THE UNITED REPUBLIC OF TANZANIA

TANZANIA COMMUNICATIONS REGULATORY AUTHORITY ISO 9001:2008 CERTIFIED



PUBLIC NOTICE

Minimum Technical Requirements and Specifications for Satellite (DVB-S2), Cable (DVB-C, DVB-C2), Terrestrial (DVB-T, DVB-T2), Internet Protocol Television (IPTV) Set Top Boxes (STBs) and Integrated Digital Television Receivers

The Tanzania Communications Regulatory Authority (TCRA), established under the Tanzania Communications Regulatory Authority Act No.12 of 2003, is mandated among other duties, to license communications and broadcasting operators and type approve communication equipment for use in the United Republic of Tanzania pursuant to Section 82 of the Electronic and Postal Communications Act, No.3 of 2010 hereby stipulating as follows:-

- 1. The Authority shall be responsible for the establishment and publication of technical standards relating to all regulated services in the United Republic of Tanzania.
- 2. In establishing such standards, the Authority shall-
 - (a) Where appropriate, seek submissions from other interested parties, in particular those persons likely to be most affected by the publication of such standards; and
 - (b) Participate in standardization activities and take due account of any relevant standards prescribed by international organizations to which the United Republic belongs, such as the International Telecommunications Union and other sub-regional groupings."

Furthermore, pursuant to Section 4(1) (a) of the Electronic and Postal Communications (Digital and Other Broadcasting networks) Regulation 2011 which empowers the Authority to determine standards for broadcasting networks in the country and Section 10 (2) of the Electronic and Postal Communications (Digital and Other Broadcasting Networks)

Regulation 2011 which empowers the Authority, from time to time review standards as provided under the Regulations.

The Authority therefore wishes to notify all importers of Digital Terrestrial (DTT), Satellite (DTH), Cable Television receivers, Multiplex Operators, Content Services Providers and the general public that, the minimum technical requirements and specifications for Terrestrial (DVB-T, DVB-T2), Satellite (DVB-S2), Cable (DVB-C, DVB-C2) digital set top boxes (STBs), Internet Protocol Set Top Boxes (IPTV) and integrated digital television receivers have been revised on grounds of technology advancement and obsoleteness of old standards for use with DTT, DTH and Cable networks.

Standards are guidelines for equipment manufacturers and/or suppliers aimed at adhering to quality product in the Tanzania.

The composed minimum technical requirements and specifications for DVB-S2, DVB-C (To be valid until when DVB-C2 is matured in the market), DVB-C2, DVB-T (To be valid until when DVB-T2 is matured in the market), DVB-T2, IPTV Set-Top-Boxes and Integrated Digital Television Receivers shall be as presented in the Tables herein below:

1.0 DVB-S2 MINIMUM TECHNICAL REQUIREMENTS AND SPECIFICATIONS

A: SE	A: SET TOP BOX (STB) MINIMUM TECHNICAL SPECIFICATIONS			
S/N	A. STB BASIC FEATURES	OPERATIONAL EFFECT(S)		
1.0	Auto and manual search modes	Basic features for broadcasting channel searching		
2.0	Signal Quality Level indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality		
3.0	Parental Control/Lock	Basic feature for controlling viewers		
4.0	Electronic Program guide (EPG)	On screen electron guide		
5.0	Full function standard IR remote control, using AA or AAA size battery.	Small size battery, hence an easier to handle (small in size) remote control		
6.0	Languages: English and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians		
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania		

8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best choice
9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)
10.0	Warranty: 1 year	To avoid substandard equipment in the market
11.0	Owner's Manual	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each STB shall be legibly and indelibly marked with at least the following information: a) Manufacturer's name or trade-mark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) Satellite input and output terminals; and g) Sockets for audio and video output.	Basic marks to enable the subscriber to have first-hand information

	B-S2 SHALL HAVIFICATIONS	/E THE FOLLOWING	MINIMUM TECHNICAL
		Input impedance	75Ω
		Modulation	Single Carrier QPSK with multiple streams
		Modulation	QPSK, 8PSK, 16APSK,32APSK
		schemes	
		Frequency	950-2150 MHz
		Input signal level	-25 dBm to -65 dBm
		FEC coding	LDPC + BCH 1/4, 1/3, 2/5, 1/2, 3/5, 2/3,
			3/4, 4/5, 5/6, 8/9, 9/10
		C/N range	-2.0 dB (QPSK) to +16 dB (32APSK)
		Signal Bandwidth	Depends on the transponder
		Interleaving	Bit-Interleaving
		Symbol rate	2~45Msps
4.0	RF tuner	Rotated	2 bit/s/Hz to 5 bit/s/Hz, optimized for
1.0	& DVB-S2 Channel	constellations	operation over non-linear transponders.
		Transport stream	MPEG-2 and MPEG-4 ISO/IEC13818-1

		Video decoding	MPEG-2/MPEG4 AVC(H.264)
			. ,
		Aspect Ratio	4:3,16:9
		(image rate)	
2.0	MPEG	Frame frequency	25Hz (PAL)
	Transport	Video Resolution	720X576 (PAL) - standard definition,
	stream video		1920X1080 (High definition)
	and Audio	Audio decoding	MPEG-2, MPEG-4
	Decoding	Audio mode	stereo
		The STB should in	iclude a frequency scanning function to
			ility of DVB-S2 signals
			gramme memory in case of cut off
3.0	Scanning		to display the number of channel currently
	function	being scanned	to display the number of chainles currently
	Tarrectori		to display number of services located
			display details of its name, network ID,
		signal strength an	u quality
		FDC:	
			next programme information, 24x7 days
		schedule	
		Auto/manual tunir	ng
		24-hourclock	
			re's, EPG, CA features must be upgradable
		over the air	
		Support receive m	nail
4.0	Software	Provides the insta	nt and personalized message prompt
		including the follo	
			d withdrawal of subtitles
			ulti-language info
			play current software and hardware version
			ne decoders
			icate whether an updates are available or
		not	icate whether an apaates are available of
			icate the unique serial number and state of
			coder (error code)
			•
			icate type of middleware and other resident
		applications	s version numbers
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5.0	Interfaces	•	r: female connector, input impedance 75
		ohms	
			female connector for video output and two
			ale connectors for stereo sound output
		RF output: female	
			shall have provisions to provide proper
		power supply and switching signal for oscillator selection and	
		polarization select	ion for LNB

	Conditional Access	a DVB-CI (Common Interface) slot to allow any type of conditional access module to be plugged in to the set top box. The CI should be upgradable to newer version
7.0	Physical	Power supply
	attributes	AC 220±10%, 50±1Hz
8.0	Environmental	Operating Temperature
	attributes	0~45°C
		Operating humidity
		Up to 90%
9.0	Reliability	MTBF
	_	>80,000Hrs

2.0 DVB-C MINIMUM TECHNICAL SPECIFICATIONS

A: SET TOP BOX (STB) MINIMUM TECHNICAL SPECIFICATIONS			
S/N	A. STB BASIC FEATURES	OPERATIONAL EFFECT(S)	
1.0	Auto and manual search modes	Basic features for broadcasting channel searching	
2.0	Signal Quality Level indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality	
3.0	Parental Control/Lock	Basic feature for controlling viewers	
4.0	Electronic Program guide (EPG)	On screen electron guide	
5.0	Full function standard IR remote control, using AA or AAA size battery.	Small size battery, hence an easier to handle (small in size) remote control	
6.0	Languages: English and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians	
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania	
8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best	
9.0	Favourite channel list editing	choice Provision for editing channels for user preference (basic feature)	
10.0	Warranty: 1 year	To avoid substandard equipment in the market	
11.0	Owner's Manual.	User manual for understanding the operation of the equipment as well as troubleshooting simple	

		problems (English and Swahili languages)
12.0	Marking: Each STB shall be legibly and indelibly marked with at least the following information:	Basic marks to enable the subscriber to have first-hand information
	 a) Manufacturer's name or trade-mark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) Cable input and output terminals; and g) Sockets for audio and video output. 	

	OVB-C SHALL HAVE STRICATIONS	THE FOLLOWING	MINIMUM TECHNICAL
		Input impedance	75Ω
		Modulation	Single Carrier QAM
		Modes	Constant Coding & Modulation
		Modulation schemes	16- to 256-QAM
1.0	RF tuner	Frequency	6 and 8 MHz
	& DVB-C	Input signal level	-40 to -60 dBm
	Channel	FEC coding	Reed Solomon (RS)
		C/N range	31 dB Min. for 64 QAM
		Signal Bandwidth	47 MHz – 862 MHz
		Interleaving	Bit Interleaving
		Channel raster	6 or 8 MHz
		Constellations	16 QAM, 64 QAM and 256 QAM
		Max Bit Rates	83.1 Mbit/s
		(8MHz)	
		Transport stream	MPEG-2/ISO/IEC13818-1
		Video decoding	MPEG-2
		Aspect Ratio (image rate)	4:3,16:9
2.0	MPEG	Frame frequency	25Hz (PAL)
	Transport	Video Resolution	720X576 (PAL) - standard definition
	stream and	Audio decoding	MPEG-2
	video and Audio Decoding	Audio mode	stereo
		The STB should inc	clude a frequency scanning function to
			ity of DVB-C signals
			ramme memory in case of cut off

		-	
3.0	Scanning	It should be able to display the number of channel currently	
	function	being scanned	
		It should be able to display number of services located	
		The decoder shall display details of its name, network ID,	
		signal strength and quality	
		EPG: current and next programme information, 24x7days	
		schedule	
		Auto/manual tuning	
		24-hourclock	
		OTA: STB software's, EPG, CA features must be upgradable	
		over the air	
4.0	Coffman	Support Receive mail	
4.0	Software	Provides the instant and personalized message prompt	
		including the following:-	
		Display and withdrawal of subtitles	
		Support multi-language info	
		 Able to display current software and hardware version 	
		stored in the decoders	
		 Able to indicate whether an updates are available or 	
		not	
		Able to indicate the unique serial number and state of	
		the STB decoder (error code)	
		Able to indicate type of middleware and other resident	
		applications version numbers	
		T I I I I I I I I I I I I I I I I I I I	
5.0	Interfaces	Input interfaces: Multiple Transport Stream and Generic	
		Stream Encapsulation (GSE)	
		RF input/output 75 ohms impedance, female connector	
		Output video 1 x RCA(cinch) type; Output audio (L and R) 2 x	
		RCA (cinch) type	
6.0	Interfaces for	STB must include at least one embedded smartcard reader or	
0.0	Conditional	a DVB-CI (Common Interface) slot to allow any type of	
	Access	, , , , , , , , , , , , , , , , , , , ,	
	Access	conditional access module to be plugged in to the set top box. The CI should be upgradable to newer version	
		box. The CI should be appraidable to newer version	
7.0	Physical	Power supply	
7.0	attributes	• • •	
8.0	Environmental	AC 220±10%, 50±1Hz	
0.0	attributes	Operating Temperature 0~45°C	
	attibutes	Operating humidity	
		Up to 90%	
9.0	Reliability	MTBF	
J.U	venaniir	>80,000Hrs	
	THE ABOVE DIVE	COPECTETCATIONS WILL BE VALID UNTIL WHEN DVD_C2	

NB: THE ABOVE DVB-C SPECIFICATIONS WILL BE VALID UNTIL WHEN DVB-C2 IS MATURED IN THE MARKET

3.0 DVB-C2 MINIMUM TECHNICAL REQUIREMENTS AND SPECIFICATIONS

A: SE	T TOP BOX (STB) MINIMUM TECHNICAL S	SPECIFICATIONS
S/N	A. STB BASIC FEATURES	OPERATIONAL EFFECT(S)
1.0	Auto and manual search modes	Basic features for broadcasting channel searching
2.0	Signal Quality Level indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality
3.0	Parental Control/Lock	Basic feature for controlling viewers
4.0	Electronic Program guide (EPG)	On screen electron guide
5.0	Full function standard IR remote control, using AA or AAA size battery.	Small size battery, hence an easier to handle (small in size) remote control
6.0	Languages: English and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania
8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best choice
9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)
10.0	Warranty: 1 year	To avoid substandard equipment in the market
11.0	Owner's Manual.	User manual for understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each STB shall be legibly and indelibly marked with at least the following information:	Basic marks to enable the subscriber to have first-hand information
	 a) Manufacturer's name or trade-mark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) Cable input and output terminals; and g) Sockets for audio and video output. 	

	VB-C2 SHALL HAVI	THE FOLLOWING	G MINIMUM TECHNICAL
		Input impedance	75Ω
		Modulation	OFDM
		Modes	Variable Coding & Modulation and Adaptive Coding & Modulation
		Modulation schemes	16- to 4096-QAM
1.0	RF tuner	Frequency	Flexible, 8 MHz or several hundred MHz
	& DVB-C2 Channel	Service specific robustness	Single and multiple PLP (physical layer pipes)
		Input signal level	-31 to -65 dBm
		FEC coding	LDPC + BCH 1/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		C/N range	-2.0 dB (QPSK) to +16 dB (32APSK)
		Inverse Fast Fourier transform	4k
		(IFFT) size	47 MH - 962 MH-
		Signal Bandwidth	47 MHz – 862 MHz
		Guard Intervals	1/64 or 1/128
		Interleaving Channel raster	Bit, Time and Frequency Interleaving 6 or 8 MHz
		Constellations	5 constellations, ranging in spectrum efficiency from 1 to 10.8 bit/s/Hz, optimized for operation in cable networks
		Pilots Pattern	Scattered and Continual Pilots
		Max Bit Rates (8MHz)	83.1 Mbit/s
		Transport stream	MPEG-2 and MPEG-4 ISO/IEC13818-1
		Video decoding	MPEG-2/MPEG4 AVC (H.264)
		Aspect Ratio (image rate)	4:3,16:9
2.0	MPEG	Frame frequency	25Hz (PAL)
	Transport stream and	Video Resolution	720X576 (PAL) -standard definition, 1920X1080 (High definition)
	video and	Audio decoding	MPEG-2, MPEG-4
	Audio Decoding	Audio mode	stereo
		detect the availabil	l clude a frequency scanning function to lity of DVB-C2 signals
3.0	Scanning function		ramme memory in case of cut off o display the number of channel currently

		It should be able to display number of services located		
		The decoder shall display details of its name, network ID,		
		signal strength and quality		
		Signal Scienger and quality		
		EPG: current and next programme information, 24x7days schedule		
		Auto/manual tuning		
		24-hourclock		
		OTA: STB software's, EPG, CA features must be upgradable over the air		
		Support Receive mail		
4.0	Software	Provides the instant and personalized message prompt including the following:-		
		Display and withdrawal of subtitles		
		Support multi-language info		
		Able to display current software and hardware version		
		stored in the decoders		
		Able to indicate whether an updates are available or		
		not		
		Able to indicate the unique serial number and state of		
		the STB decoder (error code)		
		Able to indicate type of middleware and other resident		
		applications version numbers		
5.0	Interfaces	Input interfaces: Multiple Transport Stream and Generic Stream Encapsulation (GSE)		
		RF input/output 75 ohms impedance, female connector		
		Output video 1 x RCA(cinch) type; Output audio (L and R) 2 x RCA (cinch) type		
6.0	Interfaces for	STB must include at least one embedded smartcard reader or		
	Conditional	a DVB-CI (Common Interface) slot to allow any type of		
	Access	conditional access module to be plugged in to the set top		
		box. The CI should be upgradable to newer version		
7.0	Dhysical	Dower cumply		
7.0	Physical attributes	Power supply AC 220+10% 50+1Hz		
8.0	Environmental	AC 220±10%, 50±1Hz		
0.0	attributes	Operating Temperature 0~45°C		
	attiibutes			
		Operating humidity Up to 90%		
9.0	Reliability	MTBF		
9.0	reliability	>80,000Hrs		
		/ UU/UUUI 113		

4.0 DVB-T MINIMUM TECHNICAL SPECIFICATIONS

A: SET TOP BOX (STB) MINIMUM TECHNICAL SPECIFICATIONS			
S/N	A. STB BASIC FEATURES	OPERATIONAL EFFECT(S)	
1.0	Auto and manual search modes	Basic features for broadcasting channel searching	
2.0	Signal Quality Level indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality	
3.0	Parental Control/Lock	Basic feature for controlling viewers	
4.0	Electronic Program guide (EPG)	On screen electron guide	
5.0	Full function standard IR remote control, using AA or AAA size battery.	Small size battery, hence an easier to handle (small in size) remote control	
6.0	Languages: English and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians	
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania	
8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best choice	
9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)	
10.0	Warranty: 1 year	To avoid substandard equipment in the market	
11.0	Owner's Manual.	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)	
12.0	Marking: Each STB shall be legibly and indelibly marked with at least the following information: a) Manufacturer's name or trade-mark (if any);	Basic marks to enable the subscriber to have first-hand information	
	 b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) RF input and output terminals; and g) Sockets for audio and video output. 		

B:DV	B-T SHALL HAVE	FOLLOWING MINI	MUM TECHNICAL SPECIFICATIONS	
		Input impedance	75Ω	
		Modulation	COFDM: QPSK, 16QAM, 64QAM	
		Frequency	VHF (174-230MHz) - optional, UHF (470– 862 MHz)	
		Input signal level	-33dBm to -81dBm	
		FEC coding	Convolutional Coding + Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	
		FTT Size	2k, 8k	
		C/N range	3dB (QPSK) to 7dB (64QAM)	
		Guard intervals	1/4, 1/8, 1/16, 1/32	
1.0	RF tuner	Channel raster (width)	7MHz (VHF), 8MHz (UHF)	
1.0	& DVB-T Channel	Signal Bandwidth	7.61 MHz in the 8 MHz channel; 6.66 MHz in the 7 MHz channel	
		Interleaving	Bit+ Frequency	
		Max Bit Rates (8MHz)	32 Mbit/s	
		Used Bit Rates (8MHz)	5 to 32 Mbit/s	
		Transport stream	MPEG-2 ISO/IEC13818	
		Video decoding	MPEG-2/MPEG4AVC	
		Aspect Ratio (image rate)	4:3,16:9	
2.0	MPEG	Frame frequency	25Hz (PAL)	
	Transport stream video and Audio	Video Resolution	720X576 (PAL) - standard definition, 1920X1080 (High definition)	
		Audio decoding	MPEG-2 MUSICAM Layer I&II/HEAAC	
	Decoding	Audio mode	Single track/dual track/stereo	
		Audio sampling	32KHz, 44.1KHz, 48KHz., 96KHz	
		rate	(optional)	
		The STB should include a frequency scanning function to		
		detect the availability of DVB-T signals		
3.0	Scanning	It should also automatically list the content of the terrestrial		
3.0	function	bouquet by reading the PSI/SI streams and Be capable of programme memory in case of cut off		
	Tunction	Be capable of programme memory in case of cut off It should be able to display the number of channel currently		
		being scanned		
		It should be able to display number of services located		
		Where the multiplex is seized, the decoder shall display		
		details of its name, network ID, signal strength and quality		

		EPG: current and next programme information. 24x7days schedule. Auto/manual tuning 24-hourclock OTA: STB software's, EPG, CA features must be upgradable over the air. (USB Upgrade-optional) Support receive mail		
4.0	Software	Provides the instant and personalized message prompt including the following:-		
		Display and withdrawal of subtitles		
		Support multi-language info		
		 Able to display current software and hardware version stored in the decoders 		
		Able to indicate whether an updates are available or not		
		 Able to indicate the unique serial number and state of the STB decoder (error code) 		
		 Able to indicate the received multiplex with indications of signal strength and bit errors rates based on the received PLP 		
		Able to indicate type of middleware and other resident applications version numbers		
.	A -1 -1:4: 1	DVD (sucking all)		
5.0	Additional Hardware	PVR (optional)		
6.0	Teletext	It is able to display Teletext using the OSD and/or by the		
	&Teletext subtitle	insertion of the Teletext data in the VBI of the analogue CVBS Video Output		
7.0	Interfaces	RF input connector: IEC169-2 female, input impedance 75 ohms		
		One RCA (CINCH) female connector for video output and two RCA (CINCH) female connectors for stereo sound output		
		RF bypass (loop) IEC169-2 male		
		RF output via a PAL-G modulator SCART interface (optional)		
		HDMI interface (optional)		
		Should include at least one RF cable to connect the unit with		
		its associated analogue television receiver		
8.0	Interfaces for Conditional Access	STB must include at least one embedded smartcard reader or a DVB-CI (Common Interface) slot to allow any type of conditional access module to be plugged in to the set top box. The CI should be upgradable to newer version		

9.0	Physical	Power supply: AC 220±10%, 50±1Hz	
	attributes	Power: Energy star(option)	
10.0	Environmental	Operating Temperature: 0~45°C	
	attributes	Operating humidity: Up to 90%	
11.0	Reliability	MTBF: >80,000Hrs	

NB: THE ABOVE DVB-T SPECIFICATIONS WILL BE VALID UNTIL WHEN DVB-T2 IS MATURED IN THE MARKET

5.0 DVB-T2 MINIMUM TECHNICAL SPECIFICATIONS

A: SE	A: SET TOP BOX (STB) MINIMUM TECHNICAL SPECIFICATIONS		
S/N	A. STB BASIC FEATURES	OPERATIONAL EFFECT(S)	
1.0	Auto and manual search modes	Basic features for broadcasting channel searching	
2.0	Signal Quality Level indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality	
3.0	Parental Control/Lock	Basic feature for controlling viewers	
4.0	Electronic Program guide (EPG)	On screen electron guide	
5.0	Full function standard IR remote control, using AA or AAA size battery.	Small size battery, hence an easier to handle (small in size) remote control	
6.0	Languages: English and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians	
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania	
8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best choice	
9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)	
10.0	Warranty: 1 year	To avoid substandard equipment in the market	
	Owner's Manual.	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)	
12.0	Marking: Each STB shall be legibly and indelibly marked with at least the following information:	Basic marks to enable the subscriber to have first-hand information	

a) Manufacturer's name or trade-mark (if
any);
b) Mode designation and serial No.'
c) Country of manufacture;
d) Input supply voltage and frequency;
e) Power consumption;
f) RF input and output terminals; and
g) Sockets for audio and video output.

		Input	75Ω
		impedance	7 532
		Modulation	COFDM:QPSK, 16QAM, 64QAM, 256QAM
		Frequency	VHF(174-230MHz)-optional, UHF(470–700MHz)
		Input signal level	-35dBm to -85dBm
		FEC coding	LDPC Code+ BCH Code, Code rates :1/2, 3/5, 2/3, 3/4, 4/5, 5/6
		FTT Size	1K, 2K, 4K, 8K, 16K, 32K
	RF tuner	C/N range (Rice channel)	3dB (QPSK1/2) to 24dB (256QAM5/6)
1.0	& DVB-T2	Pilot Pattern	PP1 to PP8
	Channel	Guard intervals	1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256
		Channel raster	7MHz (VHF),8MHz(UHF), 1.7MHz (VHF)- optional
		Signal Bandwidth	8MHz corresponds to 7.61 MHz in the normal carrier mode, 7.71 MHz for 8k, while 7.777 MHz for 16k and 32k
		Service specific robustness	Physical Layer Pipes (PLP)
		Interleaving	Bit+ Cell + Time + Frequency
		Diversity	SISI, MISO, (SIMO, MIMI if diversity receiver)
		Rotated constellations	Significant robustness gain in channels with severe degradations (multipath, SFN operation, narrow band interference)
		Mode of	Future Extension Frame(FEF)
		Extensions	
		Max Bit Rates (8MHz)	50.3Mbit/s,(32Ke,256QAM,CR=5/6,GI=1/28,PP7)
		Used Bit Rates (8MHz)	Portable SFN:25.0Mbit/s, Fixed SFN:37.0Mbit/s, Fixed MFN:40.2Mbit/s
		(01 11 12)	5. 1115/101 1019 5/ 1 1/Cu 1 11 11 10121 10195

		compatible	(power level measured in a 4KHz
			bandwidth)
		Transport stream	MPEG-2ISO/IEC13818
		Video decoding	MPEG-2/MPEG4AVC (H.264)
		Aspect Ratio	4:3,16:9
2.0	MPEG Transport	(image rate)	
	stream video and Audio	Frame frequency	25Hz (PAL)
	Decoding	Video Resolution	720X576 (PAL) - standard definition, 1920X1080 (High definition)
		Audio decoding	MPEG-2 MUSICAM Layer I&II/HEAAC
		Audio mode	Single track/dual track/stereo
		Audio sampling rate	32KHz, 44.1KHz, 48KHz, 96KHz (optional)
		TI 0TD I III	
			nclude a frequency scanning function to bility of DVB-T signals
			omatically list the content of the terrestrial
3.0	Scanning		ng the PSI/SI streams and
	function		gramme memory in case of cut off
			to display the number of channel currently
		being scanned	to display the number of charmer carrently
			to display number of services located
		Where the multiplex is seized, the decoder shall disp	
		details of its name	e, network ID, signal strength and quality
		EPG: current and schedule	next programme information, 24x7days
		Auto/manual tuni	ng
		24-hourclock	
			re's, EPG, CA features must be upgradable 3 Upgrade-optional)
4.0	6 6	Support receive n	
4.0	Software	Provides the instant and personalized message prompt including the following:-	
		Display and withdrawal of subtitles	
		Support multi-language info	
		· ·	play current software and hardware red in the decoders
		Able to ind not	icate whether an updates are available or
		Able to indicate the unique serial number and st	
		the STB decoder (error code)	
		Able to indicate the received multiplex with	
		indications of signal strength and bit errors rates	

		based on the received PLP		
		Able to indicate type of middleware and other		
		resident applications version numbers		
5.0	Additional Hardware	PVR (optional)		
6.0	Teletext &Teletext subtitle	It is able to display Teletext using the OSD and/or by the insertion of the Teletext data in the VBI of the analogue CVBS Video Output		
7.0	Interfaces	RF input connector: IEC169-2 female, input impedance 75 ohms		
		One RCA (CINCH) female connector for video output and two RCA (CINCH) female connectors for stereo sound output		
		RF bypass (loop) IEC169-2 male		
		RF output via a PAL-G modulator		
		SCART interface (optional)		
		HDMI interface (optional)		
		Should include at least one RF cable to connect the unit with		
		its associated analogue television receiver		
8.0	Interfaces for Conditional Access	STB must include at least one embedded smartcard reader or a DVB-CI (Common Interface) slot to allow any type of conditional access module to be plugged in to the set top box. The CI should be upgradable to newer version		
9.0	Physical attributes	Power supply: AC 220±10%, 50±1Hz Power: Energy star(option)		
10.0	Environmental	Operating Temperature: 0~45°C		
	attributes	Operating humidity: Up to 90%		
11.0	Reliability	MTBF: >80,000Hrs		

6.0 MINIMUM TECHNICAL SPECIFICATIONS FOR INTEGRATED DIGITAL TERRESTRIAL, SATELLITE AND CABLE TELEVISION (IDTV)

1. SCOPE

This specification describes a baseline profile, based on open specifications for Standard (SD) and High Definition (HD) integrated Digital Television (IDTV) receivers for the reception of digital terrestrial, satellite and cable television signals. This profile is based predominantly on Digital Video Broadcasting (DVB) specifications.

2. REFERENCES

The Standards listed in Annex I contains provisions which, through reference in this text, constitute provisions of this specifications. All specifications are subject to revision.

3. REQUIREMENTS

The IDTV shall comply to the following:-

- i. Terrestrial, satellite and cable services. IDTV receivers shall fully comply with detailed specifications in Table I.
- ii. The manufacturer shall ensure compatibility/interfacing with Consumer Electronic equipment such as Audio and Video systems in the country.

TABLE I

A: INTEGRATED DIGITAL TELEVISION – SATELLITE (DVB-S2) MINIMUM			
IECH	TECHNICAL SPECIFICATIONS		
S/N	I. BASIC FEATURES	OPERATIONAL EFFECT(S)	
1.0	Auto and manual search modes	Basic features for broadcasting channel searching	
2.0	Signal Quality Level indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality	
3.0	Parental Control/Lock	Basic feature for controlling viewers	
4.0	Electronic Program guide (EPG)	On screen electron guide	
5.0	Full function standard IR remote control, using AA or AAA size battery.	Small size battery, hence an easier to handle (small in size) remote control	
6.0	Languages: English and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians	
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania	
8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best choice	
9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)	
10.0	Warranty: 1 year	To avoid substandard equipment in the market	
11.0	Owner's Manual	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)	
12.0	Marking: Each iDTV shall be legibly and indelibly marked with at least the following information:	Basic marks to enable the subscriber to have first-hand information	

a) Manufacturer's name or trade-	
mark (if any);	
b) Mode designation and serial No.'	
c) Country of manufacture;	
d) Input supply voltage and	
frequency;	
e) Power consumption;	
f) Satellite input and output	
terminals; and	
g) Sockets for audio and video	
output.	
-	

II: MINIMUM TECHNICAL SPECIFICATIONS

		Input	75Ω
		impedance	
		Modulation	Single Carrier QPSK with multiple streams
		Modulation	QPSK, 8PSK, 16APSK,32APSK
		schemes	
		Frequency	950-2150 MHz
		Input signal level	-25 dBm to -65 dBm
		FEC coding	LDPC + BCH 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		C/N range	-2.0 dB (QPSK) to +16 dB (32APSK)
	RF tuner	Signal Bandwidth	Depends on the transponder
1.0	& DVB-S2	Interleaving	Bit-Interleaving
	Channel	Symbol rate	2~45Msps
		Rotated	2 bit/s/Hz to 5 bit/s/Hz, optimized for operation
		constellations	over non-linear transponders.
		Transport stream	MPEG-2 and MPEG-4 ISO/IEC13818-1
	MPEG Transport	Video decoding	MPEG-2/MPEG4 AVC(H.264)
2.0		Aspect Ratio (image rate)	4:3,16:9
	stream video and Audio	Frame frequency	25Hz (PAL)
	Decoding	Video	720X576 (PAL) - standard definition, 1920X1080
		Resolution	(High definition)
		Audio	MPEG-2, MPEG-4
		decoding	
		Audio mode	stereo
		The IDTV should include a frequency scanning function to o	
		the availability of DVB-S2 signals	

		Be capable of programme memory in case of cut off	
3.0	Scanning	It should be able to display the number of channel currently	
	function	being scanned	
	Tanccion	It should be able to display number of services located	
		The receiver shall display details of its name, network ID, signal	
		strength and quality	
		Strength and quality	
		EDC: gurrent and next programme information 24v7 days	
		EPG: current and next programme information, 24x7 days	
		schedule	
		Auto/manual tuning	
		24-hourclock	
		OTA: IDTV software's, EPG, CA features must be upgradable	
		over the air	
4.0	Coffman	Support receives mail.	
4.0	Software	Provides the instant and personalized message prompt including	
		the following:-	
		Display and withdrawal of subtitles	
		Support multi-language info	
		 Able to display current software and hardware version 	
		stored in the receivers	
		 Able to indicate whether an updates are available or not 	
		 Able to indicate the unique serial number and state of the 	
		IDTV receiver (error code)	
		Able to indicate type of middleware and other resident	
		applications version numbers	
5.0	Interfaces	RF input connector: female connector, input impedance 75 ohms	
		One RCA (CINCH) female connector for video output and two	
		RCA (CINCH) female connectors for stereo sound output	
		RF output: female connector	
		LNB control: IDTV shall have provisions to provide proper power	
		supply and switching signal for oscillator selection and	
		polarization selection for LNB	
6.0	Interfaces for	IDTV must include at least one embedded smartcard reader or a	
	Conditional	DVB-CI (Common Interface) slot to allow any type of conditional	
	Access	access module to be plugged in to the set top box. The CI	
		should be upgradable to newer version	
7.0	Physical	Power supply	
	attributes	AC 220±10%, 50±1Hz	
8.0	Environmental		
	attributes	0~45°C	
		Operating humidity	
		Up to 90%	
9.0	Reliability	MTBF	
		>80,000Hrs	
B: IN	TEGRATED DIGI	TAL TELEVISION — CABLE (DVB-C) MINIMUM TECHNICAL	

SPEC	IFICATIONS		
S/N	I. BASIC FEATURES		OPERATIONAL EFFECT(S)
1.0	Auto and manual search mod	des	Basic features for broadcasting channel searching
2.0	Signal Quality Level indicator	•	Basic feature for signal level indication(green or yellow) for acceptable signal quality
3.0	Parental Control/Lock		Basic feature for controlling viewers
4.0	Electronic Program guide (E		On screen electron guide
5.0	Full function standard IR re l control, using AA or AAA size battery.		Small size battery, hence an easier to handle (small in size) remote control
6.0	Languages: English and Swa	hili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians
7.0	PAL I/B/G auto conversion		PAL I is the VIDEO System for Tanzania
8.0	Minimum 1000 channels reco	eivable	The software programming for channel storage caters for 00-99 or 000 to 999 hence channel storage is the best choice
9.0	Favourite channel list editing		Provision for editing channels for user preference (basic feature)
10.0	Warranty: 1 year		To avoid substandard equipment in the market
11.0	Owner's Manual.		User manual for understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each IDTV shall be legibly and indelibly marked with at least the following information: a) Manufacturer's name or trademark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) Cable input and output terminals; and g) Sockets for audio and video output.		Basic marks to enable the subscriber to have first-hand information
II: N	INIMUM TECHNICAL SPE	75	
	impedanc		
	Modulatio	n Si	ngle Carrier QAM

		Modes	Constant Coding & Modulation
		Modulation	16- to 256-OAM
1.0	RF tuner	schemes	10 to 250 QAM
1.0	& DVB-C	Frequency	6 and 8 MHz
	Channel		-40 to -60 dBm
	Chamiei	Input signal level	-40 to -00 dbiii
		FEC coding	Reed Solomon (RS)
		C/N range	31 dB Min. for 64 QAM
		Signal	47 MHz – 862 MHz
		Bandwidth	
		Interleaving	Bit Interleaving
		Channel	6 or 8 MHz
		raster	
		Constellations	16 QAM, 64 QAM and 256 QAM
		Max Bit Rates	83.1 Mbit/s
		(8MHz)	
		Transport	MPEG-2/ISO/IEC13818-1
		stream	M250 0
		Video	MPEG-2
2.0	MDEC	decoding	42460
2.0	MPEG	Aspect Ratio	4:3,16:9
	Transport stream and	(image rate)	2511 (DAI)
	video and	Frame	25Hz (PAL)
	Audio	frequency	720VE7C (DAL) standard definition
	Decoding	Video Resolution	720X576 (PAL) - standard definition
	Decouning	Audio	MPEG-2
		decoding	MFLG-2
		Audio mode	stereo
		Audio mode	stereo
		The IDTV shou	I Ild include a frequency scanning function to detect
			of DVB-C signals
			programme memory in case of cut off
3.0	Scanning		ole to display the number of channel currently
	function	being scanned	,
		It should be at	ole to display number of services located
			nall display details of its name, network ID, signal
		strength and q	
			and next programme information, 24x7days
		schedule	
		Auto/manual to	uning
		24-hourclock	
			tware's, EPG, CA features must be upgradable
		over the air	
		Support Receiv	
4.0	Software	Provides the in	stant and personalized message prompt including

		the following:-		
		Display and withdrawal of subtitles		
			ılti-language info	
		Able to disp	play current software and hardware version	
			ne receivers	
		Able to indicate whether an updates are available or n		
		IDTV receiv	icate the unique serial number and state of the ver (error code)	
			icate type of middleware and other resident s version numbers	
	_	_		
5.0	Interfaces	Input interfaces: I Encapsulation (GS	Multiple Transport Stream and Generic Stream (E)	
		RF input/output 7	5 ohms impedance, female connector	
		Output video 1 x l RCA (cinch) type	RCA(cinch) type; Output audio (L and R) 2 x	
<i>-</i>	Total C	IDT/		
6.0	Interfaces for Conditional		e at least one embedded smartcard reader or a Interface) slot to allow any type of conditional	
	Access	`	be plugged in to the set top box. The CI	
	Access		able to newer version	
7.0	Physical	Power supply		
	attributes	AC 220±10%, 50:		
8.0	Environmental	-	rature	
	attributes	0~45°C		
		Operating humidit Up to 90%	у	
9.0	Reliability	MTBF		
310	Kenability	>80,000Hrs		
C: IN	TEGRATED DIGI		- CABLE (DVB-C2) MINIMUM	
	NICAL SPECIFIC			
S/N	I. BASIC FEATU	RES	OPERATIONAL EFFECT(S)	
1.0	Auto and manual	search modes	Basic features for broadcasting channel searching	
2.0	Signal Quality Level indicator		Basic feature for signal level indication(green or yellow) for acceptable signal quality	
3.0	Parental Control/Lock		Basic feature for controlling viewers	
4.0	Electronic Program guide (EPG)		On screen electron guide	
5.0	Full function stand control, using A/battery.		Small size battery, hence an easier to handle (small in size) remote control	
6.0	Languages: Englis	sh and Swahili	Availability language selection feature: Swahili is the national language spoken by majority Tanzanians	

	,		
7.0	PAL I/B/G auto		PAL I is the VIDEO System for Tanzania
8.0	Minimum 1000 c	hannels receivab	3
	and storable		storage caters for 00-99 or 000 to 999
			hence channel storage is the best choice
9.0	Favourite channe	el list editing	Provision for editing channels for user
			preference (basic feature)
10.0	Warranty: 1 year	•	To avoid substandard equipment in the market
11.0	Owner's Manual.		User manual for understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each ID and indelibly matthe following info	rked with at least	oly Basic marks to enable the subscriber to have
	a) Manufacturer' mark (if any); b) Mode designa c) Country of ma d) Input supply of frequency; e) Power consum f) Cable input an terminals; and g) Sockets for au output.	tion and serial Nonufacture; noltage and option; d output	
I: M	IINIMUM TECHN	IICAL SPECIFI	CATIONS
		Input impedance	75Ω
		Modulation	OFDM
		Modes	Variable Coding & Modulation and Adaptive
		riodes	Coding & Modulation
		Modulation	16- to 4096-QAM
L.O	RF tuner	schemes	10-10-1030-QAM
	& DVB-C2		Flexible, 8 MHz or several hundred MHz
	Channel	Frequency Service	Single and multiple PLP (physical layer pipes)
	3114111101		Single and multiple PLP (physical layer pipes)
		specific	
		robustness Input signal level	-31 to -65 dBm

FEC coding C/N range Inverse Fast

Fourier transform (IFFT) size 4k

LDPC + BCH 1/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 -2.0 dB (QPSK) to +16 dB (32APSK)

	1	6: 1	47 1411 062 1411	
		Signal	47 MHz – 862 MHz	
		Bandwidth		
		Guard	1/64 or 1/128	
		Intervals		
		Interleaving	Bit, Time and Frequency Interleaving	
		Channel	6 or 8 MHz	
		raster		
		Constellations	5 constellations, ranging in spectrum efficiency	
			from 1 to 10.8 bit/s/Hz, optimized for operation	
			in cable networks	
		Pilots Pattern	Scattered and Continual Pilots	
		Max Bit Rates	83.1 Mbit/s	
		(8MHz)	03.1116143	
		(0141112)		
		Transport	MPEG-2 and MPEG-4 ISO/IEC13818-1	
		Transport	1417 130/1EC13010-1	
		stream	MDEC 2/MDEC4 AVC /U 264V	
		Video	MPEG-2/MPEG4 AVC (H.264)	
2.0	MDEC	decoding	4.2.16.0	
2.0	MPEG	Aspect Ratio	4:3,16:9	
	Transport	(image rate)	2511 (241)	
	stream and	Frame	25Hz (PAL)	
	video and	frequency		
	Audio	Video	720X576 (PAL) -standard definition, 1920X1080	
	Decoding	Resolution	(High definition)	
		Audio	MPEG-2, MPEG-4	
		decoding		
		Audio mode	stereo	
		The IDTV shou	ild include a frequency scanning function to detect	
		the availability	of DVB-C2 signals	
		Be capable of	orogramme memory in case of cut off	
3.0	Scanning	It should be ab	ple to display the number of channel currently	
	function	being scanned	. ,	
			ole to display number of services located	
			nall display details of its name, network ID, signal	
		strength and q	• •	
		Sa crigari and quality		
		EPG: current a	and next programme information, 24x7days	
		schedule		
		Auto/manual tuning		
		24-hourclock		
		OTA: IDTV software's, EPG, CA features must be upgradable over the air		
			vo mail	
4.0	Software	Support Receiv		
7.0	Soltwale		stant and personalized message prompt including	
1		the following:-		
		Display and withdrawal of subtitles		
			and withdrawal of subtitles multi-language info	

		Able to disp stored in th	play current software and hardware version le receivers
			cate whether an updates are available or not
		Able to indi	cate the unique serial number and state of the
			ver (error code)
			cate type of middleware and other resident sversion numbers
5.0	Interfaces	Input interfaces: N Encapsulation (GS	Multiple Transport Stream and Generic Stream (E)
		RF input/output 75	5 ohms impedance, female connector
		Output video 1 x F RCA (cinch) type	RCA(cinch) type; Output audio (L and R) 2 x
6.0	Interfaces for Conditional Access	DVB-CI (Common	e at least one embedded smartcard reader or a Interface) slot to allow any type of conditional be plugged in to the set top box. The CI
	710000		able to newer version
7.0	Physical	Power supply	
7.0	attributes	AC 220±10%, 50=	±1Hz
8.0	Environmental	Operating Temper	
	attributes	0~45°C	
		Operating humidit	у
		Up to 90%	
9.0	Reliability	MTBF >80,000Hrs	
D: TN	TECDATED DIGI		- TERESTRIAL (DVB-T) MINIMUM
	NICAL SPECIFIC		TERESTRIAL (DVD T) PIZNIMOPI
S/N	I. BASIC FEATU	RES	OPERATIONAL EFFECT(S)
1.0	Auto and manual	search modes	Basic features for broadcasting channel searching
2.0	Signal Quality Lev	el indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality
3.0	Parental Control	/Lock	Basic feature for controlling viewers
4.0	Electronic Program guide (EPG)		On screen electron guide
5.0	Full function standard IR remote control, using AA or AAA size battery.		Small size battery, hence an easier to handle (small in size) remote control
6.0	Languages: English and Swahili		Availability language selection feature: Swahili is the national language spoken by majority Tanzanians
7.0	PAL I/B/G auto	conversion	PAL I is the VIDEO System for Tanzania
8.0	Minimum 1000 ch and storable		The software programming for channel storage caters for 00-99 or 000 to 999
			hence channel storage is the best choice

9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)
10.0	Warranty: 1 year	To avoid substandard equipment in the market
11.0	Owner's Manual.	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each IDTV shall be legibly and indelibly marked with at least the following information: a) Manufacturer's name or trademark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) RF input and output terminals; and g) Sockets for audio and video output.	Basic marks to enable the subscriber to have first-hand information

II: MINIMUM TECHNICAL SPECIFICATIONS

		Input	75Ω
		impedance	
		Modulation	COFDM: QPSK, 16QAM, 64QAM
		Frequency	VHF (174-230MHz) - optional, UHF (470- 862
			MHz)
		Input signal	-33dBm to -81dBm
		level	
		FEC coding	Convolutional Coding + Reed Solomon 1/2, 2/3,
			3/4, 5/6, 7/8
		FTT Size	2k, 8k
		C/N range	3dB (QPSK) to 7dB (64QAM)
	RF tuner	Guard	1/4, 1/8, 1/16, 1/32
1.0	& DVB-T	intervals	
	Channel	Channel	7MHz (VHF), 8MHz (UHF)
		raster (width)	
		Signal	7.61 MHz in the 8 MHz channel; 6.66 MHz in the
		Bandwidth	7 MHz channel
		Interleaving	Bit+ Frequency
		Max Bit Rates	32 Mbit/s
		(8MHz)	
		Used Bit	5 to 32 Mbit/s
		Rates (8MHz)	

		Transport	MDEC 2 ICO/IEC12010
		Transport	MPEG-2 ISO/IEC13818
		stream	
		Video	MPEG-2/MPEG4AVC
		decoding	
2.0	MPEG	Aspect Ratio	4:3,16:9
	Transport	(image rate)	
	stream video	Frame	25Hz (PAL)
	and Audio	frequency	
	Decoding	Video	720X576 (PAL) - standard definition, 1920X1080
	J	Resolution	(High definition)
		Audio	MPEG-2 MUSICAM Layer I&II/HEAAC
		decoding	I THE EG 2 MOSICAM Edych Telly HEARC
		Audio mode	Cingle track/dual track/stores
			Single track/dual track/stereo
		Audio	32KHz, 44.1KHz, 48KHz., 96KHz (optional)
		sampling rate	
		The IDT / also	Idiochida - Communication Constitut to detect
			ald include a frequency scanning function to detect
			of DVB-T signals
			automatically list the content of the terrestrial
3.0	Scanning		ading the PSI/SI streams and
	function		programme memory in case of cut off
		It should be al	ple to display the number of channel currently
		being scanned	
		It should be al	ple to display number of services located
		Where the multiplex is seized, the receiver shall display details	
		of its name, ne	etwork ID, signal strength and quality
		EPG: current a	and next programme information. 24x7days
		schedule.	
		Auto/manual t	unina
		24-hourclock	5
			ftware's, EPG, CA features must be upgradable
			JSB Upgrade-optional)
		Support receiv	
4.0	Software		istant and personalized message prompt including
		the following:-	
		the following	
		- Display	and withdrawal of subtitles
		Display and withdrawal of subtitles	
		Support multi-language info	
		Able to display current software and hardware version	
		stored in the receivers	
		Able to indicate whether an updates are available or not	
		 Able to indicate the unique serial number and state of the 	
		IDTV receiver (error code)	
		Able to	indicate the received multiplex with indications of
			trength and bit errors rates based on the received
		PLP	
		Able to	indicate type of middleware and other resident
	•		

		annlications	s version numbers	
		аррпсацоп	yersion numbers	
5.0	Additional Hardware	PVR (optional)		
6.0	Teletext &Teletext subtitle		y Teletext using the OSD and/or by the eletext data in the VBI of the analogue CVBS	
7.0	Interfaces	RF input connector: IEC169-2 female, input impedance 75 ohms One RCA (CINCH) female connector for video output and two RCA (CINCH) female connectors for stereo sound output RF bypass (loop) IEC169-2 male RF output via a PAL-G modulator SCART interface (optional)		
		HDMI interface (optional) Should include at least one RF cable to connect the unit with its associated analogue television receiver		
8.0	Interfaces for Conditional Access	IDTV must include at least one embedded smartcard reader or a DVB-CI (Common Interface) slot to allow any type of conditional access module to be plugged in to the set top box. The CI should be upgradable to newer version		
9.0	Physical attributes	Power supply: AC Power: Energy sta	220±10%, 50±1Hz	
10.0	Environmental attributes	Operating Temper Operating humidit	rature: 0~45°C y: Up to 90%	
	Reliability TEGRATED DIGI NICAL SPECIFIC		S - TERESTRIAL (DVB-T2) MINIMUM	
S/N	I. BASIC FEATU	RES	OPERATIONAL EFFECT(S)	
1.0	Auto and manual	search modes	Basic features for broadcasting channel searching	
2.0	Signal Quality Lev	vel indicator	Basic feature for signal level indication(green or yellow) for acceptable signal quality	
3.0	Parental Control/Lock		Basic feature for controlling viewers	
4.0	Electronic Prograi		On screen electron guide	
5.0	Full function stand control, using AA battery.		Small size battery, hence an easier to handle (small in size) remote control	

Languages: English and Swahili

PAL I/B/G auto conversion

6.0

7.0

Availability language selection feature: Swahili is the national language spoken by

PAL I is the VIDEO System for Tanzania

majority Tanzanians

8.0	Minimum 1000 channels receivable and storable	The software programming for channel storage caters for 00-99 or 000 to 999
		hence channel storage is the best choice
9.0	Favourite channel list editing	Provision for editing channels for user
		preference (basic feature)
10.0	Warranty: 1 year	To avoid substandard equipment in the
	, ,	market
11.0	Owner's Manual.	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each IDTV shall be legibly and indelibly marked with at least the following information: a) Manufacturer's name or trademark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) RF input and output terminals; and g) Sockets for audio and video output. INIMUM TECHNICAL SPECIFICAT	Basic marks to enable the subscriber to have first-hand information

II: MINIMUM TECHNICAL SPECIFICATIONS

		Input impedance	75Ω
		Modulation	COFDM:QPSK, 16QAM, 64QAM, 256QAM
		Frequency	VHF(174-230MHz)-optional, UHF(470- 700MHz)
		Input signal level	-35dBm to -85dBm
		FEC coding	LDPC Code+ BCH Code, Code rates :1/2, 3/5,
			2/3, 3/4, 4/5, 5/6
		FTT Size	1K, 2K, 4K, 8K, 16K, 32K
		C/N range	3dB (QPSK1/2) to 24dB (256QAM5/6)
	RF tuner & DVB-T2 Channel	(Rice channel)	
		Pilot Pattern	PP1 to PP8
1.0		Guard intervals	1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256
		Channel raster	7MHz (VHF),8MHz(UHF), 1.7MHz (VHF)-optional
		Signal	8MHz corresponds to 7.61 MHz in the normal
		Bandwidth	carrier mode, 7.71 MHz for 8k, while 7.777 MHz
			for 16k and 32k
		Service	Physical Layer Pipes (PLP)

		cnocific		
		specific robustness		
		Interleaving	Bit+ Cell + Time + Frequency	
		Diversity	SISI, MISO, (SIMO, MIMI if diversity receiver)	
		Rotated	Significant robustness gain in channels with	
		constellations	severe degradations (multipath, SFN operation,	
		constantions	narrow band interference)	
		Mode of	Future Extension Frame(FEF)	
		Extensions	ratare Extension Frame(FEF)	
		Max Bit Rates	50.3Mbit/s,(32Ke,256QAM,CR=5/6,GI=1/28,PP7)	
		(8MHz)	30131 151g 3/(321 16/230 Q/ 11 1/21 1 3/ 0/01 1/ 20/11 1 /)	
		Used Bit	Portable SFN:25.0Mbit/s, Fixed SFN:37.0Mbit/s,	
		Rates (8MHz)	Fixed MFN:40.2Mbit/s	
		GE06	Signal is under the mask of DVB-T2 (power level	
		compatible	measured in a 4KHz bandwidth)	
		<u> </u>		
		Transport	MPEG-2ISO/IEC13818	
		stream	MDEG 2/MDEG 41/10/1/10/4/	
		Video	MPEG-2/MPEG4AVC (H.264)	
2.0	MDEC	decoding	12460	
2.0	MPEG	Aspect Ratio	4:3,16:9	
	Transport stream video	(image rate)	OFILE (DAL)	
	and Audio	Frame	25Hz (PAL)	
	Decoding	frequency	720VF7C (DAL) -tdaud definition 1020V1000	
	Decouning	Video	720X576 (PAL) - standard definition, 1920X1080	
		Resolution Audio	(High definition)	
			MPEG-2 MUSICAM Layer I&II/HEAAC	
		decoding Audio mode	Single track/dual track/stereo	
		Audio	32KHz, 44.1KHz, 48KHz, 96KHz (optional)	
		sampling rate	32KHz, 44.1KHz, 46KHz, 56KHz (optional)	
		Sampling race		
		The IDTV shou	uld include a frequency scanning function to detect	
			of DVB-T signals	
		•	automatically list the content of the terrestrial	
3.0	Scanning	bouquet by rea	ading the PSI/SI streams and	
	function	Be capable of	programme memory in case of cut off	
		It should be al	ple to display the number of channel currently	
		being scanned		
		It should be able to display number of services located		
		Where the multiplex is seized, the receiver shall display details		
		of its name, ne	etwork ID, signal strength and quality	
		EDC :		
			and next programme information, 24x7days	
		schedule	uning	
		Auto/manual to	uning	
		24-hourclock	ftware's EDC CA features must be unavadable	
		OTA: IDTV software's, EPG, CA features must be upgradable		

		over the air. (USB Upgrade-optional)	
		Support receive mail	
4.0	Software	Provides the instant and personalized message prompt including	
		the following:-	
		Display and withdrawal of subtitles	
		Support multi-language info	
		 Able to display current software and hardware version 	
		stored in the receivers	
		 Able to indicate whether an updates are available or not 	
		 Able to indicate the unique serial number and state of the IDTV receiver (error code) 	
		 Able to indicate the received multiplex with indications of signal strength and bit errors rates based on the received PLP 	
		Able to indicate type of middleware and other resident applications version numbers	
5.0	Additional Hardware	PVR (optional)	
	naiuwaie		
6.0	Teletext	It is able to display Teletext using the OSD and/or by the	
0.0	&Teletext	insertion of the Teletext data in the VBI of the analogue CVBS	
	subtitle	Video Output	
		,	
7.0	Interfaces	RF input connector: IEC169-2 female, input impedance 75 ohms	
		One RCA (CINCH) female connector for video output and two	
		RCA (CINCH) female connectors for stereo sound output	
		RF bypass (loop) IEC169-2 male	
		RF output via a PAL-G modulator	
		SCART interface (optional)	
		HDMI interface (optional)	
		Should include at least one RF cable to connect the unit with its	
		associated analogue television receiver	
0.0	Tutouf f	IDTV moves in alredo at locations and added acceptant was de-	
8.0	Interfaces for	IDTV must include at least one embedded smartcard reader or a	
	Conditional	DVB-CI (Common Interface) slot to allow any type of conditional	
	Access	access module to be plugged in to the set top box. The CI	
		should be upgradable to newer version	
9.0	Physical	Power supply: AC 220±10%, 50±1Hz	
J.U	attributes	Power: Energy star(option)	
10.0	Environmental	Operating Temperature: 0~45°C	
	attributes	Operating humidity: Up to 90%	
11.0	Reliability	MTBF: >80,000Hrs	
		1	

ANNEX I: LIST OF REFFERED INTERNATIONAL STANDARDS

		INTERNATIONAL STANDARDS
S/No	Reference No.	Title
1.	TR 101 190 Ver 1.3.2	Implementation Guidelines for DVB Terrestrial
		Services; Transmission aspects
2.	EN 302 755 Ver 1.3.1	Framing structure channel coding and modulation
	2.1.002 700 10. 1.0.1	for a second generation digital terrestrial
		broadcasting system (DVB-T2)
2	EN 200 420 Vov 1 2 1	
3.	EN 300 429 Ver 1.2.1	Framing structure, channel coding and modulation
		for cable systems (DVB-C)
4.	EN 300 421 Ver 1.1.2	Framing structure, channel coding and modulation
		for 11/12 GHz satellite services (DVB-S)
5.	EN 302 307 Ver 1.2.1	Second generation framing structure, channel
		coding and modulation systems for Broadcasting,
		Interactive Services, News Gathering and other
		broadband satellite applications (DVB-S2)
6.	TS 102 773 Ver 1.3.1	
0.	13 102 //3 Vei 1.3.1	Modulation Interface for a second generation
	700 /750 10010 1	digital terrestrial television broadcasting system
7.	ISO/IEC 13818-1:	Information technology – Generic coding of
	2007/Amd. 6: 2011	moving pictures and associated audio information"
		Part 1:Systems (MPEG 2)
8.	ISO/ IEC 13818-2:	Information technology – Generic coding of
	2000/Amd. 3: 2010	moving pictures and associated audio information
	•	Part 2 Video Coding
9.	ISO/IEC 14496-3: 2009	Information technology - Coding of audio-visual
	133/123 1 1 133 3 1 2333	objects : Part 3 Audio
10	ISO/IEC 14496-15:	Information technology - Coding of audio-visual
10.	2010	objects : Part 15 Advanced Video Coding (MPEG-4
	2010	
	FTCI TC 101 154 V	Part 10 AVC) (AVC File Format)
11.		Digital Video Broadcasting (DVB); Specification for
	1.10.1	the use of Video and Audio Coding in Broadcasting
		Applications based on the MPEG-2 Transport
		Stream.
12.	ETSI EN 301 192 Ver	Digital Video Broadcasting (DVB); DVB
	1.5.1	specification for data broadcasting
13.	EN 50221 Ver 1	Common Interface Specification for Conditional
		Access and other Digital Video Broadcasting
		Receiver Applications and ETR 289 Ver 1 Support
		for use of scrambling and Conditional Access (CA)
		within digital broadcasting systems
14.	TS 101 699 Ver 1.1.1	Extensions to the Common Interface Specification
15.		
15.	13 102 000 Ver 1.3.2	Specification for System Software Update in DVB
	ETCLEN 200 460 1	Systems
16.	ETSI EN 300 468 Ver	Specifications for Service Information (SI) in DVB
	1.13.1	systems
17.		
18.	TS 101 211 Ver 1.10.1	Guidelines on implementation and usage of
		Service Information (SI) in DVB systems
19.	ETSI EN 300 743 Ver	Subtitling Systems

	1.4.1	
20.	ETSI TS 102 831 Ver 1.1.1	Digital Video Broadcasting (DVB); Implementation guidelines for a second generation digital terrestrial television broadcasting system (DVB-T2)
21.	ETSI TS 102 201 Ver	Digital Video Broadcasting (DVB); Interfaces for
	1.2.1	DVB Integrated Receiver (DVB-IRD)
22.	ETSI EN 300 706	Enhanced Teletext specification

7.0 MINIMUM TECHNICAL SPECIFICATIONS FOR INTERNET PROTOCOL TELEVISION (IPTV) SET TOP BOXES (STBs)

1. SCOPE

This minimum technical specification specifies the requirements of a digital Set Top Box (STB), for use by the subscribers to receive IPTV services delivered to the viewers' homes using fiber cable as last mile access network. In the home, the IPTV STB is to be connected to the Cable Modem using a 10/100 Base T Ethernet connector.

Alternately the STB could also be used for receiving IPTV services delivered using high speed Digital Subscriber Line (DSL) based access technologies (ADSL2, ADSL2+, VDSL etc.) or for receiving services delivered via a broadband modem connected to a 4G network. In this case STB is to be connected to the DSL Modem or the Broadband Modem using the Ethernet connector.

2. REFERENCES

The Standards listed in Annex I contains provisions which, through reference in this text, constitute provisions of this specifications. All specifications are subject to revision.

3. REQUIREMENTS

The IPTV STB shall be based on open (non-proprietary) architecture and shall ensure technical compatibility and effective interoperability amongst different IPTV services in the country. The interoperability shall be achieved by complying with the following ETSI standards:-

- TS 102 034 V1.5.1 (2014-05): Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services
- ii. over IP Based Networks TS 102 542 V1.2.1: Guidelines for the implementation of DVB IP Phase 1 Specifications
- iii. TS 102 539 V1.3.1 (2010-04): Carriage of broadband guide content information over IP
- iv. TS 102 824 V1.2.1: "Digital Video Broadcasting (DVB); Remote Management and Firmware Update System For DVB IP Services"
- v. TS 102 366 V1.2.1: "Digital Audio Compression (AC-3, Enhanced AC-3) Standard

4. SOFTWARE SPECIFICATIONS

- **4.1** The STB shall have the capability to receive the following three types of services delivered using Real Time Streaming Protocol (RTSP) as defined in S/NO. 1 of Annex I.
 - i. Live Media Broadcast (LMB): Delivery in Unicast or Multicast
 - ii. Media Broadcast with Trick Modes (MBwTM): Delivery in Unicast only
 - iii. Content on Demand (CoD) Delivery in Unicast. User initiates a presentation
- **4.2** The complete protocol stack used for the delivery of the services mentioned in Clause 4.1 above, is described in clause 4 of S/NO. 1 of Annex I. The detailed description of the process of encapsulation of the MPEG-2 transport stream packets carrying Audio/video streams and service information (DVB SI), into RTP packets and their transport over the IP network is given in Clause 7 of S/NO. 1 of Annex I. The IPTV STB should conform to this complete protocol stack.

The carriage of DVB-SI in transport streams is described in Clause 7.1.2 of S/NO. 1 of Annex I .As per this the following are applicable:

- i. Carriage of PAT & PMT is mandatory on all transport streams.
- ii. Option 1: Carriage of all DVB SI tables except NIT (TS-Full SI)
- iii. Option 2: Carriage of tables other than PMT & PAT is optional (TS-Optional SI)
- **4.3** The STB should have the capability to decode MPEG -2 MP@ML SDTV and optionally MPEG-4 Part 10 AVC HP@L4 HDTV signals.
- **4.4** The STB should have the capability to decode MPEG -2 MP@ML SDTV and optionally MPEG-4 Part 10 AVC HP@L4 HDTV signals.
- **4.5** The STB should have the capability to decode one or more of the following formats: MPEG-1 Layer2, E-AC3 Stereo, MPEG-4 HE AAC Stereo, MPEG-1 Layer3. If any multichannel audio is available, it should be transcoded and passed through to an S/PDIF if available.
- **4.6** On connection to the network, the IPTV STB should send a broadcast query requesting info from the DHCP server. On receiving this request, the DHCP server will assign an IP address to the STB. This process is defined in detail in Clause 8 of S/NO. 1 of Annex I.
- **4.7** DVB has defined a Service Discovery / Selection (SD&S) process in Clause 5 of S/NO. 1 of Annex I. SD&S protocol for multicast services is transported in IP packets in accordance with the DVB STP protocol whereas for Unicast services SD&S info is transported in HTTP. Using this information the IPTV STB should build a list of service providers and the different services available from each service provider.
- **4.8** Clause 9 of S/NO. 1 of Annex I specifies the File Upload System Stub (FUSS), which is mandatory and allows the system software of an IPTV STB to be updated on a power-cycle or reboot. The sending of the system software will be handled by the mechanisms specified in S/NO. 4 of Annex I. The IPTV STB should conform to this in order to get the software update.

- **4.9.** S/NO. 3 of Annex I specifies the signalling and transport of TV Anytime Meta data describing both Content on Demand as well as Live services delivered over an always on bi-directional IP Networks. The capability to use this information to generate Broadband Content Guide should be an optional requirement for the IPTV STB.
- **4.10** Clause 10 of S/NO. 1 of Annex I specifies Content Download Services (CDSs). CDSs provide the download of content items to a local storage of the IPTV STB via a broadband IP connection.

Two types of services are supported: push download services where the distribution decision is taken by the service provider (without explicit request from the user) and pull download services where the download is requested by the user. If a STB is equipped with appropriate local storage, it could use this service for content downloading.

- **4.11** Annex E of S/NO. 1 of Annex I defines an optional protocol for Application Layer FEC (ALFEC) protection of streaming media for DVB-IPTV services carried over RTP transport. If this option is used at the sending end, the STB should have the capability to decode this FEC.
- **4.12** Annex F of S/NO. 1 of Annex I defines an optional re-transmission mechanism (RET) to provide for protection against packet loss of DVB-IPTV services carried over RTP transport. It specifies the mechanism to provide immediate Feedback (FB) towards the network using RTCP and how to retransmit the missing packets.
- **4.13** In a scenario where the Servers at the transmitting end has so many options, there has to be a means for the Server to find out the configurations and the capabilities of the receiving devices at the consumers premises before exercising those options. This is the function of the Remote Management System (RMS) and the Firmware Update Service (FUS) described in S/NO. 4 of Annex I.

Remote Management is the ability of a server entity outside the home environment to monitor and configure the devices within the home and covers provisioning and assurance tasks. It optionally includes firmware updates to the equipment.

4.14 Conditional Access: Specific support for Conditional access or Content Protection is out of scope of this ETSI standard as given in S/NO. 1 of Annex I (Clause 1.1.2).

5.0 BASIC FEATURES

S/N	I. BASIC FEATURES	OPERATIONAL EFFECT(S)
1.0	Parental Control/Lock	Basic feature for controlling viewers
2.0	Electronic Program guide (EPG)	On screen electron guide
3.0	Full function standard IR remote	Small size battery, hence an easier to
	control, using AA or AAA size	handle (small in size) remote control
	battery.	
4.0	Languages: English and Swahili	Availability language selection feature:

		Swahili is the national language spoken by
		majority Tanzanians
7.0	PAL I/B/G auto conversion	PAL I is the VIDEO System for Tanzania
9.0	Favourite channel list editing	Provision for editing channels for user preference (basic feature)
10.0	Warranty: 1 year	To avoid substandard equipment in the market
11.0	Owner's Manual	User manual for Understanding the operation of the equipment as well as troubleshooting simple problems (English and Swahili languages)
12.0	Marking: Each IPTV shall be legibly and indelibly marked with at least the following information: a) Manufacturer's name or trademark (if any); b) Mode designation and serial No.' c) Country of manufacture; d) Input supply voltage and frequency; e) Power consumption; f) Ethernet input/output g) Sockets for audio and video output.	Basic marks to enable the subscriber to have first-hand information

6.0 HARDWARE SPECIFICATIONS

S/No	Parameter/Spec	Mandatory	Optional
1	Interfaces/	1. Input :10/100 BaseT	1. 1000 BaseT
	Connectors	Ethernet	Ethernet
		2. Analog Audio Output	connector RJ45
		3. Stereo RCA	2. Compressed
		4. Composite Video Out	Multichannel
		RCA (Yellow)	Audio
			output: S/PDIF
			(IEC 61937)
			3. Uncompressed
			digital AV Streams
			Output: HDMI
			Port V1.3a
			to V2.0

			4. USB 2.0 Ports
2	Graphics	Standard Definition (SD):	High Definition
	Resolution	720X576	(HD):
			1920 x 1080i
			(30fps) or higher
			(1080p @ 60fps)
			with capability to
			down-convert to
			SD (720x576)
3	Command Device	IR Remote Control	Keyboard / Mouse
4	Local Storage	-	Hard Disk

7.0 PERFORMANCE REQUIREMENTS

	Specification/Parameter	Mandatory	Optional
		Requirements	
1	Electrical Specs		
	a) Input Voltage range	AC 220±10%,	
	b) Frequency	50±1Hz	
2	Operating Ambient	0~45°C	
	Temperature.		
3	Operating humidity range	Up to 90%	
4	Front Panel Features		
	a) Connector	a) USB Host – A Type 5V	
		500ma	
	b) Controls (buttons 7)	b) Power, Menu, OK.	
		Remote Control Unit	
	c) LED Indicators	c) Power, Link, HD/SD,	
		Receiver	
5	Back Panel		
	a) Ethernet	10/100 Mbps Ethernet	1000 Mbps
		RJ45	Ethernet RJ45
	b) Audio Video Connectors	i) Component, Y, Pb, Pr	i) 5.1 Dolby
		ii) Component Video RCA	Digital Optical

		iii) Stereo L,R Audio RCT	Output
		(2 sets)	ii) HDMI V1.3a to
			V2.0
	c) Miscellaneous	iv) Mic Input 3.5 mm Slot	i) External IR
	Connectors	Mini-jack	Receiver
			ii) USB 2.0 Port
6	Video Codec	i) MPEG-2	i) MPEG-4
		SMPTE	ii) HEVC
7	Audio Codec	i) MPEG-1 Layer 2	i) AC-3
		(Musician)	ii) E-AC-3
		ii) MPEG-4 AAC	
		iii) MPEG-1 Layer 3	
		iv) AC-3 Stereo	
8	Processor	32-bit Host Processor	
		400MHz	
		1000DMIPS	
9	Remote Control (IR	Battery Condition	
	Support)	Power On/Off	
	Keys/Buttons/Indicators	Mute	
		Numeric Keys (10)	
		Search	
		Previous Program	
		Home	
		TV	
		CoD	
		Video Player (Play, Stop,	
		Pause, Fast Forward,	
		Rewind, Previous Frame)	
		Favourite	
		Information	
		Menu	
		Settings	
		Guide	
		Organizer	
		Coloured Buttons (4)	

		(Blue Yellow Red &	
		Green)	
		For Designer Assigned	
		Usage	
		Reset	
10	Supported Video Output	PAL	
11	Aspect Ratio	4:3 and 16:9	

ANNEX I: LIST OF REFERED INTERNATIONAL STANDARDS

ANNE	X I: LIST OF REFFERED	INTERNATIONAL STANDARDS
S/No	Reference No.	Title
1.	ETSI TS 102 034 V1.5.1 (2014-05)	Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services over IP Based Networks
2.	ETSI ETR 211	Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI)
3.	ETSI TS 102 539 V1.3.1 (2010-04)	Digital Video Broadcasting (DVB); Carriage of Broadband Content Guide (BCG) information over Internet Protocol (IP)
4.	ETSI TS 102 824 V1.2.1 (2008-07)	Digital Video Broadcasting (DVB); Remote Management and Firmware Update System for DVB IP Services
5.	ETSI TS 102 366 V1.2.1	Digital Audio Compression (AC-3, Enhanced AC-3) Standard
6.	ETSI TS 101 812 (V1.3.1)	Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP) Specification 1.0.3
7.	ETSI TS 542 V1.2.1	Guidelines for the implementation of DVB IP Phase 1 specifications
8.	IEEE 802-1990	IEEE Standards for Local and Metropolitan Area Networks: overview and architecture
9.	IEEE 802.1Q-1998	IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks
10.	IEEE 802.2-1998	IEEE Standard for Information technology- Telecommunications and information exchange between systems - Local and metropolitan area networks – Specific requirements - Part 2: Logical Link Control
11.	IEEE 802.3-2000	IEEE Standard for Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer

		Specification
12.	IETF RFC 768	User Datagram Protocol
	IETF RFC 791	Internet Protocol
	IETF RFC 826	An Ethernet Address Resolution Protocol: or
		converting Network
		Protocol Addresses to 48.bit Ethernet Address for
		Transmission
		on Ethernet Hardware
15.	IETF RFC 1042	A Standard for the Transmission of IP Datagrams
		over IEEE 802 Networks
16.	IETF RFC 1122	Requirements for Internet Hosts - Communication
		Layers
17.	IETF RFC 1213	Management Information Base for Network
		Management of
		TCP/IP-based internets: MIB-II
18.	IETF RFC 1305	Network Time Protocol (Version 3) Specification,
		Implementation and Analysis
	IETF RFC 1630	Universal Resource Identifiers in WWW
20.	IETF RFC 3550	RTP: A Transport Protocol for Real-Time
		Applications
21.	IETF RFC 1890	RTP Profile for Audio and Video Conferences with
		Minimal Control
22.	IETF RFC 2011	SNMPv2 Management Information Base for the
		Internet Protocol using SMIv2
23.	IETF RFC 2030	Simple Network Time Protocol (SNTP) Version 4
		for IPv4, IPv6
		and OSI
	IETF RFC 2250	RTP Payload Format for MPEG1/MPEG2 Video)
	IETF RFC 2326	Real Time Streaming Protocol (RTSP)
26.	ETSI TS 101 154	Digital Video Broadcasting (DVB); Implementation
	(V1.7.1)	guidelines
		for the use of Video and Audio Coding in
		Broadcasting
		Applications based on the MPEG-2 Transport
27	ETCI TC 102 222	Stream Digital Video Broadcasting (DVB): Carriage and
27.	ETSI TS 102 323	Digital Video Broadcasting (DVB); Carriage and
		signalling of TV-Anytime information in DVB transport streams
28.	ISO/IEC 23001-1	Information Technology - MPEG Systems
20.	(MPEG-B)	Technologies – Binary
	(1 11 LG D)	MPEG format for XML
29.	ETSI TS 102472	Digital Video Broadcasting (DVB);IP Data cast
25.	01 .0 102 ./ 2	over DVBH: Content Delivery Protocols
30.	SMPTE specification	Forward Error Correction for Real-time
	2022-1	Video/Audio Transport
		Over IP Networks
31.	SMPTE specification	Unidirectional transport of constant bit rate MPEG-
	2022-2	2 Transport

		Streams on IP Networks
32.	ITU-T Recommendation H.610 (07/2003)	Full service VDSL – System architecture and customer premises equipment
33.	ETSI TS 102822-3-2: (V1.3.1)	Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV Anytime"); Part 3: Metadata; Sub-part 2: System aspects in a uni directional environment
34.	ETSI TS 102 366 (V1.2.1)	Digital Audio Compression (AC-3, Enhanced AC-3) Standard

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