



भारतीय प्रौद्योगिकी संस्थान इंदौर  
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IIT Indore

Ref. No.: IITI(MM)/DAASE(PRJ)/1/1A/115/AD/2022-23/3

Aug 22, 2022

**PREBID REPORT**

The online meeting for Pre-bid discussion and presentation was held at IIT Indore on Aug 01, 2022 @ 12.00 P.M. for Procurement of VHF and UHF Ground Station and Items through GeM BoQ Bidding, Bid No. GEM/2022/B/2360501.

The report of the meeting is as below:

Sl. No.	Query raised by firms	Reference Document	Query/Clarification/ Deviation Sought	Response from IITI
01	M/s Dhruva Space, Hyderabad	GeM tender Terms & Conditions	What will be the payment terms ?	Payment will be released through RTGS within 30 days. 80% payment against delivery and acceptance of the items and balance 20% after successful installation, testing, commissioning and submission of PBG.

Note :-

1. The date of submission of online bids is extended upto 12/09/2022 @ 15:00 Hrs.
2. The date of Opening of bids is extended upto 12/09/2022 @ 15:30 Hrs.
3. The added technical specification is attached as per Annexure-I (enclosed). *(Additional)*
4. All prospective/willing bidders are requested to take note of this report as part of the Tender document. All other parts of the tender including the terms and conditions of the tender will remain unchanged.

Assistant Registrar  
MM Section  
IIT INDORE

सहायक कुलसचिव  
(सामग्री प्रबंधन विभाग)  
Assistant Registrar  
(Materials Management Section)



(A)

Annexure - I

## VHF/UHF Ground Station, Small Sat Engineering Model & Helmholtz Cage Technical Specifications

### 1. VHF/UHF Ground Station

#### Antenna - Crossed Yagi-Uda

Parameter	Specification		(Yes/No)
	VHF (2 m)	UHF (70 cm)	
Frequency Range	144 - 146 MHz	432 - 438 MHz	
Gain	12.6 dBi	16.3 dBi	
Feed Impedance	50 Ohms	50 Ohms	
SWR	1 : 1.5	1 : 1.5	
Polarization	RHCP	RHCP	
Beamwidth	52°	28°	

#### Rotator

Parameter	Specification	(Yes/No)
Power Supply Voltage	120 V AC	
Rotor Voltage	24 V AC	
Rotation Time	Elevation (180°): 67 sec	
	Azimuth (360°): 58 sec	
Rotation Range	Elevation: 180°	
	Azimuth: 360°	
Pointing accuracy	±4 percent	

#### Radio - Software Defined Radio

Parameter	Specification	(Yes/No)
Frequency Range	10 - 6000 MHz	
Output Power	10 W	

**Master Control Unit (CPU) with builtin Software to Operate Ground Station and two 17 inch Monitors.**

(B)

## Salient Features

- Operational Height of the Mast : 10 Ft (Mast will host the antennas at that height. Mast is capable of holding upto 200 Kg)
- Software to Control the Rotator.
- One click track for Amateur Satellites.
- Master Control System with GNU Radio setup compatible with the Small Sat EM.
- Orbit propagation Feature based on TLE for effective tracking.
- Complete RF Chain(LNAs etc.) built into the station to be capable of receiving data from Amateur Satellites.

## 2. Smallsat EM Bus Specifications

Category	Specification	(Yes/No)
General	LEO Optimised	
	Pre-integrated and pre-qualified	
	Redundancies on multiple levels	
Telemetry & telecommand (TT&C)	<b>UHF Band Transceiver</b>	
	Frequency Range	430 - 440 MHz
	Data Rate	Tx = 9600 bps
		Rx = 1200 bps
	Modulation	2FSK
	Output Power	Up to 30 dBm
	LNA Gain	Up to 15 dBm
	<b>UHF Beacon</b>	
	Dedicated power input and microcontroller	
	Output Power	Up to 30 dBm
Modulation	ASK-Morse Code	
Antennas	Independent Antenna for TT&C and Beacon Omnidirectional capability	
	Frequency Range	435 - 438 MHz
Electrical Power System (EPS)	Space Grade Li-ion Battery pack including 2 cells	
	Includes monitoring sensors for current and temperature	
	Bus Voltage	Regulated to 5V and 3.3V
	Battery Capacity	Upto 25.4 Wh

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Solar Panels	Space Grade Triple Junction GaInP/GaInAs cells		
	Up to 30% efficiency		
	1 Body Mounted panels		
	Integrated modules	Temperature Sensor	
Magnetorquer			
On Board Computer (OBC)	STM32F407 Microcontroller (up to 168 MHz)		
	FreeRTOS , Preemptive scheduling		
	Flash/ROM	1MB	
	RAM	196 kB	
	Data interfaces	SPI, I2C, UART	
	PWM Channels	Up to 6	
Attitude Determination & Control System (ADCS)	Active stabilisation and Detumbling capabilities		
	<b>Attitude Sensors</b>		
	High Precision Inertial Measurement Unit (IMU)		
	Magnetometer (Resolution = $\pm 4900 \mu\text{T}$ )		
	Photodiodes on all 6 sides		
	<b>Control Actuators</b>		
	Integrated magnetorquer coils		
	Slew Rate	< 5 degrees/second	
Structure (Excluding Antennas)	Conforms to CubeSat Design Specifications		
	Volume	0.5U	
	Mass	720 g $\pm$ 10 g	
	Dimensions	110 x 108 x 65.5 mm	
Data Handling	CCSDS Compliant		
	Reed Solomon, BCH, Convolutional encodings		
	AES encryption		
Mission	Fully automated Mission Operations		
	On-board orbit propagator		
	Mission operational modes	Nominal	
		Power Saving	
		Safe mode	
	Mission Management modes	Detumbling	
Sun pointing			
End of Life			



### Salient Features

- Novel Locator Pin Clamping Mechanism for separation system integration.
- Battery thermocouple assembly using Thermally Conductive Space grade epoxy.
- Completely independent Beacon System with dedicated antenna.
- Integrated Flight Software featuring Mission Planner / Scheduling, Payload operations, ADCS Operations
- $4\pi^c$  sun sensor using on-board photodiode
- Capable of detumbling in <2000 seconds from a 20 deg/s tumble
- LEO optimised GPS module integrated on OBC, including Onboard Orbit Propagator to conserve GPS power consumption
- Software Stack of configurable modules with CCSDS, Reed Solomon encoding, BCH encoding.

### 3. Helmholtz Cage

Parameter	Specification	(Yes/No)
TOTAL NUMBER OF COILS	6	
MAX FIELD GENERATION CAPACITY	160 $\mu$ T	
MAXIMUM CURRENT PER AXIS	5 A	
NOMINAL VOLTAGE PER AXIS	22 V	
CONTROL VOLUME	300 x 300 x 300 mm	
DEVIATION OF MAGNETIC FIELD	< 1%	
DEVIATION OF FIELD VECTOR	$\pm 0.1^\circ$	
POWER SUPPLY RATING	30 V DC, 5 A per axis	

### Salient Features

- Rotation Stage upto 500 RPM integrated with the Helmholtz Cage.
- Integrated ADCS test Software to test Detumbling/Control System performance of the above smallsat EM.