C support, the QoS parameters are manually configured in the terminal. When M&C is supported, the complete set of configuration parameters (including QoS parameters) is set in a configuration file that is downloaded to the terminal.

Test Case ID	Test Case Name	Applicable for Basic QoS Profile (mandatory /optional)	relevant Option (PICS)
QOS_001	QOS - BE PHB	mandatory	BASIC
QOS_002	RBDC requests	mandatory	BASIC
QOS_003	A/VBDC requests	mandatory	BASIC
IP_LAYER_QOS_004	Mixed PHB, RBDC	optional	ENHQOS
CAP_CATS_QOS_003	Mixed PHB, A/VBDC	optional	ENHQOS
DISP_QOS_003	Dispatching (3)	optional	ENHQOS
DISP_QOS_004	Dispatching (4)	optional	MPEG_TRF
DISP_QOS_005	Dispatching based on CHID_STRICT	optional	CHID_STRICT
PERF_QOS_001	Performance	optional	PERFORMANCE
GLOBAL_RBDC_QOS_001	GLOBAL_RBDCmax	optional	RCST_PARA

6.4 Test Plan for SatLabs QoS Compliance

The test plan which is described in this section is based on the requirements which are defined in SSR QoS. With respect to the compliance definition as given in Chapter 3 a set of test cases has been chosen to form this compliance test plan. The test plan is structured in several sections, each dealing with a specific functionality.

Structure of the test plan

	Test Groups	Number of Test Cases in Section
	General QoS support	**3**
	IP layer QoS	**1 optional**
	Capacity Categories	**1 optional**
	Packet dispatching	**3 optional**
	Performance	**1 optional**
	RCST level parameters	**1 optional**
	Total:	**10 (7 optional)**

6.5 Basic Parameters for Testing

If no specific structure is given for the traffic to be transported in the return channel, the input stream to the terminal will be homogeneous. (packet rate as specified, constant input inter-packet gap, constant packet size, etc). This is also valid for test cases in which several streams are provided at the input.

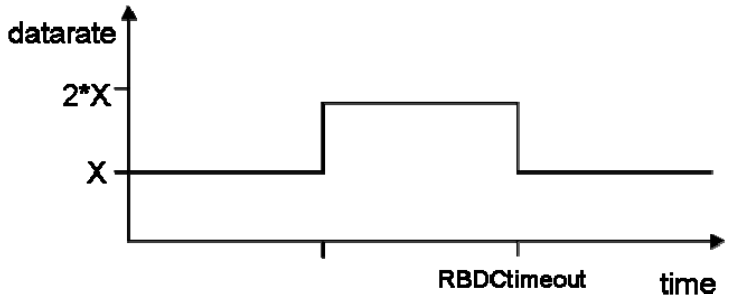
6.6 Test Cases for SatLabs QoS Compliance

The tests described in this section are based on the requirements which are defined in SSR QoS. With respect to the compliance definition as given in Chapter 3, a set of test cases has been chosen to form this compliance test plan.

The tests evaluate the RCST's capabilities to meet the QoS requirements:

- Forwarding/dispatching of data using the configured VPI/VCI (or PID, in case of MPEG)
- DSCP re-marking
- Handling of different Per Hop Behaviour (PHB) classes and their related Channel IDs.
- Support for the Capacity Request Categories CRA, RBDC and A/VBDC

Test Case ID	QOS_01	
Test Case Name	QoS - BE PHB	
References	SSR QoS, 5.1.1	
Objective / Test Purpose	The purpose of this test is to evaluate the support of - the classification based on DSCP - the consistency of the DSCP in input and output stream - The correct usage of VPI/VCI - Correct usage of Channel_ID - Sending of both RBDC and VBDC requests The specific of this test case is the support for the BE PHB (Best Effort)	
Test Description	For this test case the terminal is configured to specifically classify packets that are provided at the user interface to be forwarded within the BE PHB queue. The DSCP of the incoming IP packets is set to a value falling into the related classification range. After passing the terminal it shall be checked on IP level (e.g. for the content of the TRF bursts), if the traffic is correctly forwarded to the air interface. Also check VPI/VCI and Channel_ID.	
Test Method	Step	Description
	1	Configure the terminal to classify packets coming from the user interface to be forwarded into the BE PHB. Set terminal's RBDCmax to 10 kbps and VBDCmax to lowest non-zero value allowed in RCST
	2	Connect and logon the RCST to the CTB
	3	Establish an IP packet stream at the user interface which DSCP values set into the classification range
	4	Monitor the TRF bursts and specifically the IP packets
	5	Check whether the IP packets contain the same DSCP value as the one set on the established stream at the user interface
	6	Check that the terminal uses the correct VPI/VCI as specified in the TIM Logon Initialise descriptor
	7	Check that the Channel_ID in the SAC capacity requests are correct
	8	Check that the terminal sends both VBDC and RBDC requests when the incoming rate is set high enough (note that in this case there might be packet loss observed at the receiving side)
PASS/FAIL Criteria	The DSCP in the IP packets observed at the air interface shall be equal to the ones in the input data stream at the user interface. The VPI/VCI and the Channel_ID are correct. Terminal sends both VBDC and RBDC requests	
Remarks	Applicable to all terminals	

Test Case ID	QOS_002
Test Case Name	RBDC requests
References	SSR QoS, 5.1.4.2
Objective / Test Purpose	The RCST sends correct RBDC requests
Test Description	The RCST shall be provided with an IP stream. This IP stream shall be marked as BE PHB. The BE PHB shall be mapped to the RC BE. The RCST shall be authorized to use RBDC for the RC only. Within the time RBDCtimeout the data rate of the provided IP-data stream should be increased in one step from a default value X to the value 2*X (see figure). The CTB will dynamically serve the capacity requests from the terminal.  Note: The data rate 2*X is lower than the RBDCmax limit Note: RBDCtimeout is to be expected in the range of 7 s.

Test Method	Step	Description
	1	Configure the terminal in a way that only RBDC (with a well-defined RBDCmax) is supported (no A/VBDC)
	2	Connect and logon the RCST to the CTB
	3	Ensure that the CTB allocates TRF burst dynamically (following the terminal's requests) up to the configured RBDCmax value
	4	Establish an IP stream carrying BE/BE classified traffic at the user interface at a bit rate lower than the actually configured RBDCmax value (not more than 40 % of RBDCmax)
		Verify that the RBDC requests correspond to the data rate which is actually to be transported (requested rate ≈ rate of the IP at the user interface)
	5	Establish an IP stream carrying BE/BE classified traffic at the user interface at a bit rate which is 2 times the initial bit rate at the user interface (not more than 80 % of RBDCmax)
	6	Verify that the RBDC requests correspond to the data rate which is actually to be transported (requested rate ≈ rate of the IP at the user interface)

	7	Send some IP traffic with rate significantly larger than the RBDCmax
	8	Verify that the terminal never sends RBDC requests larger than RBDCmax
	9	Verify that the time between RBDC requests does not exceed the configured RBDCtimeout
PASS/FAIL Criteria	When the data rate of the provided IP data stream is X, the capacity request of the RCST shall be X + (overhead) + 10% tolerance When the data rate increases to 2*X within the RBDCtimeout the RCST shall invalidate the previous RBDC capacity request. The amount of the new issued RBDC capacity request by the RCST shall be 2 * (X + overhead) + (10% tolerance). Due to the definitions in section 5.1.4 in SSR QoS a smooth increase/decrease (slope) might occur in the requested volume upon input data stream change.	
Remarks	Applicable to all terminals The clarification w.r.t. the amount of the here stated tolerance can be found in chapter 5.1.4 of SSR QoS.	

Test Case ID	QOS_003
Test Case Name	A/VBDC requests
References	SSR v2.1, Part 2, 5.1.4.3, SSR v2.1, Part 2, 5.1.4.4
Objective / Test Purpose	The RCST shall consider that VBDC requests issued by the RCST are cumulative at NCC. The RCST shall consider that AVBDC requests are absolute at NCC.
Test Description	The RCST shall be provided with an IP stream. This IP stream (UDP) shall be marked as BE PHB. The BE PHB shall be mapped to the BE RC. The RCST shall be authorized to use A/VBDC for this RC only. The data rate of the IP data stream shall be fixed during the test session. The CTB shall never serve the capacity requests from the RCST. The test session shall last several minutes. Start (request session of the RCST) If the RCST only issues AVBDC requests for the duration of n*VBDCtimeout, then the amount of the different requests shall increase within the measured time interval, Several consecutive AVBDC requests shall show an increase in their requested volume until the input buffers overflow. Then the AVBDC request can either stay constant (no flushing) or start from a low capacity request again (flushing). goto end else If the RCST only issues VBDC requests for the duration of n*VBDCtimeout, then the sum of all the different requests shall not vary within the measured time interval, goto end else the RCST uses a mix of VBDC and AVBDC then the overall balance between the data volume to be transported and the overall capacity requested by the RCST shall be given. As no TRF slots are allocated by the CTB it is expected that the VBDC requests are at a constant value until VBDCtimeout expires. At this time an AVBDC request is expected. Several consecutive AVBDC requests shall show an increase in their requested volume until the input buffers overflow. Then the AVBDC request can either stay constant (no flushing) or start from a low capacity request again (flushing). end n >= 1
Test Method	Step | Description

	1	Configure the terminal in a way that only A/VBDC (with a well-defined VBDCmax) is supported (no RBDC). Set VBDCMax to 2 kByte.
	2	Connect and logon the RCST to the CTB
	3	Ensure that the CTB allocates **no** TRF burst up to the configured VBDCmax value
	4	Establish an IP stream carrying BE/BE classified traffic at the user interface at a bit rate leading to volume demand **much** lower than the actually configured VBDCmax value
	5	Monitor the VBDC requests as they are occurring at the air interface (in SYNC bursts as no TRF is allocated)
	6	Assess the methodology of requesting A/VBDC traffic according to the conditions as given in the test case description above
	7	Verify that there are only A/VBDC but no RBDC traffic requests occurring at the air interface
	8	Establish an IP stream carrying BE/BE classified traffic at the user interface at a bit rate leading to a volume demand at least 25 % higher than the actually configured VBDCmax
	9	Verify that there are only A/VBDC but no RBDC traffic requests occurring at the air interface
PASS/FAIL Criteria	The overall balance between the data volume to be transported and the overall capacity requested by the RCST shall be given.	
Remarks	Applicable to all terminals For this test, one has to be sure that no packet discard or queue flushing mechanism is in place. Only last packet in the queue should be dropped (tail dropping). The maximum resources requested in congested and non-congested conditions shall be as defined in the latest version of section 5.1.4 in the SSR QoS.	

Test Case ID	IP_LAYER_QOS_004_02	
Test Case Name	Mixed PHB, RBDC	
References	SSR QoS, 5.1.1, 5.1.5	
Objective / Test Purpose	The purpose of this test is to evaluate the support of - the classification based on DSCP - the consistency of the DSCP in input and output stream - correct RBDC capacity requests, with regards to the requested values and the Channel_IDs - Correct usage of VPI/VCI according to what is signalled in the Return Interaction Path descriptor A mix of packets from 3 streams using 3 different PHB (BE, AF and EF) shall be used in this test.	
Test Description	The RCST shall dispatch packets into the return link according to the applicable PHB specification. In addition RBDC capacity requests are applied to all classes, as well as some CRA. The RCST is configured to specifically classify packets that are provided at the user interface with respect to their DSCP and put them in the related PHB queue (EF, AF, BE). The DSCP of the incoming IP packets is set to a value falling into the related classification range. After passing the terminal it shall be checked on IP level and VPI/VCI (e.g. for the content of the TRF bursts), if the traffic is correctly forwarded to the air interface. It shall also be checked that the capacity requests for the different incoming streams are correct.	
Test Method	Step	Description
	1	Configure the terminal in a way that: • Three request classes are supported using only RBDC requests, and with CRA of 5 kbps. • Packet Classification classifies the packets coming from the user interface as EF PHB, AF PHB or BE PHB
	2	Connect and logon the RCST to the CTB
	3	Establish an IP packet streams at the user interface with DSCP value indicating CD: • Check that the DSCP in the output stream is unchanged. • Check that the stream is sent with the correct VPI/VCI according to what is signalled in TIM Return Interaction Path descriptor • Check that only RBDC requests are sent, and that these have the appropriate values (reduced by the CRA, and with 10 % tolerance, as described in the SSR)
	4	Stop the CD input stream

	5	Establish a IP packet streams at the user interface with DSCP value indicating RT: • Check that the DSCP in the output stream is unchanged. • Check that the stream is sent with the correct VPI/VCI according to what is signalled in TIM Return Interaction Path descriptor • Check that only RBDC requests are sent, and that these have the appropriate values (reduced by the CRA, and with 10 % tolerance, as described in the SSR)
	6	Stop the RT input stream
	7	Establish three IP packet streams at the user interface with DSCP value indicating BE, CD and RT: • Check that all three DSCP are seen in the output stream. • Check that the streams are sent with the correct VPI/VCI according to what is signalled in TIM Return Interaction Path descriptor • Check that only RBDC requests are sent, and that these have the appropriate values (reduced by the CRA, and with 10 % tolerance, as described in the SSR) • Verify that there is no abnormal packet loss in the three streams
	8	Verify that when the streams are stopped, the requests also stop
PASS/FAIL Criteria	The DSCP in the IP packets observed at the air interface shall be equal to the ones in the input data stream at the user interface. Correct VPI/VCIs are being used for the three streams. Correct RBDC capacity requests are being sent for the three streams	
Remarks	Applicable to ENHQOS only.	

Test Case ID	CAP_CATS_QOS_003_02	
Test Case Name	Mixed PHB, A/VBDC	
References	SSR QoS, 5.1.3, 5.1.4	
Objective / Test Purpose	The purpose of this test case is to evaluate the RCST's capability of supporting A/VBDC for BE, CD and RT request classes.	
Test Description	The RCST shall dispatch packets into the return link according to the applicable PHB specification. A/VBDC requests are applied to all classes. The RCST is configured to specifically classify packets that are provided at the user interface with respect to their DSCP and put them in the related PHB queue (EF, AF, BE). The DSCP of the incoming IP packets is set to a value falling into the related classification range. After passing the terminal it shall be checked on IP level and VPI/VCI (e.g. for the content of the TRF bursts), if the traffic is correctly forwarded to the air interface. It shall be checked that only A/VBDC capacity requests are seen, and that the requests use the correct Channel_IDs.	
Test Method	Step	Description
	1	Configure the terminal in a way that: • Three request classes are supported using A/VBDC only. • Packet Classification classifies the packets coming from the user interface as EF PHB, AF PHB or BE PHB
	2	Connect and logon the RCST to the CTB
	3	Establish an IP packet streams at the user interface with DSCP value indicating CD: • Check that the DSCP in the output stream is unchanged. • Check that the stream is sent with the correct VPI/VCI according to what is signalled in TIM Return Interaction Path descriptor • Check that only A/VBDC requests are sent, and that these are sent with correct Channel_ID
	4	Stop the CD input stream
	5	Establish an IP packet streams at the user interface with DSCP value indicating RT: • Check that the DSCP in the output stream is unchanged. • Check that the stream is sent with the correct VPI/VCI according to what is signalled in TIM Return Interaction Path descriptor • Check that only A/VBDC requests are sent, and that these are sent with correct Channel_ID.
	6	Stop the RT input stream

	7	Establish three IP packet streams at the user interface with DSCP value indicating BE, CD and RT: • Check that all three DSCP are seen in the output stream. • Check that the streams are sent with the correct VPI/VCI according to what is signalled in TIM Return Interaction Path descriptor • Check that only A/VBDC requests are sent, and that these have correct Channel_IDs
	7	Verify that there is no abnormal packet loss in the three streams
	8	Verify that when the streams are stopped, the requests also stop
PASS/FAIL Criteria	The DSCP in the IP packets observed at the air interface shall be equal to the ones in the input data stream at the user interface. Correct VPI/VCIs are being used for the three streams. Only A/VBDC requests shall occur at the air interface, and they use correct Channel_IDs	
Remarks	Applicable to ENHQOS only.	

<table>
<tr><td>Test Case ID</td><td colspan="2">DISP_QOS_003_01</td></tr>
<tr><td>Test Case Name</td><td colspan="2">Dispatching (3)</td></tr>
<tr><td>References</td><td colspan="2">SSR QoS, 5.1.5</td></tr>
<tr><td>Objective / Test Purpose</td><td colspan="2">The RCST shall dispatch packets into the return link according to the applicable PHB specification, while observing the priority between PHB (EF>AF>BE).</td></tr>
<tr><td>Test Description</td><td colspan="2">The RCST shall be provided with three IP streams. The IP streams shall be marked as EF PHB, AF PHB and BE PHB. The demand for the EF PHB shall be 100 packets/(timing-interval). The demand for the AF PHB shall be 100 packets/(timing-interval). The demand for the BE PHB shall be 100 packets/(timing-interval). The EF PHB shall be mapped to the RT RC, the AF PHB shall be mapped to the CD RC and the BE PHB shall be mapped to the BE RC. For all RCs only RBDC shall be authorized by the NCC. RBDCmax shall be set to 100 packets/(timing-interval) for all RCs.

Case 1:
The CTB allocates 300 packets/(timing-interval) in summary as response on the capacity request performed by the RCST.

Case 2:
The CTB allocates 200 packets/(timing-interval) in summary as response on the capacity request performed by the RCST.</td></tr>
<tr><td>Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td></td><td>1</td><td>Configure the terminal in a way that three request classes are supported. RT/EF shall be configured to be transported in a separate VPI/VCI. CD/AF and BE/BE shall be configured to be transported in common VPI/VCI.</td></tr>
<tr><td></td><td>2</td><td>Connect and logon the RCST to the CTB</td></tr>
<tr><td></td><td>3</td><td>Establish three IP packet streams at the user interface, each stream fulfilling the conditions for being classified in a separate queue (RT/EF, CD/AF, BE/BE)</td></tr>
<tr><td></td><td>4</td><td>Verify that all three streams provide roughly the same data rate</td></tr>
<tr><td></td><td>5</td><td>Configure the CTB to allocate enough TRF capacity to the terminal to transport all streams</td></tr>
<tr><td></td><td>6</td><td>Verify that there is no abnormal packet loss in the three streams</td></tr>
<tr><td></td><td>7</td><td>Decrease the number of allocated TRF slots by 1/3.</td></tr>
</table>

	8	Verify that there is no loss at the stream being allocated to the RT/EF request class. Check that the stream that is allocated to CD/AF is not affected more seriously (not more dropped packets) than the stream which is allocated to the BE/BE request class.
PASS/FAIL Criteria	In case 1, packets belonging to any of the three PHBs shall be transmitted (no dropping). In case 2, the RCST should prefer the traffic corresponding with the EF PHB, no packets of the RT RC shall be dropped. Both AF PHB and BE PHB might be affected by the reduction of the allocated resources; however, AF PHB shall not be affected more seriously than BE PHB.	
Remarks	Applicable to ENHQOS only RC association (alignment with VPI/VCI) will be done via the Return_Interaction_Path_Descriptor (RIP), or specified in the configuration file (if run with M&C support).	

Test Case ID	DISP_QOS_004_01	
Test Case Name	Dispatching (4)	
References	SSR QoS, 5.1.5	
Objective / Test Purpose	The RCST shall at least support the one-to-one mapping between RCs and PID.	
Test Description	The RCST shall be provided with three IP streams. The IP streams shall be marked as EF PHB, AF PHB and BE PHB. These three streams shall be mapped to the RT, CD and BE RCs respectively. They all shall have the same data rate. For each RC, a specific PID shall be allocated.	
Test Method	Step	Description
	1	Configure the terminal in a way that three RCs are supported. RT/EF, CD/AF and BE/BE shall be configured to be transported in separate PIDs.
	2	Connect and logon the RCST to the CTB
	3	Establish three IP streams of equal bit rate, one IP stream for each request class (ensure the correct classification of the IP streams)
	4	Monitor the IP traffic on the air interface and verify that the traffic for each request class (RT/EF, CD/AF and BE/BE) (DSCP value) corresponds to the allocated PID
PASS/FAIL Criteria	The RCST shall use the per RC allocated PID when transmitting IP data.	
Remarks	Applicable to MPEG_TRF only. RC association (alignment with PID) will be done via the Return_Interaction_Path_Descriptor (RIP), or specified in the configuration file (if run with M&C support).	

Test Case ID	DISP_QOS_005_01	
Test Case Name	Dispatching based on CHID_STRICT	
References	SSR QoS, 5.1.5	
Objective / Test Purpose	If the RCST implements the CHID_STRICT option or if it is enabled, the packet dispatching SHALL strictly follow the Channel_ID tagging in BTP.	
Test Description	The RCST shall be provided with two IP streams. One IP stream shall be marked as EF PHB. The stream shall be mapped to the RT RC. The other IP stream shall be marked as BE PHB. The stream shall be mapped to the BE RC. For each RC a specific VPI/VCI shall be defined. The NCC shall allocate TRF using the two Channel_IDs in the BTP. In the first step only RT RC is served, meaning that all allocated TRF slots are reserved for the EF PHB. In the second step only BE RC is served, meaning that all allocated TRF slots are reserved for the BE PHB.	
Test Method	Step	Description
	1	Configure the RCST in a way that two RCs are supported. RT/EF shall be configured to be transported in a separate VPI/VCI using its unique Channel_ID. BE/BE shall be configured to be transported in another VPI/VCI also using a unique Channel_ID.
	2	Connect and logon the RCST to the CTB
	3	Establish two IP packet streams at the user interface, each stream fulfilling the conditions for being classified in a separate queue (RT/EF, BE/BE)
	4	Configure the CTB to allocate all TRF bursts that are assigned to the RCST in the BTP to the Channel_ID used for the RT/EF request class.
	5	Verify that only the RT/EF traffic is passing through to the air interface (check Channel_ID and/or VPI/VCI in the TRF bursts)
	6	Configure the CTB to allocate all TRF bursts that are assigned to the RCST in the BTP to the Channel_ID used for the BE/BE request class.
	7	Verify that only the BE/BE traffic is passing through to the air interface (check Channel_ID and VPI/VCI in the TRF bursts)

PASS/FAIL Criteria	In the first step only traffic that belongs to the RT RC (only TRF bursts with the VPI/VCI allocated for RT RC) shall occur. In the second step only traffic that belongs to the BE RC (only TRF bursts with the VPI/VCI allocated for BE RC) shall occur.
Remarks	Applicable to CHID_STRICT only. RC association (alignment with VPI/VCI) will be done via the Return_Interaction_Path_Descriptor (RIP), or specified in the configuration file (if run with M&C support).

In the performance test case below there are 15 sub-test cases which shall be used to provide load in different combinations to the applicable RCs. Additional load will be presented to the system and it is expected that the discarding or the delay of packets in done on a certain rule based on the services priority. This will end up in different values for the packet loss, the delay, the jitter and the burstiness of traffic.

SSR QoS does not define all parameters for this test. For instance the grade of provided load/overload is not specified. Furthermore, the superframe composition will have an impact on the tested values. Therefore, in the sub-tests there are still some variables which need to be specified by the manufacturer (e.g. the k-factors and the superframe composition).

<table>
<tr><td>Test Case ID</td><td>PERF_QOS_001_01</td></tr>
<tr><td>Test Case Name</td><td>Performance (1)</td></tr>
<tr><td>References</td><td>SSR QoS, 5.2</td></tr>
<tr><td>Objective / Test Purpose</td><td>The RCST performance w.r.t. specific PHBs and congestion situation shall be verified</td></tr>
<tr><td>Test Description</td><td>The RCST shall be provided with maximum three (UDP) IP streams. The IP streams shall be marked as EF PHB, AF PHB and BE PHB. One of these IP streams shall be the observed stream, the others can be seen as the interfering (load) streams (see table below).

<table>
<tr><th>case</th><th>observed stream</th><th>load 1</th><th>load 2</th></tr>
<tr><td>1</td><td>EF (k)</td><td>none</td><td>none</td></tr>
<tr><td>2</td><td>AF (k)</td><td>none</td><td>none</td></tr>
<tr><td>3</td><td>BE (k)</td><td>none</td><td>none</td></tr>
<tr><td>4</td><td>EF (k)</td><td>BE (k1)</td><td>none</td></tr>
<tr><td>5</td><td>EF (k)</td><td>AF (k2)</td><td>none</td></tr>
<tr><td>6</td><td>EF (k)</td><td>BE (k3)</td><td>none</td></tr>
<tr><td>7</td><td>EF (k)</td><td>EF (k4)</td><td>none</td></tr>
<tr><td>8</td><td>AF (k)</td><td>BE (k1)</td><td>none</td></tr>
<tr><td>9</td><td>AF (k)</td><td>AF (k2)</td><td>none</td></tr>
<tr><td>10</td><td>AF (k)</td><td>BE (k3)</td><td>none</td></tr>
<tr><td>11</td><td>AF (k)</td><td>EF (k4)</td><td>none</td></tr>
<tr><td>12</td><td>BE (k)</td><td>BE (k1)</td><td>none</td></tr>
<tr><td>13</td><td>BE (k)</td><td>AF (k2)</td><td>none</td></tr>
<tr><td>14</td><td>BE (k)</td><td>BE (k3)</td><td>none</td></tr>
<tr><td>15</td><td>BE (k)</td><td>EF (k4)</td><td>none</td></tr>
<tr><td>16</td><td>EF (k)</td><td>BE (k5)</td><td>AF(k6)</td></tr>
<tr><td>17</td><td>AF (k)</td><td>BE (k5)</td><td>AF(k6)</td></tr>
<tr><td>18</td><td>BE (k)</td><td>BE (k5)</td><td>AF(k6)</td></tr>
</table>
k = (capacity demand)/(allocated bandwidth)
For all cases defined in the table above the CTB verifies the jitter (peak, minimum, average), delay (peak, minimum average) and maximum burst size as applicable for the observed stream.</td></tr>
<tr><td>Test Method</td><td>Step | Description</td></tr>
</table>

	1	Configure the RCST in a way that three request classes are supported. RT/EF shall be configured to be transported in a separate VPI/VCI. CD/AF and BE/BE shall be configured to be transported in common VPI/VCI.
	2	Connect and logon the RCST to the CTB
	3	According to the table above establish the "observed" IP stream with a load of "k" in the respective request class.
	4	According to the table above establish the "load 1" IP stream with a load of "k_n" (n = 1 .. 6) in the respective request class (if no load 1 is defined skip this step)
	5	According to the table above establish the "load 2" IP stream with a load of "k_n" (n = 6) in the respective request class (if no load 2 is defined skip this step)
	6	Measure the jitter (peak, minimum, average), delay (peak, minimum, average) and the maximum burst of the "observed" IP stream as applicable for the respective request class
PASS/FAIL Criteria	For all cases defined in the table above the verified values for delay, jitter and maximum burst size are within given limits. In a first approach they shall conform to the manufacturers information on the implemented performance (see PIXIT).	
Remarks	Applicable to PERFORMANCE only. Applicable • to all terminals (only cases 3, 12, 14) • to ENHQOS (all cases) In order to have reproducible results the structure of the allocated TRF slots on the DVB-RCS layer (e.g. SF length, number of frames in a SF…) must be defined. Furthermore the structure of the provided IP traffic must be defined in detail (e.g. length, repetition rate (inter-packet gap)…) and the proposed congestion situation has to be specified in detail (relation between the demand and allocated bandwidth (k-factors)). This information has to be provided by the manufacturer.	

This test case below addresses the SatLabs option RCST_PARA, which defines global values for certain parameters. The use of these global values is optional, however, when used, a certain behaviour is expected.

Test Case ID	GLOBAL_RBDC_QOS_001_01	
Test Case Name	GLOBAL_RBDCmax	
References	SSR QoS, 5.1.3, SSR QoS, 5.1.4.2, SSR M&C, 17.2.3.1.4	
Objective / Test Purpose	The RCST shall limit the instantaneous sum of all requests to RCST parameters	
Test Description	The RCST shall be provided with two IP streams. These IP streams (UDP) shall all be mapped to two separate RCs (RC(1), RC(2)). The RCST shall be authorized to use only RBDC for these RCs. The data rates of these IP data streams shall be varied randomly during the test session. The initiated IP data streams shall correspond to the following demand: - for RC(1) 100 packets/(timing-interval) - for RC(2) 100 packets/(timing-interval) RBDCmax for RC(1) shall be 100 packets/(timing-interval), RBDCmax for RC(2) shall be 100 packets/(timing-interval) The GlobalRBDCmax shall be set to 150 packets/(timing-interval). The CTB shall dynamically serve the capacity requests from the RCST. The test session shall last several minutes.	
Test Method	Step	Description
	1	Configure the RCST in a way that two RCs are supported, with separately configured RBDCmax.
	2	Configure the GlobalRBDCmax to a value lower than the sum of the RBDCmax values as configured for the RCs.
	3	Connect and logon the RCST to the CTB
	4	Establish two IP stream classified to carry traffic for these two RCs at a bit rate lower than the RBDCmax of the each RC, but higher than the GlobalRBDCmax
	5	Verify that on the air interface the instantaneous request of the RCST is never greater than the GlobalRBDCmax.
PASS/FAIL Criteria	The instantaneous request of the RCST shall never be greater than GlobalRBDCmax.	

Remarks	Applicable to RCST_PARA only. If in the configuration of the RCST it is impossible to set the GlobalRBDCmax to a value lower than the sum of the RBDCmax on two different RCs, then this test case shall not be applicable.

7 Test Cases for M&C

7.1 Introduction

This section contains the test cases which need to be performed to ensure the interoperability of SatLabs Group EEIG recommended DVB-RCS terminals with respect to the Harmonised Control and Management plane (HM&C). This document in based on the requirements as stated in the SSR M&C.

7.2 Protocol Implementation Conformance Statement (PICS)

Usually when giving the implementation conformance statement (PICS/ICS) a table is given, in which the manufacturer of a solution states, if a certain option is implemented and supported or not. When it comes to the management and control (M&C) such list would include all MIB objects that are specified as “optional” in the MIB definition. It is not very efficient to repeat the complete MIB at this point. The manufacturer is expected to provide a full list of the specified MIB objects together with a statement on its implementation. In the following an example of this table is given for reference. The PICS table shall be provided on the latest edition of MIB specification.

MIB PICS Table

OID	Name dvbRcsRcstSystem…	Syntax	Access	Description	SatLabs Appli-cability	Imple-menta-tion
1	…dvbRcsSystem MibRevision	Display string Size (0..255)	R	This object is the MIB module revision.	M	Y
2	…dvbRcsSystemLocation	Display string Size (0..255)	R, W	Physical location of the ODU antenna expressed as Longitude, Latitude and Altitude.	M	Y
3	... dvbRcsSystemOduAntennaSize	Display string Size (0..255)	R, W	This object gives the diameter of the antenna. This value shall be given in cm. Defined at installation. The object can be used in conjunction with environmental requirements.	M (read) if ODULIST is not supported (write)	N

4	etc.	etc.	etc.	etc.	etc.	etc.

In the Implementation column use “Y” (yes) for implemented; “N” (no) for not implemented. Objects that are marked as mandatory in the SatLabs applicability column must be implemented in SatLabs recommended terminals (Verified Products).

Counters PICS Table

OID	Name	DVB-RCS MAC	DVB-RCS UL	DVBS DL or DVBS2DL or DVB-RCS DL	ATM Logical Link (UL)	MPEG Logical Link (UL)	ATM Logical Link (DL)
	Interfaces MIB						
2	IfTable						
2.1	ifEntry						
2.1.1	ifIndex	Y	Y	Y	Y	Y	Y
2.1.2	ifDescr	Y	Y	Y	N	N	N
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.

General Options PICS Table

Further Implementation options might arise. If so, the following table needs to be filled accordingly before the testing can start.

PICS ID	PICS/Explanation	PICS
TX_disable_SNMP	True, if the RCST supports the functionality to enter the hold mode via a SNMP command	
FTP	FTP protocol supported by a FTP client in the RCST	
DNS	Support of DNS protocol	
NLID	Support of NLID in TIM-U in order to configure the RCST management IP address	
SNMPMISC	Complete SNMP functionality including: - Transmission disable through SNMP - Support of ATM (and MPEG if MPEG_TRF option) Logical Links	

	interfaces - Support of all optional parameters in dvbRcsRcstSystem group - Support of all optional parameters in dvbRcsRcstQos group (except optional parameters in dvbRcsPktClassTable) - Support of all optional parameters in dvbRcsRcstState group	
INSTALL_LOG	Support of installation log file	
ENHCLASSIFIER	Support of enhanced traffic classification. All optional parameters in dvbRcsPktClassTable of dvbRcsRcstQos group are supported.	

Legend

When describing the features of a terminal the following table should be used. For certain PICS IDs there is a recommendation given by the SatLabs group

- whether it is recommended to implement this feature – marked by the word “true” followed by a exclamation-mark (“true!”)
- whether it is recommended not to implement this feature – marked by the word “false” followed by an exclamation-mark (“false!”)

For those PICS IDs which are not marked by “true!” or “false!” it is under the discretion of the manufacturer whether the feature is implemented or not.

7.3 Protocol Implementation Extra Information for Testing (PIXIT)

The following Table forms a template to collect Protocol Implementation Extra Information for Testing (PIXIT) for a DVB-RCS terminal. Each of the fields given in the table must be filled in to create a specific test setup. The information given in the filled PIXIT is required by the CTB to perform a specific test case. This information is to be provided by the manufacturer of an RCST before the testing for the SatLabs Qualification Program starts. Most of the initially defined PIXIT values have been jointly defined in SatLabs Testing Parameter Ranges. Information to these values are only required if the RCST implementation deviates from the specified parameter ranges.

Preliminary PIXIT Table

Especially the performance test cases still require some further details for the testing on system recommendation basis. Therefore, the following table can not be filled completely at the time being. As the definitions which are required for the performance testing may influence further PIXIT values, this table shall be seen as a preliminary one, which is not complete yet.

PIXIT_ID	PIXIT	Value
M+C_TERM_IP	IP Address under which the terminal is accessible	
M+C_SERV_IP	Default IP Address (if applicable) under which the terminal expects the M&C Server (e.g. for download or for the provision of Traps)	
ACT_ALT_SW	Here the procedure for activating the alternate SW load shall be described (e.g. automatic, explicit re-boot, explicit validation command, etc.)	
ALT_SW_LOAD	File containing a new software load (different from normal software load at least in file name and version number).	
DEFAULT_CONF_FILE	Configuration File containing default values (for download tests)	

7.4 Test Case Selection Matrix

Following table provides an overview on the applicable test cases when SatLabs M&C features profile is supported. All these tests should be performed using the SatLabs definition for the basic profile (ATM).

Note that none of the following M&C test cases has been validated with an operational terminal yet.

Test Case ID	Test Case Name	Applicable for Basic M&C Profile (mandatory /optional)	Relevant Option (PICS)
SWU_M&C_007_01	SWU, INFO/WRQ initialisation, mixed order of parameters	Mandatory	
CONF_M&C_001_01	Unified Set of Configuration Parameters	Mandatory	
CONF_M&C_002_01	Configuration File Download	Mandatory	
CONF_M&C_003_01	Configuration Upload	Mandatory	
COMM_M&C_001_01	Mandatory Commissioning Parameters	Mandatory	
INST_M&C_001_01	Mandatory Installation Parameters	Mandatory	
LANCONF_M&C_001_01	Mandatory Commissioning and Installation Parameters via the LAN interface	Mandatory	
INSTALLATION_001	Installation	Mandatory	
FCAPS_Fault_001	Fault Status	Mandatory	
FCAPS_TROUBLE_001	Trouble Correction Reboot	Mandatory	
FCAPS_TROUBLE_002	Trouble Correction TX Disable	Optional	TX_disable_SNMP
FCAPS_TROUBLE_003	Trouble Correction User Traffic Disable	Mandatory	
FCAPS_MEASURING_003	SNR and BER Measurements	Mandatory	
FCAPS_TEST_004	Logon, CW On/Off, Logoff	Mandatory	
DATA_COLLECTION_013	Data Collection	Mandatory	

7.5 Test Plan for SatLabs H&MC Compliance

The test plan which is described in this section is based on the requirements which are defined in SSR M&C. With respect to the compliance definition as given in Chapter 3 a set of test cases has been chosen to form this compliance test plan. The test plan is structured in several sections, each dealing with a specific functionality.

Structure of the test plan

	Test Groups	**Number of Test Cases in Section**
	Software Upgrade (SWU)	**1**
	Configuration File	**3**
	Commissioning and Installation	**4**
	FCAPS	**6 (1 optional)**
	Data Collection	**1**
	Total:	**15 (1 optional)**

7.5.1 Test Group – Software Upgrade (SWU)

The test case in this group is deemed to evaluate the RCST's capabilities to upgrade its Software by downloading it from the Multicast channel it is allocated to. To perform this test the CTB shall provide the SWU initialisation blocks together with the related data carousel on different (configurable) MGroups/ports.

Test Case ID	SWU_M&C_007_01	
Test Case Name	SWU, INFO/WRQ initialisation, mixed order of parameters	
References	SSR M&C, 12, 17.2.3.1.6	
Objective / Test Purpose	Evaluate whether the terminal is able to receive and accepts SWU parameters even when they are provided in an order other than listed up in the specification.	
Test Description	After the terminal has been connected to the FL, from which it received the broadcast and multicast information, the CTB sends an INFO block containing a set of parameters that are providing a re-direction of the terminal w.r.t. the mgroup/port. The parameters are provided in a random order mixed with the mandatory parameters (such as blksize, Tsize, manufID, ver etc.) On the redirected channel the data carousel starts with a WRQ that also mixes the mandatory parameters. The terminal shall start the SW download. After the SW has been downloaded traffic will be initiated at the user interface of the terminal. CSC bursts will occur, which are checked on the SW version field within the RCST Capability field of the CSC burst. The CSC burst will be answered by TIM-U by the CTB. After having finalised the logon process, the CTB shall send a “Get dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstState.dvbRcsRcstAlternateSoftwareVersion”. The responded value shall correspond to the newly downloaded SW.	
Test Method	Step	Description
	1	The RCST is connected to the FL of the CTB
	2	The CTB transmits an INFO BLOCK command on the default mgroup/port to redirect to another Multicast -Group channel for SW download The parameters are provided in a random order mixed with the mandatory parameters (such as blksize, Tsize, manufID, ver etc.)
	3	On the redirected channel the data carousel starts with a WRQ that also mixes the mandatory parameters.
	4	After the SW download has been finalised a logon process of the RCST shall be initiated
	5	The correct composition of the CSC bursts shall be checked (correct software version field within the RCST capability field)
	6	The CTB transmits a TIM-U on CSC

	7	The CTB transmits the SNMP command “Get dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstState.dvbRcsRcstAlternateSoftwareVersion”
	8	The RCST shall report the correct version number of the uploaded software
Used Objects	dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstState.dvbRcsRcstAlternateSoftwareVersion	
PASS/FAIL Criteria	– No error messages during the SW download – Correct SW version in the RCST capability field (CSC) – Correct version of the updated software version (SNMP object).	
Remarks	Not validated with operational terminal yet	

7.5.2 Test Group – Configuration File

The test cases in this group are deemed to evaluate the content of configurations files. To test this, a configuration file as created by the RCST is investigated with respect to the contained parameters (incl. data consistency). Furthermore the correct upload and download of the configuration file is subject of testing.

In reference to the M&C, Section 7.3, an ActivateConfigFileCommand will be sent by the NCC to activate the delivered Configuration file. It may also apply that the terminal requires a reboot (vendor specific) to activate the newly received configuration file.

Test Case ID	CONF_M&C_001_01	
Test Case Name	Unified Set of Configuration Parameters	
References	SSR M&C, 11 (Appendix A)	
Objective / Test Purpose	Evaluate whether the configuration file which is provided by the RCST when storing the Configuration at the NCC contains all specified configuration parameters.	
Test Description	A configuration file as it is generated by the RCST shall be investigated (independent of the CTB). According to the specifications of the manufacturer, the file shall be analysed using the appropriate tool (e.g. text editor, XML editor, etc). If there is a specific tool required to analysing the file, this shall be provided by the manufacturer. The file must contain the unified set of configuration parameters as specified in SSR M&C, Clause 11 (Appendix A).	
Test Method	Step	Description
	1	Establish a DVB-RCS connection between the RCST and the CTB.
	2	Use an appropriate tool in order to investigate the configuration file of the RCST (e.g. text editor, XML editor, etc).
	3	Compare the content in the configuration file with the requirements given in the SSR Appendix A.
Used Objects	dvbRcsMIBObjects. dvbRcsRcst. dvbRcsRcstState.dvbRcsRcstActivatedConfigFileVersion, dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkLanInetAddress , dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkLanInetAddressPrefixLength, dvbRcsMIBObjects.dvbRcsFwdLink.dvbRcsFwdConfig. dvbRcsFwdStartPopId	

PASS/FAIL Criteria	configuration file as provided at the NCC shall contain: – Configuration file identifier (string type) – Ethernet IP address (parameter dvbRcsNetworkLanIpAddress in section 17.2.3.1.2) – Ethernet IP subnet mask (parameter dvbRcsNetworkLanIpNetworkMask in section 17.2.3.1.2) – SNMP write community string (char string) – SNMP read community string (char string) – SLA/QoS parameters (see section 17.2.3.1.4) – Operational Population ID (parameter dvbRcsFwdStartPopId in section 17.2.3.2.1)
Remarks	Not validated with operational terminal yet

Test Case ID	CONF_M&C_002_01	
Test Case Name	Configuration File Download	
References	SSR M&C, 17.2.3.1.2, 17.2.3.1.5, 17.2.3.1.6	
Objective / Test Purpose	The RCST shall be able to download a configuration file from the NCC (server)	
Test Description	When the RCST has achieved the Fine Sync State, the CTB shall provide the RCST with the full path name for the configuration file download. It includes the protocol type (tftp or ftp) and the associated server IP address or hostname (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkConfigFileDownloadUrL). Afterwards the CTB will start the download process of the RCST by sending the appropriate SNMP command (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlDownloadFileCommand). The RCST shall update the object rcstDownloadedConfigFileVersion (get dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstDownloadedConfigFileVersion) with the version of the downloaded configuration file. The CTB shall activate the donwloaded configuration file (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlActivateConfigFileCommand). When this new configuration file is activated, the object rcstActivatedConfigFileVersion shall be updated with this file version (get dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstActivatedConfigFileVersion)	
Test Method	Step	Description
	1	Establish a DVB-RCS link between the RCST and the CTB
	2	The CTB provides the RCST with the full path name for the configuration file download. It includes the protocol type (TFTP or FTP) and the associated server IP address or hostname (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkConfigFileDownloadUrL
	3	The CTB starts the download process of the RCST by sending the appropriate SNMP command (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlDownloadFileCommand
	4	Check that the RCST updates the object rcstDownloadedConfigFileVersion (get dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstDownloadedConfigFileVersion) with the version of the downloaded configuration file.

	5	The CTB activates the downloaded configuration file (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlActivateConfigFileCommand)
	6	Check that this new configuration file is activated, the object rcstActivatedConfigFileVersion shall be updated with this file version (get dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstActivatedConfigFileVersion
Used Objects	dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkConfigFileDownloadUrl dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlDownloadFileCommand dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlActivateConfigFileCommand dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstActivatedConfigFileVersion dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstDownloadedConfigFileVersion	
PASS/FAIL Criteria	The requirements from the test description are fulfilled.	
Remarks	Not validated with operational terminal yet	

Test Case ID	CONF_M&C_003_01	
Test Case Name	Configuration Upload	
References	SSR M&C, 17.2.3.1.2, 17.2.3.1.5	
Objective / Test Purpose	The RCST shall support the upload of its configuration file to the NCC.	
Test Description	When the RCST has achieved the Fine Sync State, the CTB shall provide the RCST with the full path name for the configuration file upload. It includes the protocol type (tftp or ftp) and the associated server IP address or hostname (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkConfigFileUploadUrl). Afterwards the CTB will start the upload process of the RCST by sending the appropriate SNMP command (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUploadFileCommand). The correct content and version of the configuration file has to be verified.	
Test Method	Step	Description
	1	Establish a DVB-RCS link between the RCST and the CTB
	2	The CTB provides the RCST with the full path name for the configuration file upload. It includes the protocol type (TFTP or FTP) and the associated server IP address or hostname (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkConfigFileUploadUrl).
	3	The CTB will start the upload process of the RCST by sending the appropriate SNMP command (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUploadFileCommand).
	4	Check the correct content and version of the configuration file that has been uploaded to the CTB
Used Objects	dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork. dvbRcsNetworkConfigFileUploadUrl dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUploadFileCommand	
PASS/FAIL Criteria	The requirements from the test description are fulfilled.	
Remarks	Not validated with operational terminal yet	

7.5.3 Test Group – Commissioning and Installation

The tests cases in this group are deemed to evaluate the RCST with respect to the parameters which are to be controlled during the commissioning and the installation. These test cases evaluate the accessibility and the configurability (if applicable) of the single parameters. Some of the parameters are to be presented at different interfaces. The test cases take care of this. Finally the installation procedure w.r.t. the SNMP signalling will be tested.

Test Case ID	COMM_M&C_001_01
Test Case Name	Mandatory Commissioning Parameters
References	SSR M&C,14 (Appendix D)
Objective / Test Purpose	This test case is deemed to evaluate whether the mandatory Commissioning Parameters as specified in Clause 14 (Appendix D) of SSR M&C are accessible and (if applicable) configurable via the SNMP interface by the NCC.
Test Description	This test case is a generic one, meaning it is describing the general method of test, which need to be performed for a set of sub-cases as given in the table below. After the terminal has been brought to the normal transmission state, the different MIB objects as given in the table below are investigated in more detail. This is done in the following way: First, the command “Get <MIBobject>” is sent and the response shall be stored as <MIBvalueInit>. <MIBvalueInit> is then checked for plausibility. In the next step it is checked, if <MIBobject> is configurable (W option set). If <MIBobject> is configurable, the command “Set <MIBobject> <MIBvalueTest>” is to be sent. <MIBvalueTest> is to be taken from the table below for the related <MIBobject>. If more than one <MIBvalueTest> is given, these steps shall be repeated for all given <MIBvalueTest>. Afterwards, the content of <MIBobject> is checked by “Get <MIBobject>”. The returned value shall be equal to <MIBvalueTest>. To complete this step the <MIBobject> is set back to the initial value by sending the command “Set <MIBobject> <MIBvalueInit>” (including a verification of success by “Get <MIBobject>”). If <MIBobject> is not configurable, the command “Set <MIBobject> <MIBvalueTest>” is to be sent.

	<MIBvalueTest> is to be taken from the table below for the related <MIBobject>. Afterwards, the content of <MIBobject> is checked by "Get <MIBobject>". The returned value shall be equal to <MIBvalueInit>.	
Test Method	Step	Description
	1	Establish a DVB-RCS link between the RCST and the CTB
	2	The different MIB objects as given in the table below are investigated in more detail
	3	These investigations are done as explained in the test description
PASS/FAIL Criteria	- correct provision of MIB object content - correct configuration of MIB object content (if applicable)	
Remarks	see Table below for the single sub -Test Cases. Not validated with operational terminal yet	

Sub-Test Cases to COMM_M&C_001

Sub Test Case ID	**<MIBobject>**	**<MIBvalueTest> (if more than 1, then separated by semicolon) x .. y means that a value between x and y is selected randomly**
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall**		
1	… dvbRcsInstallAntennaAlignmentState	(1) – Start; (2) – Deny; (3) – Continue; (4) – Stop; (5) – Success; (6) – Fail;
2	… dvbRcsInstallCwFrequency	140000000 .. 145000000
3	… dvbRcsInstallCwMaxDuration	5 .. 20
4	… dvbRcsInstallCoPolReading	---
5	… dvbRcsInstallXPolReading	---
6	… dvbRcsInstallCoPolTarget	260 .. 300 (26 – 30 dB)
7	… dvbRcsInstallXPolTarget	260 .. 300 (26 – 30 dB)
8	… dvbRcsInstallStandByDuration	10 .. 20
9	… dvbRcsInstallTargetEsN0	71 .. 100
objects from MIB section: **dvbRcsMIBObjects. dvbRcsFwdLink. dvbRcsFwdConfig**		
10	... dvbRcsFwdStartPopId	2 .. 30
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstControl**		
11	… dvbRcsCtrlCwEnable	1, 2
objects from MIB section: **dvbRcsMIBObjects. dvbRcsRtnLink. dvbRcsRtnConfig**		
12	… dvbRcsRtnConfigDefIfLevel	0 .. 100 (0 .. 10 dBm

Test Case ID	INST_M&C_001_01
Test Case Name	Mandatory Installation Parameters
References	SSR M&C, 15 (Appendix E)
Objective / Test Purpose	Evaluate whether the mandatory Installation Parameters as specified in Clause 15 (Appendix E) of SSR M&C are accessible and (if applicable) configurable via the SNMP interface by the NCC.
Test Description	This test case is a generic one, meaning it is describing the general method of test, which need to be performed for a set of sub-cases as given in the table below. After the terminal has been brought to the normal transmission state, the CTB sends the command “Set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable 2 (initiate TxDisable)” to stop any user TRF. The different MIB objects as given in the table below are investigated in more detail. This is done in the following way: First, the command “Get <MIBobject>” is sent and the response shall be stored as <MIBvalueInit>. <MIBvalueInit> is then checked for plausibility. In the next step it is checked, if <MIBobject> is configurable (W option set). If <MIBobject> is configurable, the command “Set <MIBobject> <MIBvalueTest>” is to be sent. <MIBvalueTest> is to be taken from the table below for the related <MIBobject>. If more than one <MIBvalueTest> is given, these steps shall be repeated for all given <MIBvalueTest>. Afterwards, the content of <MIBobject> is checked by “Get <MIBobject>”. The returned value shall be equal to <MIBvalueTest>. To complete this step the <MIBobject> is set back to the initial value by sending the command “Set <MIBobject> <MIBvalueInit>” (including a verification of success by “Get <MIBobject>”). If <MIBobject> is not configurable, the command “Set <MIBobject> <MIBvalueTest>” is to be sent. <MIBvalueTest> is to be taken from the table below for the related <MIBobject>. Afterwards, the content of <MIBobject> is checked by “Get <MIBobject>”. The returned value shall be equal to <MIBvalueInit>.
Test Method	Step: 1 Description: Establish a DVB-RCS link between the RCST and the CTB, Alternatively a PC with an appropriate MIB browser can be connected to the LAN interface of the RCST.

	2	The CTB sends the command “Set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable 2 (initiate TxDisable)” to stop any user TRF
	3	The different MIB objects as given in the table below are investigated in more detail
	4	These investigations are done as explained in the test description
PASS/FAIL Criteria	- correct provision of MIB object content - correct configuration of MIB object content (if applicable)	
Remarks	see Table below for the single sub –Test Cases. Not validated with operational terminal yet	

Sub-Test Cases to INST_M&C_001

Sub Test Case ID	**<MIBobject>**	**<MIBvalueTest> (if more than 1, then separated by semicolon) x .. y means that a value between x and y is selected randomly**
objects from MIB section: **dvbRcsMIBObjects.dvbRcsFwdLink.dvbRcsFwdConfig.**		
1	… dvbRcsFwdStartFrequency	107000000 .. 127000000
2	… dvbRcsFwdStartPolar	00, 01, 10, 11
3	… dvbRcsFwdStartInnerFec	0 .. 10, 15
4	… dvbRcsFwdStartSymbolRate	20000 .. 450000
5	… dvbRcsFwdStartRolloff	0 .. 3
7	… dvbRcsFwdStartRowStatus	1 .. 6
8	… dvbRcsFwdStartPopId	2 .. 30
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork**		
9	... dvbRcsNetworkOamIpAddress	224.x.x.x (x = 1..254)
10	… dvbRcsNetworkOamIpNetworkMask	255.0.0.0
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstSystem**		
11	… dvbRcsSystemLocation	lat: 4000.00,N .. 5000.00,N Long: 50.00,E .. 150.00,E Alt: 0 .. 5000
objects from MIB section: **dvbRcsMIBObjects.dvbRcsFwdLink.dvbRcsFwdStatus**		
12	… dvbRcsFwdStatusNetId	---
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstQos** Note: These objects are addressed when testing QoS anyhow, therefore, in this test suite the QoS related objects are not tested separately. If a product is tested for HM&C only (and not for QoS) the MIB objects are to be tested. Parameters for test are to be defined.		

Test Case ID	LANCONF_M&C_001_01
Test Case Name	Mandatory Commissioning and Installation Parameters via the LAN interface
References	SSR M&C, 16 (Appendix F)
Objective / Test Purpose	Evaluate whether the mandatory Configuration and Installation Parameters as specified in Clause 18 (Appendix F) of SSR M&C are accessible and (if applicable) configurable via the LAN interface (e.g. by the installer).
Test Description	This test case is a generic one, meaning it is describing the general method of test, which need to be performed for a set of sub-cases as given in the table below. As this test is independent of any air interface activity this test can be made without having the RCST connected to the air interface or even logged on. A host PC is connected to the LAN interface of the terminal (being in the same subnet as the OAM-IP-entity. The way, how this access is presented depends on the availability of a SNMP browser. An alternative could be that the manufacturer provides a mediation device which allows the direct access to the MIB objects (e.g. specific installer GUI on a control terminal. The different MIB objects as given in the table below are investigated in more detail. This is done in the following way: First, the command “Get <MIBobject>” is sent and the response shall be stored as <MIBvalueInit>. <MIBvalueInit> is then checked for plausibility. In the next step it is checked, if <MIBobject> is configurable (W option set). If <MIBobject> is configurable, the command “Set <MIBobject> <MIBvalueTest>” is to be sent. <MIBvalueTest> is to be taken from the table below for the related <MIBobject>. If more than one <MIBvalueTest> is given, these steps shall be repeated for all given <MIBvalueTest>. Afterwards, the content of <MIBobject> is checked by “Get <MIBobject>”. The returned value shall be equal to <MIBvalueTest>. To complete this step the <MIBobject> is set back to the initial value by sending the command “Set <MIBobject> <MIBvalueInit>” (including a verification of success by “Get <MIBobject>”). If <MIBobject> is not configurable, the command “Set <MIBobject> <MIBvalueTest>” is to be sent. <MIBvalueTest> is to be taken from the table below for the related <MIBobject>. Afterwards, the content of <MIBobject> is checked by “Get <MIBobject>”. The returned value shall be equal to

	<MIBvalueInit>.	
Test Method	Step	Description
	1	As this test is independent of any air interface activity this test can be made without having the RCST connected to the air interface or even logged on. A host PC is connected to the LAN interface of the terminal (being in the same subnet as the OAM-IP-entity. The way, how this access is presented depends on the availability of a SNMP browser. An alternative could be that the manufacturer provides a mediation device which allows the direct access to the MIB objects (e.g. specific installer GUI on a control terminal.
	2	The different MIB objects as given in the table below are investigated in more detail
	3	These investigations are done as explained in the test description
PASS/FAIL Criteria	- correct provision of MIB object content - correct configuration of MIB object content (if applicable)	
Remarks	see Table below for the single Sub-Test-Cases. Not validated with operational terminal yet	

Sub-Test Cases to LANCONF_M&C_001

Sub Test Case ID	**<MIBobject>**	**<MIBvalueTest> (if more than 1, then separated by semicolon) x .. y means that a value between x and y is selected randomly**
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstSystem**		
1	… dvbRcsSystemMibRevision	---
2	… dvbRcsSystemLocation	lat: 4000.00,N .. 5000.00,N Long: 50.00,E .. 150.00,E Alt: 0 .. 5000
3	… dvbRcsSystemOduAntennaGain	350 .. 550
4	… dvbRcsSystemOduSspa	0 .. 20
5	… dvbRcsSystemOduTxType	string of 0 .. 255 bytes length
6	… dvbRcsSystemOduRxType	string of 0 .. 255 bytes length
7	… dvbRcsSystemOduRxBand	0, 1
8	… dvbRcsSystemOduRxLO	Tbd
9	… dvbRcsSystemOduTxLO	Tbd
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstInstall**		
10	… dvbRcsInstallCwFrequency	140000000 .. 145000000
11	… dvbRcsInstallCwPower	0 .. 100
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstNetwork**		
12	... dvbRcsNetworkLanIpAddress	x.x.x.x (x = 1..254)

Sub Test Case ID	<MIBobject>	<MIBvalueTest> (if more than 1, then separated by semicolon) x .. y means that a value between x and y is selected randomly
13	… dvbRcsNetworkLanIpNetworkMask	0.0.0.0
14	... dvbRcsNetworkOamIpAddress	224.x.x.x (x = 1..254)
15	… dvbRcsNetworkOamIpNetworkMask	255.0.0.0
16	… dvbRcsNetworkOamIpAddressAssign	---
17	… dvbRcsNetworkAirInterfaceDefaultGateway	x.x.x.x (x = 1..254)
18	… dvbRcsNetworkConfigFileDownloadUrl	string of 0 .. 255 bytes length
19	… dvbRcsNetworkConfigFileUploadUrl	string of 0 .. 255 bytes length
20	… dvbRcsNetworkInstallLogFileDownloadUrl	string of 0 .. 255 bytes length
21	… dvbRcsNetworkInstallLogFileUploadUrl	string of 0 .. 255 bytes length
22	… dvbRcsNetworkLogFileUploadUrl	string of 0 .. 255 bytes length
objects from MIB section: **dvbRcsMIBObjects. dvbRcsRtnLink.dvbRcsRtnConfig**		
23	… dvbRcsRtnConfigDefIfLevel	0 .. 100 (0 .. 10 dBm)
objects from MIB section: **dvbRcsMIBObjects.dvbRcsFwdLink.dvbRcsFwdConfig.**		
24	… dvbRcsFwdStartPopId	2 .. 30
25	… dvbRcsFwdStartFormat	auto (-1), dvbs (0), dvbs2ccm (1), dvbs2acm (2)
26	… dvbRcsFwdStartFrequency	107000000 .. 127000000
27	… dvbRcsFwdStartPolar	00, 01, 10, 11
28	… dvbRcsFwdStartInnerFec	0 .. 10, 15
29	… dvbRcsFwdStartSymbolRate	20000 .. 450000
30	… dvbRcsFwdStartRolloff	0 .. 3
objects from MIB section: **dvbRcsMIBObjects.dvbRcsFwdLink.dvbRcsFwdStatus**		
32	… dvbRcsFwdStatusCnr	---
33	… dvbRcsFwdStatusBer	---
34	… dvbRcsFwdStatusNetId	---
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstQos** Note: These objects are addressed when testing QoS anyhow, therefore, in this test suite the QoS related objects are not tested separately. If a product is tested for HM&C only (and not for QoS) the MIB objects are to be tested. Parameters for test are to be defined.		
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstState**		
36	… dvbRcsRcstMode	(0) – Installation; (1) – Operational
37	… dvbRcsRcstFwdLinkStatus	---
38	… dvbRcsRcstRtnLinkStatus	---
objects from MIB section: **dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstControl**		
39	… dvbRcsCtrlRebootCommand	(1) – idle; (2) normal reboot (from current SW load); (3) – reboot from alternate load
40	… dvbRcsCtrlRcstTxDisable	(1) idle; (2) initiate TX Disable
41	… dvbRcsCtrlCwEnable	1, 2
42	… dvbRcsCtrlOduTxReferenceEnable	(1) – off, (2) – on

Sub Test Case ID	<MIBobject>	<MIBvalueTest> (if more than 1, then separated by semicolon) x .. y means that a value between x and y is selected randomly
43	… dvbRcsCtrlOduTxDCEnable	(1) – off, (2) – on
44	… dvbRcsCtrlOduRxDCEnable	(1) – off, (2) – on
45	… dvbRcsCtrlDownloadFileCommand	(1) – idle; (2) – download configuration file (3) – download installation log file
46	… dvbRcsCtrlUploadFileCommand	(1) – idle; (2) – upload RCST configuration file; (3) – upload RCST event/alarm log file (4) – upload RCST installation log file;
47	… dvbRcsCtrlActivateConfigFileCommand	(1) – idle; (2) – activate;
48	… dvbRcsCtrlRcstLogonCommand	(1) – idle; (2) – initiate RCST logon
49	… dvbRcsCtrlRcstLogoffCommand	(1) – idle; (2) – initiate RCST logoff

Test Case ID	INSTALLATION_001
Test Case Name	Installation
References	SSR M&C, 7.2, 17.2.3.1.5, 17.2.3.1.3
Objective / Test Purpose	Verification of the installation process
Test Description	The CTB transmits a linkage descriptor (RMT) containing the Installation Population ID of the RCST. The RCST shall transmit CSC bursts. The RCST shall signal installation mode (RCST capability). The CTB issues a TIM-U. The CTB will not allocate SYNC slots to the RCST. The CTB will enforce the RCST to enter CW mode (set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlCwEnable). The CTB sets the time duration the RCST has to send the CW carrier. (set dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall. dvbRcsInstallCwMaxDuration). The RCST sends CW for the time CwMaxDuration. When the RCST stops transmitting CW (CwMaxDuration period is over), the CTB sets the Antenna Alignment State to success (set dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall. dvbRcsInstallAntennaAlignmentState). Afterwards the RCST shall load its Operational Population ID. The CTB transmits a linkage descriptor (RMT) containing the Operational Population ID of the RCST. The RCST shall transmit CSC bursts. The RCST shall signal operational mode (RCST capability). The CTB issues a TIM-U. The CTB allocates SYNC slots to the RCST. The RCST transmits SYNC bursts. The test has to be performed with several values for dvbRcsInstallCwMaxDuration.

Test Method

Step	Description
1	The CTB transmits a linkage descriptor (RMT) containing the Installation Population ID of the RCST
2	The RCST shall transmit CSC bursts
3	Check that the RCST signals installation mode (RCST capability)
4	The CTB issues a TIM-U
5	The CTB is not allocating Sync slots to the RCST
6	The CTB sets the time duration the RCST has to send the CW carrier. (set dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall. dvbRcsInstallCwMaxDuration)
7	Check that the RCST sends CW for the time dvbRcsInstallCwMaxDuration.

	8	When the RCST stops transmitting CW (dvbRcsInstallCwMaxDuration period is over), the CTB sets the Antenna Alignment State to success (set dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall. dvbRcsInstallAntennaAlignmentState). (Afterwards the RCST shall load its Operational Population ID)
	9	The CTB transmits a linkage descriptor (RMT) containing the Operational Population ID of the RCST
	10	Check that the RCST transmits CSC bursts and that operational mode (RCST capability) is signalled
	11	The CTB issues a TIM-U
	12	The CTB allocates Sync slots to the RCST
	13	Check that the RCST transmits Sync bursts
	14	Perform the test with several values for dvbRcsInstallCwMaxDuration
Used Objects	dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlCwEnable dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall. dvbRcsInstallCwMaxDuration dvbRcsMIBObjects.dvbRcsRcst. dvbRcsRcstInstall. dvbRcsInstallAntennaAlignmentState	
PASS/FAIL Criteria	The requirements from the test description are fulfilled.	
Remarks	Not validated with operational terminal yet	

7.5.4 Test Group – FCAPS

The test cases in this group are deemed to evaluate the FCAPS behaviour of the RCST. These test cases are divided into several subgroups. These subgroups deal with the following functionalities:

- Fault status signalling
- Trouble correction
- Measurement opportunity of the RCST
- Miscellaneous functionalities (CW, logon, logoff)

Test Case ID	FCAPS_Fault_001	
Test Case Name	Fault Status	
References	SSR M&C, 6.1, 17.2.3.1.6	
Objective / Test Purpose	The RCST enables the NCC to detect troubles and handle the alarms. RCST alarms should be sent to an internal RCST log.	
Test Description	The RCST shall be brought into a fault state. The CTB shall issue a get command (get dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstFaultStatus) to read the fault status of the RCST.	
Test Method	Step	Description
	1	Establish a link between the CTB and the RCST
	2	The RCST shall be brought into a fault state
	3	The CTB shall issue a get command (get dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstStat e. dvbRcsRcstFaultStatus) to read the fault status of the RCST
	4	Check that the RCST signals the fault status
Used Objects	dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstFaultStatus	
PASS/FAIL Criteria	The RCST shall signal the fault status when reading the object dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstState. dvbRcsRcstFaultStatus	
Remarks	Not validated with operational terminal yet	

Test Case ID	FCAPS_TROUBLE_001	
Test Case Name	Trouble Correction Reboot	
References	SSR M&C, 6.2, 17.2.3.1.5	
Objective / Test Purpose	The RCST allows the correction of RCST behaviour from NCC.	
Test Description	The CTB issues a reboot command via SNMP. (Set dvbMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRebootCommand)	
Test Method	Step	Description
	1	Establish a link between the CTB and the RCST
	2	The CTB issues the reboot command (Set dvbMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRebootCommand)
	3	Check that the RCST is rebooting
Used Objects	dvbMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRebootCommand	
PASS/FAIL Criteria	The RCST shall proceed with the reboot process	
Remarks	Not validated with operational terminal yet	

Test Case ID	FCAPS_TROUBLE_002 (optional)	
Test Case Name	Trouble Correction TX Disable	
References	SSR M&C, 6.2, 17.2.3.1.5	
Objective / Test Purpose	The RCST allows the correction of RCST behaviour from NCC.	
Test Description	The CTB issues a TX disable command via SNMP. (Set dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable). The CTB shall read the current TX disable status of the RCST. The RCST shall signal the TX disable status (get dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable). Afterwards the CTB issues the TX enable command (TIM-U). The CTB shall read the current TX enable status of the RCST. The RCST shall signal the TX enable status (get dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable).	
Test Method	Step	Description
	1	Establish a DVB-RCS link between the CTB and the RCST
	2	The CTB issues a TX disable command via SNMP. (Set dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable) via the air interface
	3	The CTB shall read the current TX disable status of the RCST. The RCST shall signal the TX disable status (get dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable) via the LAN interface of the RCST (vendor specific methods other than via SNMP over the LAN interface shall be allowed as well)
	4	Check that the RCST is in hold mode (not transmitting)
	5	The CTB issues the TX enable command within the TIM-U
	6	A DVB-RCS link between the RCST and the CTB shall be established
	7	The CTB reads the current TX enable status of the RCST. The RCST shall signal the TX enable status (get dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable) via the air interface
Used Objects	dvbrcstMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlRcstTxDisable	
PASS/FAIL Criteria	The requirements from the test description are fulfilled. The RCST shall enter the hold state after issuing the TX disable command.	
Remarks	Not validated with operational terminal yet	

Test Case ID	FCAPS_TROUBLE_003	
Test Case Name	Trouble Correction User Traffic Disable	
References	SSR M&C, 6.2, 17.2.3.1.5	
Objective / Test Purpose	The RCST allows the correction of RCST behaviour from NCC.	
Test Description	The CTB issues a User Traffic Disable command via SNMP. (Set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable) After it is checked that the RCST has disabled the User Traffic, the CTB re-enables the User Traffic (Set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable)	
Test Method	Step	Description
	1	Establish a DVB-RCS link between the RCST and the CTB
	2	Establish a user traffic link over the RL of the RCST (ping from the RCST side to the CTB side)
	3	The CTB issues a User Traffic Disable command via SNMP. (Set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable)
	4	Check that the RCST ceases the user traffic
	5	The CTB re-enables the User Traffic (Set dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable)
	6	Check that the RCST is no again able to transmit use packets
Used Objects	dvbRcsMIBObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlUserTrafficDisable	
PASS/FAIL Criteria	The RCST shall cease the transmission of user traffic packets.	
Remarks	Not validated with operational terminal yet	

<table>
<tr><td>Test Case ID</td><td colspan="2">FCAPS_MEASURING_003</td></tr>
<tr><td>Test Case Name</td><td colspan="2">SNR and BER Measurements</td></tr>
<tr><td>References</td><td colspan="2">SSR M&C, 6.3, 17.2.3.2.2</td></tr>
<tr><td>Objective / Test Purpose</td><td colspan="2">The RCST allows the NCC to get information about measurements carried out by the RCST.</td></tr>
<tr><td>Test Description</td><td colspan="2">The CTB varies the CNR on the forward link during the test session. The test shall take several minutes. For each modification w.r.t. the CNR on the forward link the CTB issues a get command (get dvbRcsMibObjects.dvbRcsFwdlink.dvbRcsFwdStatus.dvbRcsFwdStatusCnr) in order to receive CNR value measured by the RCST and dvbRcsMibObjects.dvbRcsFwdlink.dvbRcsFwdStatus.dvbRcsFwdStatusBer) in order to receive the BER values measured by the RCST.</td></tr>
<tr><td rowspan="8">Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td>1</td><td>Establish a DVB-RCS link between the RCST and the CTB</td></tr>
<tr><td>2</td><td>The CTB transmits the FL with a specific (known) SNR value and BER.</td></tr>
<tr><td>3</td><td>The CTB issues the commands get dvbRcsMibObjects.dvbRcsFwdlink.dvbRcsFwdStatus.dvbRcsFwdStatusCnr and get dvbRcsMibObjects.dvbRcsFwdlink.dvbRcsFwdStatus.dvbRcsFwdStatusBer) in order to receive CNR and BER values measured by the RCST</td></tr>
<tr><td>4</td><td>The CTB varies the CNR value and BER on the FL</td></tr>
<tr><td>5</td><td>Repeat step 3 to step 4 several times</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Used Objects</td><td colspan="2">dvbRcsMibObjects. dvbRcsFwdlink. dvbRcsFwdStatus. dvbRcsFwdStatusCnr
dvbRcsMibObjects. dvbRcsFwdlink. dvbRcsFwdStatus. dvbRcsFwdStatusBer</td></tr>
<tr><td>PASS/FAIL Criteria</td><td colspan="2">The CNR and BER measured by the RCST is reasonable. (comparison with the values measured by the CTB)</td></tr>
<tr><td>Remarks</td><td colspan="2">Not validated with operational terminal yet</td></tr>
</table>

Test Case ID	FCAPS_TEST_004
Test Case Name	Logon, CW On/Off, Logoff
References	SSR M&C, 6.3, 17.2.3.1.5,17.2.3.1.54
Objective / Test Purpose	The RCST shall be able to perform logon initiated via SNMP. The RCST shall be able to perform CW transmission. The RCST shall be able to perform logoff initiated via SNMP.
Test Description	Logon The CTB issues the command to enforce the RCST to proceed with the logon procedure (set dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlRcstLogonCommand). CW On/Off The CTB issues the command to enforce the RCST to proceed with CW transmission (set dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlCwEnable). Afterwards the CTB issues the command to cease the CW transmission (set dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlCwEnable). The CTB shall consider the time CWMaxDuration. Logoff When the RCST has achieved the Fine Sync State the CTB issues the command (set dvbRcsMibObjects. dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlRcstLogoffCommand) to proceed with the logoff process.

Test Method

Step	Description
1	The RCST is provided with the FL transmitted by the CTB
2	The CTB issues the command to enforce the RCST to proceed with the logon procedure (set dvbRcsMibObjects.dvbRcsRcst.rcstControl.dvbRcsCtrlRcstLogonCommand).
3	Check that the RCST starts sending CSC bursts
4	The CTB issues the command to enforce the RCST to proceed with CW transmission (set dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlCwEnable
5	Check that the system transmits a CW carrier
6	The CTB issues the command to cease the CW transmission (set dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl. dvbRcsCtrlCwEnable
7	Check that the RCST ceases the CW transmission
8	CTB issues the command (set dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlRcstLogoffCommand)

	9	Check that the RCST ceases the transmission of TRF, Sync and ACQ bursts
Used Objects	dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlRcstLogonCommand, dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlCwEnable, dvbRcsMibObjects.dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlRcstLogoffCommand	
PASS/FAIL Criteria	When the CTB issues the logon command the RCST shall commence with the logon procedure. When the CTB enables the CW transmission the RCST shall transmit CW, when the CTB disables CW transmission the RCST must not transmit CW. When the CTB issues the logoff command the RCST shall commence with the logoff process, this means the RCST shall cease the transmission of TRF, SYNC and ACQ bursts.	
Remarks	Not validated with operational terminal yet	

7.5.5 Test Group – Data Collection

The test case in this group are deemed to evaluate the data collection behaviour of the RCST. Following topics are addressed:

- The number of inbound packets discarded although no errors were found. This is due to a lack of buffer memory
- The number of outbound packets that were free of errors but discarded. (i.e. packets that were filtered out, e.g. to free up memory)
- The total number of multicast packets received on the interface (inbound)
- The total number of broadcast packets received on the interface (outbound)
- The total number of multicast packets received on the interface (inbound)
- The total number of multicast packets received on the interface (outbound)
- The number of outbound packets discarded because of errors
- The number of inbound packets discarded because they contain errors
- The total number of unicast packet whose transmission to a single address was requested
- The number of subnetwork unicast packets delivered to a higher layer protocol
- The total number of octets transmitted out of the interface including framing octets
- The total number of octets received on the interface, including framing octets

The test case as given in this section shall check whether the data collection is reasonable. When figures from different sources are compared (from the CTB on hand side and from the terminal on the other) these figures need not be equal, however, the tendency must be clearly visible.

<table>
<tr><td>Test Case ID</td><td colspan="2">DATA_COLLECTION_013</td></tr>
<tr><td>Test Case Name</td><td colspan="2">Data Collection</td></tr>
<tr><td>References</td><td colspan="2">SSR M&C, 9.1, 17.2.3.1.6, 17.2.3.1.2, 17.2.3.1.5, 17.2.4.3.2, 17.2.4.3.3</td></tr>
<tr><td>Objective / Test Purpose</td><td colspan="2">The RCST shall support data collection from its interfaces</td></tr>
<tr><td>Test Description</td><td colspan="2">The CTB issues data streams, that means several data files with different file sizes to the air interface of the RCST (downlink).

The RCST shall count the number of octets received at the involved interfaces with reasonable accuracy.

The RCST shall signal the existence of an updated log file (get dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstState.dvbRcsRcstLogUpdated).

In order to get the value of the measured object for each data stream the CTB shall issue the appropriate command (set dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstNetwork.dvbRcsNetworkLogFileUploadUrl). Afterwards the RCST shall upload the modified log file (set dvbRcsMIBObjects. dvbRcsRcst. dvbRcsRcstControl.dvbRcsCtrlUploadFileCommand)

The CTB shall verify whether the value of the following objects for each data stream is reasonable:
ifInOctets
ifOutOctets
ifInUcastPkts
ifOutUcastPkts
ifInErrors
ifOutErrors
ifInDiscards
ifOutDiscards
ifInMulticastPkts
ifOutMulticastPkts
ifInBroadcastPkts
ifOutBroadcastPkts</td></tr>
<tr><td rowspan="4">Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td>1</td><td>Establish a DVB-RCS link between the RCST and the CTB</td></tr>
<tr><td>2</td><td>The CTB issues a data stream, that means a data file with a specific file size, to the air interface of the RCST (downlink)</td></tr>
<tr><td>3</td><td>The RCST shall count the number of octets received at the involved interfaces with reasonable accuracy</td></tr>
</table>

	4	The CTB issues the command (get dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstState.dvbRcsRcstLogUpdated)
	5	Check that the RCST signals the existence of an updated log file
	6	The CTB issues the command (set dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstNetwork.dvbRcsNetworkLogFileUploadUrl) to provide the RCST with the Url for the log file
	7	The CTB issues the command (set dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlUploadFileCommand) to start the log file upload
	8	The CTB verifies whether the value of the objects listed above are reasonable
	9	Repeat step 1 to step 8 several times with different file sizes for the input stream
Used Objects	dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstState.dvbRcsRcstLogUpdated dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstNetwork.dvbRcsNetworkLogFileUploadUrl dvbRcsMIBObjects. dvbRcsRcst.dvbRcsRcstControl.dvbRcsCtrlUploadFileCommand	
PASS/FAIL Criteria	The requirements from the test description are fulfilled.	
Remarks	Not validated with operational terminal yet	

8 Test Cases for PEP

8.1 Introduction

This section contains the test cases which need to be performed to ensure the interoperability of SatLabs recommended DVB-RCS terminals with respect to Performance Enhancing Proxy functionality.

The focus of this section lies on the satellite specific enhancements to standard implementations, meaning, that no features of standardised transport implementations are tested as long as there is no influence to be expected by the specific use of such solutions in DVB-RCS networks (e.g. no tests for basic TCP implementations are defined).

The following tests assume at first a standard configuration in which the I-PEP client is implemented on the RCST side. No difference is made whether the I-PEP-client is implemented in the RCST itself, in an extra box or in the host-PC. All tests assume the connection via the air interface of DVB-RCS, hence, testing will be done via the air interface, too.

SatLabs SSR describes two types of PEP:

- the Interoperable Performance Enhancement Proxy (I-PEP) protocol which refer to Transport level PEP. Test cases for this option are given under sub clause 8.5. Details of I-PEP specification are given in 'SatLabs Interoperable PEP (I-PEP) v1 - Transport Extension and Session Framework for Satellite Communications: Air Interface Specification (2005-10)'.

- the HTTP Pre-Fetching functionality which refer to HTTP level PEP. Test cases for this option are given under sub clause **Error! Reference source not found.**.

8.2 Protocol Implementation Conformance Statement (PICS)

Usually when giving the implementation conformance statement (PICS/ICS) a table is given, in which the manufacturer of a solution states, if a certain option is implemented and supported or not. When it comes to the interoperable protocol enhancing proxy (I-PEP) the following options are necessary to describe the functionality of the terminal. The completed PICS table shall be provided to define the supported features and with this to define the volume of testing.

PEP PICS Table

PICS ID	PICS/Explanation	Comment	PICS
EXT_CAP	True, if the I-PEP implementation supports SCPS-TP Extended Options (SCPS-TP Capabilities Option Extension acc. I-PEP 5.2.2)	Not currently supported by the CTB	
SACK	True, if the I-PEP implementation supports selective acknowledgements	Not currently supported by the CTB	
HEAD_COMP	True, if the I-PEP implementation supports SCPS-TP header compression (acc. to I-PEP 5.1.3)	Not currently supported by the CTB	
TIMESTAMPS	True, if the I-PEP implementation supports optional timestamps acc. to RFC 1323	Not currently supported by the CTB	
TRANSP_CAPT	True, if the I-PEP implementation supports transparent capturing to intercept TCP connections for the purpose of introducing performance enhancement functions	Not validated with operational terminal yet	
PROXY_OPER	True, if the I-PEP implementation supports proxy-based operation and is terminating TCP connections from related application supporting proxies (such as HTTP)	Not validated with operational terminal yet	
END_TO_END	True, if the I-PEP implementation supports end-to-end management of TCP connections	Not currently supported by the CTB	
HOP_BY_HOP	True, if the I-PEP implementation acknowledges TCP connection initialisation locally while initiating the next communication segment in parallel (same for connection tear-down)	Not currently supported by the CTB	
ECN	True, if the I-PEP implementation supports Explicit Congestion Notification (ECN)	Not currently supported by the CTB	
HTTP	True, if the terminal supports HTTP Pre-Fetching as PEP method		

In the Implementation column use “Y” (yes) for implemented; “N” (no) for not implemented. Objects that are marked as mandatory in the SatLabs applicability column must be implemented in SatLabs recommended terminals (Verified Products).

Legend

When describing the features of a terminal the following table should be used. For certain PICS IDs there is a recommendation given by the SatLabs group

- whether it is recommended to implement this feature – marked by the word “true” followed by a exclamation-mark (“true!”)
- whether it is recommended not to implement this feature – marked by the word “false” followed by an exclamation-mark (“false!”)

For those PICS IDs which are not marked by “true!” or “false!” it is under the discretion of the manufacturer whether the feature is implemented or not.

8.3 Protocol Implementation Extra Information for Testing (PIXIT)

The following Table forms a template to collect Protocol Implementation Extra Information for Testing (PIXIT) for a DVB-RCS terminal. Each of the fields given in the table must be filled in to create a specific test setup. The information given in the filled PIXIT is required by the CTB to perform a specific test case. This information is to be provided by the manufacturer of an RCST before the testing for the SatLabs Qualification Program starts. Most of the initially defined PIXIT values have been jointly defined in SatLabs Testing Parameter Ranges. Information to these values are only required if the RCST implementation deviates from the specified parameter ranges.

Preliminary PIXIT Table

PIXIT_ID	PIXIT	Value
NA		

8.4 Test Case Selection Matrix for PEP

Following table provides an overview on the applicable test cases when SatLabs I-PEP or HTTP pre-fetching functionality is supported. All these tests should be performed using the SatLabs definition for the basic profile (ATM).

Test Case ID	Test Case Name	Applicable for Basic M&C Profile (mandatory /optional)	Relevant Option (PICS)
Test Cases for TCP Acceleration (I-PEP)			
MCAP_IPEP_002_02	TCP and data transfer , SCPS-TP Capabilities Option, UDP and ICMP passing outside I-PEP	Mandatory	IPEP
MCAP_IPEP_003_01	SCPS-TP Extended Capabilities Option	Optional	IPEP, EXT_CAP
MCAP_IPEP_004_01	Short SNACK	Mandatory	IPEP
MCAP_IPEP_005_01	TCP Selective Acknowledgement (SACK)	Optional	IPEP, SACK
MCAP_IPEP_006_01	SCPS-TP TCP Header Compression	Optional	IPEP, HEAD_COMP
MCAP_IPEP_007_01	TCP Window Scaling	Mandatory	IPEP,
MCAP_IPEP_008_01	TCP Timestamps Option	Optional	IPEP, TIMESTAMPS
FWDF_IPEP_001_02	TCP Connection Conversion – Server and Client	Mandatory	IPEP
FWDF_IPEP_003_01	Transparent interception	Optional	IPEP, TRANSP_CAPT
FWDF_IPEP_004_01	Proxy based operation	Optional	IPEP, PROXY_OPER
FWDF_IPEP_007_01	End-to-end connection set-up semantics	Optional	IPEP, END_TO_END
FWDF_IPEP_008_01	Locally connection accept (Hop-by-Hop)	Optional	IPEP, HOP_BY_HOP
CC_IPEP_003_01	Standard Acknowledgement on the forward link	Mandatory	IPEP
CC_IPEP_005_01	Explicit Congestion Notification	Optional	IPEP, ECN
MINC_IPEP_001_01	Long SNACK	Optional	IPEP
Test Cases for HTTP-Pre-Fetching			
PRE_FETCH_001_01	HTTP pre-fetching	Optional	HTTP

8.5 Test Plan for SatLabs TCP Acceleration (I-PEP) Feature Compliance

The test cases which are described in this section are based on the requirements which are defined in SSR and more specific in the SatLabs Interoperable PEP (I-PEP) definition document. With respect to the compliance definition as given in Chapter 3, a set of test cases has been chosen to form this compliance test plan. The test plan is structured in several sections, each dealing with a specific functionality.

Structure of the test plan

	Test Groups	**Number of Test Cases in Section**
	Major Capabilities	**7 (4 optional for IPEP)**
	Forwarding Functionality	**5 (4 optional for IPEP)**
	Congestion Control Related Capabilities	**2 (1 optional for IPEP)**
	Detailed I-PEP SCPS Minor Capabilities	**1 optional for IPEP**
	HTTP pre-fetching	**1 optional (HTTP)**
	Total:	**16 (5 mandatory for IPEP option)**

8.6 Test Group – Major Capabilities

In this test group the major capabilities of transporting TCP data via I-PEP are evaluated beside the pure transport also SCPS-TP capabilities options and extensions to these are tested. TCP/SCPS-TP conversion features complete this section.

Test Case ID	MCAP_IPEP_002_02
Test Case Name	TCP and data transfer , SCPS-TP Capabilities Option, UDP and ICMP passing outside I-PEP
References	I-PEP 5.1.1, SCPS-TP 3.2.3, 3.2
Objective / Test Purpose	This test case validates: 1. That the I-PEP implementation allows for a reliable TCP connection establishment, data transfer and connection tear-down via I-PEP. 2. The SCPS capabilities as well as the acceptance of SCPS capabilities initiated by the opposite side. 3. UDP and ICMP traffic shall be transported transparently to the IPEP.
Test Description	After the terminal is properly logged onto the satellite network, a TCP application is started which initiates the download of data from the application server via the I-PEP server to the terminal, I-PEP client and further to the application client. On application side the proper reception of the data is checked. Furthermore a non-intrusive protocol analyzer is intended to be used to check the TCP connection establishment, the data transfer and the TCP connection tear-down. Monitoring shall be done at least at the I-PEP server (on I-PEP level) and one of the TCP connections (either at the application server or the application client/Host-PC). Test Session 1: The DVB-RCS terminal side shall initiate the SCPS capabilities negotiation by transmitting a SYN including the SCPS Capabilities Option in the SYN header. The DVB-RCS hub side shall indicate its willingness to use these capabilities by the corresponding SYN ACK. Test Session 2: The DVB-RCS hub side shall initiate the SCPS capabilities negotiation by transmitting a SYN including the SCPS Capabilities Option in the SYN header. (The DVB-RCS hub side shall only insert Capabilities in the SYN header which are supported by the DVB-RCS terminal side) The DVB-RCS terminal (or I-PEP client entity) side shall

	indicate its willingness to use these capabilities by the corresponding SYN ACK.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	A TCP/I-PEP connection (download) shall be established between the application server via the I-PEP server to the terminal, I-PEP client and further to the application client
	3	Initiate the SCPS capabilities negotiation from the DVB-RCS terminal side, by transmitting a SYN including the SCPS Capabilities Option in the SYN header.
	4	Check the correct establishment of the TCP/I-PEP connection
	5	Check the content of the SYN header w.r.t. the SCPS capabilities negotiation
	6	The CTB shall indicate its willingness to use these capabilities by the corresponding SYN ACK.
	7	Check the data transfer between the application server to the application client via the I-PEP link
	8	Tear-down the TCP/I-PEP connection
	9	Check the correct tear-down of the TCP/I-PEP connection
	10	Initiate the SCPS capabilities negotiation from the DVB-RCS hub side, by transmitting a SYN including the SCPS Capabilities Option in the SYN header. (The DVB-RCS hub side shall only insert Capabilities in the SYN header which are supported by the DVB-RCS terminal side)
	11	The DVB-RCS terminal (or I-PEP client entity) side shall indicate its willingness to use these capabilities by the corresponding SYN ACK
	12	Check the content of the SYN ACK DVB-RCS terminal (or I-PEP client entity) w.r.t. the SCPS capabilities negotiation
	13	Initiate UDP and ICMP traffic from the client side over the return link
	14	Validate that the UDP data is transparently passed though the link

PASS/FAIL Criteria	Reliable data transfer from the application server to the application client via the I-PEP link. TCP/I-PEP establishment successful and acknowledged TCP/I-PEP tear-down successful and acknowledged The DVB-RCS terminal side shall correctly initiate SCPS-Capability negotiation (composition of the SYN header). Furthermore the DVB-RCS terminal side shall correctly accept the SCPS-Capability request performed by the DVB-RCS hub side.
Remarks	Applicable to IPEP only.

Test Case ID	MCAP_IPEP_003_01	
Test Case Name	SCPS-TP Extended Capabilities Option	
References	I-PEP 5.2.2	
Objective / Test Purpose	Extended capabilities allow endpoints to perform signalling in addition to that supported by the 'standard' SCPS Capabilities Option. The intent of allowing extended capabilities is to allow vendors and communities of interest to implement features unique to particular environments. The purpose of this test is to verify that the DVB-RCS terminal side uses the correct format when initiating the SCPS-TP Extended Capabilities Option.	
Test Description	The DVB-RCS terminal side shall initiate the SCPS capabilities negotiation by transmitting a SYN including the SCPS-TP Extended Capabilities Option in the SYN header.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Initiate the SCPS-TP Extended Capabilities Option negotiation by transmitting the corresponding SYN from the RCST side
	3	Check the correct composition of the SYN header w.r.t. the Extended Capabilities Option, especially w.r.t. the Option length (≠ 4) and the fact that the SCPS-TP Extended Capabilities Option is identified by reuse of the SCPS Capability Option (option 20) two or more times on a particular SYN packet; (first SYN segment must have length=4 (standard SCPS capability option), for the SCPS-TP Extended Capabilities Option the length must be ≠ 4); if the used option is requiring capability binding spaces the used format must conform to the definitions of I-PEP 5.2.2 (in the extreme case even for the extension of the extended capability binding identifier space (''I-PEP 5.2.2.4).
PASS/FAIL Criteria	The DVB-RCS terminal side shall use the correct format while initiating SCPS-TP Extended Capabilities Option (especially w.r.t. the Option length (≠ 4) and the fact that the SCPS-TP Extended Capabilities Option is identified by reuse of the SCPS Capability Option (option 20) two or more times on a particular SYN packet). if the used option is requiring capability binding spaces the used format must conform to the definitions of I-PEP 5.2.2 (in the extreme case even for the extension of the extended capability binding identifier space (''I-PEP 5.2.2.4).	

Remarks	Applicable to IPEP and EXT_CAP only. Not currently supported by the CTB. Remark: If a terminal is using the TCP Option Data solution to extend the option data space, this shall not be deemed as fail.

Test Case ID	MCAP_IPEP_004_01	
Test Case Name	Short SNACK	
References	SCPS-TP 6.2.2.5	
Objective / Test Purpose	Verify that the DVB-RCS terminal side correctly supports the short SNACK option (without the SNACK bit vector).	
Test Description	The short SNACK Option shall be enabled (both TCPs include the “short” SNACK capability in the SCPS Capability Option in their TCP SYN segment header. After a TCP connection has been established between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer, TCP data is transmitted from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa. The link quality of the return link and the forward link shall be randomly modified (error insertion) to enforce TCP packet retransmission and different SNACK-scenarios.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Enable the short SNACK option (functionality) with help of the SCPS Capability Option negotiation from the DVB-RCS terminal side, the CTB side shall accept the short SNACK option
	3	Check the correct composition of the SYN header transmitted from the RCST side wrt the short SNACK negotiation
	4	Establish a TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer
	5	Transmit TCP data from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa
	6	Modify the link quality of the return link and the forward link randomly (error insertion) to enforce TCP packet retransmission and different SNACK-scenarios
	7	Check the retransmission of packets on SNACKs transmitted by the DVB-RCS hub side
PASS/FAIL Criteria	The enabling of the SCPS (short) SNACK option by the DVB-RCS terminal side is correct. The composition of the SNACKs transmitted by the DVB-RCS terminal side is correct. The response (retransmission of TCP packets) on the SNACKs transmitted by the DVB-RCS hub side is correct.	
Remarks	Applicable to IPEP only.	

Test Case ID	MCAP_IPEP_005_01	
Test Case Name	TCP Selective Acknowledgement (SACK)	
References	RFC 2018	
Objective / Test Purpose	Verify that the DVB-RCS terminal side correctly supports the SACK option.	
Test Description	The DVB-RCS terminal side initiates the SACK functionality (SACK permitted). After a TCP connection has been established between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer, TCP data is transmitted from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa. The link quality of the return link and the forward link shall be randomly modified (error insertion) to enforce TCP packet retransmission and different SACK-scenarios.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Enable the SACK functionality by issuing the SACK permitted (e.g. in a SYN segment) from the RCST side
	3	Check the correct TCP SACK permit option format issued by the RCST side
	4	Establish a TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer
	5	Transmit TCP data from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa
	6	Modify the link quality of the return link and the forward link randomly (error insertion) to enforce TCP packet retransmission and different SNACK-scenarios
	7	Check the composition of the SACKs transmitted by the DVB-RCS terminal side
PASS/FAIL Criteria	The enabling of the SACK option by the DVB-RCS terminal side is correct (SACK permitted). The composition of the SACKs transmitted by the DVB-RCS terminal side is correct. The response (retransmission of TCP packets) on the SACKs transmitted by the DVB-RCS hub side is correct.	
Remarks	Applicable to IPEP and SACK only. Not currently supported by the CTB.	

Test Case ID	MCAP_IPEP_006_01	
Test Case Name	SCPS-TP TCP Header Compression	
References	SCPS-TP C2 .5.2, updated by I-PEP 5.1	
Objective / Test Purpose	Verify that the DVB-RCS terminal side correctly supports header compression on the return link.	
Test Description	The DVB-RCS terminal is configured to use the SCPS-TP Header Compression. The DVB-RCS terminal side shall initiate a TCP connection and shall request SCPS-TP Header Compression by including the SCPS Capabilities Option with Com bit set to '1' in its uncompressed SYN segment. The opposite DVB-RCS hub side shall accept the Header Compression option by including its own SCPS Capabilities Option with Com bit set to '1' in its SYN ACK segment. In the following the DVB-RCS terminal side shall use the header compression in the correct manner.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Ensure that the RCST terminal side is configured to use the SCPS-TP Header Compression
	3	The RCST side shall request SCPS-TP Header Compression by including the SCPS Capabilities Option with Com bit set to '1' in its uncompressed SYN segment.
	4	Check the correct format of the SYN segment w.r.t. Header compression request initiated from the RCST terminal side
	5	Initiate a TCP connection between the RCST side and the Hub side
	6	Check the correct usage of the header compression functionality of the RCST terminal side
PASS/FAIL Criteria	The DVB-RCS terminal side shall correctly initiate and use the SCPS-TP Header Compression.	
Remarks	Applicable to IPEP and HEAD_COMP only. Not currently supported by the CTB.	

Test Case ID	MCAP_IPEP_007_01	
Test Case Name	TCP Window Scaling	
References	RFC 1323	
Objective / Test Purpose	The window scale extension expands the definition of the TCP window to 32 bits and then uses a scale factor to carry this 32-bit value in the 16-bit Window field of the TCP header. The maximum receive window, and therefore the scale factor, is determined by the maximum receive buffer space . The purpose of this test is to verify that the DVB-RCS terminal side correctly supports the Window Scale option.	
Test Description	The DVB-RCS terminal peer side shall provide (SYN) the opposite side with its scaling factor (in Window Scaling option). The opposite side (DVB-RCS Hub peer) shall also transmit its scaling factor in order to inform the DVB-RCS terminal peer side about its maximum receive buffer. After the establishment of a TCP connection, TCP data is transmitted from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	The DVB-RCS terminal side shall inform (SYN) the opposite side about its scaling factor (in Window Scaling option)
	3	Check the correct formatting of the Window Scaling option issued by the DVB-RCS terminal side
	4	The opposite side (Hub side) shall also transmit its scaling factor in order to inform the DVB-RCS terminal peer side about its maximum receive buffer
	5	Establish a TCP connection between the DVB-RCS terminal side and the opposite side, TCP data is transmitted from the terminal side to the hub side and vice versa.
	6	Verify that the DVB-RCS terminal side respects the window size signalled by the DVB-RCS hub side while transmitting TCP packets
PASS/FAIL Criteria	The composition of the Window Scaling option transmitted by the DVB-RCS terminal side is correct. The DVB-RCS terminal side respects the window size signalled by the DVB-RCS hub side while transmitting TCP packets.	
Remarks	Applicable to IPEP only. Not currently supported by the CTB.	

Test Case ID	MCAP_IPEP_008_01	
Test Case Name	TCP Timestamps Option	
References	RFC 1323	
Objective / Test Purpose	Verify that the DVB-RCS terminal side correctly supports the Timestamps option.	
Test Description	The DVB-RCS terminal peer side shall provide the opposite side with the current value (TSval) of the timestamp clock (Timestamps option e.g. within the initial SYN). After the establishment of a TCP connection, the DVB-RCS terminal side shall also provide echo reply value (TSecr) in the ACK message (Timestamps option) on TCP data transmitted by the DVB-RCS hub side. Afterwards, TCP traffic is initiated in both directions.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	The DVB-RCS terminal peer side shall provide the opposite side with the current value (TSval) of the timestamp clock (Timestamps option e.g. within the initial SYN)
	3	Check the correct format of the Timestamp option as issued by the DVB-RCS terminal peer side
	4	Establish a TCP connection between both sides (RCST and Hub)
	5	Check that the RCST side introduces the correct echo reply value (TSecr) in the ACK message (Timestamps option) on TCP data transmitted by the DVB-RCS hub side
PASS/FAIL Criteria	The composition of the timestamps option (especially TSval and TSerc) transmitted by the DVB-RCS terminal side is correct.	
Remarks	Applicable to IPEP and TIMESTAMPS only. Not currently supported by the CTB.	

8.6.1 Test Group – Forwarding Functionality

In this test group the features, that are necessary to properly transfer TCP or further traffic into the I-PEP transport, are tested. This ranges from the TCP to SCPS-TP (I-PEP) conversion for the TCP connection related messages through to the use of message acknowledgement strategies such as end-to-end and hop-by-hop.

Test Case ID	FWDF_IPEP_001_02	
Test Case Name	TCP Connection Conversion – Server and Client	
References	I-PEP 3.2.1, I-PEP 8.1.2.1	
Objective / Test Purpose	Evaluate whether the establishment of a connection is converted properly from an I-PEP connection to the TCP connection when initiated by the application server or client. Furthermore, the conversion of a connection tear-down shall be handled properly.	
Test Description	After the terminal is properly logged onto the satellite network, a TCP application is started which initiates the download of data from the application server via the I-PEP server to the terminal, I-PEP client and further to the application client. The data stream between I-PEP server and DVB-RCS hub is monitored as well as the data stream between the I-PEP client and the application client. On the occurrence of the SCPS-TP SYN message at the server interface, a TCP SYN message is to be expected between the I-PEP client and the application client. Also the related acknowledgements shall be visible. With the end of the data transfer (if necessary by closing down the application server) a SCPS-TP FIN message from the I-PEP server should lead to a TCP FIN message between I-PEP client and application client. Also the related acknowledgements shall be visible. The test is then repeated for the opposite direction.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Initiate an data download (TCP) from the application server via the I-PEP server to the terminal, I-PEP client and further to the application client
	3	Check that on the occurrence of the SCPS-TP SYN message at the server interface, a TCP SYN message is to be expected between the I-PEP client and the application client; check also the related acknowledgements

	4	When ending the TCP data transfer (if necessary by closing down the application server) a SCPS-TP FIN message from the I-PEP server should lead to a TCP FIN message between I-PEP client and application client; check also the related acknowledgements
	5	Repeat steps 2-4 for the opposite direction
PASS/FAIL Criteria	Proper conversion of SCPS-TP (I-PEP) messages to TCP messages.	
Remarks	Applicable to IPEP only.	

Test Case ID	FWDF_IPEP_003_01	
Test Case Name	Transparent interception	
References	I-PEP 3.2.1, IPEP 3.1.1, I-PEP 8.1.2.1	
Objective / Test Purpose	Verify the correct implementation of the transparent interception method. Transparent interception describes one possible way of intercepting TCP connections for the purpose of introducing performance enhancement functions, in contrast to proxy based operation. When transparent interception is used, the application initiating the TCP connection need not be modified or reconfigured as the interception takes place on the wire transparent to the application.	
Test Description	A transparent I-PEP transport connection will be established. The establishment shall first be initiated by the DVB-RCS terminal peer side (case 1). Afterwards a second I-PEP transport connection shall be established initiated by the DVB-RCS hub peer side (case 2).	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Establish a transparent I-PEP transport connection initiated by the DVB-RCS terminal peer side
	3	Verify that the I-PEP transport connection was successful (end to end connection) TCP dataflow between both sides is successful
	4	Verify that the TCP interception was transparent for the application that means no modifications, reconfigurations or other knowledge by the involved peers had been needed.
	5	Logoff the RCST
	6	Repeat step 1 to step 5 while the I-PEP transport connection shall be established initiated by the DVB-RCS hub peer side
PASS/FAIL Criteria	The I-PEP transport connection establishment was successful for both cases. The TCP connection establishment preserves end-to-end semantics. The TCP interception was transparent for the application that means no modifications, reconfigurations or other knowledge by the involved peers had been needed.	
Remarks	Applicable to IPEP and TRANSP_CAPT only. Not validated with operational terminal yet.	

Test Case ID	FWDF_IPEP_004_01	
Test Case Name	Proxy based operation	
References	I-PEP 3.2.1, IPEP 3.1.1, I-PEP 8.1.2.1	
Objective / Test Purpose	Verify the correct implementation of the proxy based operation. Proxy based operation refers to communication set-ups in which TCP connection from the application peer is explicitly targeted at its corresponding I-PEP peer (application client to the I-PEP client). This means that the connection set up is not completely transparent to the application. The connection set-up does therefore not preserve end-to-end semantics. The application TCP connection is terminated at the I-PEP peer. Proxy-based operation may be used with application protocols that explicitly support proxies (such as HTTP).	
Test Description	A proxy based I-PEP transport connection will be established. The establishment shall first be initiated by the DVB-RCS terminal peer side (case 1). Afterwards a second I-PEP transport connection shall be established initiated by the DVB-RCS hub peer side (case 2).	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Establish a proxy based I-PEP transport connection initiated by the DVB-RCS terminal peer side
	3	Verify that proxy based I-PEP transport connection initiated by the application peer is explicitly targeted at its corresponding I-PEP peer (application client to the I-PEP client)
	4	RCST logoff
	5	Repeat step 1 to step 3 while the I-PEP transport connection is established initiated by the DVB-RCS hub peer side
PASS/FAIL Criteria	The I-PEP transport connection establishment was successful for both cases. The application TCP connection is terminated at the I-PEP peer. The TCP connection establishment does not preserve end-to-end semantics.	
Remarks	Applicable to IPEP and PROXY_OPER only. Not validated with operational terminal yet.	

Test Case ID	FWDF_IPEP_007_01
Test Case Name	End-to-end connection set-up semantics
References	I-PEP 3.2.1, 8.1.2.1
Objective / Test Purpose	Verify that the end-to-end connection method is implemented in the correct manner
Test Description	Case 1: The DVB-RCS terminal peer (application) shall initiate the I-PEP end-to-end connection. After correctly logging on the terminal to the hub the application client initiates the establishment of the I-PEP connection. The TCP/I-PEP stream is monitored at the interfaces between - application client and terminal side I-PEP peer - DVB-RCS HUB and HUB side I-PEP peer It is evaluated whether the terminal side I-PEP peer is initiating the I-PEP connection to the HUB side I-PEP peer and whether it is then waiting for response before acknowledging back to the application client. (Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the FL (I-PEP connection from the HUB side to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP peer is not acknowledging the TCP connection at all (as it is not receiving acknowledgement from the counterpart I-PEP peer)). Case 2: The DVB-RCS terminal peer shall accept the end-to-end connection from the DVB-RCS hub side (application). After correctly logging on the terminal to the hub the application server initiates the establishment of the I-PEP connection. The TCP/I-PEP stream is monitored at the interfaces between - HUB side I-PEP peer and DVB-RCS HUB - terminal side I-PEP peer and application client It is evaluated whether the terminal side I-PEP peer is initiating the I-PEP connection to the application client and whether the I-PEP peer is then waiting for response before acknowledging back to the application server. (Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the RL (I-PEP connection from the application client to the terminal side I-PEP peer) is disrupted (measure to be

<table>
<tr><td></td><td colspan="2">defined) and that the terminal side I-PEP peer is not acknowledging the SCPS-TP connection at all (as it is not receiving acknowledgement from the counterpart TCP peer)).</td></tr>
<tr><td rowspan="9">Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td>1</td><td>Initiate the RCST logon</td></tr>
<tr><td>2</td><td>The DVB-RCS terminal peer (application client) shall initiate the I-PEP end-to-end connection to the HUB side I-PEP peer</td></tr>
<tr><td>3</td><td>Check that the terminal side I-PEP peer is initiating the I-PEP connection to the HUB side I-PEP peer and whether it is then waiting for response before acknowledging back to the application client

. (Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the FL (I-PEP connection from the HUB side to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP peer is not acknowledging the TCP connection at all (as it is not receiving acknowledgement from the counterpart I-PEP peer))</td></tr>
<tr><td>4</td><td>Logoff the RCST</td></tr>
<tr><td>5</td><td>Initiate the RCST logon</td></tr>
<tr><td>6</td><td>The DVB-RCS hub side (application) shall initiate the I-PEP end-to-end connection to the DVB-RCS terminal peer</td></tr>
<tr><td>7</td><td>Check that the terminal side I-PEP peer is initiating the I-PEP connection to the application client and whether the I-PEP peer is then waiting for response before acknowledging back to the application server

(Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the RL (I-PEP connection from the application client to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP peer is not acknowledging the SCPS-TP connection at all (as it is not receiving acknowledgement from the counterpart TCP peer)).</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>PASS/FAIL Criteria</td><td colspan="2">The I-PEP connection shall be correctly set up as described for end-to end connections (for both cases).</td></tr>
<tr><td>Remarks</td><td colspan="2">Applicable to IPEP and END_TO_END only.

Not currently supported by the CTB.</td></tr>
</table>

Test Case ID	FWDF_IPEP_008_01
Test Case Name	Locally connection accept (Hop-by-Hop)
References	I-PEP 3.2.1, 8.1.2.1
Objective / Test Purpose	Verify that the locally accept method is implemented in the correct manner. In the hop-by-hop case, the I-PEP peer may complete the SYN-ACK handshake for the incoming application TCP connection locally in parallel to initiating the I-PEP connection to the remote peer.
Test Description	Case 1: The DVB-RCS terminal peer (application) shall initiate the I-PEP hop-by-hop connection. After correctly logging on the terminal to the hub the application client initiates the establishment of the I-PEP connection. The TCP/I-PEP stream is monitored at the interfaces between - application client and terminal side I-PEP peer - DVB-RCS HUB and HUB side I-PEP peer It is evaluated whether the terminal side I-PEP peer is initiating the SCPS-TP connection to the application server and whether the I-PEP peer is completing its TCP connection set-up to application client before receiving the acknowledgement from the DVB-RCS HUB side I-PEP peer. (Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the FL (I-PEP connection from the DVB-RCS HUB side I-PEP peer to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP peer is acknowledging the TCP connection to the application server although there is no acknowledgement from the application client at all). Case 2: The DVB-RCS terminal peer shall accept the hop-by-hop connection from the DVB-RCS hub side (application). After correctly logging on the terminal to the hub the application server initiates the establishment of the I-PEP connection. The TCP/I-PEP stream is monitored at the interfaces between - HUB side I-PEP peer and DVB-RCS HUB - terminal side I-PEP peer and application client It is evaluated whether the terminal side I-PEP peer is initiating the I-PEP connection to the application client and

<table>
<tr><td></td><td colspan="2">whether the I-PEP peer is completing its connection set-up to the HUB side I-PEP peer before receiving the acknowledgement from the application server. (Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the RL (I-PEP connection from the application client to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP peer is acknowledging the SCPS-TP connection although there is no acknowledgement from the application client at all).</td></tr>
<tr><td rowspan="8">Test Method</td><td>Step</td><td>Description</td></tr>
<tr><td>1</td><td>Initiate the RCST logon</td></tr>
<tr><td>2</td><td>The DVB-RCS terminal peer (application) shall initiate the I-PEP hop-by-hop connection to the DVB-RCS hub side (application)</td></tr>
<tr><td>3</td><td>Check that the terminal side I-PEP peer is initiating the SCPS-TP connection to the application server and whether the I-PEP peer is completing its TCP connection set-up to application client before receiving the acknowledgement from the DVB-RCS HUB side I-PEP peer.

(Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the FL (I-PEP connection from the DVB-RCS HUB side I-PEP peer to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP peer is acknowledging the TCP connection to the application server although there is no acknowledgement from the application client at all).</td></tr>
<tr><td>4</td><td>Initiate the RCST logoff</td></tr>
<tr><td>5</td><td>The DVB-RCS hub side (application) shall initiate the hop-by-hop connection to the DVB-RCS terminal peer</td></tr>
<tr><td>6</td><td>Check that the terminal side I-PEP peer is initiating the I-PEP connection to the application client and whether the I-PEP peer is completing its connection set-up to the HUB side I-PEP peer before receiving the acknowledgement from the application server.

(Remark: such evaluation requires the synchronisation of the monitoring systems on client side and HUB side. If such feature is not available the test would be done that the RL (I-PEP connection from the application client to the terminal side I-PEP peer) is disrupted (measure to be defined) and that the terminal side I-PEP</td></tr>
</table>

		peer is acknowledging the SCPS-TP connection although there is no acknowledgement from the application client at all).
PASS/FAIL Criteria	The I-PEP connection shall be correctly set up as described for hop-by-hop connections (for both cases).	
Remarks	Applicable to IPEP and HOP_BY_HOP only. Not currently supported by the CTB.	

8.6.2 Test Group – Congestion Control Related Capabilities

The Test Cases in this group deal with congestion situations on the forward and return link.

Test Case ID	CC_IPEP_003_01	
Test Case Name	Standard Acknowledgement on the forward link	
References	I-PEP 5.1, RFC 793	
Objective / Test Purpose	Verify that the DVB-RCS terminal side accepts standard acknowledgement along the forward link.	
Test Description	A TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer is established. TCP data is transmitted from the DVB-RCS terminal side to the DVB-RCS hub side. The link quality of the return link shall be randomly modified (error insertion) to enforce TCP packet retransmission and different ACK-scenarios.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	Establish a TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer
	3	Transmit TCP data from the DVB-RCS terminal side to the DVB-RCS hub side
	4	Modify the link quality of the return link randomly (error insertion) to enforce TCP packet retransmission and different ACK-scenarios.
	5	Verify that the retransmissions of the DVB-RCS terminal side are according to the ACKs transmitted by the DVB-RCS hub side
PASS/FAIL Criteria	The DVB RCS terminal behaviour (TCP retransmission) is according the transmitted ACKs by the DVB-RCS hub side.	
Remarks	Applicable to IPEP only.	

Test Case ID	CC_IPEP_005_01
Test Case Name	Explicit Congestion Notification
References	I-PEP 5.1.5, RFC 3168
Objective / Test Purpose	Verify that the DVB-RCS terminal side uses the correct format when initiating the ECN capability negotiation. Furthermore the DVB-RCS terminal side must invoke congestion control in response to ECN signals in essentially the same way as to discarded packets.
Test Description	A TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer is established. TCP data is transmitted from the DVB-RCS hub side to the DVB-RCS terminal side The DVB-RCS terminal side shall initiate the ECN capability negotiation by transmitting an ECN-setup SYN packet. In this ECN-setup SYN packet the ECE and CWR flags are set. The opposite side (DVB-RCS hub side) shall accept this request by sending ECN-setup SYN-ACK (ECE flag is set only). TCP packets shall be sent from the DVB-RCS terminal side to the DVB-RCS hub side. Then a congestion situation is caused by the CTB on the return link. The DVB-RCS hub side shall signal a congestion situation by setting the ECN-Echo bit (ECE) in the TCP header of the ACK. The DVB-RCS terminal side shall react as if packets have been dropped.

Test Method

Step	Description
1	Initiate the RCST logon
2	Establish a TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS Hub peer
3	Transmit TCP data from the DVB-RCS hub side to the DVB-RCS terminal side
4	The DVB-RCS terminal side shall initiate the ECN capability negotiation by transmitting an ECN-setup SYN packet
5	Check the correct composition of the SYN packet (e.g. ECE and CWR flags are set)
6	The opposite side (DVB-RCS hub side) shall accept this request by sending ECN-setup SYN-ACK (ECE flag is set only)
7	Initiate a congestion situation on the return link
8	The Hub side signals this congestion situation by setting the ECN-Echo bit (ECE) in the TCP header of the ACK
9	Check the correct behaviour of the DVB-RCS terminal side (should react as if packets have been dropped)

PASS/FAIL Criteria	Correct format of the ECN-setup SYN packet. Correct behaviour on the reception of incoming ECN signals at the DVB-RCS terminal side. This means the terminal must invoke congestion control and behave as if TCP packets have been dropped.
Remarks	Applicable to IPEP and ECN only. Not currently supported by the CTB.

8.6.3 Test Group – Detailed I-PEP SCPS-TP Minor Capabilities

In this test group all the tests not belonging to the other described tests groups are summarized.

Test Case ID	MINC_IPEP_001_01	
Test Case Name	Long SNACK	
References	SCPS-TP 3.5.2.5	
Objective / Test Purpose	Verify that the DVB-RCS terminal side correctly supports the long SNACK option (with the help of the SNACK bit vector).	
Test Description	The long SNACK option shall be enabled (both TCPs include the “long” SNACK capability in the SCPS Capability Option in their TCP SYN segment header). After a TCP connection has been established between the DVB-RCS terminal peer and the corresponding DVB-RCS hub peer, TCP data is transmitted from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa. The link quality of the return link and the forward link shall be randomly modified (error insertion) to enforce TCP packet retransmission and different SNACK-scenarios.	
Test Method	Step	Description
	1	Initiate the RCST logon
	2	The DVB-RCST terminal side initiate the long SNACK option by transmitting the appropriate SCPS Capability Option within a SYN packet
	3	Check the correct composition of this SYN packet
	4	The DVB-RCS hub side shall accept this request by transmitting the appropriate response (SYN ACK)
	5	Establish a TCP connection between the DVB-RCS terminal peer and the corresponding DVB-RCS hub peer
	6	Transmit TCP data from the DVB-RCS terminal side to the DVB-RCS hub side and vice versa
	7	Modify the link quality of the return link and the forward link shall be randomly modified (error insertion) to enforce TCP packet retransmission and different SNACK-scenarios
	8	Check that the response (retransmission of TCP packets) on the SNACKs transmitted by the DVB-RCS hub side is correct

PASS/FAIL Criteria	The enabling of the SCPS (long) SNACK option by the DVB-RCS terminal side is correct. The composition of the SNACKs transmitted by the DVB-RCS terminal side (especially the composition of the SNACK bit vector) is correct. The response (retransmission of TCP packets) on the SNACKs transmitted by the DVB-RCS hub side is correct.
Remarks	Applicable to IPEP and LSNACK only. Not currently supported by the CTB.

8.6.4 Test Group – HTTP Pre-fetching

This test group includes the test dealing with the HTTP Pre-fetching mechanism.

Test Case ID	PRE_FETCH_001_01	
Test Case Name	HTTP pre-fetching	
References	SSR v1.3 and 2.1, 6.2.6	
Objective / Test Purpose	Verify that the DVB-RCS client side supports the single-side pre-fetching pull mechanism as described in the general SSR.	
Test Description	A TCP/IP connection is established between the DVB-RCS hub side (server side) and the DVB-RCS terminal side (client side). The delay which is introduced on the FL and the RL shall have a reasonable value. From the client side (client browser) a well known Web page (the number of embedded objects (n_Obj) is known), which is located on the server, is requested (Request Page). The number of parallel connections used by the browser shall have a reasonable value (2). The HTTP pre-fetching device on the client side shall intercept the response to the requested Web page. The HTTP pre-fetching device on the client side shall immediately start to pre-fetch the embedded Web objects (n_Obj) while using parallel connections (n_Con). The HTTP pre-fetching device on the client side caches the pre-fetched objects. On request from the client side browser these objects are forwarded from the cache to the initiating browser.	
Test Method		Description
	1	Ensure that the delay which is introduced on the FL and the RL shall have a reasonable value
	2	Initiate the RCST logon
	3	Establish a TCP/IP connection between the DVB-RCS hub side (server side) and the DVB-RCS terminal side (client side).
	4	From the client side (client browser) a well known Web page (the number of embedded objects (n_Obj) is known), which is located on the server, is requested (Request Page)

	5	Verify that the HTTP pre-fetching device on the client side shall intercept the response to the requested Web page. The HTTP pre-fetching device on the client side shall immediately start to pre-fetch the embedded Web objects (n_Obj) while using parallel connections (n_Con)
	7	Record the time needed to load the above described web page while HTTP pre-fetching is active.
	8	Repeat the test case (step_1 to step_7) while HTTP pre-fetching is disabled.
	9	Verify that there is a significant difference wrt to the time it takes to load the above described web page when HTTP pre-fetching is on or off. When HTTP pre-fetching is on it shall take at least 10% less time to load the web page.
PASS/FAIL Criteria	The test procedure is fulfilled.	
Remarks	Applicable to HTTP only.	