GOVERNMENT OF INDIA

(Ministry of Home Affairs)

DIRECTORATE GENERAL

CENTRAL RESERVE POLICE FORCE

EAST BLOCK-7, SEC-1, R.K. PURAM, NEW DELHI-110066

Email:- comncell@crpf.gov.in

No. B.V-7/2018-19-C (VSAT) Dated, the 12th July'2018

To

DIG (Comn),NSG
Mehram Nagar
Palam, New Delhi-37

Subject: QRs/TDs of Broadband VSAT (Transportable) Satellite Terminals.

QRs and TDs of Broadband VSAT (Transportable) Satellite Terminals is approved by the competent authority.

Encl: (QRs & TDs of Broadband VSAT (Transportable) Satellite Terminals.)

12/7/18
{(P. R. Jha, DC (UAV)}
For DIG (Equipment)
Directorate General, CRPF

(10)

QRs OF VSAT SATELLITE HUBs AND TERMINALs

Ser No	Parameters	Specifications/Features
1	**Man Portable Satellite Terminals**	The portable satellite Terminal should be a solution of maximum two boxes, including accessories. Whether a single or twin box solution is offered, a box should have approx 35 Kg weight (or better) and be fitted with padded strapping and harness to make it man portable. It should facilitate quick auto *alignment and deployment. Suitable batteries are to be provided. The systems* should have provision for connecting to AC power source. It should have rugged and light weight collapsible antenna. It should be able to provide upto 512 Kbps data rates and support upto 2 Mbps traffic when required. It should be interoperable with Hub and other satellite network site which is based on MFTDMA TDM/DVB S2 or latest technology Technical specifications are as follows.
2	**Network Topology**	Star
3	**Frequency Band**	KU Band including Extended KU Band
4	**Modem/Router**	Satellite Modem(1+1) i.e Single unit solution for both Modem and Router (IDU)
5	**Outbound Carrier**	Signal Format : DVB-S2 or latest
	(Receive)	Carrier Bit Rates : 2 Mbps upto 8 Mbps or better range
		Modulation : QPSK, 8PSK, 16APSK or better
		FEC Coding : Turbo or latest
		FEC rates : As per industry standards
		Receive IF freq: : 950-1750 Mhz or better range
6	**Inbound Carrier**	Access Scheme : MFTDMA or latest
	(Transmit)	*Carrier Bit Rates : 256 Kbps upto 2 Mbps or better range*
		Modulation : BPSK, QPSK, 8PSK, or better
		FEC Coding : Turbo or latest
		FEC Rates : As per industry standards
		Transmit IF freq : 950 - 1750 Mhz or better range
7	**Multiple access**	Downstream : MFTDMA and TDM/DVB-S2 or latest
		Upstream : MFTDMA or latest
8	**Access Scheme**	Bandwidth on demand, Real time, Non-real time, guaranteed throughput, QoS classes.
9	**Traffic Features**	Traffic filtering, Bandwidth on demand, multiple satellite support, Multiple outbound.
10	**Bandwidth Efficiency**	TCP acceleration, HTTP acceleration, Efficient Packet fragmentation and aggregation

NSG NSG CRPF SSB

ITBP BSF CISF

(11)

Sl. No	Parameters	Specifications/Features
11	**IP Features**	Enhanced IP features for full flexibility : IPV4, IPV6, Static Routing, OSPF, BGP, Load Balancing, TCP, UDP, IGMP, Robust Header Compression, Multi VRF Support, VLAN, GRE, MPLS support, DiffServ, DHCP, NAT/ PAT, IGMP, RIP, IP prioritization.
12	**Security**	Should be compatible for following:- DES or AES - 128 encryption or better
		End to End encryption
		FTDMA scrambling of all traffic from site to the hub
		Secure distribution of multicast keys from Hub to remote site via NMS.
		The system should be able to support an external IP encryptor.
13	**Network Management System Features**	The NMS features in Man Transportable terminals should includes following:-
		(a) It should support single centralized NMS for Configuration, Monitoring, Analysis, Provisioning, Reporting and Maintenance of STAR configuration within the network.
		(b) The NMS should support for centralized management of software upgrades and configuration changes.
		(c) The NMS must have the ability to monitor and provide statistics to central NMS and user at the site. It must also have the ability to be managed and monitor remotely.
		(d) NMS must run on a standard operating system or browser for inter-operability.
		(e) All aspects of NMS must be GUI based for ease of management.
		(f) Buyer should be able to customize the CDR (Call Data Report) as per his requirement.
		(g) Authentication of NOC operators is a must, with the ability to define what functions an operator can perform. NMS must provide remote authentication.
		(h) NMS must have the ability to connect to SNMP V2 agent or better.
		(i) NMS must provide IP and satcom statistics, both real-time and historical.
		(o) NMS must be able to provide statistics for all QoS parameters configured to user at the site.
		(p) NMS must provide support for multicast/ broadcast software and firmware upgrades.
		(q) NMS should be site independent.
		(s) NMS must provide client, to allow remote network manager to monitor the network.
		(t) The equipment should support on-line management for centralized configuration, performance monitoring, fault diagnostics and rectifications.
		(v) NMS should be able to provide statistics and updates to the central NMS/NCC.

NSG NSG CRPF SSB

ITBP BSF CISF

(12)

Sl No	Parameters	Specifications/Features
14	**Interfaces/Ports**	LAN Port : One or more 10/100/1000 BASE- T Ethernet RJ-45 ports Independent and individual configurable interfaces
		Serial RS232/Console port or suitable similar interface : For management access via CLI
		USB-A 2.0 port or suitable similar interface : Front and Rear ports for image updation configuration, WLAN etc.
		Tx Modulator Port : Suitable connection port
		Rx Demodulator Port : Suitable connection port
15	**Power Supply/ Environmental Conditions**	Operating Temp : 5^0C to 40^0C (ambient temp)
		Relative Humidity : Upto 90%
		Power Supply : Redundant 220 VAC ± 15 %, 47/53 Hz
		Built in battery backup : Min 30 mins power backup
16	**Safety & EMI/EMC Compatibility**	Safety : IEC 60950, UL/EN 60950-I or any other equivalent/appropriate International Standards
		EMC/EMI : ETSI EN 301 489-I, ETSI EN 301 489-12, FCC Part 15 Class B or any other equivalent/appropriate International Standards
		Radio Standards : EN 301 428 or any other equivalent/appropriate International Standards
		WEEE/RoHS : FCC, CE and RoHS Compliant.
17	**Antenna Systems for portable satellite terminal**	Antenna System for Portable Sat Terminal The Antenna system should be light weight, collapsible and efficient. Collapsible design is required only for ≤ 1.2m antenna in man transportable terminals. Antenna efficiency should be 65% or better, meeting CCITT & CCIR 580R specifications and should confirm to NOCC standards. Construction of antenna should adhere to pre stretch hardening with stretch forming / precision pressed forming.
18	**Antenna Specifications**	≤ 1.2m Antenna (Man Transportable)
		(i) Antenna size. Type ≤ 1.2 m
		(ii) Antenna Type : Gregorian Dual offset or better
		(iii) Operating frequency : Ku band including extended Ku band Tx 13.75 -14.50 Ghz Rx 10.70 -12.75 Ghz
		(iv) Material: Glass Fiber Reinforced Polyester SMC or better
		(v) Polarization : Linear orthogonal
		(vi) Cross-polarization : > 30 dB or better (on axis)
		(vii) Tx-Rx isolation: > 85 dB (with TRF)
		(viii) Gain (Mid Band): Tx 42.5 dBi (± 0.2 dB) Rx 41.0 dBi (± 0.2 dB)
		(ix) System G/T at 20^0 Elevation and 90^0 K LNA temp: Min 16.6 dB/K

NSG NSG CRPF SSB

ITBP BSF CISF

(13)

Sl. No	Parameters	Specifications/Features
		(x) VSWR : ≤1.50:1 or better
		(xi) Feed type: As per Industry standards.
		(xii) Tracking mode : Manual/Automatic
		(xiii) Mount movement: 0^0 to 360^0 (Azimuth)
		12^0 to 90^0 (Elevation)
		(xiii) Wind velocity: Operational -70 kmph
		Survival – 200 kmph
		(xiv) Tx Power handling : 16 Watt or more

Brig Anil Chaudhary
DIG (Comn), NSG

Col S Balakrishnan
CG, ESG, NSG

SI (Telecom) Jitendra Kumar
HQ CRPF

SFO (Tele) K K Roy
HQ SSB

AC R K Meel
HQ CISF

Insp (Telecom) E C Ajay Kumar
HQ ITBP

DC (IT) Amardeep Singh
HQ BSF

(Approved / ~~Not Approved~~)

Shri R C Tayal, IPS
DG, NSG

(14)

TRIAL DIRECTIVEs OF VSAT SATELLITE HUBs AND TERMINALs

Ser No	Parameters	Specifications/Features	Trial directives
1	**Man Portable Satellite Terminals**	The portable satellite Terminal should be a solution of maximum two boxes, including accessories. Whether a single or twin box solution is offered, a box should have approx 35 Kg weight (or better) and be fitted with padded strapping and harness to make it man portable. It should facilitate quick auto alignment and deployment. Suitable batteries are to be provided. The systems should have provision for connecting to AC power source. It should have rugged and light weight collapsible antenna. It should be able to provide upto 512 Kbps data rates and support upto 2 Mbps traffic when required. It should be interoperable with Hub and other satellite network site which is based on MFTDMA TDM/DVB S2 or latest technology Technical specifications are as follows.	The BOO will physically check for a single box based solution to include both modem and router and the vendor/rep of firm will demonstrate the Star and Mesh topology compliance through Mgt Console.
2	**Network Topology**	Star	The Board will carry out physical check through Mgt Console.
3	**Frequency Band**	KU Band including Extended KU Band	The Board will carry out physical check through Mgt Console.
4	**Modem/Router**	Satellite Modem(1+1) i.e Single unit solution for both Modem and Router (IDU)	The Board will physically check for Satellite Modem (1+1 mode).
5	**Outbound Carrier**	Signal Format : DVB-S2 or latest	The Board will physically check as well as do functional test of the mentioned parameter using Mgt console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
	(Receive)	Carrier Bit Rates : 2 Mbps upto 8 Mbps or better range	
		Modulation : QPSK, 8PSK, 16APSK or better	
		FEC Coding : Turbo or latest	
		FEC rates : As per industry standards	
		Receive IF freq: : 950-1750 Mhz or better range	
6	**Inbound Carrier**	Access Scheme : MFTDMA or latest	The Board will physically check as well as do functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
	(Transmit)	Carrier Bit Rates : 256 Kbps upto 2 Mbps or better range	
		Modulation : BPSK, QPSK, 8PSK, or better	
		FEC Coding : Turbo or latest	
		FEC Rates : As per industry standards	
		Transmit IF freq : 950 - 1750 Mhz or better range	
7	**Multiple access**	Downstream : MFTDMA and TDM/DVB-S2 or latest	The Board will carry out physical check through Mgt Console.
		Upstream : MFTDMA or latest	
8	**Access Scheme**	Bandwidth on demand, Real time, Non-real time, guaranteed throughput, QoS classes.	The Board will carry out physical check through Mgt Console.
9	**Traffic Features**	Traffic filtering, Bandwidth on demand, multiple satellite support, Multiple outbound.	The Board will carry out physical check through Mgt Console.

NSG NSG CRPF SSB

ITBP BSF CISF

(15)

Ser No	Parameters	Specifications/Features	Trial directives
10	**Bandwidth Efficiency**	TCP acceleration, HTTP acceleration, Efficient Packet fragmentation and aggregation	The Board will carry out physical check as well as functional test of the mentioned parameter using Mgt console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
11	**IP Features**	Enhanced IP features for full flexibility : IPV4, IPV6, Static Routing, OSPF, BGP, Load Balancing, TCP, UDP, IGMP, Robust Header Compression, Multi VRF Support, VLAN, GRE, MPLS support, DiffServ, DHCP, NAT/ PAT, IGMP, RIP, IP prioritization.	The Board will carry out physical check as well as do functional test of the mentioned parameter using Mgt console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
12	**Security**	Should be compatible for following:- DES or AES - 128 encryption or better	The Firm/Vendor will provide certifications and show security during demo.
		End to End encryption	
		FTDMA scrambling of all traffic from site to the hub	
		Secure distribution of multicast keys from Hub to remote site via NMS.	
		The system should be able to support an external IP Encryptor.	
13	**Network Management System Features**	The NMS features in Man Transportable terminals should includes following:-	The Board will physically check as well as do functional test of NMS via NMS mgt Console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer. Where required certificate will be provide by the firm/vendor. The vendor/firm will provide certificates for the features which can not be checked physical.
		(a) It should support single centralized NMS for Configuration, Monitoring, Analysis, Provisioning, Reporting and Maintenance of STAR configuration within the network.	
		(b) The NMS should support for centralized management of software upgrades and configuration changes.	
		(c) The NMS must have the ability to monitor and provide statistics to central NMS and user at the site. It must also have the ability to be managed and monitor remotely.	
		(d) NMS must run on a standard operating system or browser for inter-operability.	
		(e) All aspects of NMS must be GUI based for ease of management.	
		(f) Buyer should be able to customize the CDR (Call Data Report) as per his requirement.	
		(g) Authentication of NOC operators is a must, with the ability to define what functions an operator can perform. NMS must provide remote authentication.	
		(h) NMS must have the ability to connect to SNMP V2 agent or better.	
		(i) NMS must provide IP and satcom statistics, both real-time and historical.	

NSG CRPF SSB ITBP BSF CISF

(16)

Ser No	Parameters	Specifications/Features	Trial directives
		(o) NMS must be able to provide statistics for all QoS parameters configured to user at the site.	
		(p) NMS must provide support for multicast/ broadcast software and firmware upgrades.	
		(q) NMS should be site independent.	
		(s) NMS must provide client, to allow remote network manager to monitor the network.	
		(t) The equipment should support on-line management for centralized configuration, performance monitoring, fault diagnostics and rectifications.	
		(v) NMS should be able to provide statistics and updates to the central NMS/NCC.	
14	**Interfaces/Ports**	Serial RS232/Console port or suitable similar interface : For management access via CLI	The Board will carryout physical check as well as functional test of the mentioned parameter using Mgt Console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer
		USB-A 2.0 port or suitable similar interface : Front and Rear ports for image updation configuration, WLAN etc.	
		Tx Modulator Port : Suitable connection port	
		Rx Demodulator Port : Suitable connection port	
15	**Power Supply/ Environmental Conditions**	Operating Temp : 5^0C to 40^0C (ambient temp)	Vendor/firm will provide certificate for temp, humidity and power supply range. The vendor/rep of firm will also demonstrate the power supply feature to the Board of officer.
		Relative Humidity : Upto 90%	
		Power Supply : Redundant 220 VAC ± 15 %, 47/53 Hz	
		Built in battery backup : Min 30 mins power backup	
16	**Safety & EMI/EMC Compatibility**	Safety : IEC 60950, UL/EN 60950-I or any other equivalent/appropriate International Standards	The vendor/rep of firm will provide certificate to BOO.
		EMC/EMI : ETSI EN 301 489-I, ETSI EN 301 489-12, FCC Part 15 Class B or any other equivalent/appropriate International Standards	
		Radio Standards : EN 301 428 or any other equivalent/appropriate International Standards	
		WEEE/RoHS : FCC, CE and RoHS Compliant.	
17	**Antenna Systems for portable satellite terminal**	Antenna System for Portable Sat Terminal The Antenna system should be light weight, collapsible and efficient. Collapsible design is required only for ≤ 1.2m antenna in man transportable terminals. Antenna efficiency should be 65% or better, meeting CCITT & CCIR 580R specifications and should confirm to NOCC standards. Construction of antenna should adhere to pre stretch hardening with stretch forming / precision pressed forming.	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer and submit the reqd certificate.
18	**Antenna Specifications**	≤ 1.2m Antenna (Man Transportable)	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the
		(i) Antenna size. Type ≤ 1.2 m	
		(ii) Antenna Type : Gregorian Dual offset or better	

(17)

Ser No	Parameters	Specifications/Features	Trial directives
		(iii) Operating frequency : Ku band including extended Ku band Tx 13.75 -14.50 Ghz Rx 10.70 -12.75 Ghz	vendor/rep of firm will demonstrate the features to the Board of officer using test Jigs/meters and submit the reqd certificate.
		(iv) Material: Glass Fiber Reinforced Polyester SMC or better	
		(v) Polarization : Linear orthogonal	
		(vi) Cross-polarization : > 30 dB or better (on axis)	
		(vii) Tx-Rx isolation: > 85 dB (with TRF)	
		(viii) Gain (Mid Band): Tx 42.5 dBi (± 0.2 dB) Rx 41.0 dBi (± 0.2 dB)	
		(ix) System G/T at 20^0 Elevation and 90^0 K LNA temp: Min 16.6 dB/K	
		(x) VSWR : ≤1.50:1 or better	
		(xi) Feed type: As per Industry standards.	
		(xii) Tracking mode : Manual/Automatic	
		(xiii) Mount movement: 0^0 to 360^0 (Azimuth) 12^0 to 90^0 (Elevation)	
		(xiii) Wind velocity: Operational -70 kmph Survival – 200 kmph	
		(xiv) Tx Power handling : 16 Watt or more	

Brig Anil Chaudhary
DIG (Comn), NSG

Col S Balakrishnan
CG, ESG, NSG

SI (Telecom) Jitendra Kumar
HQ CRPF

SFO (Tele) K K Roy
HQ SSB

AC R K Meel
HQ CISF

Insp (Telecom) E C Ajay Kumar
HQ ITBP

DC (IT) Amardeep Singh
HQ BSF

✓ **(Approved / ~~Not approved~~)**

Shri R C Tayal, IPS
DG, NSG

(18)

QRs OF VSAT SATELLITE HUBs AND TERMINALs

Ser No	Parameters	Specifications/Features
	Hubs / Terminals	Satellite stations for Hubs and Sites should be with preferably a single box based solution to include both modem and router (i.e. IDU). The same will be referred to as satellite modems. However, if not on a single box the system should not be comprises of more than two boxes. The satellite modems used for primary network and TSTs will support both star and mesh topology.
1	**Network Topology**	Star
2	**Frequency Band**	KU Band including Extended KU Band
3	**Modem/Router**	Satellite Modem (1+1 mode) i.e. Single unit solution for both Modem and Router (IDU)
4	**Stacking**	Cascading of upto 4 units or more
5	**Outbound Carrier (Receive)**	Signal Format : DVB-S2 or latest
		Carrier Bit Rates : 2 Mbps upto 100 Mbps
		Modulation : QPSK, 8PSK, 16APSK or better
		FEC Coding : Turbo or better
		FEC rates : As per industry standards
		Receive IF freq : 950-1750 Mhz or better range
6	**Inbound Carrier (Transmit)**	Access Scheme : MFTDMA or latest
		Carrier Bit Rates : 256 Kbps upto 8 Mbps or better range
		Modulation : BPSK, QPSK, 8PSK or better
		FEC Coding : Turbo or better
		FEC Rates : As per industry standards
		Transmit IF freq : 950 - 1750 Mhz or better range
7	**Multiple access**	Downstream : MFTDMA and TDM/DVB-S2 or latest
		Upstream : MFTDMA or latest
8	**Access Scheme**	Bandwidth on demand, Real time, Non-real time, guaranteed throughput, QoS classes.
9	**Traffic Features**	Traffic filtering, Bandwidth on demand, multiple satellite support, Multiple outbound, Auto pointing tool.
10	**Bandwidth Efficiency**	TCP acceleration, HTTP acceleration, Efficient Packet fragmentation and aggregation
11	**IP Features**	Enhanced IP features for full flexibility : IPV4, IPV6, Static Routing, OSPF, BGP, Load Balancing, TCP, UDP, IGMP, Robust Header Compression, Multi VRF Support, VLAN, GRE, MPLS support, DiffServ, DHCP, NAT/ PAT, IGMP, RIP, IP prioritization.
12	**Security**	DES or AES - 128 encryption or better
		End to End encryption.
		FTDMA scrambling of all traffic from site to the hub
		Secure distribution of multicast keys from Hub to remote site via NMS.
		The system should be able to support an external IP Encryptor.
13	**Reliability and Availability**	HSRP with single or dual outdoor Units (ODUs), DDR (Dial on demand routing) for satellite backup of terrestrial WAN and terrestrial backup of satellite WAN
14	**Network Management**	The NMS/ NCC should be provided in hot standby redundant configuration. The specifications for the NMS are enumerated below :-

(19)

Ser No	Parameters	Specifications/Features
		(a) A single centralized NMS should support Configuration, Monitoring, Analysis, Provisioning, Reporting and Maintenance of STAR configuration within the network.
		(b) The NMS must provide for centralized management of software upgrades and configuration changes.
		(c) The NMS must have the ability to monitor and provide statistics for all portions of the network. One must have the ability to manage and monitor the network remotely. Hub NMS should be configurble as UNMS for its network.
		(d) NMS must have the ability to gather and display RTT times from remotes.
		(e) NMS must run on a standard operating system for inter-operability with UNMS if any in the network.
		(f) All aspects of NMS must be GUI based for ease of management.
		(g) Buyer should be able to customize the CDR (Call Data Report) as per his requirement.
		(h) Authentication of NOC operators is a must, with the ability to define what functions an operator can perform. NMS must provide remote authentication.
		(i) NMS must have the ability to manage multiple networks and hubs.
		(k) NMS must have a distributed NMS architecture and be modular to provide scalability.
		(l) NMS must have the ability to connect to SNMP V2 agent or better version.
		(m) NMS must have standard database and provide access for external applications to retrieve data for in-house use only.
		(n) NMS must provide IP and satcom statistics, both real-time and historical.
		(o) NMS must be able to provide statistics for all QoS parameters configured.
		(p) NMS must provide support for multicast/ broadcast software and firmware upgrades.
		(q) NMS should be site independent.
		(r) Network Operations of a site should not be affected even if the NMS of that site is down. It should join the NMS network automatically as soon as fault is rectified.
		(s) NMS must provide client, to allow remote network manager to monitor the network.
		(t) The equipment should support on-line management for centralized configuration, performance monitoring, fault diagnostics and rectifications.
		(v) NMS should be able to provide statistics and updates to the umbrella NMS if any.
15	**Interfaces/Ports**	LAN Port : Two or more 10/100/1000 BASE- T Ethernet RJ-45 ports Independent and Individual configurable interfaces.
		Serial RS232/Console Port or suitable similar interface: For management access via CLI
		USB-A 2.0 port or suitable similar interface : Front and Rear ports for image updation configuration, WLAN etc.
		Tx Modulator Port : Suitable connection port
		Rx Demodulator Port : Suitable connection port

NSG NSG ERPF SSB

IAFP BSF IAF

(20)

Ser No.	Parameters	Specifications/Features
16	**Power Supply/ Environmental Conditions**	Operating Temp : 5°C to 40°C (ambient Temp)
		Relative Humidity : Upto 90%
		Power Supply : Redundant 220V AC ± 15% , 47-53 Hz
17	**Safety & EMI/EMC Compatibility**	Safety : IEC 60950, UL/EN 60950-I or any other equivalent/appropriate International Standards
		EMC/EMI : ETSI EN 301 489-I, ETSI EN 301 489-12, FCC Part 15 Class B or any other equivalent/appropriate International Standards
		Radio Standards : EN 301 428 or any other equivalent/appropriate International Standards
		WEEE/RoHS : FCC, CE and RoHS Compliant.
18	**Network Accelerator (1+1 mode)**	(a) The network accelerator should provide TCP acceleration, and application QoS for locations that use encryption. The network accelerator should compensate for the long latencies in satellite links that would otherwise limit the speed of each TCP session; allowing greater utilization of available bandwidth. The network accelerator should intercept the TCP traffic, prioritise and accelerate it, before it is encrypted. This should result in a significantly higher overall TCP throughput over a satellite network.
		(b) The specifications for the network Accelerator that would be used along with the Encryption devices at remote as well as at the hub site are as follows :-
		(i) Should provide following features
		(aa) Symmetric, Universal & Scalable TCP Acceleration.
		(ab) Specific end to end QoS support
		(ac) Web acceleration
		(ad) Support for Multiple IP sessions.
		(ii) Network Interfaces 10/100 Base T Ethernet at peripherals and 10/100/1000 Base T Ethernet at the Hub.
		(iii) Terminal Interface - RS 232 serial interface
		(iv) Temperature - 0° to 40° C (ambient Temp)
		(v) Humidity - 5 - 95 %
		(vi) Power Supply - 220V AC (±15%), 47-53 Hz
		(vii) Management should be possible through a centralized dedicated GUI and should be field upgradable.
19	**Adaptive Power Control (APC) with Adaptive Coding and Modulation (ACM)**	Taking into consideration the rain statistics of India, it is proposed to have dynamic adaptive up-link power control at both the Hub-NMS and at each remote site to ensure that with SSPA/RFT power and available EPFD, 99.7% uplink time is available in the network averaged over a month.

NSG NSG CRPF SSB

JTBP BSF ITBP

(21)

Ser No	Parameters	Specifications/Features
20	**Antenna Systems**	The antennae of Hubs (< 9 Mtrs) and Sites (3.8 Mtrs) will have full auto tracking and alignment along with beacon receivers. The electronics should include auto power control facility to cater for losses due to rain fade or any other reasons. For Hubs (< 9 Mtrs) antennas facility for providing lat long data for antenna alignment will be taken from a GPS and also an option for taking the same manually from map should be provided. Two sets of software in CDs for the both antennas system should be provided. The antenna should be capable of working with any KU band transponders of INSAT/GSAT series of satellites. The antennas will be painted in disruptive colour pattern.
21	**Antenna Specifications**	(a) <**9m Antenna (Hubs)**
		(i) Antenna/Reflector Diameter : 8.0 - 9.0 M
		(ii) Operating Frequency Band : Ku Band including Extended Ku Band
		Tx : 13.75 - 14.50 GHZ
		Rx : 10.70 - 12.75 GHZ
		(iii) Gain (Mid Band)
		Tx : 60.35 dBi (+/- 1 dB)
		Rx : 59.42 dBi (+/- 1 dB)
		(iv) Polarisation : Linear
		(v) VSWR : ≤ 1.3:1 or better
		(vi) System G/T at 30^0 Elevation and 90^0 K LNA temp - Minimum 37 dB/°K
		(vii) Cross polarization : ≥ 35 dB (on Axis)
		(viii) Tx-Rx Isolation : ≥ 85 dB (with TRF)
		(ix) Radiation Pattern : CCIR.580 or latest version
		(x) Feed Interface
		Tx : WR-75
		Rx : WR-75
		(xi) Azimuth Adjustment : 90^0 continuous, 180^0 in two position
		(xii) Elevation Adjustment : 12^0 to 90^0
		(xiii) Material : Aluminium with stretch formed / precision press formed panel or better.
		(xiv) Wind Load Operational : 70 kmph Survival : 200 kmph
		(xv) Operating Temperature : -15^0C to 50^0 C (for outdoor antenna subsystem)
		(xvi) Rain : 100 mm/hr (for outdoor antenna subsystem)
		(xvii) Relative Humidity : 100% (for outdoor antenna subsystem)
		(xviii) Tracking Mode : Full Automatic
		(xix) Tx power Capability : 1 KW or better

NSG NSG CRPF SSB

ITBP BSF CISF

(22)

Ser No	Parameters	Specifications/Features
	Antenna Specifications	**(b) 3.8m Antenna (Terminals)**
		(i) Antenna size : 3.7 m - 4.2 m
		(ii) Operating frequency : Ku band including Extended Ku band
		Tx : 13.75-14.50 Ghz
		Rx : 10.70-12.75 Ghz
		(iii) Material : Aluminium with stretch formed/ precision press formed panel or better.
		(iv) Polarization : Linear Polarize
		(v) Cross-polarization : ≥ 35 dB (Tx) ≥ 30 dB (Rx)
		(vi) Tx-Rx isolation : ≥ 85 dB (with TRF)
		(vii) Gain (Mid Band)
		Tx : 53.0 dBi (+ o.5 dB)
		Rx : 51.0 dBi (+ o.5 dB)
		(viii) System G/T at 20^0 EL : minimum and 90^0 K LNA temp 29.7 dB/^{0}K
		(ix) VSWR : <1.5:1 or better
		(x) Feed type : Two port Tx-Rx Freq feed, having Orthogonal linear Polarization, with provision for manual rotation of feed for matching of linear polarization.
		(xi) Tracking mode : Full Automatic
		(xii) Mount movement : 0^0 to 360^0 (Azimuth) 12^0 to 90^0 (Elevation)
		(xiii) Wind velocity : Operational-70 kmph Survival -200 kmph
		(xiv) Power Handling : 100 Watt or higher
22	**Ku Band BUC with Booster and PLL LNB (1+1) mode**	Should be a highly integrated 200W/40W/10W ODU that comprises of BUC, booster in transmit mode and PLL LNB in receive mode, power supply and built-in M&C. BUCs should be in hot standby (1+1) configuration. The specifications are as follows.
		(a) Transmit
		(i) Transmit Frequency : 13.75 – 14.5 Ghz
		(ii) IF Frequency : 950 – 1750 Mhz or better range
		(iii) Frequency Step size : 1 Mhz
		(iv) Input Power Range : -25 dBm to -5 dBm
		(v) Gain Stability (temp) : ± 2 dB max
		(vi) Gain Adjustment : 20 dB @ 1 dB steps
		(vii) Inter Modulation Product : -25 dBc max
		(viii) Spurious : -55 dBc max
		(ix) VSWR : ≤1.3:1 or better
		(x) Frequency stability (temp) $1x10^{-8}$

NSG NSG CRPF SSB

ITBP BSF CISF

(23)

Ser No	Parameters	Specifications/Features
		(xi) M and C Interface : RS 232/RS 485
		(b) Environmental
		(i) Operating Temperature : - 30° C to 55° C
		(ii) Storage : - 40°C to 60°C
		(iii) Relative Humidity : upto 95 % at 45°C
		(c) Ku Band Booster (1+1 mode)
		(i) Gain flatness : ± 1.0 dB max
		(ii) VSWR : ≤1.3:1 or better
		(iii) Inter-modulation Product : - 25 dBc max
		(iv) Spurious : - 65 dBc max
		(v) Mgt & Control Interface RS485/RS232
		(vi) RF Output : WR75G
		(vii) Output @ P1dB : 53 dBm for 200W 46 dBm for 40 W 40 dBm for 10W
		(d) Power Supply
		(i) AC Input voltage : 220V AC (± 15%), 47-53 Hz
		(e) Phase Locked Low Noise Block (PLL LNB in 1+1 Mode)
		(i) Input frequency : Ku Band including Extended Ku Band
		(ii) L-Band output frequency : 950 – 1750 Mhz or better range
		(iii) Noise temperature at 25 deg C : 75° K max or better
		(iv) Gain : 60 dB typical
		(v) Output Impedance : 50 ohms
		(vi) Gain flatness : ± 1.0 dB max
23	**Static Antenna Control System**	The antenna tracking mechanism consisting of screw jack with AC motors, shall include the following:- (a) Antenna Control Unit (b) Motor control unit. (c) Angle detectors. (d) Beacon Receiver for auto tracking
		(a) Antenna Control Unit
		(i) Operational modes : Manual Step Track Program Track Standby, also system should revert automatically to standby in case of any of the fault condition
		(ii) Alarm indications and status monitoring (Visual & resettable - audible)
		o Limit switch alarm
		o Synchro conversion/Angle detection alarm
		o System interlock
		o Low signal alarm
		o Beacon level low

NSG NSG CRPF SSB

ITBP BSF CISF

24

Sr.	Parameters	Specifications/Features
		o PLL out of lock
		(iii) Signal level monitor : To monitor beacon signal level in dB relative to peak
		(iv) Angle indication : AZ-Elmont
		AZ : 0^0 - 360^0, EL : 12^0-90^0
		Resolution : 0.01^0,
		Accuracy : 0.02^0
		(v) Parameter check and updating data entry : Satellite standard scans cycle.
		(vi) Step Track Performance
		§ Tracking accuracy : Better than 1/10th of half power beam width , for wind speed up to 70 km/hour
		§ Auto track select Interval: 10 minutes, 30 minutes, 60 minutes, 120 minutes - Signal level select settable 0.5 dB (nominal)
		§ Auto track signal level: Settable
		(vii) Capability to drive the system from remote terminal through RS-232C interface
		(viii) Default mode to bypass the processor and enable manual control
		(b) Motor Controller
		(i) Mode selection : Local/Remote (ACU)
		(ii) Built in D.C. power supply unit
		(iii) Emergency Stop available
		(iv) Low Speed / High speed selection
		(v) Toggle switches provided for locking in local mode in all 4- directions
		(vi) All weather proof, wall mounted unit.
		(vii) Protection against single phase failure and power supply cut off
		(c) Angle detectors
		(i) Detector type : Synchro/ Resolver/ optical encoder
		(ii) Resolution : 0.01 deg
		(iii) Accuracy : 0.03 deg
		(d) Beacon Tracking Receiver
		(i) Input Frequency : 950 to 1750 MHz or better range
		(ii) Input signal level : -55 to -100 dBm,
		(iii) Gradient : 0.5 Volt/dB Nominal for 3 db range
		(iv) Output level : 0 -10V
		(v) Power Supply : 220V AC (±15%), 47-53 Hz
		(vi) Operating Temperature : 0 to 40° C (Ambient temp)

NSG NSG CRPF SSB

ITBP BSF

25

Sl No	Parameters	Specifications/Features
24	**Installation**	(a) Installation of the Hubs and Terminals will be done and a training of atleast two weeks will be imparted on site at Hub location. (b) The Antenna base preparation and installation of Antenna will be done by vendor, *which will also includes required suitable cables and accessories. Shelter for outdoor* unit will also be made (if required).
25	**Earthing**	The chemical earthing will also be done at Hubs and Terminal site for both Antenna, main equipments and UPS separately. The earthing should be less then 0.5 ohm.
26	**Power Backup**	1 x 20 KVA UPS will be required for Hubs and 1 x 5 KVA UPS will be required for Terminals as power backup for minimum 120 mins.

Brig Anil Chaudhary
DIG (Comn), NSG

Col S Balakrishnan
CG, ESG, NSG

SI (Telecom) Jitendra Kumar
HQ CRPF

SFO (Tele) K K Roy
HQ SSB

AC R K Meel
HQ CISF

Insp (Telecom) E C Ajay Kumar
HQ ITBP

DC (IT) Amardeep Singh
HQ BSF

✓ **(Approved / ~~Not Approved~~)**

Shri R C Tayal, IPS
DG, NSG

(26)

TRIAL DIRECTIVEs OF VSAT SATELLITE HUBs AND TERMINALs

Ser No	Parameters	Specifications/Features	Trial directives
	Hubs / Terminals	Satellite stations for Hubs and Sites should be with preferably a single box based solution to include both modem and router (i.e. IDU). The same will be referred to as satellite modems. However, if not on a single box the system should not be comprises of more than two boxes. The satellite modems used for primary network and TSTs will support both star and mesh topology.	The BOO will physically check for a single box based solution to include both modem and router and the vendor/rep of firm will demonstrate the Star and Mesh topology compliance through Mgt Console.
1	**Network Topology**	Star	The Board will carry out physical check through Mgt Console.
2	**Frequency Band**	KU Band including Extended KU Band	The Board will carry out physical check through Mgt Console.
3	**Modem/Router**	Satellite Modem (1+1 mode) i.e. Single unit solution for both Modem and Router (IDU)	The Board will physically check for Satellite Modem (1+1 mode).
4	**Stacking**	Cascading of upto 4 units or more	The Board will physically check the feature Mgt Console
5	**Outbound Carrier (Receive)**	Signal Format : DVB-S2 or latest	The Board will physical check as well as do functional test of the mentioned parameter using Mgt console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
		Carrier Bit Rates : 2 Mbps upto 100 Mbps	
		Modulation : QPSK, 8PSK, 16APSK or better	
		FEC Coding : Turbo or better	
		FEC rates : As per industry standards	
		Receive IF freq : 950-1750 Mhz or better range	
6	**Inbound Carrier**	Access Scheme : MFTDMA or latest	The Board will physically check as well as do functional test of the mentioned parameter using Mgt console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
	(Transmit)	Carrier Bit Rates : 256 Kbps upto 8 Mbps or better range	
		Modulation : BPSK, QPSK, 8PSK or better	
		FEC Coding : Turbo or better	
		FEC Rates : As per industry standards	
		Transmit IF freq : 950 - 1750 Mhz or better range	
7	**Multiple access**	Downstream : MFTDMA and TDM/DVB-S2 or latest	The Board will carry out physical check through Mgt Console.
		Upstream : MFTDMA or latest	
8	**Access Scheme**	Bandwidth on demand, Real time, Non-real time, guaranteed throughput, QoS classes.	The Board will carry out physical check through Mgt Console.
9	**Traffic Features**	Traffic filtering, Bandwidth on demand, multiple satellite support, Multiple outbound, Auto pointing tool.	The Board will carry out physical check through Mgt Console.
10	**Bandwidth Efficiency**	TCP acceleration, HTTP acceleration, Efficient Packet fragmentation and aggregation	The Board will carry out physical check as well as do functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.

27

Ser No	Parameters	Specifications/Features	Trial directives
11	**IP Features**	Enhanced IP features for full flexibility : IPV4, IPV6, Static Routing, OSPF, BGP, Load Balancing, TCP, UDP, IGMP, Robust Header Compression, Multi VRF Support, VLAN, GRE, MPLS support, DiffServ, DHCP, NAT/ PAT, IGMP, RIP, IP prioritization.	The Board will carry out physical check as well as do functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
12	**Security**	DES or AES - 128 encryption or better	The Firm/Vendor will provide certifications and show security during demo.
		End to End encryption.	
		FTDMA scrambling of all traffic from site to the hub	
		Secure distribution of multicast keys from Hub to remote site via NMS.	
		The system should be able to support an external IP Encryptor.	
13	**Reliability and Availability**	HSRP with single or dual outdoor Units (ODUs), DDR (Dial on demand routing) for satellite backup of terrestrial WAN and terrestrial backup of satellite WAN	The Board will carry out physical check as well as do functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer.
14	**Network Management**	The NMS/ NCC should be provided in hot standby redundant configuration. The specifications for the NMS are enumerated below :-	The Board will physically check as well as do functional test of NMS via NMS mgt Console. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer. The vendor/firm will provide certificates for the features which can not be checked physical.
		(a) A single centralized NMS should support Configuration, Monitoring, Analysis, Provisioning, Reporting and Maintenance of STAR configuration within the network.	
		(b) The NMS must provide for centralized management of software upgrades and configuration changes.	
		(c) The NMS must have the ability to monitor and provide statistics for all portions of the network. One must have the ability to manage and monitor the network remotely. Hub NMS should be configurble as UNMS for its network.	
		(d) NMS must have the ability to gather and display RTT times from remotes.	
		(e) NMS must run on a standard operating system for inter-operability with UNMS if any in the network.	
		(f) All aspects of NMS must be GUI based for ease of management.	
		(g) Buyer should be able to customize the CDR (Call Data Report) as per his requirement.	
		(h) Authentication of NOC operators is a must, with the ability to define what functions an operator can perform. NMS must provide remote authentication.	
		(i) NMS must have the ability to manage multiple networks and hubs.	
		(k) NMS must have a distributed NMS architecture and be modular to provide scalability.	

NSG NSG CRPF SSB

ITBP BSF CISF

(28)

Ser No	Parameters	Specifications/Features	Trial directives
		(l) NMS must have the ability to connect to SNMP V2 agent or better version.	
		(m) NMS must have standard database and provide access for external applications to retrieve data for in-house use only.	
		(n) NMS must provide IP and satcom statistics, both real-time and historical.	
		(o) NMS must be able to provide statistics for all QoS parameters configured.	
		(p) NMS must provide support for multicast/ broadcast software and firmware upgrades.	
		(q) NMS should be site independent.	
		(r) Network Operations of a site should not be affected even if the NMS of that site is down. It should join the NMS network automatically as soon as fault is rectified.	
		(s) NMS must provide client, to allow remote network manager to monitor the network.	
		(t) The equipment should support on-line management for centralized configuration, performance monitoring, fault diagnostics and rectifications.	
		(v) NMS should be able to provide statistics and updates to the umbrella NMS if any.	
15	**Interfaces/Ports**	LAN Port : Two or more 10/100/1000 BASE- T Ethernet RJ-45 ports Independent and Individual configurable interfaces.	The Board will carryout physical check as well as functional test of the mentioned parameter using Mgt console as and when reqd. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer
		Serial RS232/Console Port: For management access via CLI or suitable similar interface	
		USB-A 2.0 port or suitable similar interface : Front and Rear ports for image updation configuration, WLAN etc.	
		Tx Modulator Port : Suitable connection port	
		Rx Demodulator Port : Suitable connection port	
16	**Power Supply/ Environmental Conditions**	Operating Temp : 5^0C to 40^0C (ambient Temp)	Vendor/firm will provide certificate for temp and humidity. The vendor/rep of firm will demonstrate the power supply feature to the Board of officer. The cerificate will also be submit for Power supply compliance.
		Relative Humidity : Upto 90%	
		Power Supply : Redundant 220V AC ± 15% , 47-53 Hz	
17	**Safety & EMI/EMC Compatibility**	Safety : IEC 60950, UL/EN 60950-I or any other equivalent/appropriate International Standards	The vendor/rep of firm will provide certificate to BOO.
		EMC/EMI : ETSI EN 301 489-I, ETSI EN 301 489-12, FCC Part 15 Class B or any other equivalent/appropriate International Standards	
		Radio Standards : EN 301 428 or any other equivalent/appropriate International Standards	
		WEEE/RoHS : FCC, CE and RoHS Compliant.	

NSG NSG CRPF SCB

ITBP BSF CISF

(29)

Ser No	Parameters	Specifications/Features	Trial directives
18	**Network Accelerator (1+1 mode)**	(a) The network accelerator should provide TCP acceleration, and application QoS for locations that use encryption. The network accelerator should compensate for the long latencies in satellite links that would otherwise limit the speed of each TCP session; allowing greater utilization of available bandwidth. The network accelerator should intercept the TCP traffic, prioritise and accelerate it, before it is encrypted. This should result in a significantly higher overall TCP throughput over a satellite network.	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer and submite the reqd certificate.
		(b) The specifications for the network Accelerator that would be used along with the Encryption devices at remote as well as at the hub site are as follows :-	
		(i) Should provide following features	
		(aa) Symmetric, Universal & Scalable TCP Acceleration.	
		(ab) Specific end to end QoS support	
		(ac) Web acceleration	
		(ad) Support for Multiple IP sessions.	
		(ii) Network Interfaces 10/100 Base T Ethernet at peripherals and 10/100/1000 Base T Ethernet at the Hub.	
		(iii) Terminal Interface - RS 232 serial interface	
		(iv) Temperature - 0^0 to 40^0 C (ambient Temp)	
		(v) Humidity - 5 - 95 %	
		(vi) Power Supply - 220V AC (±15%), 47-53 Hz	
		(vii) Management should be possible through a centralized dedicated GUI and should be field upgradable.	
19	**Adaptive Power Control (APC) with Adaptive Coding and Modulation (ACM)**	Taking into consideration the rain statistics of India, it is proposed to have dynamic adaptive up-link power control at both the Hub-NMS and at each remote site to ensure that with SSPA/RFT power and available EPFD, 99.7% uplink time is available in the network averaged over a month.	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer and submit the reqd certificate.
20	**Antenna Systems**	The antennae of Hubs (< 9 Mtrs) and Sites (3.8 Mtrs) will have full auto tracking and alignment along with beacon receivers. The electronics should include auto power control facility to cater for losses due to rain fade or any other reasons. For Hubs (< 9 Mtrs) antennas facility for providing lat long data for antenna alignment will be taken from a GPS and also an option for taking the same manually from map should be provided. Two sets of software in CDs for the both antennas system should be provided. The antenna should be capable of working with any KU band transponders of INSAT/GSAT series of satellites. The antennas will be painted in disruptive colour pattern.	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer and submit the reqd certificate.

NSG NSG CRPF SSB

ITBP ITBP CISF

(30)

Ser No	Parameters	Specifications/Features	Trial directives
21	Antenna Specifications	(a) <9m Antenna (Hubs)	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer using test Jigs/meters and submit the reqd certificate.
		(i) Antenna/Reflector Diameter : 8.0 - 9.0 M	
		(ii) Operating Frequency Band : Ku Band including Extended Ku Band	
		Tx : 13.75 - 14.50 GHZ	
		Rx : 10.70 - 12.75 GHZ	
		(iii) Gain (Mid Band)	
		Tx : 60.35 dBi (+/- 1 dB)	
		Rx : 59.42 dBi (+/- 1 dB)	
		(iv) Polarisation : Linear	
		(v) VSWR : ≤ 1.3:1 or better	
		(vi) System G/T at 30^0 Elevation and 90^0 K LNA temp - Minimum 37 dB/°K	
		(vii) Cross polarization : ≥ 35 dB (on Axis)	
		(viii) Tx-Rx Isolation : ≥ 85 dB (with TRF)	
		(ix) Radiation Pattern : CCIR.580 or latest version	
		(x) Feed Interface	
		Tx : WR-75	
		Rx : WR-75	
		(xi) Azimuth Adjustment : 90^0 continuous, 180^0 in two position	
		(xii) Elevation Adjustment : 12^0 to 90^0	
		(xiii) Material : Aluminium with stretch formed / precision press formed panel or better.	
		(xiv) Wind Load Operational : 70 kmph Survival : 200 kmph	
		(xv) Operating Temperature : -15°C to 50° C (for outdoor antenna subsystem)	
		(xvi) Rain : 100 mm/hr (for outdoor antenna subsystem)	
		(xvii) Relative Humidity : 100% (for outdoor antenna subsystem)	
		(xviii) Tracking Mode : Full Automatic	
		(xix) Tx power Capability : 1 KW or better	
	Antenna Specifications	(b) 3.8m Antenna (Terminals)	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer using test Jigs/meters and submit the reqd certificate.
		(i) Antenna size : 3.7 m - 4.2 m	
		(ii) Operating frequency : Ku band including Extended Ku band	
		Tx : 13.75-14.50 Ghz	
		Rx : 10.70-12.75 Ghz	
		(iii) Material : Aluminium with stretch formed/ precision press formed panel or better.	

NSG NSG CRPF SSB

ITBP BSF CISF

(31)

Ser No	Parameters	Specifications/Features	Trial directives
		(iv) Polarization : Linear Polarize	
		(v) Cross-polarization : ≥ 35 dB (Tx) ≥ 30 dB (Rx)	
		(vi) Tx-Rx isolation : ≥ 85 dB (with TRF)	
		(vii) Gain (Mid Band)	
		Tx : 53.0 dBi (+ o.5 dB)	
		Rx : 51.0 dBi (+ o.5 dB)	
		(viii) System G/T at 20° EL : minimum and 90° K LNA temp 29.7 dB/°K	
		(ix) VSWR : <1.5:1 or better	
		(x) Feed type : Two port Tx-Rx Freq feed, having Orthogonal linear Polarization, with provision for manual rotation of feed for matching of linear polarization.	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer using test Jigs/meters and submit the reqd certificate.
		(xi) Tracking mode : Full Automatic	
		(xii) Mount movement : 0° to 360° (Azimuth) 12° to 90° (Elevation)	
		(xiii) Wind velocity : Operational-70 kmph Survival -200 kmph	
		(xiv) Power Handling : 100 Watt or higher	
22	**Ku Band BUC with Booster and PLL LNB (1+1) mode**	Should be a highly integrated 200W/40W/10W ODU that comprises of BUC, booster in transmit mode and PLL LNB in receive mode, power supply and built-in M&C. BUCs should be in hot standby (1+1) configuration. The specifications are as follows.	The Board will carry out physical check as well as functional test of the mentioned parameter using metrers. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer
		(a) Transmit	
		(i) Transmit Frequency : 13.75 – 14.5 Ghz	
		(ii) IF Frequency : 950 – 1750 Mhz or better range	
		(iii) Frequency Step size : 1 Mhz	
		(iv) Input Power Range : -25 dBm to -5 dBm	
		(v) Gain Stability (temp) : ± 2 dB max	
		(vi) Gain Adjustment : 20 dB @ 1 dB steps	
		(vii) Inter Modulation Product : -25 dBc max	
		(viii) Spurious : -55 dBc max	
		(ix) VSWR : ≤1.3:1 or better	
		(x) Frequency stability (temp) $1x10^{-8}$	
		(xi) M and C Interface : RS 232/RS 485	
		(b) Environmental	
		(i) Operating Temperature : - 30° C to 55° C	
		(ii) Storage : - 40°C to 60°C	
		(iii) Relative Humidity : upto 95 % at 45°C	
		(c) Ku Band Booster (1+1 mode)	
		(i) Gain flatness : ± 1.0 dB max	
		(ii) VSWR : ≤1.3:1 or better	

NSG NSG CRPF SSB

ITBP BSF

(32)

Ser No	Parameters	Specifications/Features	Trial directives
		(iii) Inter-modulation Product : - 25 dBc max	
		(iv) Spurious : - 65 dBc max	
		(v) Mgt & Control Interface RS485/RS232	
		(vi) RF Output : WR75G	
		(vii) Output @ P1dB : 53 dBm for 200W 46 dBm for 40 W 40 dBm for 10W	
		(d) Power Supply	
		(i) AC Input voltage : 220V AC (± 15%), 47-53 Hz	
		(e) Phase Locked Low Noise Block (PLL LNB in 1+1 Mode)	
		(i) Input frequency : Ku Band including Extended Ku Band	
		(ii) L-Band output frequency : 950 – 1750 Mhz or better range	
		(iii) Noise temperature at 25 deg C : 75^0 K max or better	
		(iv) Gain : 60 dB typical	
		(v) Output Impedance : 50 ohms	
		(vi) Gain flatness : ± 1.0 dB max	
23	**Static Antenna Control System**	The antenna tracking mechanism consisting of screw jack with AC motors, shall include the following:- (a) Antenna Control Unit (b) Motor control unit. (c) Angle detectors. (d) Beacon Receiver for auto tracking	The Board will carry out physical check as well as functional test of the mentioned parameter using metrers. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer
		(a) Antenna Control Unit	
		(i) Operational modes : Manual Step Track Program Track Standby, also system should revert automatically to standby in case of any of the fault condition	
		(ii) Alarm indications and status monitoring (Visual & resettable - audible)	
		o Limit switch alarm	
		o Synchro conversion/Angle detection alarm	
		o System interlock	
		o Low signal alarm	
		o Beacon level low	
		o PLL out of lock	
		(iii) Signal level monitor : To monitor beacon signal level in dB relative to peak	
		(iv) Angle indication : AZ-Elmont	
		AZ : 0^0 - 360^0, EL : 12^0-90^0	
		Resolution : 0.01 ^{0},	
		Accuracy : 0.02^0	

NSG NSG CRPF SSB

TTBP IISF CISA

33

Ser No	Parameters	Specifications/Features	Trial directives
		(v) Parameter check and updating data entry : Satellite standard scans cycle.	
		(vi) Step Track Performance	
		§ Tracking accuracy : Better than 1/10th of half power beam width , for wind speed up to 70 km/hour	
		§ Auto track select Interval: 10 minutes, 30 minutes, 60 minutes, 120 minutes - Signal level select settable 0.5 dB (nominal)	
		§ Auto track signal level: Settable	
		(vii) Capability to drive the system from remote terminal through RS-232C interface	
		(viii) Default mode to bypass the processor and enable manual control	
		(b) Motor Controller	
		(i) Mode selection : Local/Remote (ACU)	
		(ii) Built in D.C. power supply unit	
		(iii) Emergency Stop available	
		(iv) Low Speed / High speed selection	
		(v) Toggle switches provided for locking in local mode in all 4- directions	
		(vi) All weather proof, wall mounted unit.	
		(vii) Protection against single phase failure and power supply cut off	
		(c) Angle detectors	
		(i) Detector type : Synchro/ Resolver/ optical encoder	
		(ii) Resolution : 0.01 deg	
		(iii) Accuracy : 0.03 deg	
		(d) Beacon Tracking Receiver	The Board will carry out physical check as well as functional test of the mentioned parameter using metrers. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer
		(i) Input Frequency : 950 to 1750 MHz or better range	
		(ii) Input signal level : -55 to -100 dBm,	
		(iii) Gradient : 0.5 Volt/dB Nominal for 3 db range	
		(iv) Output level : 0 -10V	
		(v) Power Supply : 220V AC (±15%), 47-53 Hz	
		(vi) Operating Temperature : 0 to 40° C (Ambient temp)	
24	**Installation**	(a) Installation of the Hubs and Terminals will be done and a training of atleast two weeks will be imparted on site at Hub location.	The Board will ensure that best quality of material will be used. vendor should provide certificate for the same.
		(b) The Antenna base preparation and installation of Antenna will be done by vendor, which will also includes required suitable cables and accessories. Shelter for outdoor unit will also be made (if required).	

NSG ASG CRPF SJD

ITBP BSF CISF

(34)

Ser No	Parameters	Specifications/Features	Trial directives
25	**Earthing**	The chemical earthing will also be done at Hubs and Terminal site for both Antenna, main equipments and UPS separately. The earthing should be less then 0.5 ohm.	The Board will ensure that best quality of material will be used. Vendor/firm should provide certificate for the same.
26	**Power Backup**	1 x 20 KVA UPS will be required for Hubs and 1 x 5 KVA UPS will be required for Terminals as power backup for minimum 120 mins.	The Board will carry out physical check as well as functional test of the mentioned parameter. In case of any discrepancies/ problem, the vendor/rep of firm will demonstrate the features to the Board of officer. Also provide certificate for parameter which can not be checked phisically.

Brig Anil Chaudhary
DIG (Comn), NSG

Col S Balakrishnan
CG, ESG, NSG

SI (Telecom) Jitendra Kumar
HQ CRPF

SFO (Tele) K K Roy
HQ SSB

AC R K Meena
HQ CISF

Insp (Telecom) E C Ajay Kumar
HQ ITBP

DC (IT) Amardeep Singh
HQ BSF

(Approved / ~~Not Approved~~)

Shri R C Tayal, IPS
DG, NSG