TECHNICAL REQUIREMENTS FOR DVB-T2&T IRD&STB&iDTV FOR "IDAN+" ISRAEL -D.T.T NETWORK

1. DVB-T2 Tuner and Demodulator
   1.1 Demodulation and error correction shall be performed for all code rates and guard intervals specified in ETSI EN 302 755.
   1.2 The IRD shall support all modulation parameters as specified in ETSI EN 302 755.
   1.3 The IRD shall accept incoming DVB signals, which comply with DVB-T2, as specified in ETSI EN 302 755 V1.2.1.
   1.4 The IRD shall have tuner input connector, type: IEC female in accordance with IEC 60169-2, part 2. The input impedance 75 ohm.
   1.5 The IRD shall be able to provide power to an external antenna.
   1.6 The IRD shall display a signal strength indicator and a reception quality indicator.
   1.7 The IRD shall have Constellation (QPSK, 16-QAM, 64-QAM, 256-QAM), both rotated and non-rotated.
   1.8 The IRD shall have Code rate (1/2, 3/5, 2/3, 3/4, 4/5, 5/6).
   1.9 The IRD shall have Guard interval (TU/128, TU/32, TU/16, TU*19/256, TU/8, TU*19/128, TU/4)
   1.10 The IRD shall have Transmission mode (1K, 2K, 4K, 8K normal and extended, 16K, 32K normal and extended.
   1.11 The IRD shall have Pilot pattern (PP1, PP2, PP3, PP4, PP5, PP6, PP7, PP8)
   1.12 The IRD shall have Input Mode A (single PLP) or Input Mode B (Multiple PLPs – Common PLP, Type 1 and 2).
   1.13 The IRD shall support both the normal and extended carrier modes.
   1.14 The IRD shall be capable of receiving broadcasts according to EN 302 755(DVB-T2) shall also be capable of receiving broadcasts according to EN 300 744(DVB-T).
   1.15 The transmission networks of DVB/T2 shall include single frequency networks (SFN). The IRD shall support both SFN and MFN networks.
   1.16 The IRD shall be able to receive channels in the VHF band III and UHF bands IV, V.
   1.17 The IRD shall be able to receive signals with an offset of up to 50 kHz from the nominal frequency.
   1.18 Signal bandwidths: For 8 MHz DVB-T2 signal, a normal carrier mode corresponds to a signal bandwidth of 7.61 MHz and an extended carrier mode corresponds to a signal bandwidth of 7.71 MHz for FFT size of 8K and 7.77 MHz for FFT size of 16K and 32K.
   1.19 The IRD shall be able to receive input signal strength (-90dBm to -20dBm)
2 IRD Demultiplexer

2.1 The IRD demultiplexer shall be compliant to the MPEG-2 transport layer defined in ISO/IEC 13818-1. The IRD shall support ETSI TS 101 154 v1.10.1.

2.2 The IRD shall support variable bit rate elementary streams within a constant bit rate transport stream.

2.3 The specified Standard DVB-T2 receiver shall provide access to both SD and HD signals transmitted over DVB-T and DVB-T2 modulation.

2.4 Compliance to general EBU requirements for HDTV receivers as described in EBU Tech 3333 and in the E-Book is recommended.

2.5 If the IRD is switched-on from standby mode, then the IRD shall tune to the last viewed service.

2.6 The IRD shall be able to handle dynamic changes in the Program Map Table (PMT).

2.7 The IRD shall be able to handle a dynamic switchover from H.264/AVC HD elementary stream to H.264/AVC SD elementary stream. The maximum outage shall be below 3 seconds.

2.8 The video stream should freeze (freeze frame), until the new video stream is displayed.

3 Video Decoding:

3.1 The IRD video decoding subsystem shall comply with ETSI TS 101 154 v1.10.1 and shall comply with ETSI EN 302 307 V1.1.2.

3.2 SDTV: H.264/AVC (MPEG-4 AVC MP@L3):

3.2.1 The IRD shall comply with ETSI TS 101 154 v1.10.1, subclause 5.6.2.

3.2.2 The IRD shall decode H.264/AVC Main Profile, Level 3 (MPEG-4 AVC MP@L3) bit streams.

3.2.3 The IRD shall decode bit streams with 4:3 and 16:9 aspect ratio without distortion. It shall be possible for the user to switch the video output aspect ratio between 4:3 and 16:9. In case a 4:3 aspect ratio is preset in the IRD user preferences settings and video with an aspect ratio of 16:9 is to be displayed, the IRD shall do an automatic 16:9 letterbox conversion. TV Sets shall display the video in the correct aspect ratio (without distortion) by adding pillar box or letterbox spacing.

3.2.4 The IRD shall decode luminance resolutions of 352x576 to 720x576.

3.2.5 The IRD shall decode video bit-streams with a minimum bitrate of 300kbps video bitrate.

3.3 HDTV: H.264/AVC (MPEG-4 AVC HP@L4):

3.3.1 The IRD shall comply with ETSI TS 101 154 v1.10.1, subclause 5.7.2.

3.3.2 The IRD shall support MPEG-4 AVC HP@L4 Decoding profile.

3.3.3 The IRD shall decode and deliver video material with frame rates of 25 Hz interlaced or progressive, or 50 Hz progressive.

3.3.4 The IRD shall decode a maximum luminance resolution of up to 1920x1080.

3.3.5 The IRD shall be able to decode video bit-streams with a minimum bitrate of 1 Mbps.
3.3.6 The following HD video formats shall be supported:
   a. 1280x720p/50 frames
   b. 1920x1080/25 frames

3.3.7 **Downscaling from HD to SD**: The downscaled HD signal displayed on the analog output shall be at least the same quality and resolution as full PAL resolution SD signal. The aspect ratio conversion shall be handled.

4 **Audio Decoding**:
   4.1 The IRD’s audio decoding subsystem shall comply with ETSI TS 101 154 v1.10.1, in particular with sub-clause 6 (“Audio”) and its related annexes.
   4.2 The audio decoder shall decode the following input audio bit stream:
      a. E-AC-3 (Enhanced AC-3).
      b. MPEG-4 HE AAC V2.

4.3 **Audio – Video Synchronization**
   4.3.1 The IRDs shall not introduce more than \( \pm 5 \) ms of relative delay between the audio and video components on the primary output and not more than \( \pm 25 \) ms between the primary video output and a secondary audio output.
   4.3.2 The IRD should include a delay unit that allows used-defined adjustment of the audio/video delay. If implemented the adjustment shall be accessible in a submenu of the IRD’s configuration menu.

4.4 **Multichannel Audio**
   4.4.1 **Digital Audio Interface**:
   For the HDMI output, the IRD shall be capable of delivering the E-AC-3 audio bitstream of the selected audio component in its native incoming format and as a transcoded AC-3 bitstream on the digital audio output interfaces. For the S/PDIF output, the IRD shall transcode E-AC-3 or MPEG-4 HE AAC V2 input bit streams to AC-3 output bit streams at a bitrate of 640kbps. During this transcoding process the metadata from the E-AC-3 or MPEG-4 HE AAC V2 input bit stream shall be transferred to the AC-3 output bit stream.
   4.4.1.1 In the case of an E-AC-3 or MPEG-4 HE AAC V2 multi-channel audio stream, a stereo downmix with metadata applied shall be also available for delivery to the digital audio output interfaces.
   4.4.1.2 In case of a present HE AAC V2 multi-channel audio stream the audio format shall be optionally available as PCM bit stream on the digital audio interfaces, in case MPEG-4 HE AAC V2 is supported.

4.4.2 **Analog Audio Interface**
   4.4.2.1 The E-AC-3 or MPEG-4 HE AAC V2 multi-channel audio bit stream shall be decoded and downmixed to stereo and shall be delivered to the analog output interfaces.
   4.4.2.2 All E-AC-3 metadata parameters shall be applied to the decoded audio.

4.4.3 **Dynamic Audio Component Switching**
In case the selected E-AC-3 or MPEG-4 HE AAC V2 component is switched off inside the selected service during playback, the IRD shall select automatically one of the remaining audio components to be delivered to all audio outputs. During the switching period the interruption should be shorter than 3 seconds.

4.5 **Audio Description**

4.5.1 The IRD shall decode a main E-AC-3 input bitstream and a supplementary E-AC-3 input bitstream simultaneously.

4.5.2 The IRD shall mix the output of each decoder according to mixing metadata contained within the supplementary input bitstream as per.

4.5.3 The IRD shall include user control for the relative balance between main and supplementary audio levels.

4.5.4 The IRD shall provide an option to deliver the mixed audio over one output interface simultaneously with the main audio over a separate output interface.

4.5.5 The IRD shall deliver the mixed audio as a stereo downmix if the input channel configurations are multichannel.

5. **Service Information:**

5.1 The IRD shall be able to process the incoming MPEG-2 TS PSI and DVB SI data (descriptors, tables) according ETSI EN 300 468 v1.10.1 and ETSI TR 101 211 v1.7.1.

5.2 The following tables are a mandatory set of tables the IRD shall be able to process: PAT, PMT, CAT, NIT, SDT, EIT, TDT, and TOT.

5.3 The IRD shall process the following EIT tables:
   a. EIT actual (present/following/scheduled)
   b. EIT other (present/following/scheduled)

5.4 The following descriptors in the EIT shall be processed by the IRD: content_descriptor, short_event_descriptor, extended_event_descriptor.

5.5 Descriptors or other data structures that are currently undefined or are unknown to the IRD shall be skipped and shall not cause any harm.

5.6 The IRD shall support an extended_event_descriptor of up to 1.000 characters per event. Per service a minimum of 200 events shall be handled and shall be displayed in the EPG schedule.

6. **EPG and Navigator:**

6.1 The Navigator shall include a basic electronic program guide which displays information extracted from relevant DVB-SI tables.

6.2 The IRD shall be able to read and use ISO 639-2 language descriptors associated with the audio streams in the MPEG-2 transport stream ISO/IEC 13818-1.

6.3 The IRD shall implement a Navigator, which allows the user to control the operation of the IRD, and which provides user access to system information (user preferences settings, system settings, initiating system software updates, status check function etc.).

6.4 Now and Next EIT based EPG & 7 Day EPG.

6.5 The Navigator shall support the Hebrew, English, Arabic, Russian, French & Amharic language in all menus and submenus. The initial standard language shall be set to Hebrew language or shall be selectable during first initialization process.
6.6 The user shall be able to set storable preferences for the default audio language. If an audio-stream for the default audio language is available for the service the IRD shall automatically choose that audio stream. In addition the user shall be able to manually select between all audio streams available within the active service.

6.7 The IRD’s remote control shall include the following keys for basic TV functionality:

- Power on/off [on/off] – turns the IRD on and off.
- Programme up/down [P+, P-] – function to switch between programmes.
- Volume up/down [V+, V-] – function to adjust the volume output level.
- TV/ Radio [TV/radio] – function that puts the IRD directly into conventional television state, i.e. only audio, video and subtitling or radio state (i.e. toggle between TV and Radio category list of services).
- Subtitle/option [subt/option] – This function displays the subtitle as defined in section and could also be used to temporarily select other user selectable options (e.g. change subtitling language if several available, audio language/track if several available, video aspect ratio output format).
- Info

7. **DVB Subtitling:**

7.1 The IRD shall be capable of decoding and displaying DVB subtitle services which are transmitted in conformance with ETSI EN 300 743.

7.2 The enabling and disabling of the subtitles shall be user controlled through the user interface and/or a dedicated key of the remote control.

7.3 The IRD subtitle service shall support the Hebrew, English, Arabic and Russian language.

8. **Interface for Conditional Access:**

8.1 The IRD should support Common Interface Plus (for CA module) for conditional access.

8.2 The Common Interface may be used with CA-modules that comply with the Common Interface Plus specification V1.2/1.3, CI Plus specification; such modules are referred to as CIP-CAM.

8.3 The IRD shall be Free to Air DVB-T2&T.

9. **Audio, Video, and Data Interfaces:**

The IRD shall have one or more analog audio and video outputs. The physical interface shall be implemented as a SCART interface or a coaxial interface.

9.1 **SCART output interface**

9.1.1 The SCART interface shall comply with ETSI EN 50049-1 and ETSI EN 50157-2.

9.1.2 If a SCART interface is implemented, an analog stereo audio output interface in the SCART interface is mandatory.

9.2 **Coaxial audio and coaxial Composite video output interface**
9.2.1 The composite interface shall be implemented as an RCA connector.

9.2.2 If coaxial video output interface is implemented, the IRD shall have an analog audio stereo output interface (left and right channel RCA connector).

9.3 Digital Audio and Video Interfaces

9.3.1 Digital Audio Video Interface (HDMI)

9.3.1.1 The IRD shall have at least one HDMI output as described in ETSI TS 102 201. All digital Video Interfaces shall be compliant to the HDMI Specification Version 1.3 or higher.

9.3.1.2 An HDMI output interface capable of carrying native audio bitstreams, transcoded audio bitstreams, and decoded stereo PCM audio shall be present.

9.3.2 Digital Audio S/PDIF Interfaces

The IRD should have a digital audio S/PDIF output (electrical RCA or optical TOSLINK connector) capable of carrying transcoded audio bitstreams and decoded stereo PCM audio.

9.4 Data Interface

The IRD shall have a Universal Serial Bus Port, USB 2.0.

10. Accessories:

10.1 Remote control and Batteries.
10.2 Audio and Video cables.
10.3 RF-UHF cable.
10.4 HDMI 1.3 cable.
10.5 Getting started user manual: Hebrew, English, Arabic language.
10.6 Indoor Antenna.

11. IDAN+ DVB-T2 Network Specification:

11.1 8 MHz Bandwidth – UHF IV, V Band.
11.2 Three (3) SFN Networks (CH-28/27 & CH-32/33).
11.3 32K extended Mode.
11.4 1/16 Guard Intervals.
11.5 Input Mode B, Type 1-MPLPs- 2PLPs (Radio & TV).
11.6 PLP1-64QAM, FEC 3/4; PLP2-QPSK, FEC 3/4.
11.7 Rotated QAM Constellation.
11.8 SISO- Is used.
11.9 PAPR- No PAPR reduction is used.
11.10 Pilot pattern -PP4.
11.11 L1 Mod -QPSK.
11.12 FEC Frame length (64800).
11.13 FEF parts-None.
11.14 Auxiliary streams- None.
11.15 Normal Mode or High Efficiency Mode
11.16 MPEG 2-TS.

12. IDAN+DVB-T Network Specification:
12.1 8 MHz Bandwidth – UHF Band.
12.2 8 K Modes.
12.3 ¼ Guard Intervals.
12.4 16QAM, FEC rat 2/3.
12.6 Audio – AAC-HE 2.
12.7 MPEG 2-TS.
12.8 Three (3) SFN Networks (CH-29 &CH-26)

13. END.