| | | | |
|---|---|---|---|
| PETROBRAS | TECHNICAL SPECIFICATION | Nº: | I-ET-3010.00-5590-766-PPT-001 |
| | CLIENT: SRGE | | SHEET: 1 of 20 |
| | JOB: Television (TV) | | |
| | AREA: - | | |
| TIC | TITLE: TVRO AND ENTERTAINMENT SYSTEM | | INTERNAL |
| | | | OI/CS |

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## INDEX OF REVISIONS

| REV. | DESCRIPTION AND/OR REVISED SHEETS |
|---|---|
| 0 | ORIGINAL ISSUE |
| A | REVISED WHERE INDICATED |

| | REV. 0 | REV. A | REV. B | REV. C | REV. D | REV. E | REV. F | REV. G | REV. H |
|---|---|---|---|---|---|---|---|---|---|
| DATE | APR/08/22 | OCT/25/2022 | | | | | | | |
| DESIGN | PROJ-US | PROJ-US | | | | | | | |
| EXECUTION | Y3S7 | Y3S7 | | | | | | | |
| CHECK | CY22 | CY22 | | | | | | | |
| APPROVAL | CYR7 | X187 | | | | | | | |

INDEX

## 1. SUBJECT

1.1 The subject of this document is to establish the criteria, basic characteristics and technical specifications for the detailed design, supply and installation of Television Receiving Only (TVRO), Entertainment System and broadcasting over an IPTV network that shall be installed in PETROBRAS FPSO Unit.

## 2. ABBREVIATIONS

| | |
|---|---|
| ABNT | Associação Brasileira de Normas Técnicas (Brazilian Association of Technical Standards) |
| AC | Alternating Current |
| ACU | Antenna Control Unit |
| ANATEL | Agência Nacional de Telecomunicações (Brazilian Telecommunication Authority) |
| ANSI | American National Standards Institute |
| ART | Anotação de Responsabilidade Técnica (Technical Responsibility Note) |
| ASTM | American Society for Testing and Materials |
| CCR | Central Control Room |
| CCTV | Closed Circuit TV |
| CREA | Conselho Regional de Engenharia e Agronomia (Brazilian Engineering Counsel) |
| CT | Cabin Terminal |
| DC | Direct Current |
| DIO | Distribuidor Interno Óptico (Optical Distribution Drawer) |
| FPSO | Floating, Production, Storage and Offloading |
| GPS | Global Positioning System |
| HDMI | High Definition Multimedia Interface |
| IEC | International Electrotechnical Commission |
| IEEE | Institute of Electric and Electronic Engineers |
| IETF | Internet Engineering Task Force |
| INMETRO | Instituto Nacional de Metrologia (National Institute of Metrology) |
| IMO | International Maritime Organization |
| IP | Internet Protocol |
| IS | Intrinsic Safe |
| ITU | International Telecommunication Union |
| IPTV | Internet Protocol Television |
| LAN | Local Area Network |
| LSZH | Low Smoke Zero Halogen |
| MODU | Mobile Offshore Drilling Unit |
| MPEG | Moving Picture Expert Group |
| NBR | Norma Brasileira (Brazilian Standard) |
| NOC | Network Operation Center |
| NORMAM | Normas da Autoridade Marítima (Maritime Authority Standards) |
| OSI | Open Systems Interconnection |
| PoE | Power over Ethernet |
| QoS | Quality of Service |
| QoE | Quality of Experience |
| RF | Radio Frequency |
| RTP | Real Time Protocol |

| | |
|---|---|
| SMNP | Simple Network Management Protocol |
| SOLAS | Safety of Life At Sea |
| STB | SET-TOP BOX |
| TV | Television |
| TVRO | Television Receive only |
| UDP | User Datagram Protocol |
| UHF | Ultra High Frequency |
| UPS | Uninterruptible Power Supply |
| USB | Universal Serial Bus |
| UTP | Unshielded Twisted Pair |
| VAC | Volts Alternating Current |
| VDC | Volts Direct Current |
| VOD | Video on Demand |
| WAN | Wide Area Network |

## 3. REFERENCE DOCUMENTS, CODES AND STANDARDS

### 3.1 International Standards

a. IEC 1000-4-2: Electrostatic discharge (ESD) requirements

b. IEC 60079: Electrical apparatus for explosive gas atmospheres - all parts

c. IEC 60092-502: Electrical installations on ships

d. IEC 60331: Tests for electric cables under fire conditions - circuit integrity – all parts

e. IEC 60529: Degrees of protection provided by enclosures (IP code)

f. IEC 60533: Electrical and electronic installations in ships - electromagnetic compatibility

g. IEC 60945: Maritime navigation and radiocommunication equipment and systems – general requirements – methods of testing and required test results

h. IEC 61000: Electromagnetic compatibility (EMC) series - all parts

i. IEC 61892-7 Mobile and fixed offshore units - electrical installations - part 7: hazardous area

### 3.2 Brazilian Standards

a. INMETRO PORTARIA Nº 115 (21/março/2022): regulamento de avaliação da conformidade de equipamentos elétricos para atmosferas potencialmente explosivas, nas condições de gases e vapores inflamáveis e poeiras combustíveis.

b. NR-10: Segurança em instalações e serviços em eletricidade.

c. NR-30: Plataformas e instalações de apoio – anexo II.

d. NR-37: Segurança e saúde em plataformas de petróleo.

e. It shall be followed all others NR's – Normas Regulamentadoras (Regulatory Standards) from Ministério da Economia (Brazilian Ministry of Labor) applicable to this Technical Specification.

f. NORMAM 01/DPC – Normas da Autoridade Marítima para Embarcações Empregadas na Navegação em Mar Aberto.

g. ANATEL – any applicable resolution from Agência Nacional de Telecomunicações

3.3 Classification Society

3.3.1. The detailed design shall be submitted to approval by Classification Society. The design and installation shall take into account their requirements and comments.

## 4. GENERAL REQUIREMENTS

4.1 CONTRACTOR shall provide and install all materials and equipment, accessories, cables and infrastructure that compose the Television Receiving Only (TVRO) and IPTV Entertainment System to fully systems operationally.

4.2 For PETROBRAS detailed design requirements, Installation, Configuration, Tests training and commissioning CONTRACTOR shall comply with the Descriptive Memorandum I-MD-3010.00-5510-760-PPT-001 GENERAL CRITERIA FOR TELECOMMUNICATIONS DESIGN.

4.3 For telecommunications symbols, the Detailed Design shall comply with the Technical Specification: I-ET-3000.00-0000-940-P4X-002 – SYMBOLS FOR PRODUCTION UNITS DESIGN.

4.4 For telecommunications TAGs, the Detailed Design shall comply with the Technical Specification: I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

4.5 All electrical requirements for telecom package shall be in accordance with I-ET-3010.00-5140-700-P4X-003 – ELETRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE, I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS, I-DE-3010.00-5140-700-P4X-003 - GROUNDING INSTALLATION TYPICAL DETAILS and I-ET-3010.00-5140-

700-P4X-005 - REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS.

4.6 For the telecommunication data equipment specification, the Detailed Design shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-001– HULL DATA NETWORK.

4.7 For the cabling network used in the CCTV system, the Detailed Design shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-002- HULL STRUCTURED CABLING NETWORK.

4.8 All Television Receiving Only (TVRO) and Entertainment System equipment to be installed inside the Telecommunications Rooms shall be housed in adequate rack.

4.9 The Television Receiving Only (TVRO) and Entertainment System racks shall be installed inside the Telecommunications Upper and Lower Rooms at Accommodation Module.

4.10 A cooling system shall be installed for each cabinet and it shall be composed by 02 (two) fans on the bottom to inflate cold air inside and 02 (two) fans on the top to exhaust heated air to be collected by exhausters on ceiling. Additional clarifications for HVAC at I-MD-3010.00-5510-760-PPT-001 GENERAL CRITERIA FOR TELECOMMUNICATIONS DESIGN

4.11 The equipment and accessories shall attend the ingress protection degree, protection type, classifications zone and groups established by IEC / ABNT.

4.12 CONTRACTOR shall supply all equipment, cables, accessories approved and certificated by Classifying Society and technical conformity with the International and National standardization organism: ABNT, IEC and INMETRO.

4.13 The entire TV system shall be shown on the telecommunication layout plans.

4.14 The Entertainment System shall provide an I/O interface to connect the PAGA System.

4.15 The Entertainment System shall provide an HDMI interface to connect the computer to reproduce the data content.

4.16 The TVRO and Entertainment System (IPTV) shall provide the following benefits to PETROBRAS users:

a. Space Efficient: Provides a wide range of functions with few components.
b. Access to all digital TV signals: Digital terrestrial and satellite signals shall be all combined in the same IPTV server without the need for additional HW or licenses.
c. Video on Demand (VoD): This is the individual provider of video content to a subscriber. This service allows its users to watch any movie from the VoD server's media library. The service shall provide to the subscriber pause and rewind functions.

d. Time-Shifted TV adds interactive features to TV channel viewing: The subscriber can pause the playback at any time and resume it later. There is also a rewind option for TV programs.

e. TV on Demand (TVoD): The selected TV channels are recorded and stored for a predefined period and is available for viewing individually on each TV.

f. Corporate messages: HDMI interface for a dedicated computer to reproduce the corporate messages.

4.17 01 (one) IPTV rack installed in Telecom Upper Room shall be destinated for future 48 (forty-eight) Pay TV decoders installation supplied by PETROBRAS during commissioning on site and other devices supplied, installed and configured by CONTRACTOR. So, it shall be provided HDMI (for audio and video) cable from modulators to each decoder.

4.18 It shall be considered physical support for all set-top-boxes to be placed together with the television set support.

4.19 Television set shall be properly installed close to power energy and IPTV LAN outlet in a position to allow people in cabin to watch from their beds and height enough to avoid user hit the head.

4.20 Inside cabins, television set shall be installed in articulating wall support so that it can be better positioned forward middle of cabin and, when not in use, it can be retracted back to wall far from cabin corridor.

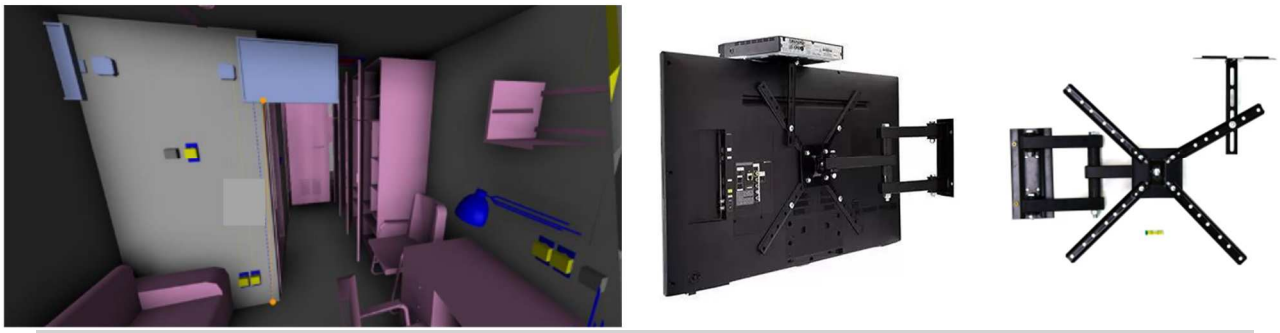

Figure 1: example of TV installation in cabin, with articulated support and STB support

## 5. SYSTEM DEFINITIONS

5.1 The Television Receive Only (TVRO) and IPTV Entertainment System shall have its own systems for receiving TV Satellite and others entertainment sources of signals and distribute it internally by a dedicated and exclusive IP infrastructure.

5.2 The IETF has defined the fundamental mechanisms for support of IPTV such as the protocols for the control of video streaming and of multicast flows.

5.3 The TVRO and IPTV Entertainment System shall follow the architecture shown in Figure 2. The requirement of each layer is described in the following items.

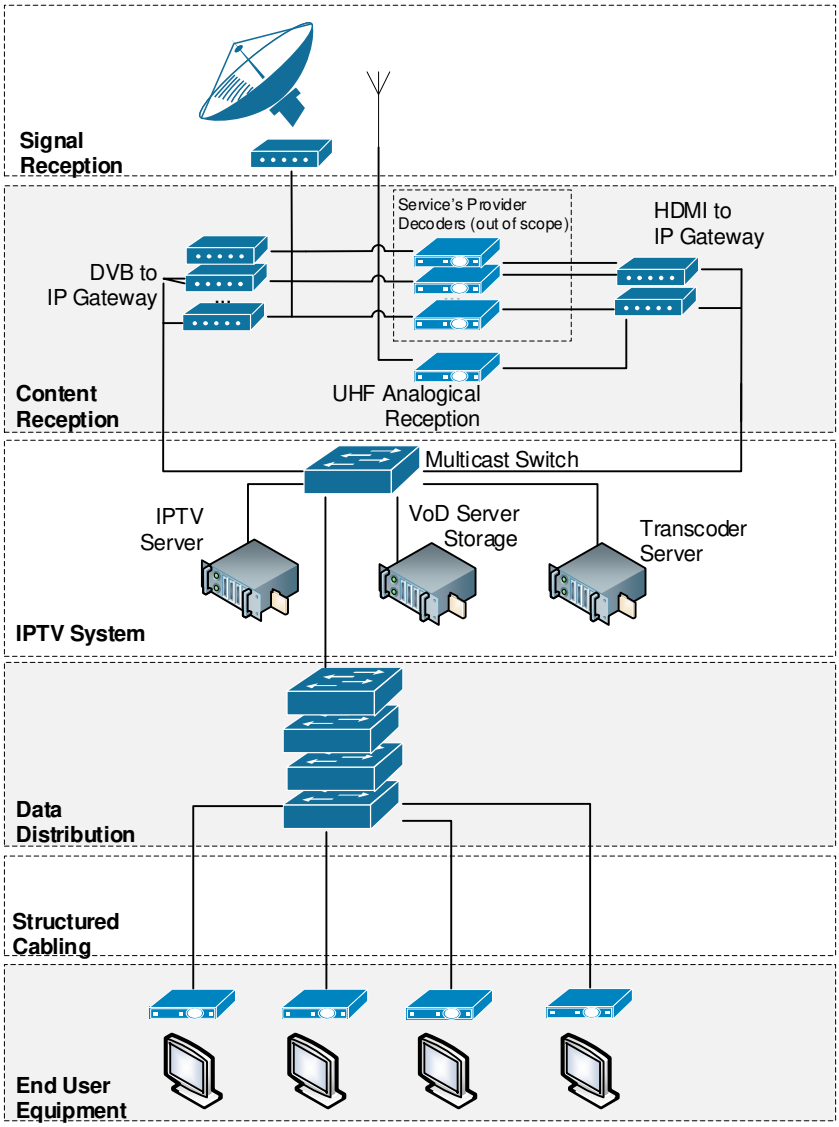


Figure 2: TVRO Architecture

## 5.4 SIGNAL RECEPTION LAYER

5.4.1. The stabilized parabolic antenna is needed to receive the TV signal. This antenna shall point to the satellite regardless of the movements of the ship and shall do this very accurately. The antenna shall be assembled inside a Radome and consists of a satellite antenna dish & feed with Low Noise Block converter (LNB) able to receive transmission from Brazilians Satellite TV providers, with polarization motor mounted, if necessary, on a stabilized antenna pedestal.

5.4.2. For satellite tracking functionality, the gyrocompass shall be connect to the antenna system through the gyrocompass interface (NMEA Interface) of the Antenna Control Unit (ACU). For more technical details about the gyrocompass see document I I-ET-3010.00-5512-762-PPT-001 - SATTELITE SYSTEM.

5.4.3. The TVRO system shall use as a secondary (backup) GPS source the Gyrocompass / GPS Compass from the Positioning System (POS) described in I-ET-3010.00-5537-850-PEA-001.

5.4.4. The roll, sway, yaw, surge, heave and pitch movements shall be compensated by the stabilized system in that way the signal level performance will not present any variations. That features high performance stabilization and satellite tracking using a 3-axis.

5.4.5. TV Signal Reception System shall be composed of, at least:

a. Satellite equipment: parabolic antenna, low noise amplifier, down converter, Quad-LNB and receiving units to be supplied;

b. Ku-Band High Definition satellite services;

c. Advanced stabilization antenna in rough sea conditions;

d. Antenna Control Unit (ACU);

e. TV reception rack (headend, receivers, multi switch).

5.4.6. The detailed design shall foresee a power line supply to feed the Antenna Positioning Control Unit through the AC Switchboard and it shall guarantee the operational condition.

5.4.7. The receiving units shall be housed in a suitable rack, standard 19”.

5.4.8. The detailed design shall define the antenna point of installation in order to avoid any obstruction with the satellite signal.

5.4.9. CONTRACTOR shall design, install and commission stabilized parabolic antenna, for Pay TV signal reception, at antennas deck above the accommodation module, without obstruction in line of sight to the TV satellite informed by PETROBRAS during de detailed design.

5.4.10. PETROBRAS will be responsible to contract the Entertainment and TV content provider and to provide the decoders to CONTRACTOR install, configure and update drawings during detail design and commissioning.

5.4.11. CONTRACTOR shall design, install and commission the omnidirectional UHF antenna at above the accommodation module on the antennas deck, without obstruction for vessels service around the PETROBRAS FPSO Unit.

5.5 CONTENT RECEPTION LAYER

5.5.1. KU Band Signal TV Channels

a. The system shall be able to receive Pay TV channels via satellite. These channels shall be distributed internally using dedicated and exclusive network infrastructure.

b. In addition, the KU Band reception system shall be composed, at least, for listed below features/hardware:

i. Modulation Modes: DVB-T/C/S2 Digital TV receptions;
ii. IPTV Gateway for digital decoders (HDMI input);
iii. IPTV Gateway for satellite receivers (DVB input);
iv. IPTV Gateway for satellite receivers (ASI- input);
v. IPTV Gateway for UHF receivers (Analogical-input);
vi. IPTV Gateway / Encoders;

5.5.2. UHF TV Signal from Service Vessels

a. The system shall be able to receive UHF TV signals and distribute them internally also by the Entertainment System (IPTV) network infrastructure and to permit the reception of UHF TV signals generated by Service Vessels located nearby PETROBRAS FPSO Unit.

b. Such signal shall be integrated to CCTV System to be always recorded and presented on demand.

c. The generation of these UHF TV signals is responsibility of the Support Vessels.

d. The supplier shall foresee the UHF tuner, amplifier and accessories for the connection of this system to the IPTV Entertainment System.

5.6 IPTV SYSTEM LAYER

5.6.1. The IPTV Service is defined by ITU-T as multimedia service such as television / video / audio / text / graphics / data delivered over IP based networks managed to provide the required level of Quality of Service (QoS) and Quality of Experience (QoE), security, interactivity and reliability.

5.6.2. PETROBRAS FPSO Unit entertainment system shall provide the entertainment facilities for the users through a set of applications, such as live-TV, Video on Demand (VoD), Recording, Safety features and Training facilities.

5.6.3. The IPTV System Layer shall consist, at least, of the following features:

a. IPTV Server;
b. Multicast switch;
c. Live TV – channels delivered using multicast or channels delivered over the Internet using unicast;

d. Transcode service – provide real-time multi-channels/format transcoder and provide on-demand file streaming as well. It allows converting streams to any MPEG-4 or H.264/H.265 format, bitrate and resolution.

e. TVoD Server – provide the television on demand store server;

f. VoD Server – provide the Video on demand store server;

g. System monitoring;

h. Corporate content – corporative streaming and delivering video on demand with many corporate communications to all teams;

i. Public Address General Alarm interface (PA/GA I/O) for muting the Entertainment System in case of Emergency Alarms (for all services);

j. Management System.

5.6.4. The IPTV system shall be design in order to allow fully operation and maintenance by PETROBRAS personnel, not being dependent of manufacturer.

5.6.5. The IPTV system shall be able to be fully operated and managed remotely.

5.6.6. The IPTV system shall be design in order to allow content visualization in smartphones (Android and iOS), tablets (Android and iOS) and computers (via Web browser). In tablets and smartphones the visualization can be by an App for IPTV Mobile Application or Web Browser. The end users can receive content in these devices by IPTV-LAN or by STB (working as an access point).

5.6.7. The IPTV system shall be able to receive information of Electronic program guide (EPG) by network and when applicable, associate it to Live TV and recorded content (TVoD).

5.6.8. The IPTV system shall be integrated to PAGA system in order to mute content, in priority calls and general alarm, and to force a determined content in an emergency.

5.6.9. The IPTV system shall be able to record all Live TV channels in storage server automatically, independent of user requisition. This content shall be available in TVoD function. The record time shall be limited by storage server capacity. When server is full, older content shall be overwritten.

5.6.10. The IPTV system shall be able to insert content (Movies, Series, etc) in storage server. This content shall be available in VoD function.

5.6.11. The IPTV system shall be able to reproduce content from portable media (USB stick and portable hard drive).

5.7 DATA DISTRIBUTION LAYER

5.7.1. Equipment of this layer are not in the scope of this document. For more technical details, see document I-ET-3010.00-5517-768-PPT-001- HULL DATA EQUIPMENT.

5.8 STRUCTURED CABLING LAYER

5.8.1. The infrastructures of this layer are not in the scope of this document. For more technical details, see document I-ET-3010.00-5517-768-PPT-002- HULL STRUCTURED CABLING NETWORK.

5.9 END USER EQUIPMENT LAYER

5.9.1. The Set-top box (STB) is the end point of the Entertainment System Network where the television set is connected.

5.9.2. The Set-top box (STB) is an IPTV CD (IPTV consumer device) that allows users to access IPTV services on the TV and as a HotSpot.

5.9.3. STB shall work as Access Point in order to share all content of Entertainment System (Live TV, TVoD and VoD) to a minimum of 04 (four) users each.

## 6. TECHNICAL REQUIREMENTS

6.1 SIGNAL RECEPTION LAYER

6.1.1. Satellite Antenna Stabilized for pay-TV Receiving

| | | |
|---|---|---|
| a) | Diameter | 1.2 meter (minimum) |
| b) | Protection | waterproof dome type |
| c) | Frequencies | 11.85 14.25 GHz |
| d) | Gain (central f) | > 45 dBi |
| e) | Wind resistance | up to 130 kilometers per hour |
| f) | Polarization | linear (Vertical and Horizontal) |
| g) | Adjustment of elevation | from 0° up to 90° |
| h) | Adjustment of azimuth | from 0° up to 360° unlimited |
| i) | Equipped with | 15° K LNB. |

6.1.2. L N B

| | | |
|---|---|---|
| a) | Operating frequency | 11.85 14.25 GHz |
| b) | Standing wave ratio (VSWR) | 1.3 |
| c) | Output frequency | from 950 to 1450 MHz |
| d) | Output impedance | 75 ohms |

| | | |
|---|---|---|
| e) | Supply voltage | 12 volts DC |
| f) | Installation | adjacent to antenna |
| g) | Quad Feeder unit | (V/Lo, V/Hi, H/Lo and H/Hi) |
| h) | Built of aluminum | |
| i) | Protected by electrostatic paint | |

## 6.2 CONTENT RECEPTION LAYER

### 6.2.1. Multiswitch

| | | |
|---|---|---|
| a) | Inputs SAT / terrestrial | 01 / 01 |
| b) | Subscriber outputs | 48 in total (stand-alone or cascade) |
| c) | Cascadeble SAT-IF | Yes, if necessary |
| d) | Mains power supply | 100 - 240 V / 47 - 63 Hz |
| e) | LNB - total remote current | max. 1200 mA |
| f) | LNB - single remote current | max. 300 mA |
| g) | Current consumption from receiver | < 20 mA |
| h) | Connectors Type | F-connectors, IEC 60169-24, (female) |
| i) | Impedance | 75 Ω |

### 6.2.2. Ku Pay TV Receiver/Ku Open TV Receiver /Tuner

| | | |
|---|---|---|
| a) | Independent outputs | video and audio |
| b) | Audio outputs | digital stereo |
| c) | Power supply | 110/220 VAC @ 60 Hz |
| d) | Output channels | up to 140 |
| e) | Frequency control | automatic |
| f) | Demodulator | QPSK |
| g) | Bit decoder coefficient | 15 Mbps |
| h) | Digital decoder for video | 544 pixels/line |
| i) | Decoder tuner frequency | 950 ~ 2150 MHz |
| j) | Video format compatibility | 4:3 and 16:9 |
| k) | Video resolution | 1280 x 720 pixels, minimum |
| l) | FI width | 36 MHz |
| m) | Input RF level | from (-)30 dBm to (-)65 dBm/75 Ohms |

### 6.2.3. IPTV Digital Gateway/Encoder

| | | |
|---|---|---|
| a) | Input | HDMI 1.4<br>DVB-S/S2/T/T2/C |
| b) | Output formats | IP STREAMS<br>Unicast or Multicast |
| c) | Video Encoding | MPEG-2 Video<br>MPEG-4 AVC (H.264) Video |
| d) | Audio Encoding | MPEG1 |
| e) | IP Output | RJ45 100/1000 Mbps |

| | | |
|---|---|---|
| f) | Channel | N streams input and N streams output |
| g) | Multicast | TS over UDP/RTP |
| h) | Power supply | 90~250 VAC, 50/60Hz |

## 6.3 IPTV SYSTEM LAYER

### 6.3.1. IPTV Server/Communicator

| | |
|---|---|
| a. Video on Demand Server | Video on Demand Admin Client |
| b. Management Studio and Contribute | Monitoring and control |
| c. Preset configuration on delivery | Connects to any 2nd layer switch |
| d. Powerful proxy services | "Plug and Play" self-installation |
| e. Recording | CCTV interface |
| f. 20 Gbps output streaming | |
| i. up to 64,000 streams @ 300 kbps, or | |
| ii. up to 8,000 streams @ 2.5 Mbps, or | |
| iii. up to 2,500 streams @ 8.0 Mbps | |
| g. Storage Capacity: 3x 12 TB (RAID 5) | |

### 6.3.2. Storage (TVoD and VoD content server)

| | |
|---|---|
| a. Installed Capacity: 3x 12 TB (RAID 5) | |
| b. Final Capacity: 48 TB | |
| i. | 180,000 h of video @ 600 kbps (e.g. mobile web TV) |
| ii. | 44,000 h of video @ 2.5 Mbps (SDTV) |
| iii. | 24,000 h @ 4.5 Mbps |
| iv. | 14,000 h of video @ 8 Mbps (HDTV) |

### 6.3.3. Transcode

| | |
|---|---|
| a) Interface | 2xRJ45, 1000M Base-T2<br>2xPCI-E slot |
| b) Input signal | DVBS/S2, DVBT/T2, DVBC, ATSC, ISDBT, DTMB, HDMI, ASI |
| c) Input Net Stream | UDP, RTP, HTTP, HLS, RTSP, Media Files |
| d) Input video codecs | MPEG-2, AVC/ H.264, HEVC / H.265 |
| e) Resolution | 1920x1080P, 1920x1080i, 1280x720P, 1024x576, 720x576i, 720x480i |
| f) Audio codecs | MP2, MP3 |
| g) Output types | UDP, RTMP, HTTP, HLS(ABR), Media Files |
| h) Output video codecs | AVC/ H.264, HEVC / H.265 |

| | |
|---|---|
| i) Resolution | 1920x1080P, 1920x1080i, 1280x720P, 1024x576, 720x576i, 720x480i, 480x576, 544x576, 640x576, 704x576 |

## 6.4 END USER EQUIPMENT LAYER

### 6.4.1. IPTV Set-Top Box (STB) / Decoder / Cabin Terminal (CT)

| | |
|---|---|
| a) I/O interfaces | USB<br>HDMI 1.4 |
| b) Video Decode | H.265 (HEVC), H.264 MVC |
| c) LAN | RJ45 (10/100/1000Base-T)<br>Wi-Fi 802.11b/g/n |
| d) Fixing | Wall mount accessories: support, nuts, screws, washers |
| e) HotSpot features | |
| f) Remote control and DC power in | |

### 6.4.2. TV Specification

| | |
|---|---|
| a) Display Type | LED, OLED, or Better |
| b) Video Input interface | 02 HDMI - Minimum |
| c) I/O Interface | 02 USB - Minimum |
| d) Power supply | AC 100~240V 50-60Hz |
| e) Remote Control | |
| f) Fixing (except for rack mounted) | Wall mount accessories: support, nuts, screws, washers |

### 6.4.3. UPS specification

| | |
|---|---|
| a) Max power | 5KVA |
| b) Efficiency | 85% |
| c) Output frequency | 50/60 Hz +/- 3Hz |
| d) Output Voltage | 220V AC |
| e) Input Voltage | 220V AC +/- 10% 50-60Hz |
| f) UPS and Battery | 19” Rack mounted |
| g) Battery Autonomy | 30 minutes |
| h) Battery Type | Maintenance-free sealed Lead-Acid battery with suspended electrolyte |

# 7. SCOPE OF SUPPLY

## 7.1 SIGNAL RECEPTION LAYER

### 7.1.1. KU Band for Pay Channels:

a. CONTRACTOR shall design, supply and install all necessary hardware to be able to receive KU Band TV channels for distribute, at least, 48 (forty-eight) simultaneous TV channels.

b. CONTRACTOR shall provide space in the TVRO and Entertainment Rack to install the 48 (forty-eight) decoders, as illustrated at Figure 3.

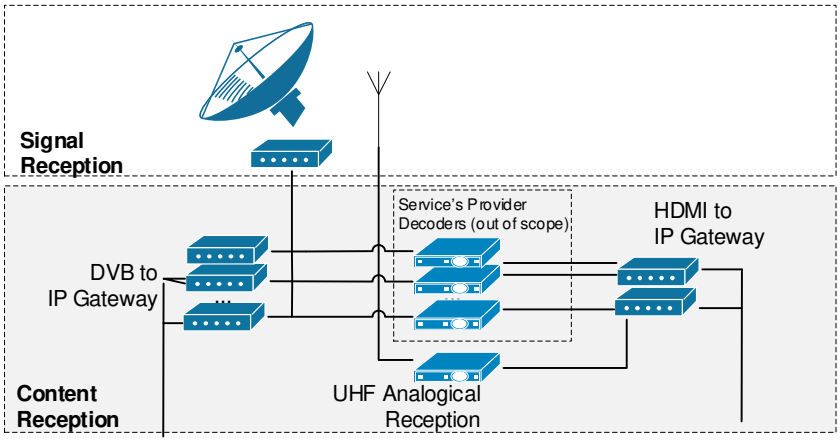


Figure 3: TVRO and Entertainment Rack

c. CONTRACTOR shall supply 01 (one) Ku Open TV receiver to be used for tests in the TVRO System during the commissioning.

7.1.2. UHF TV from Service Vessels (PSV, DSV, AHTS):

a. CONTRACTOR shall design, supply and install the system able to receive, at least, 01 (one) UHF TV signals transmission, generated by Service Vessels. CONTRACTOR shall foresee the UHF receiver, antenna, materials and accessories to connect this equipment to Content Reception Layer Subsystem.

## 7.2 CONTENT RECEPTION LAYER

7.2.1. KU Band for Pay Channels:

a. CONTRACTOR shall design, supply and install the IPTV System able to receive and distribute Pay TV channels via IPTV Entertainment System, with the following characteristics:

i. DVB Interfaces – 10 (ten) carriers to minimum of 10 (ten) streams on each

ii. HDMI Interfaces – 50 (fifty) Input interfaces

iii. ASI Interface – 06 (six) analog input interfaces

7.2.2. UHF TV from Service Vessels (PSV, DSV, AHTS):

a. CONTRACTOR shall design, supply and install the system able to distribute, at least, 01 (one) UHF TV signals transmission, generated by Service Vessels.

7.3 IPTV SYSTEM LAYER

7.3.1. CONTRACTOR shall design, supply, install and commissioning all equipment, materials and accessories necessary to connect and distribute the information, entertainment and communication to the crew as per previously required.

7.4 END USER EQUIPMENT LAYER

7.4.1. CONTRACTOR shall supply all TVs in accordance to VESA Mounting Standard, mounted and fixed as defined on the detailed design.

7.4.2. CONTRACTOR shall supply all TVs fixing supports in accordance to VESA Mounting Standard.

7.4.3. CONTRACTOR shall supply all IPTV STB mounted and fixed, in appropriated fixing support, together with the TV set, fixed by Velcro tape, as to be defined on the detailed design.

7.4.4. CONTRACTOR shall consider, at least, the following guidelines for distribute the TV, IPTV STB and outlets point according to TVRO AND ENTERTAIMENT ONE LINE DIAGRAM and TVRO AND ENTERTAIMENT SYSTEM ARRANGEMENT:

a. 01 (one) outlet point, 01 (one) IPTV STB and 01 (one) TV 32” display and 01 (one) Articulating TV Wall Mount, for each location listed below:
   i. All Cabins
   ii. Radio room
   iii. Infirmary room
   iv. All Offices
   v. Coffee Points
   vi. Telecom Control Room
   vii. Note: any different TV support shall be submitted to PETROBRAS approval

b. 01 (one) outlet point, 01 (one) IPTV STB and 01 (one) TV 55” display and 01 (one) Tilting TV Wall Mount, for each location listed below:
   i. Central Control room (CCR)
   ii. GEPLAT Office
   iii. Games room
   iv. Quiet recreation room
   v. Music Room
   vi. Gym Free Floor Area

c. 02 (two) outlet point, 02 (two) IPTV STB and 02 (two) TV 55" display and 02 (two) Tilting TV Wall Mount, for each location listed below:
   i. Academy/Gym
d. 01 (one) outlet point, 01 (one) IPTV STB and 01 (one) TV 65" display and 01 (one) Tilting TV Wall Mount, for each location listed below:
   i. Television room
   ii. Reception/Briefing room

e. 03 (three) outlet points, 03 (three) IPTV STB and 03 (three) TVs 65" display and 03 (three) Tilting TV Wall Mount, for each location listed below:
   i. Mess room

f. 01 (one) outlet point, 01 (one) IPTV STB and 01 (one) TV 55" display and 01 (one) tilting TV Wall Mount, for each location listed below, all installed inside a protective box adequate to outdoor area:
   i. Barbecue Area.

g. 02 (two) outlet points, 02 (two) IPTV STB, 03 (three) TVs 70" display and 02 (two) Tilting TV Wall Mount in the Auditorium.

h. 02 (two) outlet point, 02 (two) IPTV STB, 02 (two) TVs 65" display and 02 (two) Tilting TV Wall Mount on each Meeting/Videoconferecen Room.

i. 01 (one) outlet point and 01 (one) TV display installed inside the TVRO and Entertainment System Rack.

7.5 UPS

7.5.1. It shall be supplied and installed 02 (two) 5KVA UPS rack mounted in each IPTV rack located in Telecom Upper Room.

7.6 IPTV RACK

7.6.1. It shall be supplied and installed 02 (two) racks in Telecom Upper Room and 01 (one) rack in Telecom Lower Room.

7.7 HDMI

7.7.1. 50 (fifity) HDMI cable of 2 meters for PayTV decoders.

## 8. DIMENSIONING CRITERIA

8.1 The right number of set-top-boxes, TVs and switches shall be done according to final Basic Project one line and arrangements.

8.2 It shall be considered dedicated structured cabling and dedicated switches for this TVRO System.

## 9. COMMISSIONING

9.1 CONTRACTOR shall be responsible to realize a technical commissioning activity, check, test and evaluate the operation of equipment, panels, installations, protections and RF covering, in order to permit or authorize their use under normal operating conditions.

9.2 A professional team certified by the IPTV equipment manufacturer provided, shall perform the Installation and Commissioning activities.

9.3 The following verifications, at least, shall be verified as scope of commissioning activities in accordance with Contract and this Technical Specification.

a. Check hardware and network environments;

b. Basic commissioning: After checking the physical environment of the products, check whether, the basic information such as software system, license, and system time is correct, ensuring that the site is running properly;

c. After checking physical environments, check basic information for accuracy. The basic information includes the software system, licenses, and system time. This ensures that the local equipment works properly and suits interconnection commissioning;

d. Device check: Check devices to ensure that the device status meet deployment requirements and prepare for access commissioning and basic service commissioning;

e. Configuring a user to login to the device remotely: This operation enables a user to remotely login to the device in the central equipment room to deploy services.

f. Check and record values of VSWR, return loss and distance to fail obtained from properly calibrated Anritsu Cell Master Tool or similar for each device installed regarding to TVRO antennas and UHF antenna.

g. A proper table with measured values of VSWR at each device (antenna, coupler, splitter, radio) shall be presented comparing them to manufacturer values.

9.4 Special attention shall be done during running the coaxial cabling whose activity shall be properly inserted in constructability schedule, so that they do not get smashed.

9.5 CONTRACTOR shall consider that the Acceptance Testing shall evaluate signal strength, voice and image intelligibility in each TV, which values shall be recorded.

9.6 For UHF TV antenna, the test shall be simulated by some UHF signal generator.

9.7 All structured cabling shall be certified by calibrated data certifier equipment.

9.8 PETROBRAS shall realize a visual inspection to check the presence of all items listed on the detailed design and fill in the configurations and handbooks:

a. Antennas system;
b. STB and TVs;
c. Decoders;
d. Cabling;
e. Cabinets;
f. Handbooks;
g. Energy.

9.9 CONTRACTOR shall follow the verifications and commissioning activities in accordance with Contract documents and this Technical Specification.

9.10 In general, as a matter of acceptance, Television sets and STB functional tests shall be done with any content and UHF source at shipyard and service provider contracted and channels presented on all TVs at site operation.

## 10. TELECOM SHUTDOW SYSTEM

10.1 To meet the requirements of IEC 60079-0 and CENELEC CLC / TR 50427, CONTRACTOR shall provide a shutdown telecommunication system to avoid ignition risks when flammable gases leak were detect in the antenna deck.

10.2 The TVRO antennas shall be turned off when the fire and gas panel detect flammable gases in the antenna deck.

10.3 All air conditioner installed inside the antennas radomes shall be turned off when the fire and gas panel detect flammable gases in the antenna deck.

10.4 This automation shall be done inside the TVRO rack because of UPS installed inside it.