Compliance for Overall Major Mandatory Specifications

(The system to be built on the Guiding specifications provided in Annexure-I)

17.1 Antenna System Specifications

S.No.	Item description	Specification	Compliance(Yes/No)
		Mechanical System Specifications	
1	Antenna Type	Transmit & Receive Antenna system having Cassegrain geometry with shaped reflector.	
2	Antenna Size	7.2m to 7.6m Diameter **Note:** Bidder to specify the proposed antenna diameter in its technical bid.	
3	Antenna Mount	Elevation Over Azimuth.	
4	Panel surface accuracy Main dish: Sub reflector	 Better than 1 mm (RSS) Typical Better than 0.5 mm (RSS) Typical In-order to meet G/T, figures are indicative	
5	Pointing Accuracy (75 Kmph wind speeds)	Better than $1/5^{th}$ of Half Power Beam width	
		RF specifications	
6	Feed type	4 Port Frequency reuse CP feed having 02 orthogonal Transmit & 02 orthogonal Receive ports	
7	Operating Freq. Transmit Receive	 5850-6450MHz, 3625-4200MHz,	
8	Gain at Feed Receive Transmit	 47.5 dBi +20 log (f (GHz)/4) or better 51.0 dBi +20 log (f (GHz)/6) or better	

		With antenna efficiency 60% min.	
9	G/T at 5 deg. Elevation	25.5dB/K (or better) at 4GHz with 1:2 LNA Systems and BPF	
10	VSWR at feed flange	1.35:1 (or better) in both receive and transmit ports of both bands	
11	Axial Ratio within 1- dB beam width	0.5 dB in Receive and Transmit Bands	
12	Feed Insertion Loss	To be provided by bidder. (Shall meet EIRP and G/T specifications)	
13	Tx. To Rx. Port Isolation	85 dB min.	
14	Rx. /Rx. & Tx. /Tx Port Isolation	17 dB min.	
15	Radiation Pattern	Shall conform to ITU– R S 580-6	
16	Interface Transmit Receive	WR 137 WR 229 (Standard 1:2 LNA system interface)	
17	Power Handling Capability	Better than 1 KW CW per port in Transmit Continuous operation.	
Drive System Specifications			
18	Drive	Suitable VFD Compatible Induction motor should be provided for AZ(with brake) and EL. Both motor shall be of IP65 Standard.	
19	Max. drive speed	0.4 deg/sec in AZ axis and 0.2deg/Sec in EL axis at rated motor speed	
20	Antenna Coverage Elevation Azimuth	 0 to 90 Deg. 360 Deg. Continuous The azimuth coverage shall be 360 deg continuous as design ,but at site will be limiting the movement by considering the limit switch and cable wrap.	
21	Az Drive configuration	Gear & Pinion drives with mechanical anti-backlash system with provision for anti-backlash adjustment.	

	EL Drive configuration	Screw Jack (Auxiliary support to be provided for maintenance of online screw jack, which can be either fixed or variable length)	
Environmental Specifications			
22	Wind speed	75 Kmph Operational, 100 Kmph Gusting, 150 Kmph Survival	
23	Operational temperature	0° to 50° C	
24	Relative Humidity	0 to 100 % with condensation	
25	Corrosion	Appropriate protection against salinity and other corrosive contaminants to be provided.	
26	Rain	100 mm / hour continuous	
27	Shock and Vibration	Shall withstand shocks and vibrations encountered during transportation and operations.	
28	Total life and support	The antenna and its equipment shall be supported for trouble free operational life of 10 years minimum	
29	Safety Features for mechanical system	Hand cranking facility Flexible Couplings These features are indicative, others working safety features to be included	
30	All the exposed surface of the antenna structure to be galvanized.		
Antenna and Feed System Safety			
31	Auxiliary drive	Hand cranking facility for both the Az. and El axis.	
32	Emergency Stop Switches	Shall be deployed at all the critical antenna locations to inhibit the drive in the event of emergency. Viz., at Az. Cone, at El platform	
33	Limit switches	Two levels of limit switches in Az , El to be provided	
34	Lightening arrestor	Lightning arrester assembly conforming to the latest safety standards shall be provided and earth resistance should be less than 5 ohms or as per latest safety	

		standard. Suitable no of earth pits shall be provided to meet the requirement. Minimum two numbers of lightning down-conductors (Insulated Copper Cable of min 35 sq. mm) to be provided and connected to the earth pit. These cable to be supported on insulated supporters. Suitable test link to be provided. Slip ring arrangement for bypassing azimuth bearings and suitable cable loop for elevation bearing bypass shall be provided. Antenna body to be earthed minimum at two places with minimum two earthing.	
35	Operator safety	Approach ladder with built-in safety measures to provide access to the El. Platform & Reflector surface. Safety railings around the elevation platform.	
36	Ground clearance	At an elevation of 0 deg. The antenna reflector shall have a sufficient safe clearance from the ground level.	
37	The antenna mount structure shall be maintenance-friendly & all parts are easily assessable for maintenance purpose		
38	Provision of Hatch door to access the main reflector & accessing the sub-reflector is desirable.		
39	The Antenna Hub shall have sufficient clear internal space to accommodate equipment like 02 nos. of LTWTA , LNA Complex, TLT, in-line couplers (In Tx & Rx) and uplink switching with High power Termination. In case, if required provision should be there for mounting LTWTA outside the hub with suitable rain protection system. Preferable size of Hub-diameter: 1850mm and height: 1200mm. Exhaust fans & fresh air inlet louvers/perforations to be provided in the hub for proper air circulation. Hinged & lock type hub cover to be provided.		
40	**Pedestal Assembly:** The pedestal assembly shall be made of steel & suitably designed considering antenna load factors. Provision shall be made for mounting azimuth encoder, rotary joints, cable routing. The internal space shall be sufficient to accommodate personnel entry. Suitable personnel entry door, standardized cable entry& exit ducts and power distribution system shall be provided.		

41	**Platform**: Suitable working Platform shall be provided to enable ease of access to the RF equipment located inside and outside the reflector hub and to the azimuth and elevation drive. The platform shall have access ladder and safety hand rails. The platform shall be rigid enough to sustain point load of 120 Kg.	
42	**17.2 Special Instructions on Antenna system**	
	i. The antenna foundation and load analysis breakup to be provided along with the quote. ii. Appropriate hand drive scheme with built in safety interlock mechanism for both axes to be provided. iii. It is desirable to mount Angle encoder (Angle pick-up) on-axis. iv. All parts exposed to the environment shall be coated with anti-corrosive, protective coating. v. Feed bearing shall be protected against entry of water. vi. G/T and EIRP at specified frequencies to computed and submitted. **vii.** Panel surface accuracy computation shall be inclusive of manufacturing deviation, site alignment error, gravity and thermal errors.	

18.2 Specifications of Antenna & RF systems

S.No.	Parameter	Specification	Compliance(Yes/No)
		Transmit Chain	
1.	No. of uplink chains	Two (RHCP &LHCP)	
2.	Uplink EIRP at 6GHz with 750W LTWTA	≥76 dBW ***Note:*** ***1. Bidder shall provide detailed break-up of the uplink EIRP meeting the specification and margins if any, including LTWTA power, losses etc.*** ***2. The complete detailed specifications of the proposed LTWTA, make, model number, OEM data sheet etc. shall be provided by the Bidder in the technical bid.*** ***3. Provision for external reference to all frequency converter unit shall also be provided.***	
3.	EIRP Adjustability @ LTWTA	25 dB	
4.	Frequency Offset	±250 Hz or better	
5.	Frequency Stability	± $1X10^{-7}$ or better over 24 hrs. at operating temperature	
6.	Level stability	±1dB or better over 24 hrs. at operating temp	

7.	Spurious (Carrier related)	-55 dBc or better	
8.	Return Loss	>14 dB	
9.	Third order intermodulation distortion	- 25 dBc max. with two equal carriers1 MHz apart at 5 dB total output back off	
10.	L-Band Upconverter	Input Freq. 70 MHz (BW +/- 18 MHz) Output Freq. 950-2200 MHz or compatible with input frequency band of LTWTA Step Size: 1KHz Gain: 24 dB min. Gain Adjust: 0–25 dB in 0.10 dB steps	
11.	Linearised TWTA with BUC	Input Freq.: 950–2200 MHz or Compatible with output frequency band of L Band Upconverter (multiple LO may be part of solution). However, the total solution should meet the required transmit frequency band. (5.850-6.45 GHz) Output Freq.: 5.850-6.45 GHz or better Output Power: LTWT - 750 Watt min Gain: 70 dB min. at rated power output Provision for external freq. reference to LTWTA should exist along with internal freq. reference	
Receive Chain			
12.	No. of receive chains	Two, (LHCP & RHCP)	

13.	G/T at 5 deg. EL at 4 GHz	25.5 dB/K or better with 1:2 LNA Systems and BPF **Note:** • **Bidder to provide detailed G/T break-up meeting the specification and margins if any, including antenna noise temp, LNA noise temp, losses etc.** • **The complete detailed specifications of the proposed LNA, make, model number, OEM data sheet etc. shall be provided by the Bidder in the technical bid.**	
14.	Frequency Offset	±250 Hz or better	
15.	Frequency Stability	± $1X10^{-7}$ or better over 24 hrs. at operating temp	
16.	Level Stability	±1dB or better over 24 hrs. at operating temp	
17.	Spurious (Carrier Related)	-55 dBc or better	
18.	1:2 redundant LNA System	Frequency: 3.625 to 4.2GHz Noise temperature: 50 K max. (Including LNA & Switching) Gain: 60 dB min Gain flatness over the band: ± 1 dB Power O/P (1dB compression): +10dBm or better. BPF shall be installed at LNA input (BPF Specification as mentioned in Annex I of RFP)	

19.	C-Band Down converter	Input Freq. 3.625 to 4.2 GHz or better Output Freq. 70 MHz (BW +/- 18 MHz) Gain: 40 dB min. Gain Flatness (± 18 MHz): ±0.5 dB Frequency adjustability:1KHz	
Baseband Systems and Instrumentation			
20.	Integrated Baseband System	1.Number of IF Receivers: 3 Numbers. 2. One Rx Attached with Ranging Unit. 3. Two Rx's – each attached with 2 Demodulator chains 4. Number of Sub Carrier Demodulators: 4 No 5.All Demodulators equipped with CCSDS Viterbi/RS Decoding 6.Number of Modulators: 2 Nos. 7.Number of Command Units: 1 No. 8.Number of Ranging Units: 1 No. 9.Number of Telemetry Simulator: 1 No. 10.Full-fledged Monitoring and Control software (Graphical User Interface) should be provided. 11.Should accept IRIG-B Time code for time stamping, Telemetry and Ranging data 12.Should accept external Reference source 10 MHz frequency. 13.Unit should act as telemetry server with minimum 24 clients or More.	

		TCP/IP Interface: all data (Telemetry, Ranging, Commanding, Monitoring and control, Receiver input level) should be available through Ethernet port 10/100 Mbps. (TCP/IP protocol) which is compatible with MCF Mission software	
21.	Test Loop Translator	Input Freq. 5.85-6.45GHz Output Freq. 3.625-4.2 GHz 2225±15MHz tuneable LO Capable of taking additional external LO input	
22.	Spectrum Analyser	Input Frequency: 100KHz to 26.5 GHz or better with resolution of 1 Hz or better & having LAN interface for remote monitoring and control	
23.	Frequency Distribution Unit	Input: 2 nos. (1:1 redundant), 1 to 10 MHz, BNC connector, Outputs: 10 nos., BNC connector I/P & O/P Impedance: 50 ohms	
24.	Time Distribution Unit	Input: 2 nos. (1:1 redundant) Input and Output Connector type: BNC-Female with port impedance of 50 Ohm No of Output Port: 10 nos.,	
25.	Pressurization	The feed & waveguides will be pressurized up to 0.5 psi operation with suitable safety valve. A suitable Outdoor dehydrator with LAN interface shall be provided by the supplier.	
26.	Block schematic	**Bidder shall provide the detailed block schematic & signal flow chart of the full system depicting each and every sub-system**	

		being proposed including interfaces. Level diagram shall also be provided	
27.	Floor Standing Rack usable height	**42 U (1U=44.4 mm)**	
28.	All frequency converter unit shall have internal reference as well as provision to accept external 10 MHz reference with auto sensing facility. All such unit shall be connected with external reference from frequency distribution unit.		
29.	The party needs to provide compliance that all the delivered hardware / software / firmware are free from all kind of Malware		