REQUEST FOR PROPOSAL (RFP)

for

Vacuum compatible 183GHz Receiver Front-end Module with Integrated RF LNA MMIC, Sub-Harmonic Mixer and IF Amplifier MMIC

January 2024

SPACE APPLICATIONS CENTRE
INDIAN SPACE RESEARCH ORGANISATION
GOVERNMENT OF INDIA
AHMEDABAD - 380 015
INDIA

INTRODUCTION

Space Applications Centre (SAC), a unit of **Indian Space Research Organization** (ISRO) is developing microwave remote sensing instruments for vertical profiling of atmosphere. For humidity profiling of atmosphere, 183GHz receiver development is envisaged. The integrated 183GHz receiver front-end module is to be realized using RF low noise amplifier (LNA) MMIC, Schottky diode based sub-harmonic mixer and IF Amplifier MMIC. This RFP is for procurement of vacuum compatible packaged 183GHz Receiver Front-end Module with integrated RF LNA MMIC, Sub-Harmonic Mixer and IF Amplifier MMIC.

This document consists of different sections as listed below.

Section-I: Scope of Work

Section-II: Technical specifications

Section-III: Deliverables & Acceptance Criteria

Section-IV: Guidelines to the Vendor

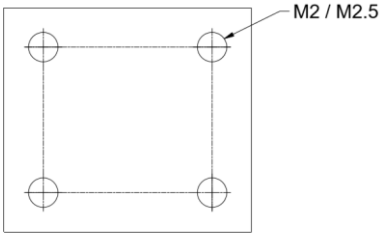
Section I: Scope of Work

SAC proposes to procure vacuum compatible packaged 183GHz Receiver Front-end Module with Integrated RF LNA MMIC, Sub-Harmonic Mixer and IF Amplifier MMIC, as per the technical specifications listed in Section-II, and acceptance criteria & deliverables listed in Section III.

Section – II: Technical Specifications

S. No.	Parameter	Specification	Vendor Offered Specifications and Remarks
Front-End Module Configuration		RF LNA MMIC + Sub-harmonic Mixer + IF Amplifier MMIC	
Electrical Specifications			
1	RF Frequency	183.31 ± 16.5GHz	
2	LO Frequency	91.655GHz	
3	IF Frequency	0.3 to 16.5 GHz	
4	LO Drive Power	5dBm (Nominal)	
5	Noise Figure (Double Side-Band) *Measurement to be done at -20°C, +25°C and +60°C*	7dB (max) over entire IF frequency range at +25°C /room temperature	

S. No.	Parameter	Specification	Vendor Offered Specifications and Remarks
6	Conversion Gain *Measurement to be done at -20°C, +25°C and +60°C*	25dB (min) over entire IF frequency range at +25°C /room temperature	
7	IF Return Loss	≥ 10dB over entire IF frequency range at +25°C /room temperature	
8	DC Input (Single positive supply)	Voltage range: 2V to 8V	
Operating Environmental Conditions			
9	Temperature Range	-20°C to +60°C	
10	Pressure range	Ambient to 10^{-6} torr or better	
Interfaces			
11	RF Input Waveguide	WR5.1, UG 387/U-M	
12	LO Input Waveguide	WR10, UG 387/U-M	
13	IF Connector	SMA-F or 2.9mm(K-type)-F	
14	DC Interface	Solderable Pins for Live and Ground	
Mechanical Specifications			
15	Material	Aluminum metal alloy with gold plating as per MIL standard MIL-G-45204 or equivalent	
16	Size and Weight	35 mm x 35mm x 50mm (max.) 200 grams (max.)	
17	Mounting Interface	Front-end module shall have mounting provision using screws (preferred four as shown, min. two) on possible faces of module not having RF, LO, IF and DC interconnects. Module mounting screws should not interfere with RF, LO, IF and DC interconnects. This mounting configuration is desired; however, bidder can propose their mounting configuration.	

			
18	**Warranty**	One Year	

Section – III: Deliverables & Acceptance Criteria

This section covers deliverables and acceptance criteria of deliverables. Deliverable would be vacuum compatible packaged 183GHz Receiver Front-end Module with Integrated RF LNA MMIC, Sub-Harmonic Mixer and IF Amplifier MMIC, as per specifications defined in Section-II, along with testing and characterization results of all the individual receiver front-end module at specified temperature ranges at ambient pressure.

Table 1: Schedule for hardware and report deliverables

Hardware			
Item	Quantity (Nos.)	Timeline	Vendor Remarks
Packaged 183GHz Receiver Front-end Module with Integrated RF LNA MMIC, Sub-Harmonic Mixer and IF Amplifier MMIC	Slabs: 4-6; 7-9; 10 and above	30 weeks total	
Reports/Documents			
Measurement data (in format as specified in Table 2)	For all deliverable modules	28 weeks total	
Mechanical drawing (.step and .pdf format) specifying the outlier interfaces and dimensions	One	20 weeks total	

The acceptance will be based on compliance to technical specifications specified in Section-II. The vendor shall carry out electrical measurements at -20 ^{o}C, +25 ^{o}C and +60 ^{o}C and provide measurement results over temperature. Before shipment of the 183GHz Receiver Front-end Module, measurement data of all individual modules as specified in Table-2 should be shared with SAC. After obtaining clearance from SAC, shipment can be done.

Table 2: Measurement Data & Formats

Sl. No.	**Parameter**	**Data Formats**	**Vendor Remarks**
1	Conversion Gain at +25^{o}C, -20^{o}C and +60^{o}C	Plots and Raw data	
2	Noise Figure at +25°C, -20 ^{o}C and +60 ^{o}C	Plots and Raw data	
3	IF Return loss at +25°C /room temperature	Plots and Raw data	
4	DC Operating Point	DC Voltage and Current	
5	Absolute Maximum Ratings	Tabular format	

Section – IV: Guidelines to the Vendor

1. The vendor is requested to examine the RFP thoroughly and offer compliance/non-compliance point by point. In case of non-compliance, the deviation from the specified parameter shall be furnished and for complied parameters the specifications (better or same) shall be provided.
2. Response from vendors, having prior experience of fabrication and testing of similar mm-wave waveguide front-end modules having integrated RF LNA, Mixer and IF Amplifier MMIC will only be considered for evaluation. Vendors to share with SAC relevant document supporting prior experience of fabrication and testing of similar modules, failing which, the offer is liable for rejection.
3. Vendor to provide the details of fabrication and test facilities available with the vendor to carry out the said activity.
4. Vendor should clearly indicate ordering information (order to be placed in favor of, component's part no. & other relevant information).
5. Vendor should provide valid authorization certificate from the manufacturer, if the vendor is not the manufacturer.
6. Vendor should provide certificate of conformance along with the deliverables.
7. All the components shall be packaged in ESD safe packs to ensure they are isolated from mechanical, electrical and environmental damage.
8. Further, the individual packages and the intermediate packages shall be fixed within the shipping package, which shall be resistant to mechanical shocks, humidity and dust.
9. In addition to other mandatory shipping marking, the following additional marking shall appear on the shipping package in bold letters.

FRAGILE
HANDLE WITH CARE
TO BE OPENED UNDER CLEAN ROOM ENVIRONMENT WITH ESD PROTECTION ONLY
STORE IN A COOL AND DRY PLACE