TECHNICAL CODE

SPECIFICATIONS ON COMMON TEST SUITE FOR DIGITAL TERRESTRIAL TELEVISION BROADCAST SERVICE RECEIVER

Developed by

Registered by

Registered date: **18 December 2014**

DEVELOPMENT OF TECHNICAL CODES

The Communications and Multimedia Act 1998 ('the Act') provides for Technical Standards Forum designated under section 184 of the Act or the Malaysian Communications and Multimedia Commission ("the Commission") to prepare a technical code. The technical code prepared pursuant to section 185 of the Act shall consist of, at least, the requirement for network interoperability and the promotion of safety of network facilities.

Section 96 of the Act also provides for the Commission to determine a technical code in accordance with section 55 of the Act if the technical code is not developed under an applicable provision of the Act and it is unlikely to be developed by the Technical Standards Forum within a reasonable time.

In exercise of the power conferred by section 184 of the Act, the Commission has designated the Malaysian Technical Standards Forum Berhad (MTSFB) as a Technical Standards Forum which is obligated, among others, to prepare the technical code under section 185 of the Act.

A technical code prepared in accordance with section 185 shall not be effective until it is registered by the Commission pursuant to section 95 of the Act.

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Committee Representation

The Multimedia Terminal Working Group (MMT WG) under the Malaysian Technical Standards Forum Berhad (MTSFB) which supervised the development of this Technical Code consists of representatives from the following organizations:

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Fraunhofer IIS
Guillemard Engineering Services
Hanitek Sdn Bhd
LG Electronics (M) Sdn Bhd
Malaysian Technical Standards Forum Berhad (MTSFB)
Media Prima Berhad
MyTV Broadcasting Sdn Bhd
Panasonic AVC Networks Kuala Lumpur Malaysia Sdn Bhd
Radio Television Malaysia (RTM)
Rohde & Schwarz Malaysia Sdn Bhd
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Sharp (M) Sdn Bhd
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Toshiba (M) Sdn Bhd

The Testing Material Sub Working Group of the Multimedia Terminal Working Group (MMT WG) which developed this Technical Code consists of representatives from the following organizations:

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MyTV Broadcasting Sdn Bhd
Panasonic AVC Networks Kuala Lumpur Malaysia Sdn Bhd
Radio Television Malaysia (RTM)
Rohde & Schwarz Malaysia Sdn Bhd
Samsung Malaysia Electronics (SME) Sdn Bhd
Sharp (M) Sdn Bhd
SIRIM QAS International Sdn Bhd
Sony EMCS (M) Sdn Bhd
Toshiba (M) Sdn Bhd

FOREWORD

This technical code for the Specifications on Common Test Suite for Digital Terrestrial Television Broadcast Service Receiver ('this Technical Code') was developed by the Testing Material Sub Working Group of the Multimedia Terminal Working Group under the Malaysian Technical Standards Forum Berhad (MTSFB) in accordance with Section 185 of the Communications and Multimedia Act 1998.

This Technical Code was developed to specify the common test suite for digital terrestrial television broadcast service receivers for the purpose of certifying the devices under the Communications and Multimedia (Technical Standards) Regulations 2000.

This Technical Code shall continue to be valid and effective until reviewed or cancelled.

SPECIFICATIONS ON COMMON TEST SUITE FOR DIGITAL TERRESTRIAL TELEVISION BROADCAST SERVICE RECEIVER

1. Scope

This Technical Code describes the test methods for the digital terrestrial television broadcast receivers in complying with the SKMM MTSFB TC T004: 2013 - *Specification for Digital Terrestrial Television Broadcast Service Receivers*, SKMM MTSFB TC G001: 2013 - *Compression Table of Service Information (SI) Descriptions for Digital Terrestrial Television Broadcast Service* and SKMM MTSFB TC G002: 2013 - *Middleware Profile for Digital Terrestrial Television Broadcast Service*. The receivers may include Integrated Digital Televisions (IDTVs), Set Top Boxes (STBs) and other types of stand-alone receivers for the reception of digital terrestrial television broadcast service in Malaysia.

2. Normative References

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative reference (including any amendments) applies.

SKMM MTSFB TC T004: 2013*, Specification for Digital Terrestrial Television Broadcast Service Receiver*

SKMM MTSFB TC G001: 2013*, Compression Table of Service Information (SI) Descriptions for Digital Terrestrial Television Broadcast Service*

SKMM MTSFB TC G002: 2013*, Middleware Profile for Digital Terrestrial Television Broadcast Service*

Television Digital Terrestre Hibrida

Test Suite for HbbTV Specification Version 2, 1 October 2014

TNT 2.0 Terminal Specification V1.1, July 2012

3. Abbreviations

For the purposes of this Technical Code, the following abbreviation applies.

AAC	Advanced Audio Coding
AFC	Automatic Frequency Control
AFD	Active Format Descriptor
AIT	Application Information Table
API	Application Protocol Interface
AVC	Advanced Video Coding
C/N	Carrier to Noise Ratio
CSS	Cascading Style Sheets
DASH	Dynamic Adaptive Streaming over HTTP
DRM	Digital Rights Management
DSM-CC	Digital Storage Media Command and Control
EIT	Event Information Table

EIT [p/f]	Information on the current event (p:present) and next event (f:following) in the EIT
EPG	Electronic Program Guide
FEC	Forward Error Correction
FFT	Fast Fourier Transforms
GI	Guard Intervals
HbbTV	Hybrid Broadcast Broadband Television
HE-AAC	High Efficiency Advanced Audio Coding
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
IDTV	Integrated Digital Television
iDTV	Integrated Digital Television (receiver)
IRD	Integrate Receiver Decoder
ISSY	Input Stream SYnchronizer
LCN	Logical Channel Number
MISO	Multiple Input Single Output
MPD	Minimum Product Distance
MPEG	Moving Picture Experts Group
MPLP	Multiple Physical Layer Pipe
OAD	Over Air Download
OFDM	Orthogonal Frequency Division Multiplexing
OIPF	Open IPTV Forum
OUI	Organizationally Unique Identifier
PAPR	Peak to Average Power Ratio
PLP	Physical Layer Pipes
PSI	Program Service Information
QAM	Quadrature Amplitude Modulation
QEF	Quasi Error Free
RF	Radio Frequency
RUT	Receiver Under Test
SFN	Single Frequency Network
SI	Service Information
SISO	Single Input Single Output
SSU	System Software Update
STB	Set Top Box
TS	Transport Stream
UTF	Universal Transformation Format
UHF	Ultra High Frequency
URL	Uniform Resource Locator
VHF	Very High Frequency
VSB	Vestigial Sideband
XML	eXtensible Markup Language

4. Requirements

4.1 RF

The receiver shall comply and pass the RF tests as specified in the Malaysia DVB-T2 RF Performance Test Suite Ver1.0

4.2 SI/PSI

The receiver shall comply and pass the tests as specified in Malaysia DVB-T2 SI/PSI Conformance Test Suite Ver1.0

4.3 OAD

The receiver shall comply and pass the OAD tests as specified in the Malaysia DVB-T2 Over Air Download (OAD) Test Suite Ver1.0

4.4 HbbTV

The receiver shall comply and pass the HBBTV tests as specified in the Malaysia Hybrid Broadcast TV (HbbTV) Test Suite Ver1.0

5. Malaysia DVB-T2 RF Performance Test Suite Ver1.0

5.1 Revision History

No	Date	Description	Version	Remark
1	2014-06-03	First official release	v1.0	

5.2 Evaluation Details

Receiver Under Test (RUT)	
RUT Device Type (iDTV/ Set top box)	
RUT Firmware Version	

5.3 Evaluation Results

Section	Test Category	Result	Remarks
1.0	C/N Performance on Gaussian channel (dB)		
2.0	C/N Performance on 0dB echo channel (dB)		
3.0	Minimum receiver signal input levels on Gaussian channel (dBm)		
4.0	Minimum IRD Signal Input Levels on 0dB echo channel		
5.0	Maximum receiver signal input levels (dBm)		
6.0	Immunity to "digital" signals in Other Channels		
7.0	Immunity to Co-Channel Interference from Analogue TV Signals		
8.0	Immunity to Adjacent Channel Interference From Analogue TV Signals		
9.0	Performance in Time-Varying Channels 10Hz Doppler (5Hz after AFC) 20μs 0dB echo		
10.0	Synchronisation for varying echo power levels in SFN (dB)		
11.0	C/(N+I) Performance in Single Frequency Networks for more than one echo (dB)		
12.0	C/(N+I) Performance in Single Frequency Networks inside the guard interval (dB)		
13.0	C/(N+I) Performance in Single Frequency Networks outside the guard interval (dB)		
OVERALL RESULT			

5.4 Malaysia DVB-T2 RF Modes and Performance Figure

5.4.1 RF Profile for Malaysia

Identifier	MS 1	MS 2	MS 3	MS 4
Overall				
FFT Size	32K	32K	32K	32K
GI	1/8	19/256	1/128	1/8
SISO/MISO	SISO	SISO	SISO	SISO
PAPR	TR	TR	TR	TR
Bandwidth	8MHz	8MHz	8MHz	7MHz
Carrier Mode	Extended	Extended	Extended	Normal
Pilot Pattern	PP2	PP4	PP7	PP2
L1 Modulation	64 QAM	64 QAM	64 QAM	64 QAM
Data Symbols per Frame (Ldata)	43	61	59	43
OFDM Symbols per Frame (Lf)	44	62	60	44
Frame Duration (ms)	178	239	217	203
Frames Per SuperFrame	2	2	2	2
PLP #0				
PLP Type	1	1	1	1
Time Interleaver Type (TIME_IL_Type)	0	0	0	0
Modulation	256 QAM	256 QAM	256 QAM	256 QAM
Rate	3/4	3/5	2/3	3/4
FEC Type	64 LDPC	64 LDPC	64 LDPC	64 LDPC
Rotated QAM	Yes	Yes	Yes	Yes
FEC blocks per interleaving Frame Full channel (Trial mode)	135	200	200	132
TI blocks per frame (N_TI)	2	3	3	2
Frame_Interval (I_JUMP)	1	1	1	1
TIME_IL_LENGTH	2	3	3	2
Approx. Time Interleaving Length (ms)	89	81	72	101
Data Rate (Mbit/s)	36.9256	32.49116	39.8165	31.5919

5.4.2 Performance Figures for Malaysia

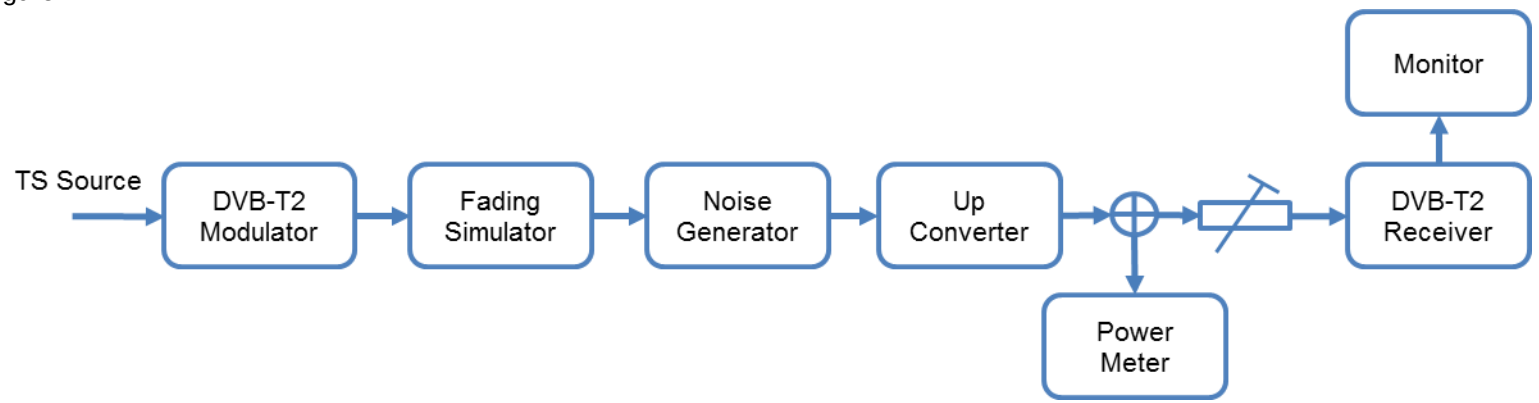
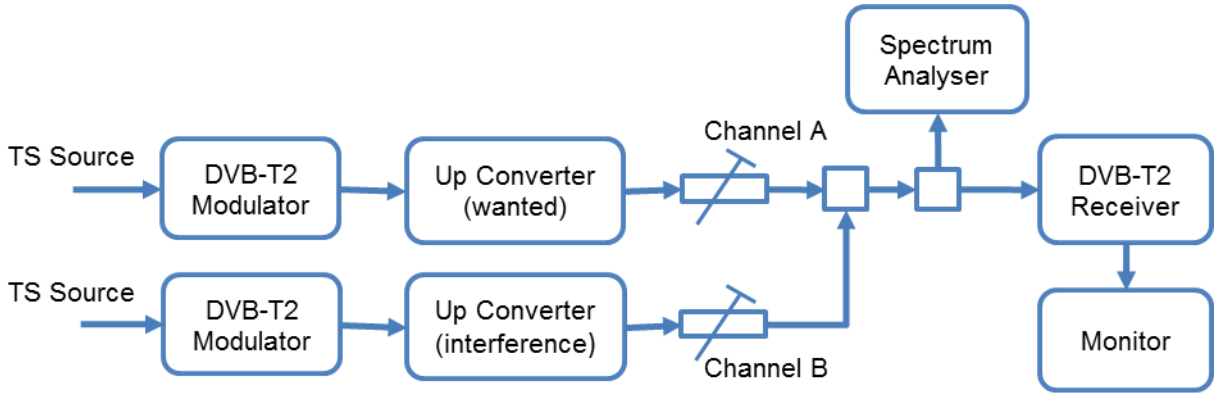
Test Section	Section	Identifier	MS 1	MS 2	MS 3	MS 4
		Description	Performance Figure			
1.0	A.1	C/N Performance on Gaussian channel (dB)	22.9	18.9	19.7	22.9
2.0	A.2	C/N Performance on 0dB echo channel (dB)	28.0	22.6	23.9	28.0
3.0	A.3	Minimum receiver signal input levels on Gaussian channel (dBm)	-76.2	-80.2	-79.3	-76.9
4.0	A.4	Minimum IRD Signal Input Levels on 0dB echo channel	-71.1	-76.5	-75.1	-71.8
	A.5	Receiver noise figure on Gaussian channel[1]	6.0	6.0	6.0	6.0
5.0	A.6	Maximum receiver signal input levels (dBm)	-35	-35	-35	-35
6.0	A.7	Immunity to "digital" signals in Other Channels				
		Digital ACI N+/-1 C/I (dB)	-28.0	-28.0	-28.0	-28.0
		Digital ACI N+/-2 C/I (dB)	-38.0	-38.0	-38.0	-38.0
		Digital ACI N+9 C/I (dB)	-28.0	-28.0	-28.0	-28.0
7.0	A.8	Immunity to Co-Channel Interference from Analogue TV Signals				
		PAL B/G CCI C/I (dB)	7.0	3.0	5.0	7.0
8.0	A.9	Immunity to Adjacent Channel Interference From Analogue TV Signals				
		PAL B/G ACI C/I N+/-1 (dB)	-33.0	-33.0	-33.0	-33.0
		PAL B/G ACI C/I N+/-2 (dB)	-44.0	-44.0	-44.0	-44.0
		PAL B/G ACI C/I N+9 (dB)	-44.0	-44.0	-44.0	-44.0
9.0	A.10	Performance in Time-Varying Channels 10Hz Doppler (5Hz after AFC) 20μs 0dB echo	3	3	3	3
10.0	A.11	Synchronisation for varying echo power levels in SFN (dB)	31.0	26.1	28.1	31.0
11.0	A.12	C/(N+I) Performance in Single Frequency Networks for more than one echo (dB)	28.0	22.6	23.9	28.0
12.0	A.13	C/(N+I) Performance in Single Frequency Networks inside the guard interval (dB)	28.0	22.6	23.9	28.0

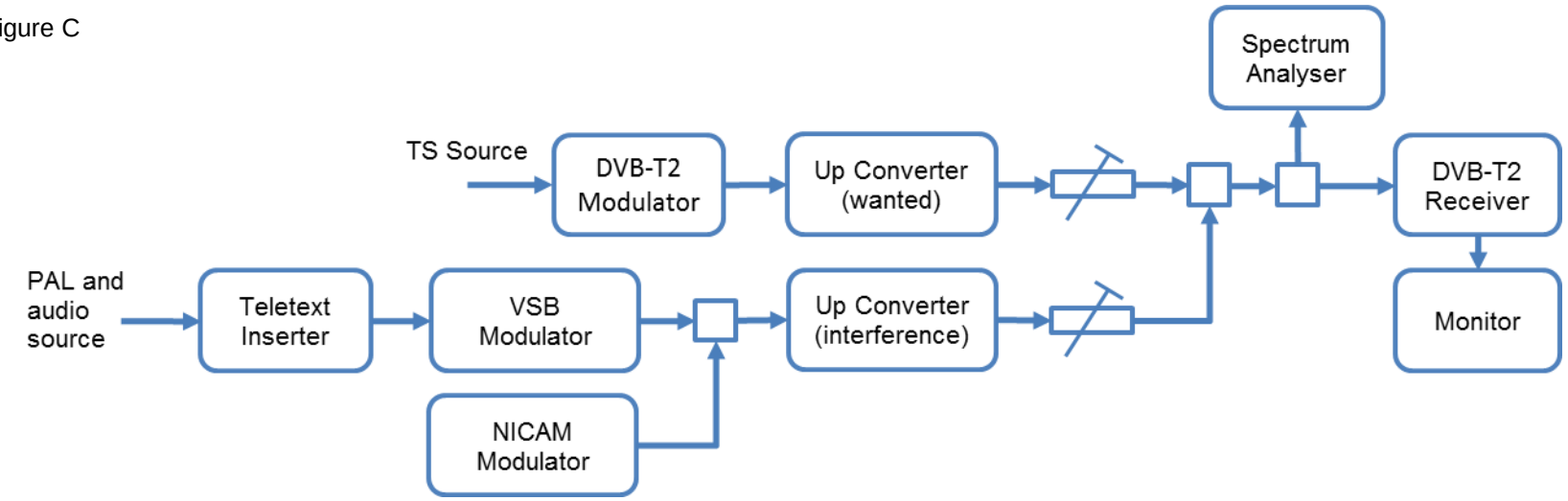
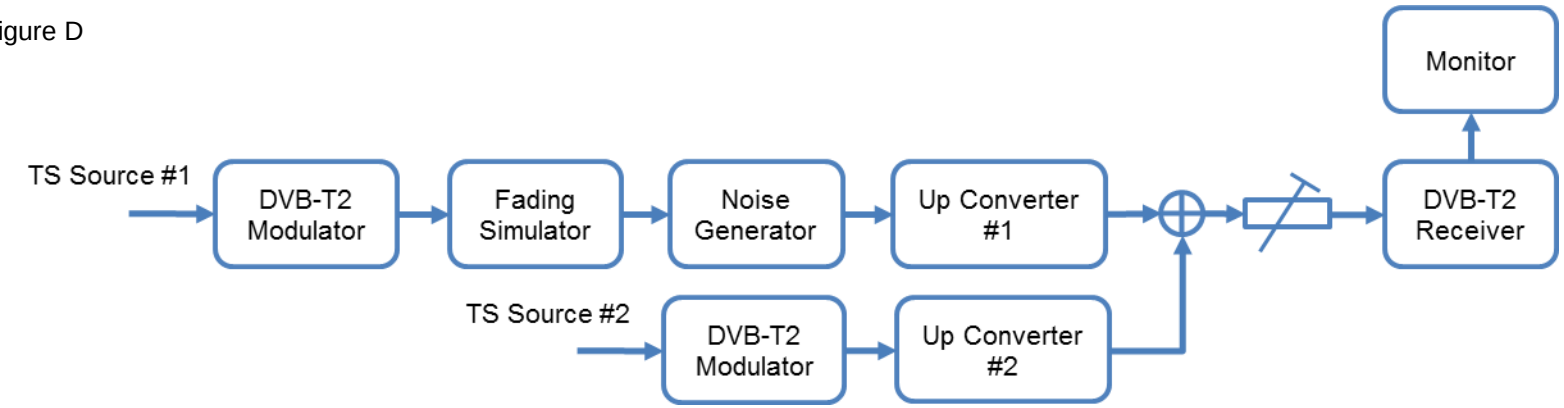
[1] *No testing is required as this is purely calculation based*

Test Section	Section	Identifier	MS 1		MS 2		MS 3		MS 4	
		Description	Performance Figure							
13.0	A.14	C/(N+I) Performance in Single Frequency Networks outside the guard interval (dB)	Echo Delay (µs)	Echo level (dBc)	Echo Delay (µs)	Echo level (dBc)	Echo Delay (µs)	Echo level (dBc)	Echo Delay (µs)	Echo level (dBc)
			-532	-12.0	*See Note 1*		-133	-9.5	-608	-12.0
			-525	-11.5			-120	-9.0	-600	-11.5
			-510	-10.5			-90	-7.5	-580	-10.5
			-490	-9.0			-60	-5.0	-560	-9.0
			-475	-7.5			-30	-2.0	-540	-7.0
			-448	-2.0	-266	-2	-28	-2.0	-512	-2.0
			448	-2.0	266	-2	28	-2.0	512	-2.0
			475	-7.5	*See Note 1*		30	-2.0	540	-7.0
			490	-9.0			60	-5.0	560	-9.0
			510	-10.5			90	-7.5	580	-10.5
			525	-11.5			120	-9.0	600	-11.5
			532	-12.0			133	-9.5	608	-12.0

*Note 1: There is no allowance for echo outside guard for 19/256 PP4 in Nordig due to 19/256 guard (266μs) being very close to the Nyquist limit for PP4 (298.67μs). Nordig defines the max delay for echo outside guard to be 57/64*Nyquist which is equal to the guard interval of 266μsec for 19/256 PP4.*

5.5 Test Instrument Set Up

Test Instrument Set Up	Applicable Section
Figure A 	1.0 2.0 3.0 4.0 5.0 9.0 10.0
Figure B 	6.0

Test Instrument Set Up	Applicable Section
Figure C 	7.0 8.0
Figure D 	11.0 12.0 13.0

5.6 Test Category

5.6.1 Carrier to Noise Ratio (C/N) Performance on Gaussian Channel

Section:	1.0	
Test Case:	C/N Performance on Gaussian channel.	
Requirement:	Receiver shall have at least the quasi error free (QEF) performance for the C/N ratios given in the Performance Figure outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.*	
Purpose:	To test the required C/N for QEF reception in Gaussian channel.	
Expectation:	The required C/N for QEF reception in Gaussian channel shall be lesser than the figures specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.*	
Test Instrument Set Up:	Figure A	
Calibration Requirement:	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start* with MS 1)
	2	Ensure that the receiver signal input level (wanted signal) is set to -50dBm.
	3	Perform a channel search (tune) on frequency 666MHz.
Test Outline:	1	Adjust and measure the C/N for the range of frequencies and T2 modes defined below for QEF reception.
	2	*Remark* The performance requirement is based on 30 seconds error free video.

Result:

		C/N				
Centre Frequency (MHz)		474.0	570.0	666.0	762.0	858.0
Modes	MS 1					
	MS 2	X	X		X	X
	MS 3	X	X		X	X
	MS 4	X	X	X	X	X

*** Remark - If 'Failed', please indicate the level of failure (dB)*

Conformity:		Passed	Failed	Not Tested	
Remark:	1				
	2				
	3				

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.2 C/N Performance on 0dB Echo Channel

<table>
<tr><td>Section:</td><td colspan="2">2.0</td></tr>
<tr><td>Test Case:</td><td colspan="2">C/N Performance on 0dB echo channel.</td></tr>
<tr><td>Requirement:</td><td colspan="2">Receiver shall have at least the QEF performance for the C/N ratios given in the Performance Figure outlined in Annex A of the SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.</td></tr>
<tr><td>Purpose:</td><td colspan="2">To test the required C/N for QEF reception in 0dB echo channel.</td></tr>
<tr><td>Expectation:</td><td colspan="2">The required C/N for QEF reception in 0dB echo channel shall be lesser than the figures specified in Annex A of the SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.</td></tr>
<tr><td>Test Instrument Set Up:</td><td colspan="2">Figure A</td></tr>
<tr><td rowspan="4">Calibration Requirement:</td><td>1</td><td>Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start with MS 1)</td></tr>
<tr><td>2</td><td>Ensure that the fading simulator is set at 0dB echo profile with a delay of 1.95µs, 0 degree phase offset from channel centre and 0dB attenuation on the second path.</td></tr>
<tr><td>3</td><td>Ensure that the receiver signal input level (wanted signal) is set to -50dBm.</td></tr>
<tr><td>4</td><td>Perform a channel search (tune) on frequency 666MHz.</td></tr>
<tr><td rowspan="2">Test Outline:</td><td>1</td><td>Adjust and measure the C/N for the range of T2 modes defined below for QEF reception in 0dB echo channel.</td></tr>
<tr><td>2</td><td>Remark
The performance requirement is based on 30 seconds error free video.</td></tr>
<tr><td>Result:</td><td colspan="2"><table><tr><th>Modes</th><th>C/N</th></tr><tr><td>MS 1</td><td></td></tr><tr><td>MS 2</td><td></td></tr><tr><td>MS 3</td><td></td></tr><tr><td>MS 4</td><td>X</td></tr></table>** Remark - If 'Failed', please indicate the level of failure (dB)</td></tr>
<tr><td>Conformity:</td><td></td><td>Passed | Failed | Not Tested</td></tr>
<tr><td rowspan="3">Remark:</td><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
</table>

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.3 Minimum Receiver Signal Input Levels on Gaussian Channel

Section	3.0	
Test Case	Minimum receiver signal input levels on Gaussian channel.	
Requirement	The receiver shall provide QEF reception for the minimum signal levels (P_{min}) for 8MHz Extended bandwidth as given in the Performance Figure outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.* (P_{min} = -105.1 dBm + NF [dB] + C/N [dB])	
Purpose	To verify the sensitivity of the receiver on Gaussian channel over the supported frequency range.	
Expectation	The sensitivity shall be equal or better for all measured frequencies (channels) and for all modes specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.*	
Test Instrument Set Up	Figure A	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start* with MS 1)
	2	Obtain the receiver signal (wanted signal) input level by taking consideration of the attenuation from the attenuator and cables.
	3	Perform a channel search (tune) on frequency 666MHz, with the wanted signal level set to -50dBm.
Test Outline	1	Increase the received signal input level from low to higher value until QEF reception is achieved. This will be the minimum receiver signal input level.
	2	Repeat the test for the range of frequencies and T2 modes defined below.
	3	*Remark* The performance requirement is based on 30 seconds error free video.
Result		

		C/N				
Centre Frequency (MHz)		474.0	570.0	666.0	762.0	858.0
Modes	MS 1					
	MS 2	X	X		X	X
	MS 3	X	X		X	X
	MS 4	X	X	X	X	X

*** Remark - If 'Failed', please indicate the level of failure (dB)*

Conformity		Passed	Failed	Not Tested	
Remark	1				
	2				
	3				

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.4 Minimum Integrated Receiver Decoder (IRD) Signal Input Levels on 0db Echo Channel

Section		4.0
Test Case		Minimum IRD signal input levels on 0dB echo channel.
Requirement		The receiver shall provide QEF reception for the minimum signal levels (P_{min}) for 8MHz Extended bandwidth as given in the Performance Figure outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.* (P_{min} = -105.1 dBm + NF [dB] + C/N [dB])
Purpose		To verify the sensitivity of the receiver on frequency selective channel.
Expectation		The minimum signal level shall be equal or lower in dBm for all modes specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.*
Test Instrument Set Up		Figure A
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start* with MS 1)
	2	Ensure that the fading simulator is set at 0dB echo profile with a delay of 1.95µs, 0 degree phase offset from channel centre and 0dB attenuation on the second path.
	3	Obtain the receiver signal (wanted signal) input level by taking consideration of the attenuation from the attenuator and cables.
	4	Perform a channel search (tune) on frequency 666MHz with the wanted signal level set to -50dBm.
Test Outline	1	Increase the received signal input level from low to higher value until QEF reception is achieved. This will be the minimum receiver signal input level.
	2	Repeat the test for the range of T2 modes defined below.
	3	*Remark* 1. The performance requirement is based on 30 seconds error free video. 2. 0dB echo profile must be activated when measuring the power level.
Result		

		Minimum input signal levels					
0db echo (µs)		10	26	133	224	253	426
Modes	MS 1		X	X		X	
	MS 2		X		X		X
	MS 3			X	X	X	X
	MS 4	X	X	X	X	X	X

*** Remark - If 'Failed', please indicate the level of failed (dB)*

Conformity		Passed		Failed		Not Tested	
Remark	1						
	2						
	3						

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.5 Maximum Receiver Signal Input Levels

<table>
<tr><td>Section</td><td colspan="2">5.0</td></tr>
<tr><td>Test Case</td><td colspan="2">Maximum receiver signal input levels.</td></tr>
<tr><td>Requirement</td><td colspan="2">The receiver shall provide QEF reception for DVB-T and DVB-T2 signals up to the level specified in Annex A of SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.</td></tr>
<tr><td>Purpose</td><td colspan="2">To test that the receiver is able to handle high power RF signals.</td></tr>
<tr><td>Expectation</td><td colspan="2">The reception shall be QEF for input level higher than or equal to the level for all modes specified in Annex A of SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.</td></tr>
<tr><td>Test Instrument Set Up</td><td colspan="2">Figure A</td></tr>
<tr><td rowspan="3">Calibration Requirement</td><td>1</td><td>Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start with MS 1)</td></tr>
<tr><td>2</td><td>Obtain the receiver signal (wanted signal) input level by taking consideration of the attenuation from the attenuator and cables.</td></tr>
<tr><td>3</td><td>Perform a channel search (tune) on frequency 666MHz.</td></tr>
<tr><td rowspan="3">Test Outline</td><td>1</td><td>Increase the received signal input level until QEF reception is achieved. Ensure that the receiver is able to output the content of the TS source as the receiver signal level increases.</td></tr>
<tr><td>2</td><td>Repeat the test for the range of T2 modes defined below.</td></tr>
<tr><td>3</td><td>Remark
The performance requirement is based on 30 seconds error free video with the receiver input signal level calculated as a function of attenuation.</td></tr>
<tr><td>Result</td><td colspan="2"><table><tr><td>Modes</td><td>Maximum input signal levels</td></tr><tr><td>MS 1</td><td></td></tr><tr><td>MS 2</td><td></td></tr><tr><td>MS 3</td><td></td></tr><tr><td>MS 4</td><td>X</td></tr></table>** Remark - If 'Failed', please indicate the level of failure (dBm)</td></tr>
<tr><td>Conformity</td><td></td><td>Passed | Failed | Not Tested</td></tr>
<tr><td rowspan="3">Remark</td><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
</table>

NOTE: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.6 Immunity to "Digital" Signals in Other Channels

Section	6.0	
Test Case	Immunity to "digital" signals in Other Channels.	
Requirement	The receiver shall permit an interfering DVB-T or DVB-T2 signal for the supported frequencies outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* with a minimum interference to signal level ratio (I/C) while maintaining QEF reception.	
Purpose	To verify the QEF reception for digital signal interference on adjacent or other channels.	
Expectation	The wanted DVB-T2 signal shall be QEF for the interference signal levels specified for all modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.*	
Test Instrument Set Up	Figure B	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*. (Start with MS 1)
	2	Perform a channel search (tune) on frequency 666MHz, with the interferer switched off.
	3	With Channel B or the interferer signal level set to -20dBm, decrease the receiver signal input level (Channel A or the wanted signal) until QEF is obtained.
	4	*Remark* 1. Require the interferer to operate at DVB-T2 extended mode for worst case testing. 2. Ensure that the interferer signal does not have too high shoulders to avoid out-of-band emissions in the reception of the wanted signal. Use a band pass filter on the interference signal if necessary.
Test Outline	1	Select the frequencies for Channel A and Channel B based on the required values indicated in the Result Table.
	2	The difference in signal level shall be measured at QEF reception.
	3	*Remark* The performance requirement is based on 30 seconds error free video.

Result

Centre Frequency (MHz) - 666MHz		C/I				
Interferer Centre Frequency (MHz)		650	658	674	682	738
Modes	MS 1					
	MS 2					
	MS 3					
	MS 4	X	X	X	X	X

Centre Frequency (MHz) - 786MHz		C/I				
Interferer Centre Frequency (MHz)		770	778	794	802	858
Modes	MS 1					
	MS 2					
	MS 3					
	MS 4	X	X	X	X	X

*** Remark - If 'Failed', please indicate the level of failure (dB)*

Conformity		Passed	Failed	Not Tested	
Remark	1				
	2				
	3				

Note: *Attach graph (if any)*

X *Indicates no test needed*

5.6.7 Immunity to Co-Channel Interference from Analogue TV Signals

Section	7.0	
Test Case	Immunity to Co-Channel Interference from Analogue TV Signals.	
Requirement	The receiver shall perform better than the RF figure specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* when the signal is exposed to interference from a co-channel G/PAL signal including video with teletext, FM audio and a NICAM sub carrier while maintaining QEF reception.	
Purpose	To verify the QEF reception for DVB-T2 receiver when there is a co-channel interference from analogue TV.	
Expectation	The received signal shall have a 30s error free video for DVB-T2 modes with C/I equal or better than the requirement.	
Test Instrument Set Up	Figure C	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start* with MS 1)
	2	Ensure the following: 1. 10% modulation depth for vision carrier. 2. NICAM signal level is at -20dB and +5.85MHz relative to the vision carrier. 3. Insert 12 lines of teletext.
	3	Set the analogue TV source with the following requirements: 1. The analogue TV source and DVB-T2 modulator shall be connected to the same reference signal (10MHz). 2. The analogue TV source shall have 0Hz centre frequency offset from the digital TV source. 3. The analogue TV source should not have too high out-of-band emissions to avoid interference to other frequencies. 4. Use a colour bar 75% as the input for PAL signal. 5. FM sound carrier can be modulated at a deviation of 1kHz - 50kHz tone, and the level set at -13dB relative to the vision carrier.
	4	Calibrate the C/I level (Att C and Att I).
	5	Ensure that the receiver signal input level (wanted signal) is set to -50dBm.
Test Outline	1	Execute the test for the range of the frequencies and modes outlined in the Result Table.
	2	Increase the C/I from low value to higher value until the QEF measurement is achieved.
	3	*Remark* The performance requirement is based on 30 seconds error free video.

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<table>
<tr><td rowspan="6">Result</td><td colspan="5"><table>
<tr><td colspan="2"></td><td>C/I</td></tr>
<tr><td colspan="2">Centre Frequency (MHz)</td><td>666</td></tr>
<tr><td rowspan="4">Modes</td><td>MS 1</td><td></td></tr>
<tr><td>MS 2</td><td></td></tr>
<tr><td>MS 3</td><td></td></tr>
<tr><td>MS 4</td><td>X</td></tr>
</table>
** Remark - If 'Failed', please indicate the level of failure (dB)</td></tr>
<tr><td>Conformity</td><td></td><td>Passed</td><td>Failed</td><td>Not Tested</td><td></td></tr>
<tr><td rowspan="3">Remark</td><td>1</td><td colspan="4"></td></tr>
<tr><td>2</td><td colspan="4"></td></tr>
<tr><td>3</td><td colspan="4"></td></tr>
</table>

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.8 Immunity to Adjacent Channel Interference from Analogue TV Signals

Section	8.0	
Test Case	Immunity to Adjacent Channel Interference From Analogue TV Signals.	
Requirement	The receiver shall perform better than the RF figure specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* when the signal is exposed to interference from adjacent G/PAL signal including video with teletext, FM audio and a NICAM sub carrier while maintaining QEF reception.	
Purpose	To verify the QEF reception for DVB-T2 receiver when there is adjacent channel interference from analogue TV.	
Expectation	The received signal shall have a 30s error free video for DVB-T2 modes with C/I equal or better than the requirement.	
Test Instrument Set Up	Figure C	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*. (Start with MS 1)
	2	Ensure the following: 1. 10% modulation depth for vision carrier. 2. NICAM signal level is at -20dB and +5.85MHz relative to the vision carrier. 3. Insert 12 lines of teletext.
	3	Set the analogue TV source with the following requirements: 1. The analogue TV source and DVB-T2 modulator shall be connected to the same reference signal (10MHz). 2. The analogue TV source shall have a centre frequency value from the digital TV source (indicated in the Result Table below). 3. The analogue TV source should not have too high out-of-band emissions to avoid interference to other frequencies. 4. Use a colour bar 75% as the input for PAL signal. 5. FM sound carrier can be modulated at a deviation of 1kHz - 50kHz tone, and the level set at -13dB relative to the vision carrier.
	4	Calibrate the C/I level (Att C and Att I).
	5	Ensure that the receiver input level for analogue TV (unwanted signal) is set to -25dBm (defined as the R.M.S value of the vision carrier at peaks of the modulated envelope).
Test Outline	1	Execute the test for the range of the frequencies and modes outlined in the Result Table.
	2	Increase the C/I from high value to lower value until the QEF measurement is achieved. This should be achieved by keeping the level of the unwanted signal and decreasing the level of the wanted signal.
	3	*Remark* The performance requirement is based on 30 seconds error free video.

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Result

Centre Frequency (MHz) - 666MHz		C/I				
Interferer Centre Frequency (MHz)		650	658	674	682	738
Modes	MS 1					
	MS 2					
	MS 3					
	MS 4	X	X	X	X	X

Centre Frequency (MHz) - 786MHz		C/I				
Interferer Centre Frequency (MHz)		770	778	794	802	858
Modes	MS 1					
	MS 2					
	MS 3					
	MS 4	X	X	X	X	X

*** Remark - If 'Failed', please indicate the level of failure (dB)*

Conformity		Passed	Failed	Not Tested	
Remark	1				
	2				
	3				

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.9 Performance in Time-Varying Channels 10Hz Doppler (5Hz after Automatic Frequency Control (AFC)) 20µs 0dB Echo

Section	9.0	
Test Case	Performance in Time-Varying Channels 10Hz Doppler (5Hz after AFC) 20µs 0dB echo.	
Requirement	The receiver shall be able to operate with all signal time variations. The increase in required C/N for QEF reception shall be less than the RF figures specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*, corresponding to a Doppler shift of +/- 10Hz (5Hz after AFC) compared to a 0dB echo with a delay of 20µs.	
Purpose	To verify the QEF reception for DVB-T2 receiver on a channel where time variation exists.	
Expectation	The increase in the required C/N shall be less than the RF figures specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* for 0dB 20µs echo from frequency separation 1Hz to 10Hz.	
Test Instrument Set Up	Figure A	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start* with MS 1)
	2	Ensure that the fading simulator is set at 0dB echo profile with a delay of 20µs, 0 degree phase offset from channel centre and 0dB attenuation on the second path (for 1Hz frequency separation).
	3	Configure the following: 1. Path 1: Static, 0dB attenuation, and 0µs delay. 2. Path 2: Pure Doppler, 0dB attenuation, and 20µs delay.
	4	Ensure that the receiver signal input level (wanted signal) is set to -50dBm (with no noise applied).
	5	Perform a channel search (tune) on frequency 666MHz.
Test Outline	1	Execute the test for the range of the frequencies and modes outlined in the Result Table.
	2	Increase the C/I from low value to higher value until the QEF measurement is achieved.
	3	*Remark* The performance requirement is based on 30 seconds error free video.

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<table>
<tr><td rowspan="6">Result</td><td colspan="7">
<table>
<tr><td colspan="2">Centre Frequency (MHz) 666MHz</td><td colspan="5">C/N</td></tr>
<tr><td colspan="2">Frequency Separation (Hz)</td><td>1</td><td>5</td><td>10</td><td>Max difference dB</td><td>Pass/ Fail</td></tr>
<tr><td rowspan="4">Modes</td><td>MS 1</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>MS 2</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>MS 3</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>MS 4</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
</table>
** Remark - If 'Failed', please indicate the level of failure (dB)
</td></tr>
<tr><td>Conformity</td><td></td><td>Passed</td><td>Failed</td><td>Not Tested</td><td colspan="3"></td></tr>
<tr><td rowspan="3">Remark</td><td>1</td><td colspan="5"></td></tr>
<tr><td>2</td><td colspan="5"></td></tr>
<tr><td>3</td><td colspan="5"></td></tr>
</table>

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.10 Synchronization for Varying Echo Power Levels in Single Frequency Networks (SFN)

Section	10.0	
Test Case	Synchronization for varying echo power levels in SFN.	
Requirement	The required C/N value for QEF reception as specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* shall be obtained when the channel contains two paths with relative delay from 1.95μs up to 0.95 x GI length and the relative power levels of the two paths are dynamically varying including 0dB echo level crossing.	
Purpose	To verify the SFN synchronization when the amplitude of the echo compared to the amplitude of the direct signal varies in a function of time.	
Expectation	The receiver shall maintain SFN synchronization and the C/N value shall not exceed the specified value outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* when the amplitude of the echo signal varies in time.	
Test Instrument Set Up	Figure A	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC *T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver*. (Start with MS 1)
	2	Set up the fading simulator as follows, disconnecting and re-connecting the wanted signal after the echo delay is changed between each test. 1. Path 1 (direct): 0dB attenuation, 0μs delay. 2. Path 2 (1st echo): 0dB attenuation and delay value from the Result Table. 3. Path 3 (2nd echo): 1dB attenuation and delay value from the Result Table with 0.1Hz frequency separation.
	3	Ensure that the receiver signal input level (wanted signal) is set to -50dBm (with no noise applied).
	4	Perform a channel search (tune) on frequency 666MHz.
Test Outline	1	Increase the C/N from low to higher value until QI reception is achieved.
	2	Repeat the test for the range of echo delay values and T2 modes defined in the Result Table below.
	3	*Remark* 1. The performance requirement is based on 30 seconds error free video. 2. The QI reception shall be obtained when the channel contains two paths with relative delay from 1.95μs up to 0.95 x GI length and the relative power levels of the two paths are dynamically varying (inclusive of 0dB echo level crossing). 3. FRY input signal to the receiver shall be disconnected when changing the echo delay.

<table>
<tr><td rowspan="6">Result</td><td colspan="8">
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="6">C/N</td></tr>
<tr><td colspan="2">0db echo (is)</td><td>10</td><td>26</td><td>133</td><td>224</td><td>253</td><td>426</td></tr>
<tr><td rowspan="4">Modes</td><td>MS 1</td><td></td><td>X</td><td>X</td><td></td><td>X</td><td></td></tr>
<tr><td>MS 2</td><td></td><td>X</td><td></td><td>X</td><td></td><td>X</td></tr>
<tr><td>MS 3</td><td></td><td></td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>MS 4</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
</table>
** Remark - If 'Failed', please indicate the level of failure (dB)
</td></tr>
<tr><td>Conformity</td><td></td><td>Passed</td><td>Failed</td><td>Not Tested</td><td></td></tr>
<tr><td rowspan="3">Remark</td><td>1</td><td colspan="4"></td></tr>
<tr><td>2</td><td colspan="4"></td></tr>
<tr><td>3</td><td colspan="4"></td></tr>
</table>

Note: *Attach graph (if any)*

[X] *Indicates no test needed*

5.6.11 C/(N+I) Performance in SFN for more than one echo

Section	11.0	
Test Case	C/(N+I) Performance in SFN for more than one echo.	
Requirement	The required C/N value for QI reception as specified in Annex A of SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* shall be obtained when the channel contains two static paths with relative delay from 1.95μs up to 0.95 x GI length, independently of the relative amplitudes and phases of the two paths.	
Purpose	To verify the SFN synchronization of the receiver when two echo signals are present.	
Expectation	The receiver shall synchronize all combinations defined in the result table, with the C/N values not exceeding the required C/N figured defined outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*.	
Test Instrument Set Up	Figure D	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*. (Start with MS 1)
	2	Set up the fading simulator as follows, disconnecting and re-connecting the wanted signal after the echo delay is changed between each test 1. Path 1 (static): 0dB attenuation, 0μs delay and 0 degree phase. 2. Path 2 (Pre echo): Follow the values specified in the table below (with 0 degree phase). 3. Path 3 (Post echo): Follow the values specified in the table below (with 0 degree phase).
	3	Ensure that the receiver signal input level (wanted signal) is set to -50dBm (with no noise applied).
	4	Perform a channel search (tune) on frequency 666MHz.
Test Outline	1	Increase the C/N from low to higher value until QI reception is achieved.
	2	Repeat the test for the range of echo delay values and T2 modes defined in the Result Table below.
	3	*Remark* 1. The performance requirement is based on 30 seconds error free video. 2. FRY input signal to the receiver shall be disconnected when changing the echo delay.

Result

Modes		MS 1	MS 2	MS 3	MS 4
Relative Delay Difference	Path 2 Pre echo	-200.1μs	-120.1μs	-13.1μs	X
	Path 3 Post echo	+200.0μs	+120.0μs	+13.0μs	X

Attenuation (dB)			
Path 2 Pre echo	Path 3 Post echo	C/N	
0	0		X
3	3		X
6	6		X
9	9		X
12	2		X
15	15		X
18	18		X
21	21		X
15	0		X
15	3		X
15	6		X
15	9		X
15	12		X
15	18		X
15	21		X
0	15		X
3	15		X
6	15		X
9	15		X
12	15		X
18	15		X
21	15		X

*** Remark - If 'Failed', please indicate the level of failure (dB)*

Conformity		Passed	Failed	Not Tested	
Remark	1				
	2				
	3				

Note: *Attach graph (if any)*

X *Indicates no test needed*

5.6.12 C/(N+I) Performance in Single Frequency Networks inside the Guard Interval (GI)

Section	12.0	
Test Case	C/(N+I) Performance in SFN inside the guard interval.	
Requirement	The required C/N value for QI reception as specified in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver* shall be obtained when the channel contains two static paths with relative delay from 1.95μs up to 0.95 x GI length, independently of the relative amplitudes and phases of the two paths.	
Purpose	To verify the required C/N for echoes in SFN inside the guard interval.	
Expectation	The receiver shall synchronize in all echo attenuation and delay combinations defined in the result table, with the C/N values for 0dB echo not exceeding the required C/N figures outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*.	
Test Instrument Set Up	Figure D	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver. (Start* with MS 1)
	2	Ensure that the fading simulator is set at 0dB echo profile with a delay of 1.95μs, 0 degree phase offset from channel centre and 0dB attenuation on the second path.
	3	Ensure that the receiver signal input level (wanted signal) is set to -50dBm.
	4	Perform a channel search (tune) on frequency 666MHz.
Test Outline	1	Apply noise and increase the C/N from low to higher value until QI reception is achieved.
	2	Repeat the test for the range of echo values and T2 modes defined in the Result Table below.
	3	*Remark* 1. The performance requirement is based on 30 seconds error free video. 2. FRY input signal to the receiver shall be disconnected when changing the echo delay and attenuation level. 3. The delay of the echo shall be maintained constant during the changes of attenuation.

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Result

Delay(μs)		-426		-224		-1.95		1.95		224		426	
Attenuation (dB)		0	20	0	20	0	20	0	20	0	20	0	20
Mode	MS 1	X		X		X							

Delay(μs)		-253		-133		-1.95		1.95		133		253	
Attenuation (dB)		0	20	0	20	0	20	0	20	0	20	0	20
Mode	MS 2	X		X		X							

Delay(μs)		-26		-10		-1.95		1.95		10		26	
Attenuation (dB)		0	20	0	20	0	20	0	20	0	20	0	20
Mode	MS 3	X		X		X							

*** Remark - If 'Failed', please indicate the level of failure (dB)*

Conformity		Passed	Failed	Not Tested	
Remark	1				
	2				
	3				

Note: *Attach graph (if any)*

X *Indicates no test is needed*

5.6.13 C/(N+I) Performance in SFN outside the Guard Interval

Section	13.0	
Test Case	C/(N+I) Performance in SFN outside the guard interval.	
Requirement	For echoes outside the guard interval, QI reception shall be possible with echo levels up to the values outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*.	
Purpose	To verify the SFN synchronization in SFN for echoes outside guard interval.	
Expectation	The echo levels shall be equal or higher compared to the FRY figures outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver.*	
Test Instrument Set Up	Figure D	
Calibration Requirement	1	Set up the equipment based on the modes outlined in Annex A of the SKMM MTSFB TC T004:2013 - *Specification for Digital Terrestrial Television Broadcast Service Receiver*. (Start with MS 1)
	2	Configure the echo signal with channel simulator relative delay difference set at 448µs.
	3	Set the echo level to 0 dB.
	4	Ensure that the receiver signal input level (wanted signal) is set to -50dBm.
	5	Perform a channel search (tune) on frequency 666MHz.
Test Outline	1	Decrease the echo level from high to lower value until QEF reception is achieved.
	2	Repeat the test for the range of echo values and T2 modes defined in the Result Table below.
	3	*Remark* 1. The performance requirement is based on 30 seconds error free video.

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Result	Modes	MS 1		MS 2		MS 3		MS 4	
		Echo Delay (µs)	Echo level (dBc)	Echo Delay (µs)	Echo level (dBc)	Echo Delay (µs)	Echo level (dBc)	Echo Delay (µs)	Echo level (dBc)
		-532		X	X	-133		-608	X
		-525		X	X	-120		-600	X
		-510		X	X	-90		-580	X
		-490		X	X	-60		-60	X
		-475		X	X	-30		-540	X
		-448		-266		-28		-512	X
		448		266		28		512	X
		475		X	X	30		540	X
		490		X	X	60		560	X
		510		X	X	90		580	X
		525		X	X	120		600	X
		532		X	X	133		608	X
	*** Remark - If 'Failed', please indicate the level of failure (dB)*								

Conformity		Passed	Failed	Not Tested	
Remark	1				
	2				
	3				

Note: *Attach graph (if any)*

[X] *Indicates no test is needed*

6. Malaysia DVB-T2 SI/PSI Conformance Test Suite Ver1.0

6.1 Revision History

No	Date	Description	Version	Remark
1	2014-06-03	First official release	v1.0	

6.2 Evaluation Details

Receiver Under Test (RUT)	
RUT Device Type (iDTV/Set top box)	
RUT Firmware Version	

6.3 Evaluation Results

Test Category	Total Test Item	Pass	Fail	Not Tested	
1.0 Basic SI/PSI					
2.0 Logical Channel Numbering					
3.0 Network Evolution					
4.0 Character Test					
5.0 Active Format Description					
6.0 Multiple Physical Layer Pipes (MPLP)					
7.0 Declaration					
Results Total					

Test Approved by	Stamp	Signature

6.4 Test Category

6.4.1 Basic SI/PSI Test

Description	Test Streams :	Stream Configuration :
This test contains the following sections: *Section 1.1 : Service Installation & Information* *Section 1.2 : Event Information* *Section 1.3 : Codec Information* *Section 1.4 : Audio & Subtitle Language* *Note :* *Reference Document (Ref.): SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.*	MYS_SIPSI_1a.ts *Note :* *The Test Streams are available with the Communication and Multimedia Certification Section, SIRIM QAS International Sdn Bhd*	Modulation Type : DVB-T2 Channel Frequency : 474 MHz - 858 MHz Bandwidth : 8 MHz Mode : 32K Guard Interval : 1/128 Modulation : 256 QAM Cell Identifier : 0

6.4.1.1 Service Installation and Information

Section 1.1 : Service Installation and Information					
No.	Test Instruction	Expectation	Ref.	Result	Remarks
1.1.1	Play out MYS_SIPSI_1a.ts and perform receiver full scan. Enter each service and ensure that all of them are accessible via numerical keys. Confirm the correct service name and LCN numbering in each service.	Observe the service name and LCN numbering for each service in the service list and ensure they are correctly arranged in an ascending order as below: LCN 208 : TV1_SD LCN 209 : TV2_HD LCN 210 : TV3_HD LCN 211 : TV4_SD LCN 212: TV5_Radio LCN 213: TV6_Radio	3.2.11.1		

Section 1.1 : Service Installation and Information					
No.	Test Instruction	Expectation	Ref.	Result	Remarks
1.1.2	Check clock information.	Thursday 12th April 21:00:00.	3.2.13		

6.4.1.2 Event Information

Section 1.2 : Event Information						
No.	Test Instruction	Expectation		Ref.	Result	Remarks
1.2.1	Play out MYS_SIPSI_1a.ts and perform receiver full scan. Using numerical keys, press '208' to enter service LCN 208 TV1_SD. Access the banner and check the present (now) event information. *Note:* *The event description may optionally be truncated by receiver when the character length exceeds the allocated area for display of event description.*	Service Name	TV1_SD	3.2.12 3.2.12.1		
1.2.2		Event start and end time	Thursday 12th April 21:00:00 - 21:30:00 (30 minutes).			
1.2.3		Event name	TV1_SD Present Event			
1.2.4		Short Event Description	Short Event Description for TV1_SD Present Event.			
1.2.5		Extended Event Description	Extended Event Description for TV1_SD Present Event: TV1_SD has a parental rating of 9 years and its genre is classified as Movie/Drama or Adult Movie/Drama.			
1.2.6		Rating	9 years			
1.2.7	Next, access the banner again and check the following (next) event information. *Note:* *The event description may optionally be truncated by receiver when the*	Service Name	TV1_SD			
1.2.8		Event start and end time	Thursday 12th April 21:30:00 - 22:00:00 (30 minutes).			
1.2.9		Event name	TV1_SD Following Event			
1.2.10		Short Event Description	Short Event Description for TV1_SD Following Event.			

Section 1.2 : Event Information						
No.	Test Instruction	Expectation		Ref.	Result	Remarks
1.2.11	*character length exceeds the allocated area for display of event description.*	Extended Event Description	Extended Event Description for TV1_SD Following Event: TV1_SD has a parental rating of 15 years and its genre is classified as News/ Current Affairs or Documentary.	3.2.12 3.2.12.1		
1.2.12		Rating	15 years			
1.2.13	Using numerical keys, press '209' to enter service LCN 209 TV2_HD.	Service Name	TV2_HD			
1.2.14	Access the banner and check the present (now) event information.	Event start and end time	Thursday 12th April 2012 21:00:00 - 21:30:00 (30 minutes).			
1.2.15		Event name	TV2_HD Present Event			
1.2.16	*Note: The event description may optionally be truncated by receiver when the character length exceeds the allocated area for display of event description.*	Short Event Description	Short Event Description for TV2_HD Present Event.			
1.2.17		Extended Event Description	Extended Event Description for TV2_HD Present Event: TV2_HD has a parental rating of 11 years and its genre is classified as Show/ Game Show or Variety Show.			

6.4.1.3 Codec Information

Section 1.3 : Codec Information						
No.	Test Instruction	Expectation		Ref.	Result	Remarks
1.3.1	Play out MYS_SIPSI_1a.ts and perform receiver full scan.	Video Component	The 576i (16:9) MPEG-4 AVC MP@L3 SD “Flowers" video shall be presented.	3.2.3 3.2.3.1 3.2.3.2		
1.3.2	Using numerical keys, press '208' to enter service LCN 208 TV1_SD.	Audio Component	"Guitar Solo" audio shall be selectable when the audio selection is set to English.	3.2.4 3.2.4.1		
1.3.3	Using numerical keys, press '209' to enter service LCN 209 TV2_HD.	Video Component	The 1080i MPEG-4 AVC MP@L4 HD "Village" video shall be presented.	3.2.3 3.2.3.1 3.2.3.2		
1.3.4	Using numerical keys, press '210' to enter service LCN 210 TV3_HD.	Video Component	The 720p MPEG-4 AVC MP@L4 HD "Park" video shall be presented.	3.2.3 3.2.3.1 3.2.3.2		
1.3.5	Using numerical keys, press '211' to enter service LCN 211 TV4_SD.	Video Component	The 576i (4:3) MPEG-4 AVC MP@L3 SD "Bridge" video shall be presented.	3.2.3 3.2.3.1 3.2.3.2		
1.3.6	Play out ChID_voices_swp_ddp_DVB_h264_25fps.trp and perform receiver full scan. Enter Service Dolby Labs Test Stream	Audio Component	Audio alternates between each channel should be presented. *Note: Audio presentation is optional.*	3.2.4 3.2.4.1		

6.4.1.4 Audio and Subtitle Language

Section 1.4 : Audio and Subtitle Language						
No.	Test Instruction	Expectation		Ref.	Result	Remarks
1.4.1	Play out MYS_SIPSI_1a.ts and perform receiver full scan. Enter Service TV_SD	Audio	"Keyboard" audio shall be selectable when the audio selection is set to Bahasa Melayu (MSA).	3.2.4 3.2.4.1 3.2.6.2		
1.4.2	Firstly, perform the following setting: Enable Subtitles	Subtitle	Bahasa Melayu subtitles, “SIPSI Test. Subtitle 1, number…” shall be selectable when the subtitle selection is set to Bahasa Melayu (MSA).	3.2.5 3.2.6.1		
1.4.3	*Note 1: All subtitles presented are in English*.	Audio	"Bell rings" audio shall be selectable when the audio selection is set to Chinese (ZHO).	3.2.4 3.2.4.1 3.2.6.2		
1.4.4	*Note 2: If subtitles do not display due to PTS-PCR difference, then subtitle tests can be considered a PASS.*	Subtitle	Chinese subtitles, “SIPSI Test. Subtitle 2, number…", shall be selectable when the subtitle selection is set to Chinese (ZHO).	3.2.5 3.2.6.1		
1.4.5	Please indicate in Remarks if this is the case, and also ensure to make self-declaration in section 7.1 regarding the Display of Subtitles	Audio	"Drum Solo" audio shall be selectable when the audio selection is set to Tamil (TAM).	3.2.4 3.2.4.1 3.2.6.2		
1.4.6		Subtitle	Tamil subtitles, “SIPSI Test. Subtitle 3, number…” shall be selectable when the subtitle selection is set to Tamil (TAM).	3.2.5 3.2.6.1		
1.4.7		Audio	"Guitar Solo" audio shall be selectable when the audio selection is set to English.	3.2.4 3.2.4.1 3.2.6.2		

Section 1.4 : Audio and Subtitle Language						
No.	Test Instruction	Expectation		Ref.	Result	Remarks
1.4.8		Subtitle	English subtitles, "SIPSI Test. Subtitle 0, number…", shall be selectable when the subtitle selection is set to English.	3.2.5 3.2.6.1		
1.4.9		Audio	Receiver shall present any of the following audio components when the audio selection is set to other languages besides Bahasa Melayu, English, Chinese and Tamil: English (ENG) - "Guitar Solo" Bahasa Melayu (MSA) - "Keyboard" Chinese (ZHO) - "Bell rings" Tamil (TAM) - "Drum Solo"	3.2.4 3.2.4.1 3.2.6.2		
1.4.10		Subtitle	Receiver shall present any of the following subtitle components when the subtitle selection is set to other languages besides Bahasa Melayu, English, Chinese and Tamil: English (ENG) Subtitles Bahasa Melayu (MSA) Subtitles Chinese (ZHO) Subtitles Tamil (TAM) Subtitles	3.2.5 3.2.6.1		
1.4.11	Enter Service TV2_HD. Firstly, perform the following settings : - Enable Subtitles	Audio	"Birds" audio shall be selectable when the audio selection is set to Original Audio (QAA).	3.2.4 3.2.4.1		

6.4.1.5 Results of Basic SI/PSI Test

Results of Basic SI/PSI Test	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.2 Logical Channel Numbering (LCN) Test

Description	Test Streams :	Stream Configuration :
This test contains the following sections: *Section 2.1 : Decoding of LCN descriptors* *2.1.1 LCN V1 Descriptors* *2.1.2 LCN V2 Descriptors* *Section 2.2 : Foreign Services* *Section 2.3 : No LCN Descriptor* *Section 2.4 : Regional Broadcast Management* *Note :* *Reference Document (Ref.) : SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.*	MYS_SIPSI_2.1a.ts MYS_SIPSI_2.1b.ts MYS_SIPSI_2.3.ts FGN_SIPSI_2.2.ts FGN_SIPSI_2.3.ts MYS_SIPSI_2.4.ts *Note :* *The Test Streams are available with the Communication and Multimedia Certification Section, SIRIM QAS International Sdn Bhd*	Modulation Type : DVB-T2 Channel Frequency : 474 MHz - 858 MHz Bandwidth : 8 MHz Mode : 32K Guard Interval : 1/128 Modulation : 256 QAM Cell Identifier : 0 *Note:* *In the case of simultaneous playing of two streams, the streams should be played out at different frequencies. For example, one stream is played out at 474 MHz and the other is played out at 858 MHz.*

6.4.2.1 Decoding of LCN descriptors

Section 2.1 : Decoding of LCN descriptors						
No.	Test Category	Instructions	Expectations	Ref.	Result	Remarks
2.1.1	LCN V1 descriptors	Play out MYS_SIPSI_2.1a.ts and perform receiver auto scan.	Total of 6 services shall be visible in the service list and shall be in ascending order as below: LCN 010 MYS_TV 1 LCN 031 MYS_TV 4.1/MYS_TV 4.2 LCN 561 MYS_Radio 9 LCN 800++ MYS_TV 4.1/MYS_TV 4.2 LCN 800++ MYS_TV 6 LCN 800++ Service with no LCN Confirm that receiver shall be able to access each service normally via numeric button and service list. Using numerical keys, press '102' to enter service LCN 102 MYS_Radio 8. 'Drum Solo' audio shall be presented. This service is hidden and can only be selected using direct key entry. Using numerical keys, press '031' to enter service LCN 031 MYS_TV 4.1/ or MYS_TV 4.2. 'Bridge' video and 'Keyboard' audio shall be presented. Select 'Service with no LCN' service. LCN 800++ shall be assigned to this service. 'Bridge' video and 'Guitar Solo' audio shall be presented.	3.2.11.2 3.2.11.4 3.2.19		

Section 2.1 : Decoding of LCN descriptors						
No.	Test Category	Instructions	Expectations	Ref.	Result	Remarks
2.1.2	LCN V2 descriptors	Play out MYS_SIPSI_2.1b.ts and perform receiver auto scan.	Total of 6 services shall be visible in the service list and shall be in ascending order as below: LCN 005 TV5 LCN 055 TV55_A LCN 166 Radio 5 LCN 800++ TV 55_B LCN 800++ TV 132 LCN 800++ Service with no LCN Service with LCN 300 is hidden and shall not appear in the service list. Confirm that receiver is able to access each service normally via numerical keys. Using numerical keys, press '300' to enter service LCN 300 Radio7. This service is hidden and can only be selected using direct key entry. 'Drum Solo' audio shall be presented. Using numerical keys, press '055' to enter service LCN 055 TV55_A. 'Bridge' video and 'Keyboard' audio shall be presented. Select 'Service with no LCN' service. LCN 800++ shall be assigned to this service. 'Bridge' video and 'Guitar Solo' audio shall be presented.	3.2.11.3 3.2.11.4 3.2.19		

6.4.2.2 Foreign Services

Section 2.2 : Foreign Services						
No.	Test Category	Instructions	Expectations	Ref.	Result	Remarks
2.2.1	Foreign Service	Play out MYS_SIPSI_2.1b.ts and FGN_SIPSI_2.2.ts simultaneously and perform receiver's auto scan method. Note: Please refer to the stream configuration method as stated above	Total of 12 services shall be visible in the service list and shall be an ascending order as below: LCN 005 TV 5 LCN 055 TV 55_A/TV 55_B LCN 166 Radio 5 LCN 800++ TV 55_A/TV 55_B LCN 800++ TV 132 LCN 800++ Service with no LCN LCN 800++ SI Television 100 LCN 800++ TV Service 101 LCN 800++ TV Service 102 LCN 800++ MI Television 201 LCN 800++ MI Television 202 LCN 800++ LL Television 300 Confirm that receiver is able to access to each service normally via numerical keys and service list. Service with LCN 300 is hidden and shall not appear in the service list. Confirm that receiver is able to access each service normally via numerical keys. Using numerical keys, press '300' to enter service LCN 300 Radio7. This service is hidden and can only be selected using direct key entry. 'Drum Solo' audio shall be presented. Confirm that all of the foreign services are assigned with channel number 800++.	3.2.11.4 3.2.19		

6.4.2.3 No LCN Descriptor

Section 2.3 : No LCN Descriptor						
No.	Test Category	Instructions	Expectations	Ref.	Result	Remarks
2.3.1	No LCN Descriptor	Play out MYS_SIPSI_2.3.ts and FGN_SIPSI_2.3.ts simultaneously and perform receiver's auto scan method.	Total of 12 services shall be visible in the service list and shall be an ascending order as below: LCN 001 TV 5 LCN 002 TV 55_A LCN 003 Radio 5 LCN 004 Radio 7 LCN 005 TV 55_B LCN 006 TV 132 LCN 007 SI Television 100 LCN 008 TV Service 101 LCN 009 TV Service 102 LCN 010 MI Television 201 LCN 011 MI Television 202 LCN 012 LL Television 300 Confirm that receiver is able to access each service normally via numerical keys and service list.	3.2.11.4 3.2.19		

6.4.2.4 Regional Broadcast Management

Section 2.4 : Regional Broadcast Management						
No.	Test Category	Instructions	Expectations	Ref.	Result	Remarks
2.4.1	Regional Broadcast Management	Play out MYS_SIPSI_2.4.ts and perform receiver auto scan. 1. Select the channel list for Central Region (ID : 0x0001) in the receiver's	Total of 9 services shall be visible in the service list and shall be in ascending order as below for the Central Region channel list (ID:0x0001) LCN 001 MY_TV 1 LCN 005 MY_TV 15 LCN 007 MY_TV 2 LCN 033 MY_HDTV 4 LCN 155 MYTV_10 LCN 431 MY Radio 6 LCN 611 MY_TV 5 LCN 701 MY_TV 7 LCN 800++ MY_TV 8 Confirm that receiver is able to access each service normally via numerical keys and service list *Note: Data type service is optional*.	3.2.11.5 3.2.19		

Section 2.4 : Regional Broadcast Management						
No.	Test Category	Instructions	Expectations	Ref.	Result	Remarks
		2. Perform receiver auto scan again and select the channel list for Southern region (ID : 0x0002) in the receiver's channel list menu.	Total of 9 services shall be visible in the service list and shall be in ascending order as below for the Southern Region channel list (ID:0x0002) LCN 002 MY_TV 2 LCN 006 MY_TV 15 LCN 010 MY_TV 1 LCN 036 MY_HDTV 4 LCN 105 MYTV_10 LCN 437 MY_Radio 6 LCN 617 MY_TV 5 LCN 770 MY_TV 7 LCN 800++ MY_TV 8 Confirm that receiver is able to access each service normally via numerical keys and service list. *Note: Data type service is optional.*	3.2.11.5 3.2.19		

6.4.2.5 Results of LCN Test

Results of LCN Test	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.3 Network Evolution

Description	Test Streams :	Stream Configuration :
This test contains the following sections: *Section 3.1 : Service Addition and Deletion* *Section 3.2 : Clash LCN Resolution* *Section 3.3 : Multiplex Addition and Deletion* *Section 3.4 : Service and Event Updates*	MYS_SIPSI_3.1a.ts MYS_SIPSI_3.1a_addition.ts MYS_SIPSI_3.1a_deletion.ts MYS_SIPSI_3.2a.ts MYS_SIPSI_3.2b.ts MYS_SIPSI_3.2a_02.ts MYS_SIPSI_3.2b_01.ts MYS_SIPSI_3.2b_02.ts MYS_SIPSI_3.3a.ts MYS_SIPSI_3.3a_mux.ts MYS_SIPSI_3.3b_mux.ts MYS_SIPSI_3.5.ts	Modulation Type : DVB-T2 Channel Frequency : 474 MHz - 858 MHz Bandwidth : 8 MHz Mode : 32K Guard Interval : 1/128 Modulation : 256 QAM Cell Identifier : 0
Note : *Reference Document (Ref.): SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.*	*Note :* *The Test Streams are available with the Communication and Multimedia Certification Section, SIRIM QAS International Sdn Bhd*	*Note:* *In the case of simultaneous playing of two streams, the streams should be played out at different frequencies. For example, one stream is played out at 474 MHz and the other is played out at 858 MHz.*

6.4.3.1 Service Addition and Deletion

Section 3.1 : Service Addition and Deletion					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.1.1	Play out MYS_SIPSI_3.1a.ts and perform receiver auto scan.	A total of 4 services shall be presented as follows in ascending order: LCN 005 MY_TV Channel 1 LCN 013 MY_ Radio Channel 5 LCN 166 MY_TV Channel 11 LCN 180 MY_TV Channel 17 Confirm that receiver shall be able to access to each service normally via numerical keys and service list.	3.2.11.6		
3.1.2	Stop MYS_SIPSI_3.1a.ts and play out MYS_SIPSI_3.1a_addition.ts at the same frequency as before. Note : Do not perform auto scan	At interval 0::121, same services shall be displayed in the service list as Ref. 3.1.1.			
3.1.3		Network update shall start within the interval 121::240. Receiver shall automatically undergo network update and update the service list. A total of 6 services shall be presented in the service list as follows in ascending order: LCN 005 MY_TV Channel 1 LCN 013 MY_ Radio Channel 5 LCN 166 MY_TV Channel 11 LCN 180 MY_TV Channel 17 LCN 290 MY_Radio Channel 32 LCN 351 MYS_TV Channel 106 Confirm that receiver shall be able to access to each service normally via numerical keys and service list.			

Section 3.1 : Service Addition and Deletion					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.1.4	Next, stop MYS_SIPSI_3.1a_addition.ts and play out MYS_SIPSI_3.1a.ts again. Perform receiver auto scan.	A total of 4 services shall be presented as follows in ascending order: LCN 005 MY_TV Channel 1 LCN 013 MY_ Radio Channel 5 LCN 166 MY_TV Channel 11 LCN 180 MY_TV Channel 17 Confirm that receiver shall be able to access to each service normally via numerical keys and service list.	3.2.11.6		
3.1.5	Stop MYS_SIPSI_3.1a.ts and play out MYS_SIPSI_3.1a_deletion.ts at the same frequency as before *Note : Do not perform auto scan*	At interval 0::121, same services shall be displayed in the service list as Ref. 3.1.4.			
3.1.6		Network update shall start within the interval 121::240. Receiver shall automatically undergo network update and update the service list. Confirm that 2 services are deleted from the service list and the remaining service presented in the service list are as follows in ascending order: LCN 005 MY_TV Channel 1 LCN 013 MY_ Radio Channel 5 Confirm that receiver is able to access each service normally via numerical keys and service list.			

6.4.3.2 Clash LCN Resolution

Section 3.2 : Clash LCN Resolution					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.2.1	Play out MYS_SIPSI_3.2a.ts and MYS_SIPSI_3.2b.ts simultaneously and perform receiver auto scan method.	Total of 9 services shall be visible in the service list and shall be an ascending order as below: LCN 100 Service_TV1_SD LCN 101 Service_TV2_SD LCN 102 Service_TV3_SD LCN 103 Service_Radio1 LCN 104 Service_Radio2 LCN 111 SD Service 1 LCN 222 SD Service 1_muxB LCN 333 SD Service 2_muxB LCN 444 SD Service 2 Confirm that receiver shall be able to access to each service normally via numerical keys and service list. Using numerical keys, press '222' to enter LCN 222 SD Service 1_muxB. 'Bridge' video and 'Bell Ring' audio shall be presented. Commence following test from LCN 222 SD Service 1_muxB.	3.2.11.6		

Section 3.2 : Clash LCN Resolution					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.2.2	Stop the streams and play out MYS_SIPSI_3.2a_02.ts and MYS_SIPSI_3.2b_01.ts simultaneously at the same frequency as before. Set power of Set the power of multiplex to be such that MYS_SIPSI_3.2b_01.ts > MYS_SIPSI_3.2a_02.ts *Note: Do not perform receiver auto scan.*	Perform receiver method of network configuration update. Ensure the following services shall be listed : LCN 100 Service_TV1_SD LCN 101 Service_TV2_SD LCN 102 Service_TV3_SD LCN 103 Service_Radio1 LCN 104 Service_Radio2 LCN 111 SD Service 1 LCN 222 SD Service 1_muxB LCN 333 SD Service 2_muxB LCN 444 SD Service 2 LCN 555 Service_Radio10 LCN 666 Service_TV7_SD LCN 800++ SD_Service 2_muxA Using numerical keys, press '333', '555', and '666', and ensure the following components are available in the services : In LCN 333, 'Bell Ring' audio and 'Bridge' video shall be presented. In LCN 555, 'Keyboard' audio and 'Flowers' video shall be presented. In LCN 666, 'Keyboard' audio and 'Flowers' video shall be presented.	3.2.11.6		

Section 3.2 : Clash LCN Resolution					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.2.3	Stop the streams and play out MYS_SIPSI_3.2a_02.ts and MYS_SIPSI_3.2b_02.ts simultaneously at the same frequency as before. *Note :* *Do not perform receiver auto scan.* *Please refer to the stream configuration method as stated above*	Perform receiver method of network configuration update. Ensure that the following is displayed : LCN 100 Service_TV1_SD LCN 101 Service_TV2_SD LCN 102 Service_TV3_SD LCN 103 Service_Radio1 LCN 104 Service_Radio2 LCN 222 SD Service 1_muxB LCN 444 SD Service 2 LCN 555 Service_Radio10 LCN 666 Service_TV7_SD LCN 800++ SD Service 2_muxA Ensure that the below services are removed : 1. LCN 111 SD Service 1 2. LCN 333 SD Service 2_muxB	3.2.11.6		

6.4.3.3 Multiplex Addition and Deletion

Section 3.3 : Multiplex Addition and Deletion					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.3.1	Static Multiplex Addition Play out MYS_SIPSI_3.3a.ts and perform receiver auto scan.	A total of 6 services shall be presented as follows in ascending order: LCN 001 - TV1 LCN 002 - TV2 LCN 003 - TV3 LCN 004 - TV4 LCN 005 - TV5 LCN 006 - Radio6 Confirm that receiver shall be able to access to each service normally via numerical keys and service list. Using numerical keys, press '001' to enter LCN 001 TV1. 'Flowers' video and 'Guitar Solo' audio shall be presented. Commence following test from LCN001 TV1.	3.2.11.6		
3.3.2	Stop_MYS_SIPSI_3.3a and play out MYS_SIPSI_3.3a_mux.ts and MYS_SIPSI_3.3b_mux.ts simultaneously.	Perform receiver method of network configuration update. (Note: Do not perform receiver autoscan.) A total of 10 services shall be presented as follows in ascending order: LCN 001 - TV1 LCN 002 - TV2 LCN 003 - TV3 LCN 004 - TV4 LCN 005 - TV5 LCN 006 - Radio6 LCN 100 - TV11 LCN 200 - TV_12 LCN 501 - TV_15 LCN 502 - Radio 17	3.2.11.6		

Section 3.3 : Multiplex Addition and Deletion					
No.	Instruction	Expectation	Ref.	Result	Remarks
		Confirm that receiver shall be able to access to each service normally via numerical keys and service list. Using numerical keys, press '001' to enter LCN 001 TV1. 'Flowers' video and 'Guitar Solo' audio shall be presented.			
3.3.3	<u>Multiplex Deletion/Addition</u> Next, stop above streams and play out MYS_SIPSI_3.3a.ts at frequency 474 MHz and perform auto scan.	A total of 6 services shall be presented as follows in ascending order: LCN001 - TV1 LCN002 - TV2 LCN 003 - TV3 LCN 004 - TV4 LCN 005 - TV5 LCN 006 - Radio6 Confirm that receiver shall be able to access to each service normally via numerical keys and service list.	3.2.11.6		
3.3.4	Stop MYS_SIPSI_3.3a.ts and change the frequency to 858MHz. Perform receiver method of service update.	A total of 6 services shall be presented as follows in ascending order: LCN001 - TV1 LCN002 - TV2 LCN 003 - TV3 LCN 004 - TV4 LCN 005 - TV5 LCN 006 - Radio6 Confirm that receiver shall be able to access to each service normally via numerical keys and service list.	3.2.11.6		

6.4.3.4 Service and Event Updates

Section 3.4 : Service and Event Updates					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.4.1	Play out MYS_SIPSI_3.5.ts and perform receiver auto scan.	Using numerical keys, press '120' to enter LCN120 TV Channel 120. At interval 0::60s, 'Village' video with 'Keyboard' audio shall be presented. Ensure no juddering or erroneous effects in components during presentation. At interval 61::180s, audio and video shall stop. Receiver may optionally freeze the last image of the video during this interval. *Note: Receiver shall handle clean transitions into and out of the active and inactive states during the interval 60-61s.*	3.2.2.1		

Section 3.4 : Service and Event Updates					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.4.2		Using numerical keys, press '131' to enter LCN131 TV Service 131. At interval 0::60s, no components shall be presented. At interval 61::180s, 'Park' video with 'Bell rings' audio shall be presented. Ensure no juddering or erroneous effects in components during presentation. *Note: Receiver shall handle clean transitions into and out of the active and inactive states during the interval 60-61s.* Using numerical keys, press '131' to enter LCN131 TV Service 131. At interval 0::60s, no components shall be presented. At interval 61::180s, 'Park' video with 'Bell rings' audio shall be presented. Ensure no juddering or erroneous effects in components during presentation. *Note: Receiver shall handle clean transitions into and out of the active and inactive states during the interval 60-61s.*	3.2.2.1		

Section 3.4 : Service and Event Updates					
No.	Instruction	Expectation	Ref.	Result	Remarks
3.4.3		Using numerical keys, press '555' to enter LCN555 Channel 266. Press 'Info' key to view 'Now' and 'Next' event information at banner and optionally at other user interface. Ensure the event information is as in expectations below and take note of the changes of this information at interval 61s. At interval 0::60s, present event information are as follows: Event Name : News at TV1 Event Start/End Time: 9 April, 5:30 PM - 6:30 PM Event Description: News programme on air. Rating: Not defined At interval 61s, receiver shall detect version change in event p/f and event p/f information shall be updated accordingly. Present event information during interval 61::180s shall be presented as follows: Event Name : Movie programme Event Start/End Time: 9 April, 6:30 PM - 8:00 PM Event Description: Movie programme on air. Rating: Not defined	3.2.12.1		

6.4.3.5 Results of Network Evolution Test

Results of Network Evolution Test	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.4 Character Test

Description	Test Streams :	Stream Configuration :
This test contains the following sections: *Section 4.1 : Event p/f* *Section 4.2 : Event Schedule* *Section 4.3 : Event p/f (Huffman Encoding)* *Section 4.4 : Event Schedule (Huffman Encoding)* *Section 4.5 : Huffman Encoding (Malay)* *Section 4.6 : Huffman Encoding (ESC character)* *Section 4.7 : No Table Definition* *Section 4.8 : Latin Table 05 ISO-8859-9* *Note :* *Reference Document (Ref.): SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.*	MYS_CHAR_4a.ts MYS_CHAR_4b.ts MYS_CHAR_4c.ts MYS_CHAR_4d.ts MYS_CHAR_4e.ts MYS_CHAR_4f.ts *Note :* *The Test Streams are available with the Communication and Multimedia Certification Section, SIRIM QAS International Sdn Bhd*	Modulation Type : DVB-T2 Channel Frequency : 474 MHz - 858 MHz Bandwidth : 8 MHz Mode : 32K Guard Interval : 1/128 Modulation : 256 QAM Cell Identifier : 0

6.4.4.1 Event p/f

Section 4.1 : Event p/f							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.1.1	Play out stream MYS_CHAR_4a.ts and perform receiver auto scan method. Enter each service.	Ensure all services are populated correctly as in expectation. Ensure services are accessible via numerical keys. Confirm correct service name and LCN numbering in each service.	LCN 100 Test 1: Normal Encoding Character LCN 101 Test 2: Normal Encoding Character LCN 102 Test 3: Normal Encoding Character		3.2.8		
4.1.2	Using numerical keys, press '100' to enter service LCN 100 Test 1: Normal Encoding Character.	Ensure all present event descriptions are presented as in expectations in the EPG.	Event Name	"Event 1: Combination of long event name which consists many letter and number ranges 12abc" *Note: Some truncation might occur*.			
4.1.3	Access the banner and guide to view the present (now) event information.		Short Event Description	"Short Event Description: In 1987, statistics show that 43 percent of people in the world aged between 18 to 35 smoke 25 cigarettes per day. This is bad news."			
4.1.4	Access the following events on the banner.		Extended Event Description	"Extended Description: Cigarettes contain a chemical called carcinogen which could endanger the human lungs. Not only does this endanger the smokers, this could be harmful to others as well for they are inhaling the smoke through second hand smoking." *Note: Some truncation might occur.*			

Section 4.1 : Event p/f							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.1.5		Ensure all following events are presented as in expectations in the EPG	Short Event Description	"Short Event Description: Zebras have many black stripes. It is said that they come from a species of the African horse family."	3.2.8		
4.1.6			Extended Event Description	"Extended Event Description: They are united by their distinctive black and white stripes which come in different patterns and are unique to each individual." *Note: Some truncation might occur.*			
4.1.7	Using numerical keys, press '101' to enter service LCN101	Ensure all present event descriptions are presented as in expectations in the EPG.	Event Name	"Event 1 : Character Test"			
4.1.8	Test 2: Normal Encoding Character.		Short Event Description	"CAPITAL ALPHABET: ABCDEFGHIJKLMNOPQRSTUVWXYZ Numbers: 0123456789. abcdefghijklmnopqrstuvwxyz"			
4.1 .9	Access the banner and guide to view the present (now) event information. Access the following events on the banner		Extended Event Description	“SIX OF THE WOMEN QUIETLY GAVE BACK PRIZES TO THE JUDGE. THE JUDGE QUICKLY GAVE BACK SIX PRIZES TO THE WOMEN. Six of the women quietly gave back prizes to the judge. The judge quickly gave back six prizes to the women.” *Note: Some truncation might occur*.			

Section 4.1 : Event p/f							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.1.10		Ensure all following events are presented as in expectations in the EPG.	Event Name	"Event 2:CharacterTest123"	3.2.8		
4.1.11			Short Event Description	"THE BOY WORE A RED SHIRT. HE WAS SEEN STROLLING IN THE ZOO WHILE FEEDING THE FLAMINGOS AND DUCKLINGS. HE WAS WITH HIS FAMILY WHEN SUDDENLY AN UNPREDICTED WEATHER OCCURRED. IT STARTED DRIZZLING BEFORE A HEAVY DOWNPOUR CAME."			
4.1.12			Extended Event Description	"The boy wore a red shirt. He was seen strolling in the zoo while feeding the flamingos and ducklings. He was with his family when suddenly an unpredicted weather occurred. It started drizzling before a heavy downpour came." *Note: Some truncation might occur.*			
4.1.13	Using numerical keys, press '102' to enter service LCN102 Test 3: Normal Encoding Character. Access the banner and guide to view the present (now) event information.	Ensure all present event descriptions are presented as in expectations in the EPG	Event Name	"Event 1 : Test NBSP and SHY code in description"			
4.1.14			Short Event Description	"NBSP : word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc word abc SHY : worddef worddef" Pass Criteria's: 1. For NBSP, the line may only be broken after word "abc" such that "word abc" is kept together.			

Section 4.1 : Event p/f							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
				2. For SHY, the word should be broken at the [SHY] Character position when the line needs to wrap and display a hyphenation Character “-”, when no line wrap occurs then the [SHY] is not presented. Receivers not implementing SHY are likely to display a single line.			

6.4.4.2 Event Schedule

Section 4. 2 : Event Schedule						
No.	Test instructions	Checkpoints	Expectations	Ref.	Result	Remarks
4.2.1	Using numerical keys, press '101' to enter service LCN 101 Test 2: Normal Encoding Character. Press the Guide button to access the EPG information.	Ensure EPG is accessible.	EPG is able to be presented when Guide key is pressed.	3.2.8 3.2.12.2		
4.2.2	Toggle keys to continue to next day event schedule and previous days.	Ensure 7 days of EPG are displayed.	7 days of Event Schedule shall be presented. If less than 7 days of Event Schedule is accessed, this test shall fail.			

Section 4. 2 : Event Schedule							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.2.3	Check the service names on the EPG.	Ensure services are correct.	All services shall be populated in the EPG with the same details as in expectations in Section 4.1.1		3.2.8 3.2.12.2		
4.2.4	Toggle up, down, left, right keys	Ensure EPG is interactive with different key press.	No erroneous effects occur during different key press.				
4.2.5	Select Event 3 in LCN 101.	Ensure correct Event Names, Event Description, and Event Start and End Times are presented as in expectation.	Event Name	"Event 3 : Characters Row A-B-C"			
4.2.6			Short Event Description	"¡¢£€¥§¤‘“«←↑→↓°±²³×µ¶·÷’”»¼½¾¿"			
4.2.7			Extended Event Description	"ÀÁÂÃĀĂÄÅĄ"			
4.2.8	Select Event 4 in LCN 101	Ensure correct Event Names, Event Description, and Event Start and End Times are presented as in expectation	Event Name	"Event 4 : Characters Row D-E"			
4.2.9			Short Event Description	"—¹®©™♪¬¦⅛⅜⅝⅞ΩÆĐªĦIJĿŁØŒº ÞŦŊ'n"			
4.2.10			Extended Event Description	"Event information is not available."			
4.2.11	Select Event 5 in LCN 101	Ensure correct Event Names, Event Description, and Event Start and End Times are presented as in expectation	Event Name	"Event 5 : Characters Row F"			
4.2.12			Short Event Description	"ĸæđðħıijłøœßþŧŋ"			
4.2.13			Extended Event Description	"Event information is not available."			

6.4.4.3 Event p/f (Huffman Encoding)

Section 4. 3 : Event p/f (Huffman Encoding)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.3.1	Play out stream MYS_CHAR_4b.ts and perform receiver auto scan method. Enter each service.	Ensure all services are populated correctly as in expectation. Ensure services are accessible via numerical keys. Confirm correct service name and LCN numbering in each service.			3.2.8		
4.3.2	Using numerical keys, press '100' to enter service LCN 100	Ensure all present event descriptions are presented as in expectations in the banner and the EPG	Event Name	"Event 1 : Combination of long event name which consists many letter and number ranges 12abc"			
4.3.3	Test 1: Huffman Encoding Character.		Short Event Description	"Short Event Description: In 1987, statistics show that 43 percent of people in the world aged between18 to 35 smoke 25 cigarettes per day. This is bad news."			
4.3.4	Access the banner and guide to view the present (now) event information. Access the following events on the banner.		Extended Event Description	"Extended Description: Cigarettes contain a chemical called carcinogen which could endanger the human lungs. Not only does this endanger the smokers, this could be harmful to others as well for they are inhaling the smoke through second hand smoking." *Note: Some truncation might occur.*			

Section 4. 3 : Event p/f (Huffman Encoding)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.3.5		Ensure all following events are presented as in expectations in the banner and the EPG	Short Event Description	"Short Event Description: Zebras have many black stripes. It is said that they come from a species of the African horse family."	3.2.8		
4.3.6			Extended Event Description	"Extended Event Description: They are united by their distinctive black and white stripes which come in different patterns and are unique to each individual." *Note: Some truncation might occur.*			
4.3.7	Using numerical keys, press '101' to enter service LCN101	Ensure all present event descriptions are presented as in the banner and the EPG.	Event Name	"Event 1 : Character Test"			
4.3.8	Test 2: Huffman Encoding Character.		Short Event Description	"CAPITAL ALPHABET: ABCDEFGHIJKLMNOPQRSTUVWXYZ Numbers: 0123456789. abcdefghijklmnopqrstuvwxyz."			
4.3.9	Access the banner and guide to view the present (now) event information. Access the following events on the banner		Extended Event Description	“SIX OF THE WOMEN QUIETLY GAVE BACK PRIZES TO THE JUDGE. THE JUDGE QUICKLY GAVE BACK SIX PRIZES TO THE WOMEN. Six of the women quietly gave back prizes to the judge. The judge quickly gave back six prizes to the women.” *Note: Some truncation might occur*.			

Section 4. 3 : Event p/f (Huffman Encoding)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.3.10		Ensure all following events are presented as in expectations in the banner and the EPG	Event Name	"Event 2 : CharacterTest123"	3.2.8		
4.3.11			Short Event Description	"THE BOY WORE A RED SHIRT. HE WAS SEEN STROLLING IN THE ZOO WHILE FEEDING THE FLAMINGOS AND DUCKLINGS. HE WAS WITH HIS FAMILY WHEN SUDDENLY AN UNPREDICTED WEATHER OCCURRED."			
4.3.12			Extended Event Description	"The boy wore a red shirt. He was seen strolling in the zoo while feeding the flamingos and ducklings. He was with his family when suddenly an unpredicted weather occurred. It started drizzling before a heavy downpour came." *Note: Some truncation might occur*.			
4.3.13	Using numerical keys, press '102' to enter service LCN102	Ensure all present event descriptions are presented as in expectations in the banner and the EPG	Event Name	"Huffman English"	3.2.8		
4.3.14	Test 3: Huffman Encoding Character. Access the banner and guide to view the present (now) event information.		Short Event Description	"This is a verification test for English Huffman Encoding. If this text appears, then the encoding is successful."			

6.4.4.4 Event Schedule (Huffman Encoding)

Section 4. 4 : Event Schedule (Huffman Encoding)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.4.1	Using numerical keys, press '101' to enter. Service LCN 101 Test 2: Huffman Encoding Character. Press the Guide button to access the EPG information	Ensure EPG is accessible.	EPG is able to be presented when Guide key is pressed.		3.2.8		
4.4.2	Select Event 3 in LCN 101.	Ensure correct Event Names, Event Description, and Event Start and End Times are presented as in expectation.	Event Name	"Event 3 : Huffman EPG 1"			
4.4.3			Short Event Description	"Zebras have many black stripes. It is said that they come from a species of the African horse family. This text should display in the EPG with Huffman Encoding implemented."			
4.4.4	Select Event 4 in LCN 101.		Event Name	"Event 4 : Huffman EPG 2"			
4.4.5			Short Event Description	"In 1987, statistics show that 43 percent of people in the world aged between 18 to 35 smoke 25 cigarettes per day. This text should display in the EPG with Huffman Encoding implemented."			

Section 4. 4 : Event Schedule (Huffman Encoding)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.4.6	Select Event 5 in LCN 101.		Event Name	"Event 5 : Huffman EPG 3"	3.2.8		
4.4.7			Short Event Description	"The boy wore a red shirt. He was seen strolling in the zoo while feeding the flamingos and ducklings. This text should display in the EPG with Huffman Encoding implemented."			

6.4.4.5 Huffman Encoding (Malay)

Section 4. 5 : Huffman Encoding (Malay)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.5.1	Play out stream MYS_CHAR_4c.ts and perform receiver auto scan method. Enter service.	Ensure all services are populated correctly as in expectation. Ensure services are accessible via numerical keys. Confirm correct service name and LCN numbering in each service.	LCN 100 Huffman Malaysia Service		3.2.8		
4.5.2	Using numerical keys, press '100' to enter service LCN 100 Test 1: Huffman Malaysia Service.	Ensure all present event descriptions are presented as in expectations in the banner and the EPG.	Event Name	"Huffman Bahasa Malaysia"			
4.5.3			Short Event Description	"Ikuti berita yang memaparkan perkembangan terkini dan semasa termasuk berita ekonomi dan kewangan. Rancangan khas khusus untuk tontonan anda persembahan daripada TV6. Berhibur dengan kumpulan muzik tempatan dengan pilihan lagu-lagu." *Note: Some truncation might occur.*			

Section 4. 5 : Huffman Encoding (Malay)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.5.4	Access the banner and guide to view the present (now) event information.		Extended Event Description	"Istimewa Bersama Zaidi Zainal yang menyampaikan lagu-lagu popularnya. Saksikan Rentak Juara 2010 Konsert Peringkat Akhir untuk hiburan semua hanya di TV6. Nikmati klip-klip video tempatan pilihan peminat yang terdiri daripada pelbagai kaum dan etnik." *Note: Some truncation might occur.*			

6.4.4.6 Huffman Encoding (ESC character)

Section 4.6 : Huffman Encoding (ESC character)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.6.1	Play out stream MYS_CHAR_4f.ts and perform Enter service.	Ensure all services are populated correctly as in expectation. Ensure services are accessible via numerical keys. Confirm correct service name and LCN numbering in each service.	LCN 100 Huffman Malaysia Service		3.2.8		
4.6.2	Using numerical keys, press '100' to enter service LCN 100	Ensure all present event descriptions are presented as in expectations in the banner and the EPG.	Event Name	"Huffman Bahasa Malaysia"	3.2.8		
4.6.3	Test 1: Huffman Malaysia Service.		Short Event Description	"RM10 adalah bersamaan dengan £2.05 atau ¥278.34"			

Section 4.6 : Huffman Encoding (ESC character)							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.6.4	Access the banner and guide to view the present (now) event information.	Ensure all following events are presented as in expectations in the banner and the EPG.	Event Name	"Huffman English"			
4.6.5	Access the following events on the banner.		Short Event Description	"RM10 adalah bersamaan dengan £2.05 atau ¥278.34"			

6.4.4.7 No Table Definition

Section 4. 7: No Table Definition							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.7.1	Play out stream MYS_CHAR_4d.ts and perform receiver auto scan method. Enter service.	Ensure all services are populated correctly as in expectation. Ensure services are accessible via numerical keys. Confirm correct service name and LCN numbering in each service.	LCN 100 Test 1: No Table Defined		3.2.8		
4.7.2	Using numerical keys, press '100' to enter service LCN 100	Ensure all present event descriptions are presented as in expectations in the banner and the EPG.	Event Name	"Event 1 : No Table Defined"	3.2.8		

Section 4. 7: No Table Definition							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.7.3	Test 1: No Character Table. Access the banner and guide to view the present (now) event information.		Short Event Description	"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789abcdefghijklmnopqrstuvwxy z.!#$%&'()*+,-./:;<=>?[\]^_@{|}~ ¡¢£€¥§¤‘“«←↑→↓°±²³×µ¶·÷’”»¼½¾¿ÀÁÂ ÃĀĂÄÅĄ—¹®©™♪¬¦⅛⅝⅞ΩÆĐªĦIJŁŁØ Œº ÞŦŊŉĸæđðħıijłøœßþŧŋ"	3.2.8		

6.4.4.8 Latin Table 05 - ISO-8859-9

Section 4. 8: Latin Table 05 - ISO-8859-9							
No.	Test instructions	Checkpoints	Expectations		Ref.	Result	Remarks
4.8.1	Play out stream MYS_CHAR_4e.ts and perform receiver auto scan method. Enter service.	Ensure all services are populated correctly as in expectation. Ensure services are accessible via numerical keys. Confirm correct service name and LCN numbering in each service	LCN 100 Test 1: Character Table 05 (ISO-8859-9)		3.2.8		
4.8.2	Using numerical keys, press '100' to enter service LCN 100 Test 1: Character Table 05 (ISO-8859-9). Access the banner and guide to view the present (now) event information.	Ensure all present event descriptions are presented as in expectations in the banner.	Short Event Description	"!"#$%&'()*+,./0123456789:;<=>?@ ABCDEFGHIJKLMNOPQRSTUVW XYZ[\]^_`abcdefghijklmnopqrstuvwx yz{|}~¡¢£¤¥§¨©×«¬®¯°±²³´µ¶·¸¹°»¼ ½¾¿ÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏĞÑÒÓÔ ÕÖ×ØÙÚÛÜİŞßàáâãäåæçèéêëìíîïğñ òóôõö÷øùúûüışÿ"			

6.4.4.9 Results of Character Test

Results of Character Test	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.5 Active Format Descriptor (AFD) Test

This test contains the following sections:	Test Streams :	Stream Configuration :
Section 5.1 : AFD Test *Note :* *Reference Document (Ref.): SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver.*	MYS_AFD.ts *Note :* *The Test Streams are available with the Communication and Multimedia Certification Section, SIRIM QAS International Sdn Bhd*	Modulation Type : DVB-T2 Channel Frequency : 474 MHz - 858 MHz Bandwidth : 8 MHz Cell Identifier : 0 Guard Interval : 1/128 Mode : 32K Modulation : 256 QAM

6.4.5.1 AFD

<table>
<tr><td colspan="8">Section 5.1 : AFD</td></tr>
<tr><td>No.</td><td>Test instructions</td><td>Checkpoints</td><td colspan="3">Expectations</td><td>Ref.</td><td>Result</td><td>Remarks</td></tr>
<tr><td>5.1.1</td><td>Play out stream MYS_AFD.ts and perform receiver auto scan method
Note: Configure the receiver screen setting to display the video as coded frame.</td><td>Ensure all services appear in the service list.</td><td colspan="3">LCN 100 AFD (1000)
LCN 200 AFD (1011)
LCN 300 AFD (1001)</td><td rowspan="2">3.2.3.5</td><td></td><td></td></tr>
<tr><td>5.1.2</td><td>Enter service 'AFD (1000)' by pressing 100.</td><td>Observe that the video is displayed accordingly.

Note :
For a 16:9 iDTV or STB connected to a 16:9 display, it shall follow Figure 5.1b.

For an STB connected to a 4:3 display, it shall follow Figure 5.1a</td><td>4:3 Display</td><td>16:9 Display</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Video as in Figure 5.1a shall be presented :
 

Figure 5.1a</td><td>Video as in Figure 5.1b shall be presented :
 

Figure 5.1b</td><td></td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><td colspan="8">Section 5.1 : AFD</td></tr>
<tr><td>No.</td><td>Test instructions</td><td>Checkpoints</td><td colspan="2">Expectations</td><td>Ref.</td><td>Result</td><td>Remarks</td></tr>
<tr><td>5.1.3</td><td>Enter service 'AFD (1011)' by pressing 200.</td><td>Observe that the video is displayed accordingly.

Note :
For a 16:9 iDTV or STB connected to a 16:9 display, it shall follow Figure 5.1d.

For an STB connected to a 4:3 display, it shall follow Figure 5.1c.</td><td>Video as in Figure 5.1c shall be presented :

Figure 5.1c</td><td>Video as in Figure 5.1d shall be presented :

Figure 5.1d</td><td>3.2.3.5</td><td></td><td></td></tr>
<tr><td>5.1.4</td><td>Enter service 'AFD (1001)' by pressing 300.</td><td>Observe that the video is displayed accordingly.

Note :
For a 16:9 iDTV or STB connected to a 16:9 display, it shall follow Figure 5.1f.

For an STB connected to a 4:3 display, it shall follow Figure 5.1e.</td><td>Video as in Figure 5.1e shall be presented :

Figure 5.1e</td><td>Video as in Figure 5.1f shall be presented :

Figure 5.1f</td><td>3.2.3.5</td><td></td><td></td></tr>
</table>

6.4.5.2 Results of AFD Test

Results of AFD Test	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.6 Multiple Physical Layer

<table>
<tr>
<td>This test contains the following sections :

Section 6.1 : Multiple Physical Layer Pipes

Note :
Reference Document (Ref.) : SKMM MTSFB TC T004:2013 - Specification for Digital Terrestrial Television Broadcast Service Receiver</td>
<td><u>Test Streams :</u>

MYS_MPLP_HD.ts
MYS_MPLP_SD.ts
MYS_MPLP_Radio.ts

Note :
The Test Streams are available with the Communication and Multimedia Certification Section, SIRIM QAS International Sdn Bhd</td>
<td><u>Stream Configuration :</u>

Playback Settings:

Modulation Type : DVB-T2
Guard Interval : 1/128
Channel Frequency : 474 MHz - 858 MHz
Mode : 32K
Bandwidth : 8 MHz
Modulation : 64 QAM

Recommended PLP Parameters:
<table>
<tr><td>Numbers of PLPs</td><td colspan="3">3</td></tr>
<tr><td>Stream</td><td>MYS_MPLP_HD.ts</td><td>MYS_MPLP_SD.ts</td><td>MYS_MPLP_Radio.ts</td></tr>
<tr><td>PLP ID</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>Group</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>PLP Type</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>Modulation</td><td>256 QAM</td><td>64 QAM</td><td>16 QAM</td></tr>
<tr><td>Code Rate</td><td>4/5</td><td>4/5</td><td>4/5</td></tr>
<tr><td>FEC Type</td><td>64K</td><td>64K</td><td>64K</td></tr>
<tr><td>Baseband Mode</td><td>HEM</td><td>HEM</td><td>HEM</td></tr>
<tr><td>BUFS</td><td>1,517.14</td><td>476.313</td><td>476.313</td></tr>
<tr><td>Design Delay</td><td>674.934</td><td>674.934</td><td>674.934</td></tr>
<tr><td>ISSY</td><td>Long</td><td>Long</td><td>Long</td></tr>
<tr><td>Time Interleaver type</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Time Interleaver type</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>Interleaver frame</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1st Frame</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>In band signalling</td><td>Disabled</td><td>Disabled</td><td>Disabled</td></tr>
<tr><td>Constellation Rotation</td><td>YES</td><td>YES</td><td>YES</td></tr>
<tr><td>Number of Blocks</td><td>84</td><td>28</td><td>28</td></tr>
</table>
*Note : T2Xpress file configuration setting is provided in the test stream folder as a reference setting</td>
</tr>
</table>

6.4.6.1 Multiple Physical Layer Pipes

Section 6.1 : Multiple Physical Layer Pipes					
No.	Test instructions	Expectations	Ref.	Result	Remarks
6.1.1	Ensure L1 Post Scrambling is disabled. Play out streams MYS_MPLP_HD.ts, MYS_MPLP_SD.ts, and MYS_MPLP_Radio.ts and perform receiver auto scan method.	Total of 9 services shall be visible in the service list and shall be in ascending order as below: LCN 001 MPLP HD Service 1 LCN 002 MPLP HD Service 2 LCN 003 MPLP HD Service 3 LCN 004 MPLP SD Service 1 LCN 005 MPLP SD Service 2 LCN 006 MPLP SD Service 3 LCN 007 MPLP Radio Service 1 LCN 008 MPLP Radio Service 2 LCN 009 MPLP Radio Service 3 Confirm that receiver shall be able to access to each service normally via numerical keys and service list. Enter each service and ensure video and audio components are available. For Radio service types, only audio components shall be available. *Note: This is a functional test and as such it is acceptable if artefacts are observed when the stream loops around.*	3.2.10.5 3.2.10.6		

Section 6.1 : Multiple Physical Layer Pipes					
No.	Test instructions	Expectations	Ref.	Result	Remarks
6.1.2	Ensure L1 Post Scrambling is enabled. Play out streams MYS_MPLP_HD.ts, MYS_MPLP_SD.ts, and MYS_MPLP_Radio.ts and perform receiver auto scan method.	Total of 9 services shall be visible in the service list and shall be an ascending order as below: LCN 001 MPLP HD Service 1 LCN 002 MPLP HD Service 2 LCN 003 MPLP HD Service 3 LCN 004 MPLP SD Service 1 LCN 005 MPLP SD Service 2 LCN 006 MPLP SD Service 3 LCN 007 MPLP Radio Service 1 LCN 008 MPLP Radio Service 2 LCN 009 MPLP Radio Service 3 Confirm that receiver shall be able to access to each service normally via numerical keys and service list. Enter each service and ensure video and audio components are available. For Radio service types, only audio components shall be available. *Note : This is a functional test and as such it is acceptable if artefacts are observed when the stream loops around*	3.2.10.5 3.2.10.6		

6.4.6.2 Results of Multiple-PLP Test

Results of Multiple-PLP Test	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.7 Self Declaration

This section is to declare that this receiver confirms to the Malaysia Specification for the following.

No	Section	Section name	Result
7.1	3.2.4	Decoding of Audio	
7.2	3.2.5	Display of Subtitles	
7.3	3.2.15	Outputs	
7.4	3.2.16	Remote Control	
7.5	3.2.17	Maintenance & Upgrade: Summary	

6.4.7.1 Results of Declaration

Results of Declaration	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

6.4.7.2 Notes - T2Xpress Settings

Number of PLPs	3		
Stream	MYS_MPLP_HD.ts	MYS_MPLP_SD.ts	MYS_MPLP_Radio.ts
PLP ID	0	1	2
Group	1	1	1
PLP Type	2	2	2
Modulation	256 QAM	64 QAM	16 QAM
Code Rate	4/5	4/5	4/5
FEC Type	64K	64K	64K
Baseband Mode	HEM	HEM	HEM
BUFS	1,517.14	476.313	476.313
Design Delay	674.934	674.934	674.934
ISSY	Long	Long	Long
Time interleaver type	0	0	0
Time interleaver length	3	3	3
Interleaver frame	1	1	1
1st Frame	0	0	0
In band signalling	Disabled	Disabled	Disabled
Constellation Rotation	YES	YES	YES
Number of Blocks	84	28	28

7. Malaysia (MYS) SI/PSI Test Requirement

This document contains the general Test Requirements derived from the Malaysian Specification and covers all the mandatory test items that are required in the test suite. This document is categorized into multiple sections covering test elements which are mandated in the Specification.

7.1 Frequency Range

Sec	Category	Purpose and Outcome	Ref	Classification
1	Frequency Range			
	1.1 Channel Bandwidth	Purpose : To ensure the channels are captured within the frequency range specified in the Malaysia Specification, as defined below: Bandwidth : 7 MHz VHF III : 174 - 230 MHz Bandwidth : 8 MHz UHF IV & V : 470 - 860 MHz Outcome : When tuning is performed, receiver shall be able to capture all the services correctly with the above configuration.	3.2.10.4	Mandatory
	1.2 Operating Modes	Purpose: To ensure the operating modes in the Malaysia Specification are fulfilled. (These include MPLP and L1 Post Scrambling functionalities.) Outcome : When tuning is performed, receiver shall be able to capture all the services signalled with the parameters set as in the Malaysia Specification.	3.2.10.5 3.2.10.6	Mandatory

7.2 Service Installation

Sec	Category	Purpose and Outcome	Ref	Classification
2	Service Installation			
	2.1 Automatic Tuning	Purpose: To ensure receiver is able to perform automatic tuning and installed all the services. Outcome: Captured services are successfully presented in the service list.	3.2.11.1	Mandatory

7.3 Video Decoding

Sec	Category	Purpose and Outcome	Ref	Classification
3	Video Decoding			
	3.1 Video Resolution, Video Aspect ratio and Profile	Purpose: To ensure that the receiver shall support and display video resolution, aspect ratio and profile as below: 1080i/25Hz; 16:9 ; AVC HP@L4 720p/50Hz; 16:9 ; AVC HP@L4 576i/25Hz; 4:3 & 16:9 ; AVC MP@L3 Outcome: The receiver shall correctly present the video component in the supported resolutions as specified above.	3.2.3 3.2.3.1 3.2.3.2	Mandatory
	3.2 Active Format Description (AFD)	Purpose: To ensure Active Format Description (AFD) is supported as mentioned in the Malaysia Specification. General Outcome: Receiver shall be able to process the AFD information and display the correct AFD.	3.2.3.5	Mandatory

7.4 Audio Decoding

Sec	Category	Purpose and Outcome	Ref	Classification
4	Audio Decoding			
	4.1 Audio Formats	Purpose: To ensure that the receivers are able to support the following audio requirements as defined in the Malaysia Specification: MPEG-4 HE-AAC v2L2 (Stereo) MPEG-4 HE-AAC multi-channel Outcome: The audio formats as defined above shall be decoded correctly by the receiver.	3.2.4 3.2.4.1	Mandatory

7.5 Subtitling

Sec	Category	Purpose and Outcome	Ref	Classification
5	Subtitling			
	5.1 Subtitle Support	Purpose: To ensure the receiver is able to decode DVB subtitles according to the Malaysia Specification. Outcome: The receiver shall be able to display the subtitles correctly as signalled in the stream.	3.2.5	Mandatory

7.6 Time and Data Information

Sec	Category	Purpose and Outcome	Ref	Classification
6	Time and Data Information			
	6.1 Time and Date Information	Purpose : To ensure receiver shall display the time and date information carried in the relevant SI tables. Outcome : The receiver shall be able to display the information on the screen correctly.	3.2.13	Mandatory

7.7 EIT Presentation

Sec	Category	Purpose and Outcome	Ref	Classification
7	EIT Presentation			
	7.1 Event Information (Present and Following)	Purpose: To ensure that the receiver is able to present the event Information based on the EIT p/f tables as mentioned in the Malaysia Specification. Outcome: The receiver shall display the content of the event Information correctly in the 'Now/Next' screen guide.	3.2.12 3.2.12.1	Mandatory
	7.2 Event Schedule	Purpose : To ensure the receiver is able to display 7 days of EPG information Outcome: The event schedule presented for 7 days contains complete information.	3.2.12.2	Mandatory

Sec	Category	Purpose and Outcome	Ref	Classification
7	EIT Presentation			
	7.3 Character Transmission	Purpose : To ensure the receiver is able to support the Character Sets specified in Malaysia Specification. Outcome : The receiver is able to display the correct characters signalled in the PSI tables which are related to the character transmission.	3.2.8	Mandatory

7.8 Audio and Subtitle Language Support

Sec	Category	Purpose and Outcome	Ref	Classification
8	Audio and Subtitle Language Support			
	8.1 Multiple Subtitle Language Support	Purpose: To ensure the receiver is able to support multiple subtitles within the same service. Outcome: The receiver shall be able to present the correct subtitle languages according to user settings.	3.2.6	Mandatory
	8.2 Multiple Audio Language Support	Purpose : To ensure the receiver is able to support multiple audio languages within the same service. Outcome : The receiver shall be able to present the correct audio languages according to user settings.	3.2.6	Mandatory

7.9 Logical Channel Numbering

Sec	Category	Purpose and Outcome	Ref	Classification
9	Logical Channel Numbering			
	9.1 LCN Version 1	Purpose: To ensure receivers are able to process the LCN Version 1 descriptor. Outcome: The receiver shall be able to solve duplicate and conflicted LCN conditions and access hidden services via numerical keys with the usage of the LCN Version 1 descriptor.	3.2.11.2 3.2.11.4 3.2.19	Mandatory

Sec	Category	Purpose and Outcome	Ref	Classification
9	Logical Channel Numbering			
	9.2 LCN Version 2	Purpose: To ensure receivers are able to process the LCN Version 2 descriptor. Outcome: The receiver shall be able to solve duplicate and conflicted LCN conditions, access hidden services via numerical keys, and select preferred channel list with the usage of the LCN Version 2 descriptor.	3.2.11.3 3.2.11.4 3.2.19	Mandatory
	9.3 Regional Broadcast Management	Purpose: To ensure receivers are able to collate all channel lists and the services are presented based on preferred channel list. Outcome: Services with correct logical channel number are presented.	3.2.11.5 3.2.19	Mandatory

7.10 Network Evolution

Sec	Category	Purpose and Outcome	Ref	Classification
10	Network Evolution			
	10.1 Service Addition/ Deletion	Purpose: To ensure receiver is able to perform service addition and deletion when network scan is performed. Outcome: The added services shall be presented in the service list. The deleted services shall not be available to user.	3.2.11.6	Mandatory
	10.2 Multiplex Reconfiguration	Purpose: To ensure the receiver shall automatically detect configuration changes to the network, such as addition of new multiplexes. Outcome: Services from newly added multiplex shall populate the service list after network scanning.	3.2.11.6	Mandatory
	10.3 Clash Resolution	Purpose: To ensure the receiver is able to behave according to the Malaysian Specification in the case of clash resolution. Outcome: The receiver shall give precedence to the service belonging to the multiplex with the best RF when as LCN Conflict is detected.	3.2.11.6	Mandatory

Sec	Category	Purpose and Outcome	Ref	Classification
10	Network Evolution			
	10.4 Event p/f Transitions	Purpose : To ensure receiver is able to perform event p/f transitions with version updates. Outcome : Receiver shall display the event p/f information according to the version updates.	3.2.12.1	Mandatory

7.11 Time Exclusive Services

Sec	Category	Purpose and Outcome	Ref	Classification
11	Time Exclusive Services			
	11.1 Transition between active and inactive state	Purpose: To ensure the receiver is able to handle transition between the active and inactive states of time exclusive service orderly. Outcome: Receiver shall present clean transition into and out of the service presentation.	3.2.2.1	Mandatory

8. Malaysia DVB-T2 Over Air Download (OAD) Test Suite Ver1.0

8.1 Revision history

No	Date	Description	Version	Remark
1	2014-06-03	First official release	v1.0	

8.2 Evaluation details

Receiver Under Test (RUT)	
RUT Device Type (iDTV/Set top box)	
RUT Firmware Version	

8.3 Evaluation Results

No.	Test Descriptions	Result	Remarks
1.	Stream with SSU matches target receiver (Valid OUI) and model tested. *Note: Higher package version*		
2.	Stream with SSU does not match target receiver (Invalid OUI).		
3.	Stream with SSU matches target receiver (Valid OUI) and but with different model tested. *Note: Higher package version*		
4.	Stream with SSU matches target receiver (Valid OUI) and model tested. *Note: Same package version*		
5.	Interruption while OAD downloading/updating		
	OVERALL RESULTS		

8.4 Test Description

Test ID	Test Description	Test Environment (TS name, etc.)	Test Procedure	Expected Behaviour	Result	Remarks
1	Stream with SSU matches target receiver (Valid OUI) and model tested. *Note: Higher package version*	Modulate TS1 *(any frequency is ok, i.e. 650MHz)*	1. Check the receiver base software version in the menu system and place receiver to the shipping condition (e.g. Factory Reset). 2. Play stream and perform installation. 3. Perform receiver mechanism to initiate OAD download (e.g. Put receiver into standby). *Note: The OAD download shall not be initiated from the system menu.*	Receiver shall be capable to download OAD data completely and update the new software version correctly.		
2	Stream with SSU does not match target receiver (Invalid OUI).	Modulate TS2 *(any frequency is ok, i.e. 650MHz)*	1. Check the receiver base software version in the menu system and place receiver to the shipping condition (e.g. Factory Reset). 2. Play stream and perform installation. 3. Perform receiver mechanism to initiate OAD download (e.g. Put receiver into standby). *Note: The OAD download shall not be initiated from the system menu.*	Receiver shall not detect any OAD data and prompt any software update notification Software version in receiver system menu shall remain the same.		
3	Stream with SSU matches target receiver (Valid OUI) and but with different model tested. *Note: Higher package version*	Modulate TS3 (any frequency is ok, i.e. 650MHz)	1. Check the receiver base software version in the menu system and place receiver to the shipping condition (e.g. Factory Reset). 2. Play stream and perform installation. 3. Perform receiver mechanism to initiate OAD download (e.g. Put receiver into standby). *Note: The OAD download shall not be initiated from the system menu*.	Receiver shall not detect any OAD data and prompt any software update notification. Software version in receiver system menu shall remain the same.		

Test ID	Test Description	Test Environment (TS name, etc.)	Test Procedure	Expected Behaviour	Result	Remarks
4	Stream with SSU matches target receiver (Valid OUI) and model tested. *Note:* *Same package version*	Modulate TS4 (any frequency is ok, i.e. 650MHz)	1. Check the receiver base software version in the menu system and place receiver to the shipping condition (e.g. Factory Reset). 2. Play stream and perform installation. 3. Perform receiver mechanism to initiate OAD download (e.g. Put receiver into standby).	Receiver shall not detect any OAD data and prompt any software update notification. Software version in receiver system menu shall remain the same.		
5	Interruption while OAD downloading/updating i.e. unplug power cord *Note:* *Stream with SSU matches target receiver (Valid OUI) and model with higher package version tested.*	Modulate TS1 *(any frequency is ok, i.e. 650MHz)*	1. Check the receiver base software version in the menu system and place receiver to the shipping condition (e.g. Factory Reset). 2. Play stream and perform installation. 3. Perform receiver mechanism to initiate OAD download (e.g. Put receiver into standby). 4. While receiver is downloading the OAD, unplug the power cord of the receiver. 5. Then, plug in the power cord again and confirm the receiver is operational. 6. Perform receiver mechanism to initiate OAD download (e.g. put receiver into standby). *Note: The OAD download shall not be initiated from the system menu.*	Receiver shall restart OAD downloading until completion and update the new software version correctly.		

8.5 Results of OAD Test

Results of OAD Test:	
Number of Passes	
Number of Fails	
Number of Not Tested	
Total test items	

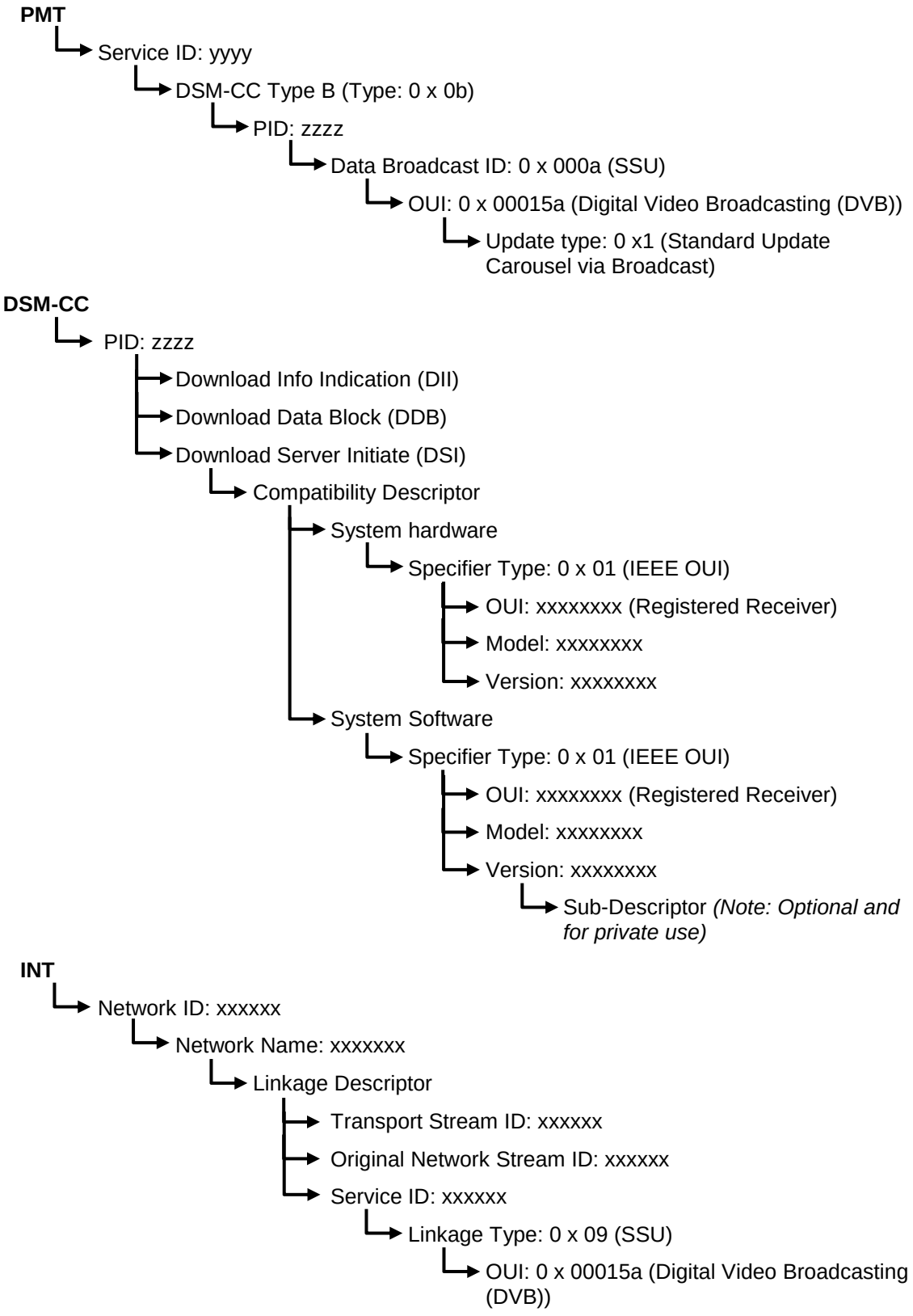
8.6 Test Environment

No	Name	TS Description
1	TS1	1. TS1 contains valid target receiver OUI in PMT and the OAD data for the target receiver in DSM-CC. 2. OAD data includes higher package version than the base version.
3	TS3	1. TS3 contains invalid OUI, which does not match the target receiver and model type. 2. OAD data includes higher package version than the base version.
4	TS4	1. TS4 contains valid OUI, which matches the target receiver but does not match the model type. 2. OAD data includes higher package version than the base version.
5	TS4	1. TS5 includes valid OUI which matches the target receiver and model type. 2. OAD data includes same package version than the base version.

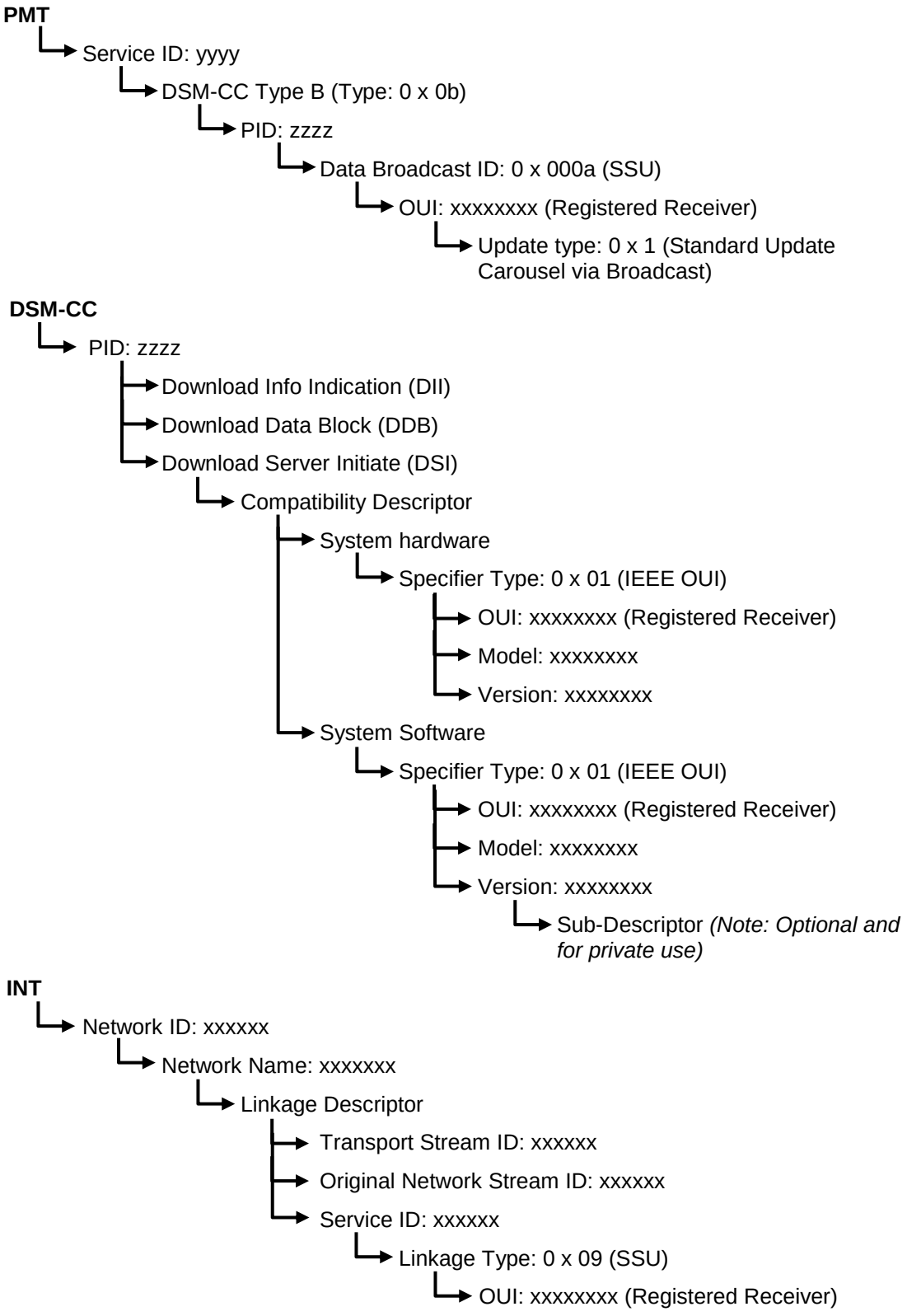
Note: It is the responsibility of each manufacturer to create their own transport streams.

8.7 Transport Stream Structure

8.7.1 Transport Stream (option 1)



8.7.2 Transport Stream (option 2)



9. Malaysia Hybrid Broadcast TV (HBBTV) Test Suite Ver1.0

9.1 Revision history

No	Date	Description	Version	Remark
1	2014-06-03	First official release	v1.0	

9.2 Evaluation details

Receiver Under Test (RUT)	
RUT Device Type (iDTV/Set top box)	
RUT Firmware Version	

9.3 Evaluation results

No	Test Suite	Test Case	Passed	Failed	Not Tested	Remark
1.0	HbbTV 0.9					
2.0	DASH					
3.0	Recording					
4.0	Marlin DRM					
5.0	EIT					
6.0	References					

9.4 Test Suite

9.4.1 HbbTV 0.9

No	Test Case	Title	Result	Remark
1	00000020	Test for running PRESENT application after service selection (Service Bound)		
2	00000030	Test for running AUTOSTART application after service selection (Not Service Bound)		
3	00000040	Test for running PRESENT application after service selection (Not Service Bound)		
4	00000050	Test for running DISABLED application after service selection (Not Service Bound)		
5	00000060	Test for KILLED application after service selection (Not Service Bound)		
6	00000070	Test for NOT SIGNALLED application after service selection (Not Service Bound)		
7	00000110	AIT changes while no broadcast related application is running, AUTOSTART application from DSMCC signalled, part 1		
8	00000130	Service selection with AUTOSTART application from broadband, part 1 (success)		

No	Test Case	Title	Result	Remark
9	00000160	AIT changes while no broadcast related application is running, multiple AUTOSTART applications signalled, broadband and broadcast, part 1		
10	00000170	AIT changes while no broadcast related application is running, multiple AUTOSTART applications signalled, broadband and broadcast, part 2		
11	00000190	AIT changes while no broadcast related application is running, multiple AUTOSTART applications signalled, broadband, part 1		
12	00000200	AIT changes while no broadcast related application is running, multiple AUTOSTART applications, broadband signalled, part 2		
13	00000210	AIT changes while no broadcast related application is running, AUTOSTART application signalled on broadband and broadcast, part 1		
14	00000220	AIT changes while no broadcast related application is running, AUTOSTART application signalled on broadband and broadcast, part 2		
15	00000240	AIT changes while no broadcast related application is running, AUTOSTART application signalled on broadcast (higher priority) and broadband, part 1		
16	00000250	AIT changes while no broadcast related application is running, AUTOSTART application signalled on broadcast (higher prio) and broadband, part 2 (failure)		
17	00000260	AIT update with no AUTOSTART applications, broadband and broadcast, part 3		
18	00000270	AIT changes while broadcast related application is running, application still signalled		
19	00000280	AIT changes while broadcast related application is running, application signalled with KILL		
20	00000290	AIT changes while broadcast related application is running, application not signalled		
21	00000300	AIT changes while no broadcast related application is running, AUTOSTART application from HTTP signalled		
22	00000310	Application exits		
23	00000320	Triggering Channel Change Succeeded Event when transitioning from Broadcast Related to Broadcast Independent state		
24	00000330	Broadcast Independent Applications created from an HTML page accessed over HTTP		
25	00000340	A broadcast-independent application transitioning to a broadcast-related application shall not be killed if all specified conditions are met		
26	00000350	A broadcast-independent application transitioning to a broadcast-related application shall be killed if the first of the specified conditions are not met		

No	Test Case	Title	Result	Remark
27	00000360	A broadcast-independent application transitioning to a broadcast-related application shall be killed if the second of the specified conditions are not met		
28	00000370	A broadcast-independent application transitioning to a broadcast-related application shall be killed if the third of the specified conditions are not met		
29	00000380	A broadcast-independent application transitioning to a broadcast-related application shall be killed if the fourth of the specified conditions are not met		
30	00000400	Broadcast Independent Applications created from an XML AIT over HTTP and with no boundary defined		
31	00000440	Broadcast Independent Applications started from a Broadcast Related application		
32	00000450	Transition of an Application from Broadcast Related to Broadcast Independent state using Set Channel		
33	00000460	A broadcast-independent application transitioning to a broadcast-related application shall be killed if the fifth of the specified conditions are not met		
34	00000570	User input - VK_BACK		
35	00000580	User input - VK_0		
36	00000590	User input - VK_1		
37	00000600	User input - VK_2		
38	00000610	User input - VK_3		
39	00000620	User input - VK_4		
40	00000630	User input - VK_REWIND		
41	00000640	User input - VK_RED		
42	00000650	User input - VK_GREEN		
43	00000660	User input - VK_YELLOW		
44	00000670	User input - VK_BLUE		
45	00000680	User input - VK_UP		
46	00000690	User input - VK_DOWN		
47	00000700	User input - VK_LEFT		
48	00000710	User input - VK_RIGHT		
49	00000720	User input - VK_ENTER		
50	00000730	User input - VK_5		
51	00000740	User input - VK_6		
52	00000750	User input - VK_7		
53	00000760	User input - VK_8		
54	00000770	User input - VK_9		
55	00000780	User input - VK_STOP		
56	00000790	User input - VK_PLAY		
57	00000800	User input - VK_PAUSE		

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No	Test Case	Title	Result	Remark
58	00000810	User input - VK_PLAY_PAUSE		
59	00000820	User input - VK_FAST_FWD		
60	00000830	User input - CSS3 directional focus navigation - VK_UP		
61	00000840	User input - CSS3 directional focus navigation - VK_DOWN		
62	00000850	User input - CSS3 directional focus navigation - VK_LEFT		
63	00000860	User input - CSS3 directional focus navigation - VK_RIGHT		
64	00000910	User input - Javascript navigation - VK_UP		
65	00000920	User input - Javascript navigation - VK_DOWN		
66	00000930	User input - Javascript navigation - VK_LEFT		
67	00000940	User input - Javascript navigation - VK_RIGHT		
68	00000950	User input - Navigation priority - VK_RIGHT		
69	00000960	User input - Navigation priority - VK_UP		
70	00000970	User input - Navigation priority - VK_DOWN		
71	00000980	User input - Navigation priority - VK_LEFT		
72	00000990	Access to resources inside the boundary of an application loaded from carousel		
73	00001000	Loading a document outside the boundary of an application loaded via HTTP		
74	00001010	Loading a document from outside the application boundary including a document from within the application domain		
75	00001020	Access to resources within the Application domain via XMLHttpRequest		
76	00001030	Access to resources outside the application domain via XmlHttpRequest		
77	00001040	Access to "trusted" API from within an iframe loaded from inside the application domain		
78	00001050	Block access to trusted API from document outside the application domain		
79	00001060	Access to trusted APIs from a document inside the application boundary of a trusted application loaded via HTTP		
80	00001150	Access to trusted API from a document outside the application domain (app loaded via HTTP)		
81	00001160	Access to trusted API from a document outside the application domain (app loaded via carousel)		
82	00001170	Access to trusted API from a document inside the application domain (app loaded via carousel)		
83	00001180	Access to carousel via XMLHttpRequest (app loaded via carousel)		

No	Test Case	Title	Result	Remark
84	00001190	Access to resources outside the application domain via XMLHttpRequest		
85	00001200	Access to trusted API from a document inside the application domain (app loaded via carousel)		
86	00001210	Blocking access to trusted API from a document outside the application domain (app loaded via carousel)		
87	00001410	Status value is 404 when trying to access non-existing DSM-CC objects with XMLHttpRequest		
88	00001420	When accessing DSM-CC objects with XMLHttpRequest, statusText will return an empty string		
89	00001450	Calls to getAllResponseHeaders() return an empty string when accessing DSM-CC objects with XMLHttpRequest		
90	00001460	When accessing a DSM-CC File object with XMLHttpRequest, responseText returns the content of the requested file		
91	00001470	When accessing a DSM-CC Directory object with XMLHttpRequest, responseText returns a comma-separated list of objects in the directory		
92	00001480	When accessing a DSM-CC File object with ".xml" extension with XMLHttpRequest, responseXML returns an XML document object		
93	00001490	When accessing a DSM-CC Directory object with XMLHttpRequest, responseXML returns null		
94	00001500	When accessing a DSM-CC Stream Event object with XMLHttpRequest, responseXML returns null		
95	00001520	Test of minimum terminal capabilities. Supported proportional font		
96	00001530	Test of minimum terminal capabilities. Supported proportional font		
97	00001540	Test of minimum terminal capabilities. Supported proportional font		
98	00001550	Test of minimum terminal capabilities. Supported proportional font		
99	00001560	Test of minimum terminal capabilities. Supported non-proportional font		
100	00001570	Test of minimum terminal capabilities. Supported non-proportional font		
101	00001580	Test of minimum terminal capabilities. Supported non-proportional font		
102	00001680	State of a video/broadcast object when it is instantiated		
103	00001710	Change of state of a video/broadcast object when the bindToCurrentChannel() method is called while it is in the unrealized state		
104	00001720	Change of state of a video/broadcast object when the release() method is called while it is in the unrealized state		

No	Test Case	Title	Result	Remark
105	00001730	Change of state of a video/broadcast object when the stop() method is called while it is in the unrealized state		
106	00001810	Change of state of a video/broadcast object when the nextChannel() method is called while it is in the presenting state		
107	00001820	Change of state of a video/broadcast object when the prevChannel() method is called while it is in the presenting state		
108	00001830	Change of state of a video/broadcast object when the bindToCurrentChannel() method is called while it is in the presenting state		
109	00001840	Change of state of a video/broadcast object when the release() method is called while it is in the presenting state		
110	00001850	Change of state of a video/broadcast object when the stop() method is called while it is in the presenting state		
111	00001900	Change of state of a video/broadcast object when the bindToCurrentChannel() method is called while it is in the stopped state		
112	00001910	Change of state of a video/broadcast object when the release() method is called while it is in the stopped state		
113	00001920	Change of state of a video/broadcast object when the stop() method is called while it is in the stopped state		
114	00001940	video/broadcast object presentation - presenting state		
115	00001950	video/broadcast object presentation - stopped state		
116	00001970	Change of state of a video/broadcast object when the setChannel() method is called (with a null parameter) while it is in the unrealized state		
117	00002000	Change of state of a video/broadcast object when the setChannel() method is called (with a correct parameter) while it is in the presenting state		
118	00002010	Change of state of a video/broadcast object when the setChannel() method is called (with a null parameter) while it is in the presenting state		
119	00002020	Change of state of a video/broadcast object when the setChannel() method is called (with a correct parameter) while it is in the stopped state		
120	00002030	Change of state of a video/broadcast object when the setChannel() method is called (with a null parameter) while it is in the stopped state		
121	00002230	AV Object Overlap (Partial overlap of object with a higher Z index)		
122	00002240	AV Object Overlap (Partial overlap of object with a lower Z index)		
123	00002250	AV Object Overlap (Total overlap of object with a higher Z index)		

No	Test Case	Title	Result	Remark
124	00002260	AV Object Overlap (Total overlap of object with a lower Z index)		
125	00002270	AV Object Scaling (1/8; Video Res 1280x720; 16:9)		
126	00002280	AV Object Scaling (1/8; Video Res 640x720; 16:9)		
127	00002290	AV Object Scaling (1/8; Video Res 720x576; 16:9)		
128	00002300	AV Object Scaling (1/8; Video Res 352x288; 4:3)		
129	00002310	AV Object Scaling (2/13; Video Res 1280x720; 16:9)		
130	00002320	AV Object Scaling (2/13; Video Res 640x720; 16:9)		
131	00002330	AV Object Scaling (2/13; Video Res 720x576; 16:9)		
132	00002340	AV Object Scaling (2/13; Video Res 352x288; 4:3)		
133	00002350	AV Object Scaling (x2; Video Res 1280x720)		
134	00002360	AV Object Scaling (x2; Video Res 640x720)		
135	00002370	AV Object Scaling (x2; Video Res 720x576)		
136	00002380	AV Object Scaling (x2; Video Res 352x288)		
137	00002390	AV Object Scaling (1/2x1/4; Video Res 1280x720)		
138	00002400	AV Object Scaling (1/2x1/4; Video Res 640x720)		
139	00002410	AV Object Scaling (1/2x1/4; Video Res 720x576)		
140	00002420	AV Object Scaling (1/2x1/4; Video Res 352x288)		
141	00002430	Terminal stores cookies with an expiry date in persistent memory		
142	00002440	Cookies expire at the correct time		
143	00002510	Test of support for MP4 File Format streamed over HTTP; 1280x720p@25, 16:9		
144	00002520	Test of support for MP4 File Format streamed over HTTP; 352x288i@25, 4:3		
145	00002530	Test of support for MPEG-2 TS streamed over HTTP; 1280x720p@25, 16:9		
146	00002540	Test of support for MPEG-2 TS streamed over HTTP; 352x288i@25, 4:3		
147	00002590	Test of High Bitrate Streaming; MP4 File Format		
148	00002610	Test that terminal ignores any AIT signalling present in MPEG-2 TS streamed over HTTP		
149	00002630	Test of support for AVC_SD_25; 720x576p@25, 16:9		
150	00002640	Test of support for AVC_SD_25; 544x576p@25, 16:9		
151	00002650	Test of support for AVC_SD_25; 480x576p@25, 16:9		
152	00002660	Test of support for AVC_SD_25; 352x576p@25, 16:9		
153	00002670	Test of support for AVC_SD_25; 352x288p@25, 16:9		
154	00002680	Test of support for AVC_SD_25; 720x576i@25, 16:9		
155	00002690	Test of support for AVC_SD_25; 544x576i@25, 16:9		
156	00002700	Test of support for AVC_SD_25; 480x576i@25, 16:9		
157	00002710	Test of support for AVC_SD_25; 352x576i@25, 16:9		

No	Test Case	Title	Result	Remark
158	00002720	Test of support for AVC_SD_25; 352x288i@25, 16:9		
159	00002730	Test of support for AVC_SD_25; 720x576p@25, 4:3		
160	00002740	Test of support for AVC_SD_25; 544x576p@25, 4:3		
161	00002750	Test of support for AVC_SD_25; 480x576p@25, 4:3		
162	00002760	Test of support for AVC_SD_25; 352x576p@25, 4:3		
163	00002770	Test of support for AVC_SD_25; 352x288p@25, 4:3		
164	00002780	Test of support for AVC_SD_25; 720x576i@25, 4:3		
165	00002790	Test of support for AVC_SD_25; 544x576i@25, 4:3		
166	00002800	Test of support for AVC_SD_25; 480x576i@25, 4:3		
167	00002810	Test of support for AVC_SD_25; 352x576i@25, 4:3		
168	00002820	Test of support for AVC_SD_25; 352x288i@25, 4:3		
169	00002830	Test of support for AVC_HD_25; 1280x720p@25, 16:9		
170	00002840	Test of support for AVC_HD_25; 960x720p@25, 16:9		
171	00002850	Test of support for AVC_HD_25; 640x720p@25, 16:9		
172	00002860	Test of support for AVC_HD_25; 1280x720i@25, 16:9		
173	00002870	Test of support for AVC_HD_25; 960x720i@25, 16:9		
174	00002880	Test of support for AVC_HD_25; 640x720i@25, 16:9		
175	00002890	Test of support for AVC_HD_25; 1920x1080p@25, 16:9		
176	00002900	Test of support for AVC_HD_25; 1440x1080p@25, 16:9		
177	00002910	Test of support for AVC_HD_25; 1280x1080p@25, 16:9		
178	00002920	Test of support for AVC_HD_25; 960x1080p@25, 16:9		
179	00002930	Test of support for AVC_HD_25; 1920x1080i@25, 16:9		
180	00002940	Test of support for AVC_HD_25; 1440x1080i@25, 16:9		
181	00002950	Test of support for AVC_HD_25; 1280x1080i@25, 16:9		
182	00002960	Test of support for AVC_HD_25; 960x1080i@25, 16:9		
183	00002970	Test of support for AVC_HD_25; 1280x720p@50, 16:9		
184	00002980	Test of support for AVC_HD_25; 960x720p@50, 16:9		
185	00002990	Test of support for AVC_HD_25; 640x720p@50, 16:9		
186	00003000	Test of support for HE-AAC; Mono, AV Content, Streamed over HTTP		
187	00003010	Test of support for HE-AAC; Stereo, AV Content, Streamed over HTTP		
188	00003020	Test of support for HE-AAC; Multichannel, AV Content, Streamed over HTTP		
189	00003030	Test of support for AAC; Mono, AV Content, Streamed over HTTP		
190	00003040	Test of support for AAC; Stereo, AV Content, Streamed over HTTP		
191	00003050	Test of support for AAC; Multichannel, AV Content, Streamed over HTTP		

No	Test Case	Title	Result	Remark
192	00003060	Test of support for AC-3; Mono, AV Content, Streamed over HTTP		
193	00003070	Test of support for AC-3; Stereo, AV Content, Streamed over HTTP		
194	00003080	Test of support for AC-3; Multichannel, AV Content, Streamed over HTTP		
195	00003120	Test of support for HE-AAC; Mono, Audio Only (Radio) Content, Streamed over HTTP		
196	00003130	Test of support for HE-AAC; Stereo, Audio Only (Radio) Content, Streamed over HTTP		
197	00003140	Test of support for HE-AAC; Multichannel, Audio Only (Radio) Content, Streamed over HTTP		
198	00003180	Test of support for MP3; Mono, Audio Only (Radio) Content, Streamed over HTTP		
199	00003190	Test of support for MP3; Stereo, Audio Only (Radio) Content, Streamed over HTTP		
200	00003400	Test of downmixing Multichannel HE-AAC (AV Content) Streamed over HTTP		
201	00003410	Test of downmixing Multichannel AAC (AV Content) Streamed over HTTP		
202	00003420	Test of downmixing Multichannel AC-3 (AV Content) Streamed over HTTP		
203	00003460	Test of interpretation of audio metadata when downmixing Multichannel AC-3 (AV Content) Streamed over HTTP		
204	00003540	AV Object Seeking Within Buffer (MP4 Forward 5s)		
205	00003560	AV Object Seeking Outside Buffer (MP4 Forward)		
206	00003580	AV Object Seeking Outside Buffer (MP4 Backward)		
207	00003600	AV Object Seeking Within Buffer (MP4 Backward 5s)		
208	00003630	AV Streaming Tests: AV Object (Pause)		
209	00003640	AV Streaming Tests: AV Object (Stop)		
210	00003650	Test for onPlayStateChanged event when transitioning from Play to Pause		
211	00003660	Test for onPlayStateChanged event when transitioning from Play to Stop		
212	00003670	Test for onPlayStateChanged event when transitioning from Paused to Playing		
213	00003680	Test for onPlayStateChanged event when transitioning from Paused to Stop		
214	00003690	Test for onPlayStateChanged event when transitioning from Stop to Play		
215	00003700	Test for onPlayStateChanged event when transitioning from Stopped to Pause		
216	00003710	the application.privateData.currentChannel after application start		

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No	Test Case	Title	Result	Remark
217	00003730	the application.privateData.currentChannel after channel selection by application		
218	00003740	CreateApplication with parameters in URL		
219	00003750	CreateApplication with hash in URL		
220	00003760	video.currentChannel after channel selection by application		
221	00003780	video.currentChannel after application start		
222	00003790	EIT p/f		
223	00003800	Letter Gothic font rendering width		
224	00003810	Line-height CSS style		
225	00003820	Tiresias font rendering width		
226	00003830	OIPF capabilities: hasCapability()		
227	00003840	OIPF Capabilities: extra decodes		
228	00003850	OIPF Configuration: preferredAudioLanguage		
229	00003860	OIPF Configuration: preferredSubtitleLanguage		
230	00003870	OIPF Configuration: countryId		
231	00003880	StreamEvent reference DVB URL		
232	00003890	StreamEvent reference event description file		
233	00003920	Invalid video playback: A/V format		
234	00003930	Invalid video playback: cannot connect		
235	00003940	Invalid video playback: video not found		
236	00003950	Playback of video without content-range support		
237	00003960	Video playtime		
238	00003970	Video queue		
239	00003980	Seek in broadband video playback		
240	00003990	Video/mp4 keeps aspect ratio		
241	00004000	Video/broadcast keeps aspect ratio		

9.4.1.1 Results

Results	
Passed	
Failed	
Not Tested	
Total test items	

9.4.2 Dynamic Adaptive Streaming over HTTP (DASH)

No	Test Case	Title	Result	Remark
1	org.hbbtv_DA540290	Simple DASH A/V stream		

No	Test Case	Title	Result	Remark
2	org.hbbtv_DA540310	DASH A/V stream with two video representations		
3	org.hbbtv_DA541210	Support for stopping DASH encoded clear content streamed over HTTP		

9.4.2.1 Results

Results	
Passed	
Failed	
Not Tested	
Total test items	

9.4.3 Recording

No	Test Case	Title	Result	Remark
1	fr.hdforum_93463000	Recording of broadband MP4 content not permitted		
2	fr.hdforum_93463010	Recording of broadband MP2 TS content not permitted		
3	fr.hdforum_93463020	Recording of broadband MP4 DASH content not permitted		

9.4.3.1 Results

Results	
Passed	
Failed	
Not Tested	
Total test items	

9.4.4 Marlin Digital Rights Management (DRM)

No	Test Case	Title	Result	Remark
1	fr.hdforum_93440002	Verify signalling of Marlin DRM capability to HbbTV application		
2	fr.hdforum_93440102	Support of live encrypted streaming with key rotation and static MPD for Marlin Terminals		
3	fr.hdforum_93440146	Support for normal playback of DASH encoded protected content streamed over HTTP - Marlin Terminals		

9.4.4.1 Results

Results	
Passed	
Failed	
Not Tested	
Total test items	

9.4.5 Event Information Table (EIT)

No	Test Case	Title	Result	Remark
1	org.hbbtv_E1210020	EIT P/F - video/broadcast object can decode all required UTF-8 characters		
2	org.hbbtv_E1210030	EIT Schedule - MetadataSearch object can decode all required UTF-8 characters		

9.4.5.1 Results

Results	
Passed	
Failed	
Not Tested	
Total test items	

9.5 References

No	Test Case	Title	Remark
1	HbbTV 0.9	Validates products against HbbTV 1.1.1 Release by HbbTV consortium	
2	TNT 2.0	Designed to check conformance to the TNT 2.0 Terminal Specification. 1. Tests to check conformance with the HbbTV 1.2.1 profile of DASH 2. Tests to check DRM conformance for both Marlin & Microsoft PlayReady when integrated with HbbTV	
3	TDT Hibrida	This test suite comprises of test cases covering 1. Device certification validation 2. Supported Audio codecs, including 5.1 surround sound 3. Aspect ratio conformance 4. Video seeking	

Acknowledgements

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