Regional Telecommunications Satellite Systems

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OVERVIEW
concept

- *The intent is to procure space vehicle (satellite) for the purpose of meeting regional telecommunications need of the Islamic countries. The satellite, is designed to operate for fifteen years and provide 24 transponders in the Ku-band, 12 in C-band and12 in Ka-band to support applications.*

- *The configuration of the space vehicle will use a proven bus with all the subsystems to support space operations, i.e., electrical power, thermal control, attitude determination and control, power conditioning and distribution, telemetry tracking, and control, spacecraft software subsystem, etc., launch mass of approximately 6,000 kg and electrical power of 15 kw.*

- *The satellite bus will be augmented with an orbit adjust and maintenance propulsion module and payload module. The orbit adjust and maintenance propulsion module must provide a capability to adjust and maintain the orbit position after deployment by the launch vehicle. The payload module must provide the volume to house payload equipment and a surface on which to mount communications antennae and sensors.*

SPACE SEGMENT OBJECTIVES

- *To provide a space vehicle system (SVS) that meets the reliability requirements of 0.9 reliability at the end of mission (fifteen years on-orbit).*

- *To enter into service, this powerful satellite should provide a significantly expanded mission and superior coverage across the Middle East, Central Asia and Far East. The space segment of the satellite should be designed (6 tones at launch) with; 36+ plus transponders with 15 years life expectancy to operate in three frequency bands connected to fixed and steerable antennas for maximum flexibility in C, Ku and Ka to increase and diversify resources for markets in the Middle East, far East and Central Asia. With a single platform assembling Ku, C and Ka transponders the users should be able to select the most relevant frequency band for different types of service.*

- *Services:* *Broadcast, Telecom (VSAT & GSM Backhauling) and Broadband (MENOS & IP Trunking)*

SYSTEM REQUIREMENTS

Type of Traffic	*Multichannel telephony, computer data, television, digital data, potential modes of operations, e.g. SCPS*
Location	*26, 34, or 47 degrees East longitude, geosynchronous*
Stationkeeping	*+ 0.1 degree long. & - 0.1 degree incl.*
Mission Life	*Minimum 15 Years with S-class parts and 0.9 reliability at end of life*
Stabilization	*Star Tracker and Redundant Gyro Augmented with Coarse and Fine Sun Sensors with Sun-pointing Inertial, Thruster- based "Safe-Haven Mode, 3-axis with proven modular concept*

SYSTEM REQUIREMENTS – cont.

Propulsion	*Cold gas or hydrazine with sufficient capacity to provide station keeping for mission life*
Transponders	*24, Ku-band transponders, each capable of television and data transmission, with additional 12 C-band and 12 Ka-band transponders*
Bandwidth	*Each transponder with bandwidth of 72 MHz at Ku-band, others with 34 & 36 MHz, bandwidths of C- band & Ka-band (TBD)*
EIRP	*50 dBW at Ku-band per transponder*
RX/TX Frequency	*11/14 GHz (14.0-14.5 GHz receiving, 10.95-11.20 GHz & 11.45-11.70 GHz transmission)*

SYSTEM REQUIREMENTS – cont.

- ***Polarization*** — *Ku-band Linear-Horizontal or Vertical, offset: 30 MHz, C-band Circular – RHCP or LHCP*
- ***Modulation*** — *QPSK*
- ***Steerable Spot Beam*** — *2 degrees circular beam, two Ku-band transponders with 72 MHz, 50 dBW-EIRP, switchable*
- ***Ku+L-band*** — *L- band option is requested to provide two way communications with low and high rate data services using mobile and portable antennas. The Mobile Satellite Services (MSS) in 1.5/1.6 MHz range output, SSPAs with 20 W power and 16 MHz bandwidth for voice and data transmission. The L-band network (TBD) should complement the Ku-band communications infrastructures by permitting communications to remote areas. L-band MSS: 7 degrees broad beam*

SYSTEM REQUIREMENTS – cont.

X-Polarization Isolation (Typical)	30 db for Ku-band 30 dB for C-band
Typical G/T	4 dB/K for Ku-band 1.2 dB/K for C-band
Typical EIRP	52 dBW for Ku-band 43 dBW for C-band (High Power)

SYSTEM REQUIREMENTS
Advance Technology

- ***Advance Technology*** *Multi-beam satellite antennas: offset-fed reflection, with array feeds, lens antennas with array feeds, active phase antennas, Hopping spot beam, Digital technology: compressed video digital voice, etc. TDMA & SSTDMA, for efficient utilization of EIRP, Demo/remod satellite repeaters with on-board processing, SSPA replacing TWTA's for reliability, Signal fade compensation systems, Earth station antennas for VSAT & USAT.*
- ***Note 1*** *The Ku-band antenna shall consist of a conventional offset-fed parabola with the reflector deployed on one side of the spacecraft and a fixed array of feed horns,*
- ***Note 2*** *The 5-horn array for vertical polarization and the 4-horn array for horizontal polarization should be mounted close to the spacecraft body, allowing short waveguide runs to the transmitters and receivers.*

SYSTEM REQUIREMENTS
Advance Technology

- ***Note 3*** *The polarization degradation of the offset configuration should be restored by the use of a dual-gridded reflector, that consists of two nested shells (one for each polarization), with parallel wires imbedded in the skins of each shell and oriented to reflect one sense of linear polarization. The feeds of each array shall be rectangular of various sizes, that in combination achieve the far-field pattern contoured to cover the target area. The gain of this antenna shall be approximately at 34 dBi, matched with 55 watt TWTAs to provide the required EIRP of 50 dBW.*

- ***Note 4*** *The Land Mobile Satellite Service (LMSS) option shall provide 1 MHz of bandwidth (100 carriers of 10 KHz spacing) at L-band and on the Ku-band. The capability shall be provided to place the 1 MHz bandwidth of carriers anywhere within a 29 MHz band for both transmit and receive (tunable in steps of 250 KHz) and to switch from one sense of circular polarization to the other- all by ground command.*

SYSTEM REQUIREMENTS
Advance Technology

- ***Note 5*** *The L-band antenna should be an offset-fed parabola of 1.5 meters with a single CP feed, diplexed for transmit and receive, providing 25 dB gain over the required coverage. An EIRP of 37 dBW can be obtained with 20 watts of RF power provided by two 10 watts SSPAs, each driving one of the ports of the CP feed.*

- ***Note 6*** *Steerable Ka band beams to quickly address changing requirements*

- ***Note 7*** *Broadband service for global, high-quality, secure internet access with back up networks for disaster recovery*

- ***Advantages*** *Highly Secure, Flexible Coverage, Reliability, and Multi-Purpose Applications*

Emerging Markets Potential Partnership

- *Partnership with emerging markets entities who own and operate teleport facilities in the region. To secure supports for approximately 1,200 MCPC/SCPC sites in over 140 countries. Multiple sites in almost every country in Africa and support offices in four continents.*

- *Providing maintenance services to more than 100 additional sites spread out around the globe that are managed from its Global Operation Centre. To focuses its services on large enterprises, governments, oil & gas, banking and wholesale services segment. Reference customers include the United Nations, the World Bank, and the International Monetary Fund and AT&T.*

Emerging Markets Potential Partnership (cont.)

- **Star:** *iDirect Evolution*
- **Mesh:** *ViaSat, LinkWay*
- **SCPC:** *Comtech, Modems & NRC, Cisco*
- **Frequency:** *C, Ku, Ka, X & L-band*
- **Hubs:** *Raisting Hubs*
- **Install, S&M:**
- **Capacity:** *>1 GHz*

BOTTOM LINE

Satellite System

To rank among the top five satellite systems

DEFINITIONS

- *APSCO* — *Asia Pacific Space Communications Organization*
- *EMC* — *Emerging Markets Communications Inc.*
- *TDMA* — *Time Division Multiple Access*
- *BUS* — *Area of satellite to house components*
- *G/T* — *Gain to Temperature ratio*
- *TWTA* — *Travelling Wave Tube Amplifier*
- *RF* — *Radio Frequency*
- *SVS* — *Space Vehicle System*
- *ERIP* — *Effective Isotropically Radiated Power*
- *MSS* — *Mobile Satellite Service*
- *LMSS* — *Land Mobile Satellite Service*
- *dBW* — *Unit of measurement in decibel watts*
- *QPSK* — *Quadrature Phase-Shift Keying*
- *SSPA* — *Solid State Power Amplifier*
- *VSAT* — *Very Small Aperture Terminal*
- *SCPC* — *Single Channel Per Carrier*