Unified Test Specification for HDTV DVB-C and DVB-T2 digital receiver for Finnish market

Version 2.0

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1 Introduction

1.1 General

This document describes the Unified test cases for digital DVB-T2 and DVB-C receivers for the Finnish Digital Terrestrial and Cable Television market.

1.2 Version History

Version	Date	Comments
1.0	18.11.2010	1st release version
2.0	13.12.2011	PVR tasks added, Nordig PVR tasks removed.

1.3 Test categories

Test cases are divided into two main categories, tests for DVB-T2 receivers and tests for DVB-C receivers. For both receiver types the tests consists of test cases from NorDig Unified Test Specification 2.2 and additional test cases for DVB-T2 and DVB-C receivers for the Finnish Market defined in chapter 4 of this document.

2 Test cases for DVB-T2 receivers from NorDig Unified Test Specification 2.2

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Task 3:24 Performance: Maximum Receiver Signal Input Levels

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Task 3:26 Performance: Immunity to "digital" signals in Other Channels

Task 3:27 Performance: Immunity to Co-Channel Interference From Analogue TV Signals

Task 3:28 Performance: Performance in Time-Varying Channels

Task 3:29 Performance: Synchronization for varying echo power levels in SFN

Task 3:30 Performance: C/(N+I) Performance in Single Frequency Networks for more than one echo

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Task 3:35 DVB-T2: Frequencies: Signal bandwidths

Task 3:36 DVB-T2: Modes

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Task 3:44 DVB-T2: Verification of Signal Strength Indicator (SSI)

Task 3:45 DVB-T2: Verification of Signal Quality Indicator (SQI)

Task 3:46 DVB-T2: Changes In Modulation Parameters

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Task 3:48 DVB-T2: Input/Output Data Formats

Task 3:49 DVB-T2: Performance: BER vs C/N verification

Task 3:50 DVB-T2: Performance: C/N performance on Gaussian channel

Task 3:51 DVB-T2: Performance: C/N performance on 0dB echo channel

Task 3:52 DVB-T2: Performance: Minimum receiver signal input levels on Gaussian channel

Task 3:53 DVB-T2: Performance: Minimum IRD Signal Input Levels on 0dB echo channel

Task 3:54 DVB-T2: Performance: Receiver noise figure on Gaussian channel

Task 3:55 DVB-T2: Performance: Maximum Receiver Signal Input Levels

Task 3:56 DVB-T2: Performance: Immunity to "digital" signals in Other Channels

Task 3:57 DVB-T2: Performance: Immunity to Co-Channel Interference From Analogue TV Signals

Task 3:58 DVB-T2: Performance: Performance in Time-Varying Channels

Task 3:59 DVB-T2: Performance: Synchronisation for varying echo power levels in SFN

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Task 5:11 16:9 displayed on 4:3 monitors

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Task 5:14 Luminance resolution

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Task 5:39 M4 Level - Audio format support - E-AC3 with HDMI output interface

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Task 6:2 SSU end user functionality

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Task 8:26 Quasi static update of service list - service addition

Task 8:27 Quasi static update of service list - non-visible data service addition

Task 8:28 Quasi static update of service list - services moved between different transport streams

Task 8:29 Quasi static update of service list - service remove

Task 8:30 Update of service list from NIT_actual for non-existing multiplexers

Task 8:31 Update of service list from NIT_actual for removing a multiplex

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Task 8:39 Dynamic update of EIT actual/other p/f

Task 8:41 Dynamic update of EIT actual/other p/f short_event_descriptor, extended_event_descriptor and content_descriptor

Task 8:42 Dynamic update of EIT actual/other p/f content descriptor and component_descriptor

Task 8:43 Dynamic update of EIT actual/other p/f parental_rating_descriptor

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Task 11:1 Stored preferences

Task 11:2 Deletion of service lists

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Task 12:5 File system intact after update

Task 12:6 Limitations in recorded content - no extraction

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Task 12:20 Accurate Recording - EIT information missing

Task 12:21 Accurate Recording - EIT update in stand-by

Task 12:23 Back-to-back recordings - Static EIT information

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Task 12:25 Timeshift recording

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Task 12:28 One Touch Recording (OTR)

Task 12:31 Maximum length of recordings

Task 12:32 Basic recording/playback functions

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2.9 Common Interface

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3 Test cases for DVB-C receivers from NorDig Unified Test specification 2.2

3.1 Cable Tuner and Demodulator

Task 2:1 General

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3.2 MPEG-2 demultiplexer and Video/Audio decoder

Task 5:3 Maximum transport stream data rate

Task 5:4 Number of elementary streams

Task 5:6 Variable Bitrate Elementary Streams

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Task 5:31 M4 Level - Dynamic changes in video stream

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Task 6:1 IRD System software update using DVB SSU simple profile

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3.4 Interfaces, signal levels and performance

Task 7:2 SCART Interface

Task 7:3 Video performance

Task 7:4 Audio performance

Task 7:5 Zapping time

Task 7:7 M4 Level - HDMI interface - EDID information

Task 7:8 M4 Level - HDMI interface - Original format

Task 7:9 M4 Level - HDMI - Manual setting for resolution

Task 7:10 M4 Level - HDMI - Signal protection

Task 7:11 M4 Level - Analogue video interface (Option)

Task 7:12 Smart Card Interface

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Task 8:13 Service list - NIT_actual network_ID

Task 8:16 Service list - Simultaneous transmission of LCD v1 and v2

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Task 12:28 One Touch Recording (OTR)

Task 12:31 Maximum length of recordings

Task 12:32 Basic recording/playback functions

Task 12:34 Dynamic updating of PSI/SI tables while recording

Task 12:35 M4 Level - Dynamic changes in video stream while recording

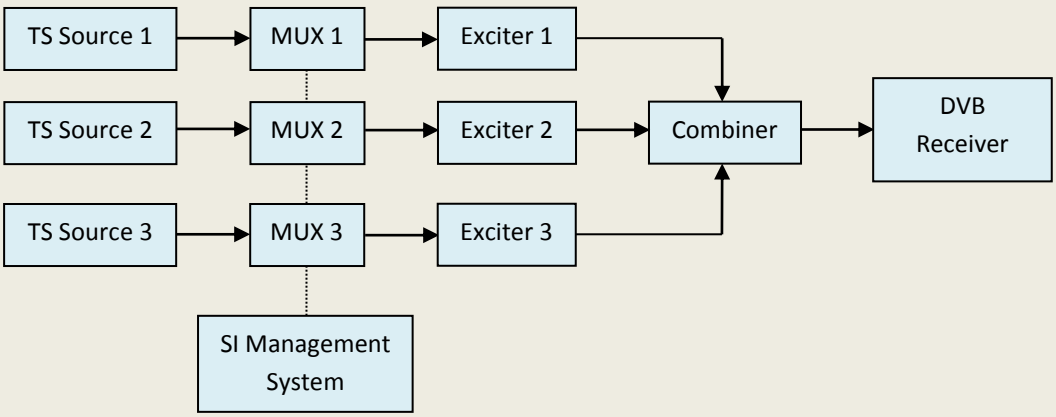
3.9 Common Interface

Task 13:1 Use of Common Interface

4 Additional test cases for DVB-T2 and for DVB-C receivers for the Finnish market

Additional tests are divided into three categories. Category A are test cases for DVB-T2 receivers only, category B test cases are for DVB-C receivers only and category C test cases are performed for both type of receivers.

Test Case	**A1. Automatic installation of different DVB-T and DVB-T2 networks.**
Section	Unified Requirements for Finnish Market, Chapter 6.2.1 and 6.2.3
Requirement	The operators may send the same ONID, SID and TSID for the same service with different LCN number and the IRD shall install the services as many times as they are in signaled in the NIT table. The Finnish DVB-T2 networks' channel list name shall not be visible, because Finnish DVB-T2 network have several independent networks and selection of the channel list name is obsolete.
Test Procedure	**Purpose of test:** To verify that the IRD is able to install the service list correctly. **Equipment:**



Transmitter	Service 1	Service 2	Service 3	Service 4	Frequency
MUX 1 TS_ID 1 N_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 S_Type 0x19 PMT PID 1100 V PID 1109 A PID 1108 LCD 4, LCD 301	SID 1200 S_Name Test12 S_Type 0x19 PMT PID 1200 V PID 1209 A PID 1208 LCD 6, LCD 302	SID 1300 S_Name Test13 S_Type 0x1 PMT PID 1300 V PID 1309 A PID 1308 LCD 7, LCD 303		Can be chosen depending of the distribution media.
MUX 2 TS_ID 2 N_ID 2 ON_ID [1)]	SID 2100 S_Name Test21 S_Type 0x1 PMT PID 2100 V PID 2109 A PID 2108 LCD 1	SID 2200 S_Name Test22 S_Type 0x1 PMT PID 2200 V PID 2209 A PID 2208 LCD 3	SID 2300 S_Name Test23 S_Type 0x1 PMT PID 2300 V PID 2309 A PID 2308 LCD 9	SID 2400 S_Name Test24 S_Type 0x2 PMT PID 2400 A PID 2408 LCD 3	Can be chosen depending of the distribution media. Not same as Exciter 1 or Exciter 3.
MUX 3 TS_ID 3 N_ID 3 ON_ID [1)]	SID 3100 S_Name Test31 S_Type 0x19 PMT PID 3100 V PID 3109 A PID 3108 LCD 5, LCD 201	SID 3200 S_Name Test32 S_Type 0x19 PMT PID 3200 V PID 3209 A PID 3208 LCD 8, LCD 202	SID 3300 S_Name Test33 S_Type 0x1 PMT PID 3300 V PID 3309 A PID 3308 LCD 12, LCD	SID 3400 S_Name Test34 S_Type 0x2 PMT PID 3400 A PID 3408 LCD 2, LCD 204	Can be chosen depending of the distribution media. Not same as

				203		Exciter 1 or Exciter 2.

[1)] ON_id (Original_network_id) is 0x20F6 (Finland)

Test Procedure:

1. Perform factory reset and automatic channel search.
2. Fill in the Measurement Record 1.

Expected Result:

IRD installs service list correctly.

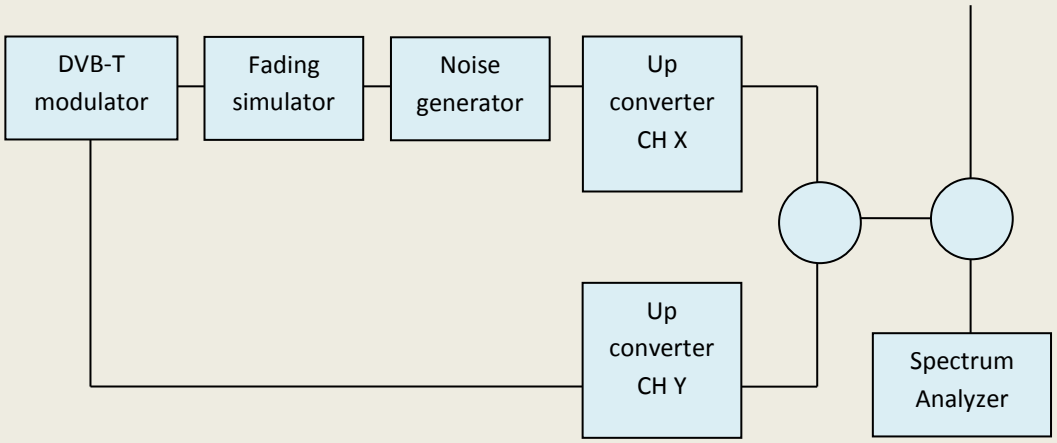
Test Result(s)

Measurement Record 1:

TV list	Radio list	OK / NOK
1 Test 21	2 Test 34	
3 Test 22	3 Test 24	
4 Test 11	204 Test 34	
5 Test 31		
6 Test 12		
7 Test 13		
8 Test 32		
9 Test 23		
12 Test 33		
201 Test 31		
202 Test 32		
203 Test 33		
301 Test 11		
302 Test 12		
303 Test 13		

Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:		
Date		**Sign**	

Test Case	**A2. Manual scanning in MFN networks**
Section	Unified Requirements for Finnish Market, Chapter 6.2.2
Requirement	In addition to the automatic search, it shall be possible to perform a manual search where the channel id(or frequency) is entered by the end user. Code rate, constellation and guard interval shall be detected automatically. By manual scan user shall be able to add only multiplexes user wants to the channel list. When manual scan is used, automatic service list updates and best service selection shall be set to 'disabled', which means that no SI changes shall be detected. In case IRD has a menu item manual scan available, existing service list shall not be deleted at any time manual scan is launched.
Test Procedure	**Purpose of test:** To verify that best service selection and stand-by scan are disabled after manual channel search. **Equipment:** TS Source 1 → DVB –T Receiver



Transmitter	Service 1	Service 2	Service 3	Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109 A PID 1108 LCD 1	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209 A PID 1208 LCD 2	SID 1300 S_Name Test13 PMT PID 1300 V PID 1309 A PID 1308 LCD 3	MUX1 is broadcasted on frequencies X and Y which can be chosen depending on the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Channels X and Y shall not be equal. If the transport stream NIT_actual contains terrestrial_delivery_system_descriptor, X and Y must not match with it.

Relative signal levels may be observed with a spectrum analyzer.

Test Procedure:

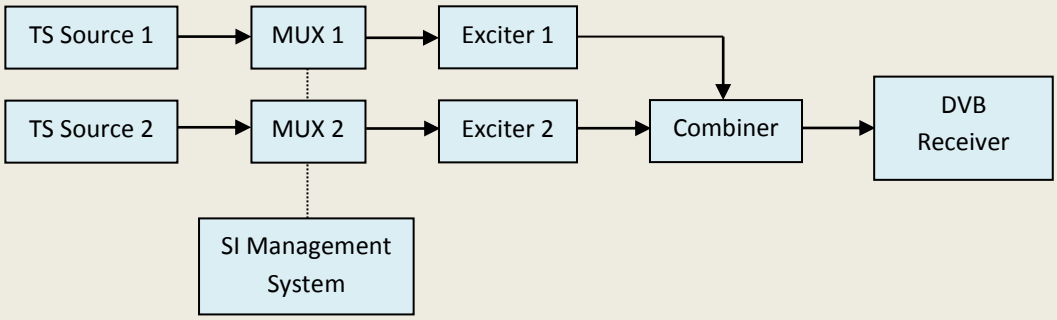
1. Broadcast MUX1 on two different carriers CH X and CH Y.
2. Set signal level of both carriers CH X and CH Y to the same level. The signal level shall match up to good reception quality (no errors in decoded video).
3. Perform a factory reset and manual installation of CH X.
4. Verify that service list contains the services from MUX1 and they are receivable.
5. Decrease the signal quality of CH X until QMP1 is fulfilled.
6. Turn off the IRD.
7. Make sure that no automatic service list update is initiated.
8. Turn on the IRD.
9. Verify that the channel list still contains channels from MUX1 and they are being received from transmitter on CH X.

Expected Result:
IRD shall not utilize best service selection if manual scanning has been used for tuning.

Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major	☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			

Date		Sign	

Test Case	**A3. Quasi-static update of service list from NIT_actual for changing center frequency of a multiplex**
Section	Unified Requirements for Finnish Market, Chapter 8
Requirement	Channel list updates are triggered by the changes in NIT and/or SDT actual tables. Changes in the SI Signaling can be detected by a table version number change. Since there are several networks available, the IRD shall be able to store version number information about SI tables by network basis. When NIT version change is detected from any Finnish network available, all other receivable networks shall also be scanned for network changes.
Test Procedure	**Purpose of test:** To verify that the IRD is able to update the service list automatically. **Equipment:**



Transmitter	Service 1	Service 2	Service 3	Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109 A PID 1108 LCD 1	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209 A PID 1208 LCD 2	SID 1300 S_Name Test13 PMT PID 1300 V PID 1309 A PID 1308 LCD 3	Can be chosen depending of the distribution media.
MUX 2 TS_ID 2 Network_ID 1 ON_ID [1)]	SID 2100 S_Name Test21 PMT PID 2100 V PID 2109 A PID 2108 LCD 4	SID 2200 S_Name Test22 PMT PID 2200 V PID 2209 A PID 2208 LCD 5	SID 2300 S_Name Test23 PMT PID 2300 V PID 2309 A PID 2308 LCD 6	Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Test Procedure:

1. Set up the system and verify that both transport streams contains identical NIT_actual with ON_ID in operating range.
2. Do a re-installation of the IRD.
3. Verify which services IRD has in its service list (and a service from following steps is not stored in the service list.)
4. Select any service which is located in MUX 1.
5. Change the center frequency in the terrestrial_delivery_system_descriptor at NIT_actual for MUX 2.
6. Turn off the IRD if needed for automatic service list update.
7. Check, if automatic service list update is initiated.

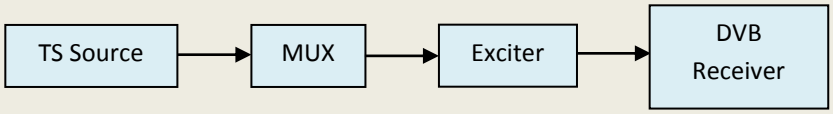
	8. Verify that services from MUX2 are still receivable. **Expected Result:** IRD shall update the service list by doing automatic service list update.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**A4. Field test – First time installation**			
Section				
Requirement	Whole frequency range from VHF III band with 7 MHz raster and UHF IV – V bands with 8 MHz raster and bandwidth shall be scanned. All digital services in the network shall be found with correct LCD numbering and are accessible.			
Test Procedure	**Purpose of test:** To verify that IRD installs all available channels in all Finnish Terrestrial Networks. **Equipment:** Use the ordinary terrestrial signal. **Test Procedure:** Perform factory reset and automatic channel search. **Expected Result:** All digital services in the network shall be found with correct LCD numbering.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

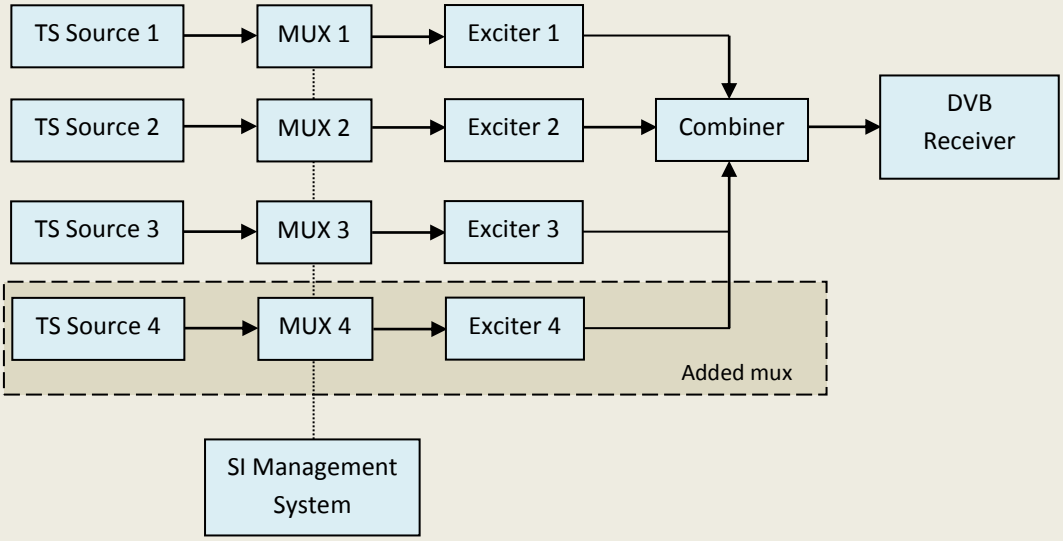
Test Case	**A5. Field test – General operation in different networks**
Section	
Requirement	IRD works fluently in all Finnish Terrestrial networks.
Test Procedure	**Purpose of test:** To verify that general use of IRD is faultless in Finnish Terrestrial Networks. **Equipment:** Use the ordinary terrestrial signal.

	Test Procedure: Perform factory reset and automatic channel search. Start viewing different services in the networks (unscrambled/scrambled). Check that DVB and teletext subtitling are displayed on services, video and audio are decoded properly, channel zapping works within specified tolerances and ESG is working. **Expected Result:** IRD does not encounter any problems on daily use.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**A6. Field test – EMM Handling**			
Section				
Requirement	IRD filters EMM packets properly in live networks.			
Test Procedure	**Purpose of test:** To verify that scrambled services are accessible without problems. **Equipment:** Use the ordinary terrestrial signal. **Test Procedure:** Make a new installation of the box. Use a valid smart card with access to all services but without valid entitlements stored in the card. When necessary, pair the smart card with the receiver or CI+ CAM module before usage. **Expected Result:** Verify that all entitlements are processed within 30 minutes.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**B1. Manual scanning**		
Section	Unified Requirements for Finnish Market, Chapter 6.3.2		
Requirement	In addition to the automatic search, it shall be possible to perform a manual search where the scanning parameters are entered by the end user. By manual scan user shall be able to add only multiplexes user wants to the channel list. When manual scan is used, automatic service list updates shall be set to 'disabled', which means that no SI changes shall be detected. In case IRD has a menu item manual scan available, existing service list shall not be deleted at any time manual scan is launched.		
Test Procedure	**Purpose of test:** To verify that SI updates are set to 'OFF' when manual scan is used. Also existing services in the service list shall not be removed when manual scan is used. **Equipment:**  **Test Procedure:** 1. Install manually one multiplex with two services. 2. Add third service to the multiplex. 3. Turn off the IRD if needed for automatic service list update. 4. Make sure that no automatic service list update is initiated. 5. Turn on the receiver and verify that only two services from the installed multiplex are available in the services list. **Expected Result:** All digital channels in the installed multiplexes are added to the channel list.		
Test Result(s)			
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:		
Date		**Sign**	

Test Case	**B2. Quasi static update of service list - handling multiple updates in service list**
Section	Unified Requirements for Finnish Market, Chapter 8
Requirement	Channel list updates are triggered by the changes in NIT and/or SDT actual tables. Changes in the SI Signaling can be detected by a table version number change. Since there are several networks available, the IRD shall be able to store version number information about SI tables by network basis. When NIT version change is detected from any Finnish network available, all other receivable networks shall also be scanned for network changes.
Test Procedure	**Purpose of test:** To check that receiver is able to handle several different simultaneous changes in SI signaling. **Equipment:**



Initial network:

Transmitter	Service 1	Service 2	Service 3	Service 4	Frequency
MUX 1 TS_ID 1 N_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 S_Type 0x1 PMT PID 1100 V PID 1109 A PID 1108 LCD 1	SID 1200 S_Name Test12 S_Type 0x1 PMT PID 1200 V PID 1209 A PID 1208 LCD 2	SID 1300 S_Name Test13 S_Type 0x1 PMT PID 1300 V PID 1309 A PID 1308 LCD 3		Can be chosen depending of the distribution media.
MUX 2 TS_ID 2 N_ID 1 ON_ID [1)]	SID 2100 S_Name Test21 S_Type 0x1 PMT PID 2100 V PID 2109 A PID 2108 LCD 5	SID 2200 S_Name Test22 S_Type 0x1 PMT PID 2200 V PID 2209 A PID 2208 LCD 7	SID 2300 S_Name Test23 S_Type 0x1 PMT PID 2300 V PID 2309 A PID 2308 LCD 8		Can be chosen depending of the distribution media. Not same as Exciter 1 or Exciter 3.
MUX 3 TS_ID 3 N_ID 1 ON_ID [1)]	SID 3100 S_Name Test31 S_Type 0x1 PMT PID 3100 V PID 3109 A PID 3108 LCD 10	SID 3200 S_Name Test32 S_Type 0x1 PMT PID 3200 V PID 3209 A PID 3208 LCD 11	SID 3300 S_Name Test33 S_Type 0x1 PMT PID 3300 V PID 3309 A PID 3308 LCD 12	SID 3400 S_Name Test34 S_Type 0x2 PMT PID 3400 A PID 3408 LCD 2	t

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Changed network:

Transmitter	Service 1	Service 2	Service 3	Service 4	Frequency
MUX 1 TS_ID 1 N_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 S_Type 0x1 PMT PID 1100 V PID 1109 A PID 1108 LCD 1	SID 2400 S_Name Test21 S_Type 0x1 PMT PID 2400 V PID 2409 A PID 2408 LCD 2	SID 1300 S_Name Test13 S_Type 0x1 PMT PID 1300 V PID 1309 A PID 1308 LCD 3		

MUX 2 TS_ID 2 N_ID 1 ON_ID [1)]	SID 1400 S_Name Test12 S_Type 0x1 PMT PID 1400 V PID 1409 A PID 1408 LCD 5	SID 2200 S_Name Test22 S_Type 0x1 PMT PID 2200 V PID 2209 A PID 2208 LCD 7	SID 3400 S_Name Test34 S_Type 0x2 PMT PID 3400 A PID 3408 LCD 2		
MUX 3 TS_ID 3 N_ID 1 ON_ID [1)]	SID 3100 S_Name Test31 S_Type 0x1 PMT PID 3100 V PID 3109 A PID 3108 LCD 10	SID 3200 S_Name Test32 S_Type 0x1 PMT PID 3200 V PID 3209 A PID 3208 LCD 11	SID 3300 S_Name Test33 S_Type 0x1 PMT PID 3300 V PID 3309 A PID 3308 LCD 12	SID 3500 S_Name Test35 S_Type 0x1 PMT PID 3500 V PID 3509 A PID 3508 LCD 9	
MUX 4 TS_ID 4 N_ID 1 ON_ID [1)]	SID 4100 S_Name Test41 S_Type 0x1 PMT PID 4100 V PID 4109 A PID 4108 LCD 6	SID 4200 S_Name Test42 S_Type 0x1 PMT PID 4200 V PID 4209 A PID 4208 LCD 13	SID 4300 S_Name Test43 S_Type 0x2 PMT PID 4300 A PID 4308 LCD 1		Can be chosen depending of the distribution media. Not same as Exciter 1, Exciter 2 or Exciter 3.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Test Procedure:

1. Perform factory reset and automatic channel search.
2. Verify that the services from MUX 1, MUX2 and MUX3 are located in service list as they are signaled.
3. Fill in the measurement record 1
4. Change SI signaling and content in multiplexes to
    a. Add new multiplex and its services (MUX4)
    b. Move service Test21 from MUX2 to MUX1 with new service_ID 2400 and LCN number 2.
    c. Move service Test12 from MUX1 to MUX2 with new service_ID 1400 and LCN number 5.
    d. Remove service Test23 from MUX2.
    e. Move service Test34 from MUX3 to MUX2.
    f. Add service Test35 to MUX3 with LCN number 9.
5. Make sure that automatic service list update is initiated.
6. Verify the services are stored at their logical numbers in the service list.
7. Fill in the measurement record 2.

Expected Result:

IRD shall update the service list by correctly after SI changes.

Test Result(s)

Measurement Record 1:

TV list	Radio list	OK / NOK
1 Test 11 2 Test 12 3 Test 13 5 Test 21 7 Test 22 8 Test 23 10 Test 31	2 Test 34	

Measurement Record 2:

TV list	Radio list	OK / NOK
1 Test 11 2 Test 21 3 Test 13 5 Test 12 6 Test 41 7 Test 22 9 Test 35	1 Test 43 2 Test 34	

	11 Test 32 12 Test33			10 Test 31 11 Test 32 12 Test 33 13 Test 42		
Conformity	☐ OK	**Fault**	☐ Major	☐ Minor, define fail reason in comments		
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:					
Date			**Sign**			

Test Case	**B3. Field test – First time installation**
Section	
Requirement	The NIT scanning shall be able to find all the available channels on the network. During the first boot sequence or any time the IRD is re-installed, it will begin scanning for the Network Information Table using the following parameters: Center frequencies: 114 MHz onwards in 8MHz steps until 858 MHz. Modulations: 64 QAM, 128 QAM and 256 QAM Symbol rates: 6.875 Msym/s and 6.900 Msym/s. The scanning shall stop as soon as a valid Network Information Table (NIT_actual) is found. After that the NIT scanning procedure will continue according to information acquired from NIT.
Test Procedure	**Purpose of test:** To verify that IRD installs all available channels in all Finnish Cable Networks. **Equipment:** Use the ordinary CATV networks in Finland (Welho, Elisa, DNA, VLP, TeliaSonera, TurkuCable). The NIT shall describe all the digital channels. **Test Procedure:** Perform factory reset and automatic channel search. **Expected Result:** All digital services in the network shall be found with correct LCD numbering.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**B4. Field test – General operation in different networks**
Section	
Requirement	IRD works fluently in all Finnish Cable networks.
Test Procedure	**Purpose of test:** To verify that general use of IRD is faultless in Finnish Cable Networks. **Equipment:** Use the ordinary CATV networks in Finland (Welho, Elisa, DNA, AnviaTV, TeliaSonera, Super Head-end Finland). **Test Procedure:** Perform factory reset and automatic channel search. Start viewing different services in the network (unscrambled/scrambled). Check that DVB and teletext subtitling are displayed on services, video and audio are decoded properly, channel zapping works within specified tolerances and ESG is working. **Expected Result:** IRD does not encounter any problems on daily use.
Test Result(s)	**Network** / **OK / NOK** Welho Elisa DNA AnviaTV TeliaSonera lumoTV
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

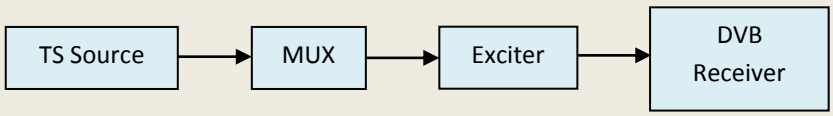
Test Case	**B5. Field test – EMM Handling**
Section	
Requirement	IRD filters EMM packets properly in live networks.
Test Procedure	**Purpose of test:** To verify that scrambled services are accessible without problems. **Equipment:** Use the ordinary CATV networks in Finland (Welho, Elisa, DNA, AnviaTV, TeliaSonera, Super Head-end Finland). **Test Procedure:** Make a new installation of the box. Use a valid smart card with access to all services but without valid entitlements stored in the card. When necessary, pair the smart card with the receiver or CI+ CAM module before usage.

	Expected Result: Verify that all entitlements are processed within 30 minutes.
Test Result(s)	

Network	OK / NOK
Welho Elisa DNA AnviaTV TeliaSonera lumoTV	

Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:		
Date		**Sign**	

Test Case	**C1. Service list requirements – Supporting service type 0x11**
Section	Unified Requirements for Finnish Market, Chapter 7
Requirement	IRD shall support service types as specified in the NorDig Unified specification [1] and additionally support TV service type 0x11, MPEG2-HD service as specified by DVB.
Test Procedure	**Purpose of test:** To verify that the IRD is supporting service type 0x11 (MPEG2-HD). **Equipment:**



Transmitter	Service 1	Service 2		Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 S_Type 0x19 PMT PID 1100 V PID 1109 A PID 1108 LCD 1	SID 1200 S_Name Test12 S_type 0x11 PMT PID 1200 V PID 1209 A PID 1208 LCD 2		Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Test Procedure:

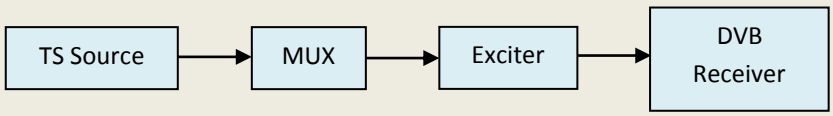
1. Perform factory reset and automatic channel search.
2. Verify that service list contains services Test11 and Test12 and both services are accessible.

Expected Result:
IRD supports service type 0x11.

Test Result(s)	

Conformity	☐ OK	Fault	☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:		
Date		Sign	

Test Case	**C2. Audio selection by audio type**
Section	Unified Requirements for Finnish Market, Chapter 5.5.2
Requirement	The Finnish broadcasters provide broadcast-mixed audio track for visually and hearing impaired people. These audio tracks are defined with audio type 0x03 (Visual impaired commentary) or type 0x02 (Hearing impaired audio) in the PMT table and may be with or without supplementary audio descriptor. These audio tracks contain broadcast-mixed sound from original audio track and hearing aids. In order to support automatic selection for this audio track, all IRDs shall have user preference available for normal audio / visual impaired commentary audio setting. The IRD shall also support supplementary_audio_descriptor as specified in ETSI EN 300 468 and ETSI TR 101 211.
Test Procedure	**Purpose of test:** To verify that the IRD is supporting audio type 0x03 properly. **Equipment:**



Transmitter	Service 1	Service 2		Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109 A PID 1108 (FIN, type 0x00) A PID 1107 (FIN, type 0x03	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209 A PID 1208 (FIN, type 0x03) A PID 1207 (ENG, type 0x00)		Can be chosen depending of the distribution media.

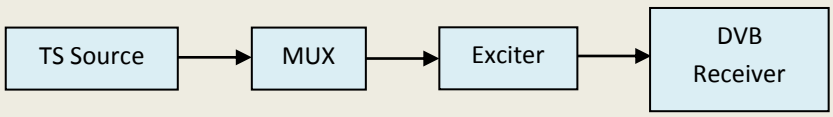
[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Test Procedure:

1. Set the primary audio selection to Finnish and secondary to Swedish.
2. Set audio type preference to “normal” audio.
3. Tune to Service 1 and verify that audio PID 1108, Finnish 0x00 audio type is selected.
4. Tune to Service 2 and verify that audio PID 1207, English 0x00 audio type is selected.
5. Set audio type preference to “visual impaired commentary”.
6. Tune to Service 1 and verify that audio PID 1107, Finnish 0x03 audio type is selected.

	7. Tune to Service 2 and verify that audio PID 1208, Finnish 0x03 audio type is selected. 8. Set primary audio selection to Swedish and secondary to Finnish. 9. Repeat procedures 2-7. **Expected Result:** IRD supports audio type 0x03.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C3. Displaying of Subtitles**
Section	Unified Requirements for Finnish Market, Chapter 11
Requirement	The IRD shall comply with teletext and subtitling as specified by the NorDig Unified specification [1]. As a clarification to the NorDig Unified specification, IRD: • Shall not automatically display subtitling in case subtitling language available does not match primary or secondary subtitling language selection. • Shall not automatically display Hard of Hearing (HoH) DVB subtitle, when HoH subtitle is not enabled from the menu
Test Procedure	**Purpose of test:** To verify that the IRD is displaying subtitling by default but only when matching to menu selections. **Equipment:**



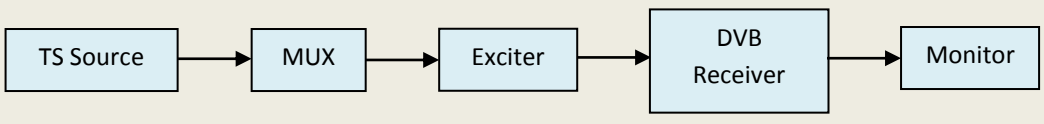
Transmitter	Service 1	Service 2	Service 3	Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109 A PID 1108 DVB subtitling PID 1107 (FIN) Teletext subtitling PID 1106 (FIN)	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209 A PID 1208 DVB subtitling HoH PID 1207 (FIN)	SID 1300 S_Name Test13 PMT PID 1300 V PID 1309 A PID 1308 DVB subtitling PID 1307 (FIN) DVB subtitling PID 1306 (SWE)	Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

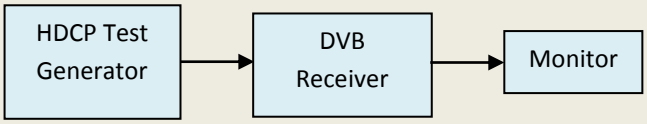
Test Procedure:

1. Set primary subtitling language to Finnish and secondary to Swedish.
2. Set Hard of Hearing subtitling to 'OFF'.
3. Tune to Service 1.
4. Verify that Finnish DVB subtitling is displayed.

	5. Tune to Service 2. 6. Verify that no subtitling is displayed. 7. Set primary subtitling language to Swedish and secondary to Finnish. 8. Tune to Service 1. 9. Verify that Finnish DVB subtitling is displayed. 10. Tune to Service 2. 11. Verify that no subtitling is displayed. 12. Set primary subtitling languages to Swedish secondary subtitling to Norwegian. 13. Tune to Service 1. 14. Verify that no subtitling is displayed. 15. Tune to Service 2. 16. Verify that no subtitling is displayed. 17. Set primary subtitling language to Finnish and secondary to Danish. 18. Tune to Service 3. 19. Verify that Finnish DVB subtitling is displayed. 20. Drop Finnish DVB subtitling from PMT table. 21. Verify that no subtitling is displayed. 22. Add Finnish DVB subtitling to PMT table. 23. Verify that Finnish DVB subtitling is displayed. **Expected Result:** IRD displays subtitling as specified.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C4. Subtitling on analogue interfaces**
Section	Unified Requirements for Finnish Market, Chapter 5.4
Requirement	If IRD is equipped with analogue video outputs, i.e. SCART interface: • In case of STB, analogue output must apply the rules specified by the NorDig Unified specification [1]. Teletext subtitling and DVB subtitling shall be available at all analogue video outputs. • In case of iDTV, the aspect ratio signaling is optional in SCART interface.
Test Procedure	**Purpose of test:** Verify that the subtitling is available at IRD analogue interface(s). This test is not relevant for IDTVs. **Equipment:**  **Test Procedure:**

	Verify that different subtitling (DVB/Teletext) is available through analogue interface(s). **Expected Result:** Subtitling is available at analogue interface(s).			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**C5. HDMI interface**			
Section	NorDig Unified 8.6.4			
Requirement	In order to verify interoperability between iDTVs and STBs, the HDMI HDCP compliance shall be tested according to HDCP Specification Compliance Test Specification, June 14, 2006 Revision 1.1 published by Intel Corporation / Digital Content Protection LLC.			
Test Procedure	**Purpose of test:** Verify that the IRD complies with HDMI HDCP. **Equipment:**  **Test Procedure:** Perform transmitter tests for STB and receiver tests for iDTV. Also perform recommended tests respectively. **Expected Result:** HDMI interface passes compliance tests.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**C6. Durability test**
Section	General
Requirement	IRD can operate without faults for longer period of times.
Test Procedure	**Purpose of test:** Verify that the IRD works in digital TV network for longer period of times.

	Equipment: Use the ordinary digital TV network. **Test Procedure:** Set up IRD to live TV network. Leave IRD powered on for a channel, check after periods of 3 - 4 hours that the IRD is still functional (open EPG, open channel list and select another channel, open menu and return to TV mode). Perform the test on a channel containing DVB subtitling or teletext subtitling available. In case of HDTV IRD, it is preferable to use HD channel. In case of PVR make also recordings and verify that the playbacks of the recorded files are also OK. Test period is 3 - 4 days. **Expected Result:** During the test the IRD shall work without any errors.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C7. Single tuner PVR – Basic Recording Functions**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	• Receiver shall be able to record at least one scrambled event or unscrambled event at one time while displaying another unscrambled event from the multiplex that the IRD is tuned to. • Support for scheduled recordings from EPG, manual timer recordings and one-touch recordings where scheduled recording has the highest priority as described in chapter 14 • User notification procedures for overlapping recordings.
Test Procedure	**Purpose of test:** Verify that receiver handles basic recording functions. **Equipment:** Use the ordinary digital TV network. **Test Procedure:** 1. Set timer to start recording manually at certain time. 2. Verify that the Receiver starts recording according timer settings and stays on mode. 3. Set timer to start recording manually at certain time. 4. Set the receiver to stand-by mode. 5. Verify that the Receiver starts recording according timer settings and sets the receiver back to stand-by mode after recording. 6. Set timer to start recording from the ESG at certain time. 7. Verify that the Receiver starts recording according timer settings.

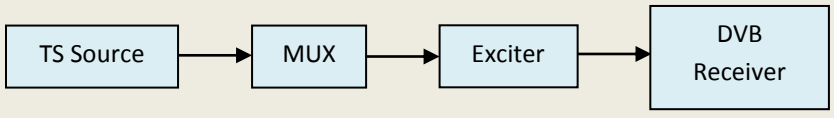
	8. Set timer to start recording from the ESG at certain time. 9. Set the Receiver to stand-by mode. 10. Verify that the Receiver starts recording according timer settings and sets the Receiver back to the stand-by mode after recording. 11. Set timer to start recording from the ESG at certain time. 12. Set another timer to overlap previous timer setting. 13. Verify that the receiver warns the user about conflict and receiver preserves the first timer recording. 14. Set timer to start recording from the ESG at certain time. 15. 5 minutes before scheduled recording, select a service from another multiplex and start OTR recording. 16. Verify that the receiver warns the user about conflict and records the original scheduled recording. 17. Record the storage full. 18. Add a new timer event from ESG and/or manually and/or select OTR. 19. Verify that the receiver warns the user about end of storage and does not allow new recordings to take place until user frees storage capacity. 20. Set timer to start recording at certain time. 21. Set the Receiver to stand-by mode. 22. Unplug the power cable and wait 15 seconds. 23. Plug the power cable. 24. Verify that the Receiver starts recording according timer settings and sets the Receiver back to the stand-by mode after recording. **Expected Result:** The receiver is handling basic recording functions.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C8. Single tuner PVR – Basic Playback Functions**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	• General recording and playback functions as described in NorDig Unified specification [1]. • Time-shift functions as described in NorDig Unified specification [1]. • Parental rating control for all scheduled events as specified in chapter 14.2.
Test Procedure	**Purpose of test:** Verify that receiver handles basic playback functions. **Equipment:** Use the ordinary digital TV network.

	Test Procedure: 1. Record an event with subtitling available. 2. Start playback of the recorded file. 3. Fast Forward playback. 4. Rewind playback. 5. Pause playback. 6. After each action verify that in playback video is in sync with audio and subtitling. 7. Start recording by using OTR. 8. Start playback some file from the storage. 9. Verify that simultaneous playback and recording is working properly. 10. Verify that the file recorded by OTR is not affected while another file is being played back. 11. Tune the receiver to a service. 12. Press pause to enable time shifting. 13. Verify that time shifting functions are working as expected. 14. Make a recording over at least two events by OTR or manual timer where the second event contains EIT parental rating value higher than on the first one. 15. Set the parental rating in the receiver to be lower than it is on the second event but higher than on the first event. 16. Verify that on playback the first event is displayed but the second event is parental locked. **Expected Result:** The receiver is handling basic playback functions.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C9. Single tuner PVR – Content Management Functions**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	• Basic content management for mass memory including file removal and format options. • Mass memory content protection as defined in Security requirements of digital HDTV receiver for the Finnish market [3].
Test Procedure	**Purpose of test:** Verify that receiver handles basic content management functions. **Equipment:** Use the ordinary digital TV network.

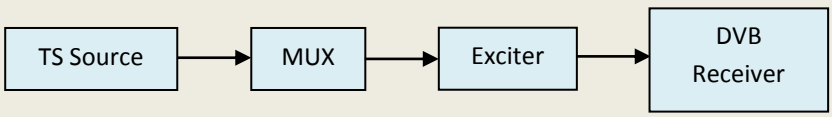
	Test Procedure: 1. Open the receivers PVR content menu. 2. Select one recorded program and change its name. 3. Verify that name is changed. 4. Select one recorded program and delete it. 5. Verify that the content is removed and mass memory storage is freed. 6. Format the mass memory 7. Verify that all content is removed from mass memory and the whole storage space is available. 8. Verify that all files recorded to mass memory are protected with sufficient encryption to ensure copy protection (Manufacturer shall guarantee this). **Expected Result:** The receiver is handling basic content management functions.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C10. Single tuner PVR – Dynamic updates of PMT table while recording**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that receiver that the Receiver handles the dynamic updates of PMT table during recording / playback. **Equipment:** 

Transmitter	Service 1	Service 2		Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109 A PID 1108 Teletext subtitling PID 1107 DVB subtitling PID 1106	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209 A PID 1208		Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

	Test Procedure: 1. Tune to Service 1. 2. Start recording. 3. Drop PIDs in following order: a. DVB subtitling PID 1106 b. Teletext subtitling PID 1107 c. Audio PID 1108 4. Add PIDs in following order: a. Audio PID 1108 b. Teletext subtitling PID1107 c. DVB subtitling PID 1106 5. Stop recording. 6. Verify that the service is displayed properly on playback. 7. Tune to Service 2. 8. Start recording. 9. Change the following PID values: a. Video PID 1209 to 1203 b. Audio PID 1208 to 1202 10. Stop recording. 11. Verify that the service is displayed properly on playback. **Expected Result:** The receiver handles changes in PMT table properly on playback.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C11. Single tuner PVR – Dynamic changes in video stream while recording**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the receiver is able to handle dynamic changes in transmission between different video modes while recording. **Equipment:**  Transport stream containing services with following video content and transitions between them: • MPEG-4 AVC HP@L3 576i 25Hz

	• MPEG-4 AVC HP@L4 720p 50Hz • MPEG-4 AVC HP@L4 1080i 25Hz • MPEG-2 MP@ML 576i 25Hz **Test Procedure:** Tune to the service and start recording a service where video transitions are occurring. Verify that changes between modes are happening correctly on playback. Fill in result to test results table below. **Expected Result:** The IRD is able to handle mode changes on recording and playback.
Test Result(s)	

From	To	OK / NOK
MPEG-4 AVC HP@L3 576i 25Hz	MPEG-4 AVC HP@L4 720p 50Hz	
MPEG-4 AVC HP@L4 720p 50Hz	MPEG-4 AVC HP@L3 576i 25Hz	
MPEG-4 AVC HP@L4 720p 50Hz	MPEG-4 AVC HP@L4 1080i 25Hz	
MPEG-4 AVC HP@L4 1080i 25Hz	MPEG-4 AVC HP@L4 720p 50Hz	
MPEG-4 AVC HP@L4 1080i 25Hz	MPEG-4 AVC HP@L3 576i 25Hz	
MPEG-4 AVC HP@L3 576i 25Hz	MPEG-4 AVC HP@L4 1080i 25Hz	
MPEG-2 MP@ML 576i 25Hz	MPEG-4 AVC HP@L4 720p 50Hz	
MPEG-4 AVC HP@L4 720p 50Hz	MPEG-2 MP@ML 576i 25Hz	

Conformity	☐ OK	**Fault**	☐ Major	☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**C12. PVR - Maximum number of simultaneous recordings and conflict handling**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	
Test Procedure	**Purpose of test:** To verify the number of simultaneous recordings the IRD is able to perform. The information will be used in the following tests. **Equipment:** Live network with both scrambled and FTA services are used for this test. **Test Procedure:** 1. Tune to a multiplex with multiple MPEG-2 SD television services (type 0x1). 2. Initiate OTR. 3. Zap to another service in the same multiplex and repeat step 2. 4. Repeat the procedure in steps 3-4 until IRD refuses to record more services. 5. Verify that the IRD accordingly *informs the user* when the maximum number of possible simultaneous recordings has been exceed and handles the upcoming conflict gracefully. 6. Stop all recordings.

	7. Verify that all the previously made recordings can be replayed correctly. 8. Repeat steps 2-7 for MPEG-4 HD services (type 0x19). 9. Tune to a multiplex with MPEG-2 SD television services (type 0x1). 10. Initiate OTR. 11. Zap to another service in a different multiplex and repeat step 2. 12. Repeat the procedure in steps 10-11 until IRD refuses to record more services. 13. Verify that the IRD accordingly *informs the user* when the maximum number of possible simultaneous recordings has been exceed and handles the upcoming conflict gracefully. 14. Tune back to the multiplexes on which the recording was initiated in steps 10-13. Try to initiate more recordings on those multiplexes. 15. Stop all recordings. 16. Verify that all the previously started recordings can be replayed. 17. Repeat steps 9-16 for MPEG-4 HD services (type 0x19). **Expected Result:** The IRD is able to record at least two services simultaneously. These services may be in one or two different multiplexes. The maximum number of possible simultaneous recordings is defined both for SD and HD television services. The maximum number of possible simultaneously tunable multiplexes is defined. The IRD informs the user if the user tries to initiate more simultaneous recordings than the IRD can handle.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

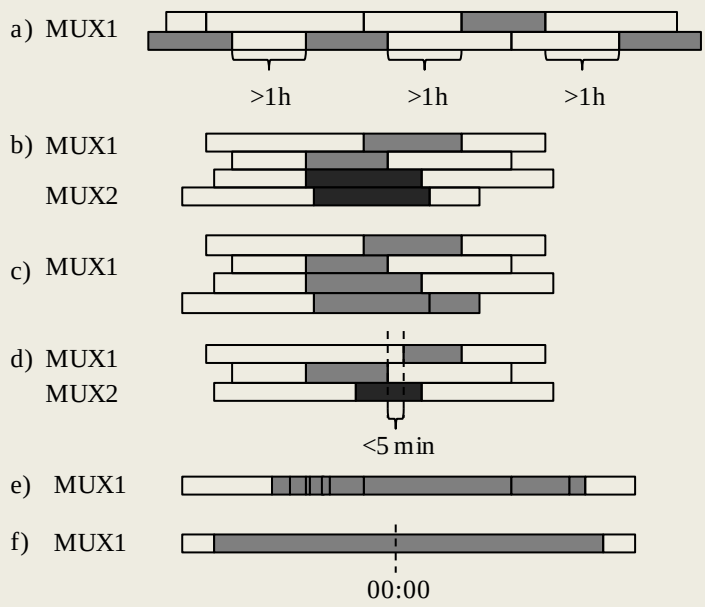
Test Case	**C13. PVR – Maximum number of simultaneous scheduled recordings and conflict handling**
Section	NorDig Unified 14.3.16 Unified Requirements for Finnish Market, Chapter 14.1
Requirement	• Basic content management for mass memory including file removal and format options. • Mass memory content protection as defined in Security requirements of digital HDTV receiver for the Finnish market [3].
Test Procedure	**Purpose of test:** To verify that the IRD does not allow the user to schedule more recordings than the IRD is capable to record. To verify that the IRD handles the recording conflicts gracefully and informs the user accordingly. **Equipment:** Live network with both scrambled and free services is used for this test.

	Test Procedure: 1. Schedule a recording for a forthcoming event via ESG/EPG. 2. Schedule a simultaneous recording on another service in the same multiplex via ESG/EPG or manually. 3. Repeat step 2 until the maximum number of simultaneous recordings has been exceeded. 4. Verify that the IRD accordingly *informs the user* when maximum number of possible simultaneous recordings is exceeded and handles the upcoming conflict gracefully. 5. Zap to any service and start OTR, of which recording time is going to overlap the events scheduled in the previous steps. 6. Verify that the IRD accordingly *informs the user* that the maximum number of possible simultaneous recordings has been reached and handles the upcoming conflict gracefully. 7. Try to schedule multiple simultaneous recordings on different multiplexes both via ESG/EPG and manually. 8. Verify that the IRD accordingly *informs the user* when maximum number of possible simultaneous recordings is exceeded and handles the upcoming conflict gracefully. **Expected Result:** The IRD does not allow the user to initiate more simultaneous recordings than the IRD is capable to record. Verify that the IRD accordingly *informs the user* that the maximum number of possible simultaneous recordings has been reached and handles the upcoming conflict gracefully.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C14. PVR - Priorities between scheduled recordings, live viewing, time-shift recording and playback**
Section	Unified Requirements for Finnish Market, Chapter 14.1
Requirement	Scheduled recordings have the highest priority in PVR functions. This means that in case of two different scheduled recordings occupy both PVR tuners, the user shall not be able to select a service which is not receivable from two multiplexes PVR is tuned to. This also means that one-touch recordings shall never override reserved recordings. User shall also be warned when overlapping one-touch recording is attempted to reserved recordings
Test Procedure	**Purpose of test:** To verify that the IRD handles priorities and conflicts between ESG/EPG and manual scheduled recordings, live viewing and time-shift recording. **Equipment:** Live network with both free and scrambled services is used for this test.

	Test Procedure: 1. *Schedule* maximum number of separate overlapping events, both manually and from ESG/EPG at services on two multiplexes (hereby referred as MUX1, MUX2). 2. Take note on the services, start times and durations. 3. Zap to a service on a third multiplex (MUX3) and *view* the service until the start times for the all *scheduled recording* events have been reached. 4. Verify that the IRD *informs the user on an incoming recording conflict* and by default prioritizes the scheduled events over the live viewing. 5. Try to zap back to a service on MUX3. 6. Verify that the IRD does not allow the user to tune out from the multiplexes and accordingly *informs the user* of the ongoing recordings and handles the upcoming conflict gracefully. 7. Repeat procedure steps 1-6 but start *time-shift recording mode* on MUX3 in procedure step 3. 8. Repeat procedure steps 1-6 but start *playback* of a previously recorded file in procedure step 3. 9. Verify that the scheduled recordings are performed correctly. **Expected Result:** IRD prioritizes scheduled recordings over live viewing and time-shift recording. IRD informs user about incoming conflict. Playback does not cause harm to the scheduled recordings.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C15. PVR - Scheduled recordings**
Section	Unified Requirements for Finnish Market, Chapter 14.1
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the IRD is able to handle several scheduled recordings (manual and EPG scheduled) in on mode. To verify that the IRD is able to wake up from standby to perform scheduled recordings and set itself back into the originating power state after the scheduled recordings have been completed. **Equipment:** Live network with both scrambled and free services is used for this test. ESG schedule events as follows:



Test Procedure:

1. Schedule recording for several events from ESG/EPG and manually for the following day. Plan the recording schedule in a way that at least the following situations occur (see the illustration above):
    a) Several events in a single multiplex *with at least 1 hour between the events.*
    b) *Maximum number of simultaneous events* with equal start times on two different multiplexes.
    c) *Maximum number of simultaneous events* with equal start times on a single multiplex.
    d) *Almost overlapping events*: *event1* and *event2* on MUX1 with a short interval between end of *event1* and start of *event2*. *Event3* on MUX2 scheduled when *event1* is active and ending when *event2* is active.
    e) Several *consecutive events* of different lengths on a single service.
    f) A long event which continues *over midnight*.
2. Take note on the scheduled events (start time, duration, service (FTA, CAS, SD, HD)).
3. Select some service at MUX3 and set the IRD to standby.
4. Verify that the IRD has returned back to the originating power state after the last scheduled event.
5. Resume the IRD from standby.
6. Verify that all the scheduled events have been correctly recorded and are played back correctly.

Expected Result:
The IRD performs scheduled recordings correctly in all possible situations.
The IRD sets itself back to the originating power state after recording.

Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major	☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			

Date		**Sign**	

Test Case	**C16. PVR - Recordings together with zapping , playback and chase playback**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	• General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the IRD is able to handle maximum number of simultaneous recordings together with zapping and playback. To verify that the IRD performance is not degraded under a heavy workload. **Equipment:** Live network with both free and scrambled services is used for this test. **Preparations for the test:** 1. Tune to a HD service including at least the following components: a. MPEG-4 AVC video, resolution 1280x720p50 or higher b. AC-3 audio c. Subtitling d. Conditional access 2. Record service for at least one hour. 3. Verify that there are no glitches or synchronization problems in A/V or subtitling. **Test Procedure:** 1. Tune to a multiplex with at least two television services MPEG-4 AVC video, resolution 1280x720p50 or higher. At least one of the services shall include subtitling. 2. Start OTR. 3. Zap to another service on that multiplex. 4. Repeat the steps 2-3 as many times as the IRD still allows the user to zap to other multiplexes. 5. Zap through all services available in the network. 6. Stop all the recordings. 7. *Play back* the recordings made in the step 2. 8. Verify that all components in the service are available. 9. Verify that there are no glitches or synchronization problems in A/V or subtitling. 10. Tune to a multiplex with at least two television services MPEG-4 AVC video, resolution 1280x720p50 or higher. At least one of the services shall include subtitling. 11. Start OTR. 12. Zap to some other service. 13. Repeat steps 11 - 12 until the maximum number of simultaneous recordings has been reached. 14. *Play back* the whole recording made in the *preparation step 2*. 15. Verify that all components in the service are available. 16. Verify that there are no glitches or synchronization problems in A/V or

	subtitling. 17. Fast forward, pause and rewind the recording with all available methods in a random sequence. 18. Verify that A/V and subtitling are still in sync and the playback continues gracefully. 19. Stop all the recordings. 20. *Play back* the recordings made in the step 2. 21. Verify that all components in the service are available. 22. Verify that there are no glitches or synchronization problems in A/V or subtitling. 23. Repeat the steps 10-22, but in step 14, *chase playback* one of the recently started recordings instead of playback. **Expected Result:** The IRD is able to perform maximum number of recording correctly during normal use. Simultaneous recording and playback is possible.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C17. PVR – Recording of all components defined in PMT**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the IRD is able to record all the subtitling components and audio tracks defined in PMT. **Equipment:**

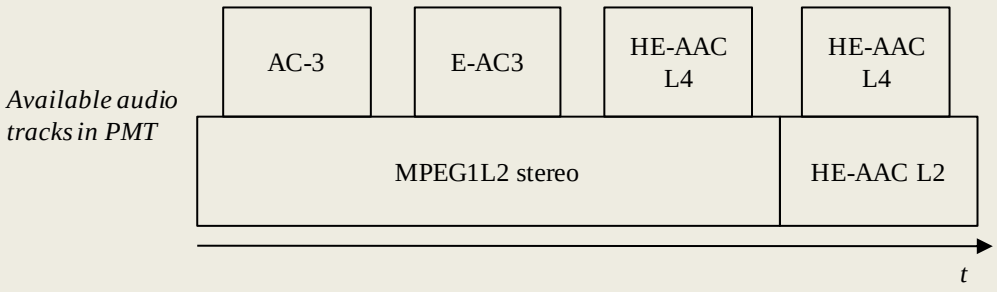
Transmitter	Service 1	Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1111 (MPEG4 HD) A PID 1110 (MPEG1L2) A PID 1108 (AC3) Teletext PID 1106 DVB subtitling PID 1103 (FIN) DVB subtitling PID 1102 (ENG) DVB subtitling HoH PID 1101 (FIN)	Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)

Test Procedure:

1. Start OTR on service Test11.
2. Record the service for at least 15 minutes.

	3. Stop the recording and play back the recorded file. 4. Verify that all the expected components are recorded and user-selectable during the playback. **Expected Result:** All the audio/video/subtitling components defined in the PMT are available also in the recording and selectable for user also in recording playback.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C18. PVR – Dynamic update of PMT - Audio priorities during playback**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the IRD reacts on PMT updates during playback. To verify that the IRD selects the correct audio track correspondingly. **Equipment:** Test stream with dynamic audio track addition and removal as follows:  **Test Procedure:** 1. Record the service with audio track updates in PMT as described above. 2. Set the IRD multichannel setting as '*enabled*' in menu preferences. 3. Play back the recording and verify that the IRD reacts on PMT updates dynamically and selects the multichannel audio tracks accordingly. 4. Set the IRD multichannel setting as '*disabled*' in menu preferences. 5. Re-start the playback. Verify that the IRD plays the stereo audio track all the time. **Expected Result:** The IRD is able to react on PMT updates also during recording playback.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO

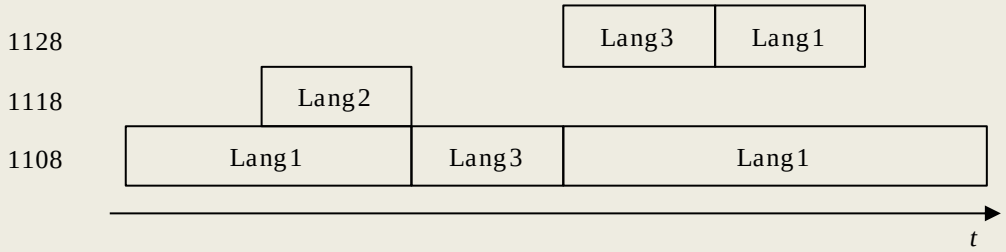
	Describe more specific faults and/or other information:		
Date		**Sign**	

Test Case	**C19. PVR – Audio selection by audio type for recordings**			
Section	Unified Requirements for Finnish Market, Chapter 14.3			
Requirement	General recording and playback functions as described in NorDig Unified specification [1].			
Test Procedure	**Purpose of test:** To verify that audio selection by audio type is available on recordings. **Equipment:** Test configuration is the same as in Finnish Unified Task C2. This test can be performed in parallel with Finnish Unified Task C2. **Test Procedure:** 1. While performing Finnish Unified Task C2, perform OTR on the services with visual impaired audio. 2. After the test C2 is complete, stop the recordings. 3. Play back the recording. 4. Verify that the IRD selects the correct audio track depending on the IRD "*visual impaired commentary*" setting. 5. Toggle the *"visual impaired commentary"* setting and repeat steps 3-4. **Expected Result:** IRD records all available audio tracks regardless of the audio type preference. IRD is able to playback the correct audio track according to the audio type preference.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major	☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**C20. PVR – Audio language support during playback**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the IRD reacts on the PMT updates during recording playback and selects the audio languages according to the user preferences. **Equipment:**

Transmitter	Service 1	Service 2		Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109, inc PCR A PID 1108 (MPEG1-L2) A PID 1118 (MPEG1-L2) A PID 1128 (AC-3) LCN 1	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209, inc PCR A PID 1208 Teletext PID 1207 DVB Sub PID 1206 LCN 2		Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)



Test Procedure:

1. Select audio language user preferences at IRD menu:
    a. Primary: Language 1
    b. Secondary: Language 2
2. Tune to Service1 with the following available components signaled in PMT:
    a. Video PID 1119
    b. Audio PID 1118, language 1
3. Start OTR.
4. Add, modify and remove audio PIDs as shown in the picture above:
    a. Add PID 1118 with language 2.
    b. Remove PID 1118 and change audio language of PID 1108 to language 3.
    c. Add PID 1128 with language 3 and change audio language of PID 1108 to language 1.
    d. Change audio language of PID 1128 to language 1.
    e. Remove PID 1128.
5. Stop the recording.
6. Change audio language user preferences at IRD menu:
    a. Primary: Language 2
    b. Secondary: Language 1
7. Play back the recording.
8. Verify that all the audio tracks are available and user selectable.
9. Verify that the IRD selects the audio track according to user preferences.

Expected Result:
Selection of primary and secondary language works also for the playback.

If the selected primary language is not available in the recording, the selected secondary audio language shall be selected automatically.

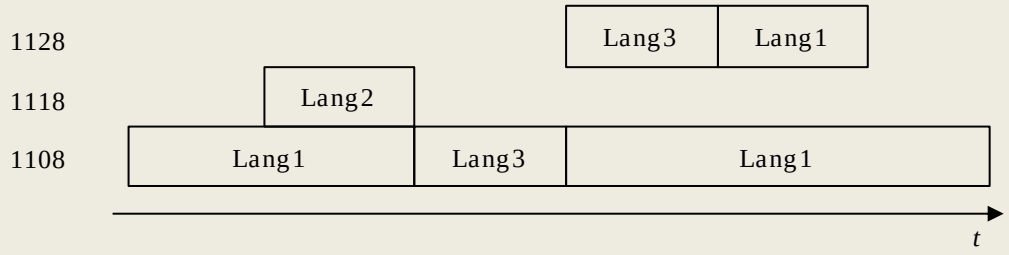
Test Result(s)	

Conformity	☐ OK	Fault	☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:		
Date		Sign	

Test Case	**C21. PVR – Subtitling language support during playback**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that the IRD reacts on the PMT updates during recording playback and selects the subtitling languages according to the user preferences. **Equipment:**

Transmitter	Service 1	Service 2		Frequency
MUX 1 TS_ID 1 Network_ID 1 ON_ID [1)]	SID 1100 S_Name Test11 PMT PID 1100 V PID 1109, inc PCR A PID 1108 DVB Sub PID 1107 DVB Sub PID 1106 Teletext sub PID 1105 LCN 1	SID 1200 S_Name Test12 PMT PID 1200 V PID 1209, inc PCR A PID 1208 LCN 2		Can be chosen depending of the distribution media.

[1)] ON_id (Original_network_id) can be chosen in range 0x0001-0xfe00 (operational network)



Test Procedure:

1. Select audio language user preferences at IRD menu:
    a. Primary: Language 1
    b. Secondary: Language 2
2. Tune to Service1 with the following available components signaled in PMT:
    a. Video PID 1119
    b. Audio PID 1118, language 1
3. Start OTR.
4. Add, modify and remove audio PIDs as shown in the picture above:
    a. Add PID 1118 with language 2.
    b. Remove PID 1118 and change audio language of PID 1108 to language

	3. c. Add PID 1128 with language 3 and change audio language of PID 1108 to language 1. d. Change audio language of PID 1128 to language 1. e. Remove PID 1128. 5. Stop the recording. 6. Change audio language user preferences at IRD menu: a. Primary: Language 2 b. Secondary: Language 1 7. Play back the recording. 8. Verify that all the audio tracks are available and user selectable. 9. Verify that the IRD selects the audio track according to user preferences. **Expected Result:** Selection of primary and secondary language works also for the playback. If the selected primary language is not available in the recording, the selected secondary audio language shall be selected automatically.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:
Date	**Sign**

Test Case	**C22. PVR – Maintaining scheduled recordings after network updates**
Section	Unified Requirements for Finnish Market, Chapter 14.3
Requirement	General recording and playback functions as described in NorDig Unified specification [1].
Test Procedure	**Purpose of test:** To verify that network changes do not affect the recording schedule. **Equipment:** Test configuration is the same for NorDig Unified Task 8:28. **Test Procedure:** 1. Set up the NorDig Unified Task 8:28 initial situation. 2. Schedule a *manual recording* for service 'Test12' after the time event when the IRD quasi-statically reacts to the network changes. (Example: If the IRD reacts to the network changes always at 03:00, schedule the recording to happen after that time) 3. Perform the network change according to Task 8:28. 4. Make sure that automatic service list update is initiated. 5. Set the IRD to standby. 6. Verify that the IRD performs the recording correctly as scheduled in step 2.

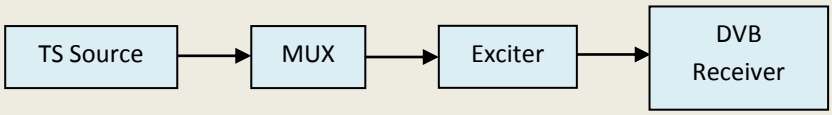
	Expected Result: Scheduled recordings are not affected by network changes.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

Test Case	**C23. PVR – EIT parental lock during playback**
Section	Unified Requirements for Finnish Market, Chapter 14.2
Requirement	IRD shall follow dynamic updates of the EIT Parental Rating descriptor values in EIT present actual table in all recordings during recording and playback.
Test Procedure	**Purpose of test:** To verify that the IRD reacts to dynamic changes in EIT parental rating value also for the recordings. **Equipment:** Test configuration the same as in NorDig Unified Task 8:43. **Test Procedure:** 1. Choose an arbitrary parental rating value N. 2. Set the parental lock value as "*disabled"* or over N. 3. Initiate an OTR over consecutive events having the parental ratings as follows: No rating | Rating value N | No rating | Rating Value M < N | No rating 4. Stop the recording. 5. Change the IRD parental lock value between M and N. 6. Play back the recording. 7. Verify that the IRD dynamically blanks the A/V and invokes parental lock when parental_rating_descriptor value is more than the user preference. 8. Verify that the IRD dynamically displays the A/V when parental_rating_descriptor value is less or equal than the user preference. 9. Stop the playback. 10. Disable the parental lock . 11. Play back the recording again. 12. Verify that the IRD does not invoke parental lock during the playback. 13. Set the parental lock value below M. 14. Repeat the steps 2 – 11. **Expected Result:** The IRD reacts to dynamic changes in EIT parental_rating_descriptor value during the playback, regardless of the parental rating value during the recording.
Test Result(s)	
Conformity	☐ OK **Fault** ☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO

	Describe more specific faults and/or other information:		
Date		**Sign**	

Test Case	**C24. PVR – Time offset changes in TDT/TOT**			
Section	Unified Requirements for Finnish Market, Chapter 14.1			
Requirement	Scheduled recording IRD internal timer shall refer to UTC time and recording shall not be disturbed by time offset changes (daylight saving changes). The scheduled recordings UI shall be in local time with daylight saving.			
Test Procedure	**Purpose of test:** To verify that the IRD is able to perform recording at correct time after changing between summer time and normal time. **Equipment:** Stream with time offset change and events starting after a time offset change. **Test Procedure:** 1. Schedule a recording for an event after the time offset change. 2. Set the IRD to standby. 3. Wait until the time event for the time offset change has been passed. 4. Resume the IRD from standby. 5. Verify that the recording start time and duration are correctly as scheduled. 6. Play back the recording and verify it is replayed correctly. **Expected Result:** IRD performs the scheduled recording according to the UTC time. Scheduled recordings UI indicates the local time. Time offset changes do not affect to the recordings.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major	☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		

<table>
<tr><td>Test Case</td><td colspan="4">C25. PVR – Failure scenario handling: Reception problems</td></tr>
<tr><td>Section</td><td colspan="4">Unified Requirements for Finnish Market, Chapter 14.3</td></tr>
<tr><td>Requirement</td><td colspan="4">General recording and playback functions as described in NorDig Unified specification [1].</td></tr>
<tr><td>Test Procedure</td><td colspan="4">Purpose of test:
To verify that the PVR IRD is able to handle reception errors gracefully.

Equipment:
 

Test Procedure:
1. Tune to a HD service including at least the following components:
a. MPEG-4 AVC video, resolution 1280x720p50 or higher
b. AC-3 audio
c. Subtitling
d. Conditional access
2. Start OTR.
3. Cut the connection between Exciter and IRD (that is, unplug the antenna cord) for 30 seconds.
4. Re-establish the signal connection.
5. Verify that the IRD continues recording after the incident in step 3.
6. Stop the recording and play back the file.
7. Verify that the recording is played back correctly both before and after the incident in step 3.
8. Repeat steps 1-7, but in step 3, cut the connection between Multiplexer and Exciter instead (Modulated RF signal but no TS data).
9. Repeat steps 1-7, but in step 3, cut the connection between MPEG-2 source and Multiplexer instead (Multiplex is present but no program-specific data).
Expected Result:
IRD is able to handle reception errors gracefully.</td></tr>
<tr><td>Test Result(s)</td><td colspan="4"></td></tr>
<tr><td>Conformity</td><td>☐ OK</td><td>Fault</td><td colspan="2">☐ Major ☐ Minor, define fail reason in comments</td></tr>
<tr><td>Comments</td><td colspan="4">If possible describe if fault can be fixed with software update ☐ YES ☐ NO
Describe more specific faults and/or other information:</td></tr>
<tr><td>Date</td><td colspan="2"></td><td>Sign</td><td></td></tr>
</table>

Test Case	**C26. PVR – User actions disturbing recording**		
Section	Unified Requirements for Finnish Market, Chapter 14.3		
Requirement	General recording and playback functions as described in NorDig Unified specification [1].		
Test Procedure	**Purpose of test:** Verify that receiver handles basic content management functions. **Equipment:** Use the ordinary digital TV network. **Test Procedure:** 1. Tune to a HD service including at least the following components: a. MPEG-4 AVC video, resolution 1280x720p50 or higher b. AC-3 audio c. Subtitling d. Conditional access 2. Start OTR. 3. Try to set the IRD to standby. 4. Verify that the IRD continues recording. 5. Stop the recording. 6. Start OTR. 7. Shut down the HDMI sink for a short time and re-start the HDMI sink. 8. Verify that the IRD continues recording. 9. Stop the recording. 10. Start OTR. 11. Power cycle the IRD. 12. Verify that the IRD continues recording after reboot. 13. Stop the recording. 14. Verify that the recordings made in steps 2 and 6 are fully available and played back correctly. 15. Verify that the recording is played back correctly both before and after the incident in step 11. **Expected Result:** IRD is able to handle the disturbances in the operational environment gracefully. IRD returns to the originating power state after a power cut.		
Test Result(s)			
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:		
Date		**Sign**	

Test Case	**C27. PVR – Subtitling on playback**			
Section	Unified Requirements for Finnish Market, Chapter 14.3			
Requirement	General recording and playback functions as described in NorDig Unified specification [1].			
Test Procedure	**Purpose of test:** To verify that the subtitling on playback is accurately displayed and in sync with different content. **Equipment:** Use the ordinary digital TV network containing services with following video content and subtitling types: • Standard definition MPEG-2 video with DVB subtitling • Standard definition MPEG-2 video with teletext subtitling • High definition MPEG-4 AVC video with DVB subtitling • High definition MPEG-4 AVC video with DVB-DDS subtitling • High definition MPEG-4 AVC video with teletext subtitling **Test Procedure:** Tune to each service and make a recording lasting at least 45 minutes each. Playback each recording and verify that subtitling is displayed accurately and in sync. **Expected Result:** The IRD is able to display different subtitling reliably on playback.			
Test Result(s)				
Conformity	☐ OK	**Fault**	☐ Major ☐ Minor, define fail reason in comments	
Comments	If possible describe if fault can be fixed with software update ☐ YES ☐ NO Describe more specific faults and/or other information:			
Date		**Sign**		