

## **SATELLITE MASTER ANTENNA TELEVISION (SMATV) SYSTEM**

The Contractor shall supply, install, test, commission, guarantee and maintain a Modern Satellite Master Antenna Television (SMATV) system for the distribution of TV signals. The system shall be capable of receiving and distributing the present Satellite, television and Radio transmissions as listed with sufficient allowances made to include any future transmissions within the foreseeable future, without degrading of the system parameters.

The system shall have a central RF Headend for receiving & processing of the signals from the satellites and distribute through RF distribution network.

The system shall be from an approved manufacturer, supplied and installed by a specialist contractor, who shall be the main agent of the equipment supplied.

The contractor shall submit a complete proposal with schematic drawings with signal level calculations, list of materials and original detailed catalogues of the equipment for consultant/client approval before starting the work

### **1. System Parameters**

- 1.1** In accordance with **CENELEC SPECS. TC 209**
- 1.2** Conform to an overall minimum total signal cross-modulation ratio of 57dB with the maximum output for all present and future programs set with an allowance of at least 3dB output under all known conditions.
- 1.3** A pre-planning site survey will take into account the following factors, which must be satisfactory as agreed by a representative of the authority:
  - a) Adequate signal levels not less than 65 dB provided at the outlets for the specified signal / noise ratio or an agreed satisfactory subjective result.
  - b) Sockets with different attenuation levels shall be used to obtain the above mentioned signal level, if required.
  - c) Clean signals free from reflections and co-channel interference effects.
  - d) Regard to be paid to any very high level local field strengths leading to possible immunity and pre-image problems.
  - e) Possibility of interference from any source that may interfere with the system performance.

## 1.4 **Quality Assurance**

Designing, Manufacturing and Installing of all the Equipment shall conform with the latest Standard Rules of the following:

- Abu Dhabi Distribution Company (ADDC) regulations for electrical installation works
- Department of Civil Defense requirements
- Etisalat Standards and requirements

## 1.5 **Submittals**

### 1.5.1 **Manufacturers Technical Data**

The contractor shall submit to the Consultant 5 Copies of Descriptive Literature, Technical Data, Catalogues, Maintenance recommendation and Installation Instructions of all the Products used.

### 1.5.2 **Drawings & Documentation:**

The Contractor shall provide detailed Shop Drawings for the review / approval by the Consultant which include the following:

- Schematic Diagram of the TV/FM Distribution Network showing signal level at various levels with all supporting calculations and indicating all the System components including Splitters, Line Amplifiers, Sockets, Cables etc.
- TV/FM Socket Outlets Layout Plan indicating the routing of cables from Headend Station to floor distribution boxes and then to final sockets.
- Installation details of Mast/Satellite Dishes, LNB etc.

## 1.6 **Codes & Standards**

All the equipment and components shall meet the following standards & markings:

- All parts of the system (Head-ends, Multiswitchers, Amplifiers, tap offs, distribution boxes, sockets) shall be **CE certified and tested** and **CE** Marking shall appear on the packaging and/or included in the operating instructions.
- European Standards for "Cable Networks for television signals, sound signals and interactive services" from the standardization organization **CENELEC**.

- For compliance with the legal **EMC** (Electromagnetic Compatibility) requirements and to prevent interference between TV cable networks and radio services, components with shielding rate defined in European standard EN 50083-2 shall be used for distribution items including connecting cables for terminal equipment. **The components shall bear the Class A label.**
- **Protection class 2** according to IEC 60417-5172 for components with power connection 230 / 240 V ~.

## **2. Selected Channels for the System**

The following free to air satellite channels from Arabsat 3A Hotbird and Nilesat satellites shall be provided in the system through the central RF headend.

### **2.1 Arabsat 3A**

15 Nos. free to air digital (QPSK to PAL) channels

### **2.2 Hotbird**

10 Nos. free to air digital (QPSK to PAL) channels

### **2.3 Nilesat 101**

15 Nos. free to air digital (QPSK to PAL) channels

**Actual selection of channels will be done at the time of commissioning.**

The system shall be of a modular construction, thus making it possible to add extra stations at a later date.

A 13 AMP Fusible test socket shall be installed for the future connection of signal test equipment to aid the service requirement.

## **3. SYSTEM'S SPECIFICATIONS:**

All radio frequency levels in this sub-division are to be construed and referred to microvolt across 75-Ohm (dB $\mu$ V).

- 3.1.** One standard radio frequency distribution impedance of 75-Ohm shall be used within the system.

- 3.2. Return loss shall not be less than 14dB at any point of the system.
- 3.3. Isolation between any two outlets shall be at least 22dB. Adjacent channels operation requires more than 50dB isolation.
- 3.4. The system shall be such that the short or open circuit at any outlet socket will not significantly affect signals at other outlets (tap-off system).
- 3.5. The system shall be capable of continuous operation in an ambient temperature up to + 50<sup>0</sup> C.

#### 4. **EQUIPMENT SPECIFICATION**

##### 4.1 **General**

The system shall include, but not be limited to the following:-

- 4.1.01 3 Nos. 1.2 m solid aluminium dishes for Arabsat 3A, Hotbird & Nilesat satellites.
- 4.1.02 Microprocessor based control unit having provision for 8 Nos. Satellite signal processing modules, with integrated power supply unit and power-passive IF distribution panel.
- 4.1.03 Digital satellite processing modules.
- 4.1.04 All necessary sockets, splitters, taps and filters suitable to handle a frequency up to 2400 MHz.

##### 4.2 **Dish Antenna:**

Following shall be the minimum requirement for the Satellite dishes for signal reception from Arabsat 3A, Nilesat and Hotbird satellites. Separate dish shall be installed for each of the satellite signal reception.

##### 4.2.01 Satellite Dish Ku band

- |                              |   |                  |
|------------------------------|---|------------------|
| - Frequency                  | : | 10.7 - 12.75 GHz |
| - Gain @ 10.95GHz            | : | 41.5 dB          |
| - Noise temp @ 30° elevation | : | 36° K            |
| - Wind Load                  | : | 1270 N           |
| - Diameter                   | : | 1.2 meter        |
| - Reflector Material         | : | Aluminum         |

#### **4.2.02** Feed Horn & L.N.B

- Output Frequency            950 MHz - 2150 MHz.
- Polarization                 Linear, 4 outputs
- Noise Figure                 25 Deg. K

### **4.3**    **Head-end Station**

**4.3.01** The head-end shall be capable of using adjacent channels without any restriction.

**4.3.02** Satellite processing head-end stations shall consist of basic unit with slots for plugging in the digital processing modules, vestigial / double side band modulator modules, power supply unit and microprocessor-based control unit, output distribution panel (combiner), all housed in steel cabinet with a lockable door.

**4.3.03** The channel processing and modulator modules must be physically independent, thereby the system will have built-in modularity enabling easy maintenance and support.

**4.3.04** Programming of the modules shall be done using remote control.

**4.3.05** It shall support VBI subtitling.

**4.3.06** It shall have the following technical specifications:

- Number of module slots    :        8 slots.
- Sat input distribution panel :        4 RF inputs with 8 outputs
- Input/output impedance    :        75Ω
- Remote feed of LNBS        :        0/13/18 V Switchable
- Remote feed current        :        4 x 400 mA, 1 A max.
- Input Level                  :        44...84 dBμV.
- Output Level                 :        100 dBμV.
- Operating temperature      :        -10 °C to + 45 °C
- Mains voltage                :        200V – 250 VAC/ 50/60Hz
- Gain at o/p collector panel :        20 dB
- Power consumption         :        Max.appro. 160W
- Material                      :        Galvanised Steel, RAL 7035

#### **4.4 Digital Satellite Processing Module**

**4.4.01** Satellite Digital Processing Module shall be suitable for processing QPSK modulated Sat IF signals audio video output for feeding to the modulator modules in the same basic unit. Each digital module shall be suitable for processing single channel.

**4.4.02** It shall have the following technical specifications:

- Processing	:	QPSK to AM TV or AV
- Input Frequency	:	920-2150 MHz.
- Input level range	:	44dB $\mu$ V – 84 dB $\mu$ V
- Input Impedance	:	75 Ohms
- Output frequency range	:	110-862 MHz.
- Operating temperature	:	-10 °C to + 45 °C
- Output Level	:	90 dB (Typical)

#### **4.5 Modulator Modules**

**4.5.01** Modulator modules shall be used to convert the Audio Video signal output from digital processors into standard TV channels.

**4.5.02** The RF output channels thus received shall be suitable for adjacent channel operation.

**4.5.03** Modulator modules shall have the following technical specifications:

- Video Input Level	:	1 Vpp
- Video band width	:	20 Hz – 5 MHz
- Video S/N ratio	:	56 dB
- Audio signal	:	Stereo, dual, mono
- Audio band width	:	40 Hz – 15 KHz
- Audio S/N ratio	:	48 dB
- Audio freq. response	:	-2...+2 dB
- Distortion factor (1 kHz)	:	0.8%
- Output frequency range	:	110-862 MHz
- Output Level	:	90 dB $\mu$ V
- TV Standard	:	B/G
- Operating temperature	:	-10 °C to + 45 °C
- Attenuator	:	0-10 dB

#### **4.6 19" Steel Rack Cabinet**

- 4.6.01** 19" Steel rack cabinets shall be provided for housing the basic units and decoders. Racks for the decoders shall have suitable number of horizontal shelves for placing them.
- 4.6.02** The rack shall have enough ventilation to allow for dissipation of heat generated from the basic units and the decoders.
- 4.6.03** The racks shall have required numbers of 230 / 240 V, 13A power sockets to power the basic units / decoders. Unused sockets shall be concealed.
- 4.6.04** The racks shall have enough space to provide trunkings, splitters for cabling.
- 4.6.05** Cables in the racks shall be wired through trunkings and shall be fastened by cable ties. No loose / unused cables shall be exposed.
- 4.6.06** Metallic parts of the cabinets & racks shall be connected to earth rails for potential equalization.

#### **5. DISTRIBUTION NETWORK:**

The distribution elements shall be of die-cast aluminium housing protecting the electrical components against moisture and corrosion.

All such units shall be located in manholes on dedicated weatherproof boxes protected from ingress of water and other external forces.

The distribution components including amplifiers and splitters/tap-offs along the riser cable shall be of CATV grade.

##### **5.1. Cables:**

Low loss coaxial cable shall be used in order to limit the limit the number of cascaded amplifiers along the main line.

- 5.1.01** Cables used within the system shall have air or polyethylene dielectric.
- 5.1.02.** Cables used for wiring dish antennas shall be ultra violet resistant.

**5.1.03.** All the internal cables shall be double screened with the following minimum shielding rates:

30 – 470 MHz	≥ 75 dB
470 - 1000 MHz	≥ 75 dB
1000 - 2050 MHz	≥ 65 dB.

**5.1.04** Maximum loss of the coax-cables shall be as listed:

For external feeders	6 dB/100m at 800 MHz.
For internal sockets wiring	18 dB/100m at 800 MHz.
For dish antennas wiring	29 dB/100m at 2150 MHz.

**5.1.05** Joints and cable termination shall be adequately sealed against ingress of moisture and migration along the cable.

## **5.2. Splitters and tap-off boxes:**

**5.2.01** Splitters and tap-off boxes used within the system shall ensure approximately even signal levels at all the outlets in the villas. Difference between the signal levels at the subscribers' outlets shall not exceed 7 dB $\mu$ V under any circumstances.

**5.2.02** All splitters and tap-off boxes used within the system for distributing the signal to the outlet sockets shall have a minimum frequency range of 5 MHz - 2400 MHz.

**5.2.03** The minimum mutual attenuation between the branched outputs shall be 25dB or better.

**5.2.04** Main riser cable shall be securely clamped at each splitter and tap-off position.

## **5.3. TV/FM sockets:**

**5.3.01** Sockets shall be broadband type with operating frequency range from 5 MHz - 2400 MHz.

**5.3.02** Sockets shall have male/female double outlet in rigid metallic structure with cover similar to the adjacent wiring accessories.

**5.3.03** Sockets shall be wired in radially from the concerned junction box. 75-Ohm end-of-line resistors shall be used for reflection-free terminations.

#### **5.4. Line / Distribution amplifiers:**

**5.4.01** Trunk/Distribution Amplifier shall be used as necessary with a virgin line fed from the main head end system; the specifications are as follows:

- Broad - band range : 47 – 862 MHz.
- Maximum gain : 29/36 dB
- Maximum noise factor : 7 dB
- Maximum output level : 122 dB $\mu$ V
- Ambient operating temp. : -20°C to + 50°C
- Built-in level attenuator : 0 – 18dB
- Integrated line equalizer : 0 – 18dB
- Possibilities of plug in return channel modules.
- Shielded metal housing (IP 65).

**5.4.02** The number of line-amplifiers shall be made as required for the final wiring layout.

**5.4.03** Proper arrangements shall be made to dissipate the heat generated during normal working of the amplifier.

#### **5.5. House Connection Amplifiers:**

**5.5.01** Each villa shall be provided with house connection amplifiers to boost the incoming signal to required level.

**5.5.02** Specifications are as follows:

- Broad - band range : 47 – 862 MHz.
- Maximum gain : 29 dB
- Maximum noise factor : 6 dB
- Maximum output level : 102 dB $\mu$ V
- Ambient operating temp. : -20°C to + 50°C
- Level control : 20 dB
- Integrated line equalizer : 18 dB
- RF connections : F-connectors
- Plastic / metal housing (IP 20).

6. **MAINTENANCE:**

The system shall be warranted for a period of 12 months after final approval. To maintain the system in a proper working condition a maintenance contract is strongly recommended.

**Bill of materials:**

No.	Description	Unit	Qty	Rate	Total
	<b><u>Satellite Reception System :</u></b>				
	Supply and installation of Satellite Reception system for the building as per the enclosed specifications :				
1.	1.2 m solid aluminium dish antenna as specified, with Quattro Ku-band LNB (for Arabsat 3-A, Hotbird and Nilesat complete with stand).	Nos			
2.	Steel housed Signal processing basic cabinets with 8 slots for signal processing modules	Nos			
3.	Digital Channel processing modules as specified to receive and process 40 numbers digital programs from Arabsat3A, Hotbird & Nilesat	Nos			
4.	Digital Modules with common interface for pay channel modules	Nos			
5.	Modulator modules for converting the AV output of the above modules to standard TV channels in PAL	Nos			
6.	Trunk / Line / Distribution Amplifiers	Nos			
7.	Weather proof boxes located in manholes for housing amplifiers, distribution boxes, tap-off units etc.	Lot			
8.	S.M.A.TV. System network as per enclosed specifications complete with the distribution boxes, coaxial cables and cable fittings.	Lot			
9.	TV/FM outlet socket with plastic cover plate.	Nos			
10.	All necessary concrete bases, PVC pipes, trunking and all accessories with installation.	Lot			