IISc/CSD/2023/EPR

Tender Notification for the Procurement of CW Electron Paramagnetic Resonance Spectrometer (both X band and Q band) with Liquid Nitrogen Cryostat and Accessories

(Last Date for Submission: Tuesday, May 30th, 2023)

Best quotations are invited for the procurement of **CW Electron Paramagnetic Resonance Spectrometer (both X band and Q band) with Liquid Nitrogen Cryostat and Accessories** with the following technical specifications on FOR-IISc Bangalore basis from experienced OEM (Original Equipment Manufacturer) domestic vendors in INR only. Your quotation should clearly mention the validity of quote, terms of delivery, delivery schedule, estimated delivery date, and payment terms. The tender should be submitted in two separate sealed and distinctly marked envelopes: one containing the technical bid and the other containing the commercial bid, both of which should reach us duly signed on or before 17:00 hours, May 30th 2023.

The bids should be addressed to:

Prof. G. Mugesh
Dean, Chemical Sciences Division
Indian Institute of Science (IISc)
Bengaluru, India - 560012.
Ph: +91 80 2360-2566/2293-3354
email: mugesh@iisc.ac.in

The sealed bids should be sent to the following address:

Dr. Abhishake Mondal
Solid State and Structural Chemistry Unit
Room F-213, F-Block, Second Floor
Chemical Sciences Building
Indian Institute of Science (IISc)
Bengaluru, India - 560012.
Ph: +91-9932207177
email: mondal@iisc.ac.in

Please enclose a compliance statement along with the technical bid.

Section 1: Bid Schedule

1.	Tender No	
2.	Tender date	May 9th, 2023
3.	Instrument	CW Electron Paramagnetic Resonance Spectrometer (both X band and Q band) with Liquid Nitrogen Cryostat and Accessories
4.	Tender type	Domestic Tender
5.	Documents to be submitted	i) Technical bid (part A) ii) Commercial bid (part B)
6.	Place of tender submission	**Dr. Abhishake Mondal**, Solid State and Structural ChemistryUnit Room F-213, F-Block, Second Floor Chemical Sciences Building Indian Institute of Science (IISc) Bengaluru, India – 560012
7.	Last date and time of tender submission	May 30th, 2023, Tuesday, 17:00 hours
8.	For Further clarification	**Dr. Abhishake Mondal** Solid State and Structural ChemistryUnit Chemical Sciences Building Indian Institute of Science (IISc) Bengaluru, India - 560012. Ph: +91-9932207177 Email: *mondal@iisc.ac.in*

Section 2 - Eligibility Criteria:

Prequalification criteria:

1. The quote should come only from an Indian Original Equipment Manufacturer (OEM). The bidder must be either OEM or authorized dealers or resellers of the original manufacturer of the proposed equipment in India.
2. The quotations should be on FOR-IISc Bangalore basis in INR only.
3. The bidder's firm should exist for at least 3 years (Enclose Company Registration Certificate).
4. The bidder should belong to either class 1 or class 2 supplier distinguished by their "local content" as defined by recent edits to GFR. They should mention clearly which class they belong to in the cover letter.

   a) Class 1 supplier: Goods and services should have local content of equal to or more than 50%.

   b) Class 2 supplier: Goods and services should have local content of equal to or more than 20 %and less than 50%.
5. Purchase preference as defined by the recent edits to GFR (within the "margin of purchase preference") will be given to Class-1 supplier.
6. The Bidder should sign and submit the declaration for Acceptance of Terms and Conditions as per - Annexure 4.
7. The Bidder must not be blacklisted/banned/suspended or have a record of any service- related dispute with any organization in India or elsewhere. A declaration to this effect has tobe given as per Annexure 3.

Section 3 - Technical Specifications for EPR Spectrometer along with Liquid Nitrogen Cryostat

1. Broad System Requirements and Usage

We are seeking to procure a state-of-the-art CW EPR Spectrometer (both X band and Q band) with Liquid Nitrogen Cryostat and accessories to be part of our Chemical Sciences Division. Therefore, the following technical criteria are to be met by any EPR Spectrometer being quoted under this tender notice:

1) Access of the instrument being quoted should be multi-user friendly with an easy-to-use software interface, modular hardware design that allows for rapid user training. It should also be easy to change from one operational mode to another with relative ease so that our students can set-up experiments and handle the instrument.
2) We are working in diverse areas of research at the intersection of fundamental chemistry, physics, biology, and new material synthesis and characterization. Therefore, the EPR spectrometer being quoted should be an advanced and updated version that can go far beyond the basic instruments with the highest level of accuracy.
3) In addition, the system being quoted should have a modular design providing the flexibility to support upgradation for possibility of integrating future updates and additional options for measurement either at the time of procurement or at a later date.

2. EPR Spectrometer (both X band and Q band) with Liquid Nitrogen Cryostat and Accessories

Magnet

- 10” double yoke electromagnet
- Electromagnet with magnetic field control, with linearity better than 0.1%
- High stability and proper cooling of magnet
- 13 kG weight <1100 kg, water cooled version

Magnetic Field Strength	1.3 T at 62 mm air gap or better with 12 kW Power supply
Power Supply	Solid state power supply with minimum 12 kW output power
Maximum Current	30 A
Impedance	3 Ohm/6 Ohm/8 Ohm
Field Homogenity	5×10^{-6} /cm^3 (at approx. 0.33 T); 33 mG. The system should be able to have a good levels of uniformity
Pole diameter	150 mm at pole root
Pole gap	60 mm
Resolution	23 mG at 100 kHz or better

Microwave Bridge

X-band Microwave bridge

Solid state microwave source

X Band Frequency range	9.3 to 9.65 GHz
Maximum source output	200 mW to 0.1 µW (63 dB). The system should be able to change power continuously.
Microwave oscillator	Gunn diode oscillator. The EPR system should be with smooth (no noise) and high-power oscillator
Frequency Counter	Integrated frequency counter with 1 kHz resolution

Frequency Control	Automatic frequency control (AFC)
Frequency stability	$1X10^{-6}$ or better (at AFC ON, 10^{-8} desirable
Noise	Low noise: -130dBc/ 10kHz from carrier
Phase correction	Automatic phase correction over attenuation range
Phase shift range:	400^{0}
Phase shift setting resolution	0.1 degree or better
Reference Arm	Reference Arm with phase shifter

All parameters of the bridge should be software controlled.

The system should evaluate the probe head (resonator) and display the loaded Q-Factor of a resonator in Tuning Mode at 33 dB, indicates this value in workstation software and stores it with other parameters.

Detection method	Homodyne method, reflection-type diode Detection
Data Channel	2. The EPR system should be able to capture the first and second harmonics at the same time.
Modulation Coil	Internal. The system should be able to use an internal modulation method to uniformly and efficiently modulate the entire sample.
Auto Gain	The EPR system should be able to acquire signals up to 16 times the original scale. Useful for tracking signals whose intensity is lower.
G value correction	The offered EPR system should be able to determine the g value from frequency information and Mn signal with 5-digit accuracy (organic radical).
Simulation	Both Isotropic and Anisotropic Simulation should be possible with the Software.

Q-Band Microwave Bridge

Q-band Frequency Range	34 GHz
Microwave power	50 mW - 80 mW
Signal bandwidth	30 Hz – 400 kHz or better
Power attenuation range	50 dB in 1 dB resolution
Frequency counter	Integrated with 1 kHz resolution (or if manual, provide details)
Frequency Control	Automatic frequency control (AFC)
Frequency Stability	AFC Stability 10^{-8} (When AFC is on)
Resonator	For VT from 4 K to 400K (Liquid/Gaseous Nitrogen or Helium)
Optical access	12 mm optical window at Q band
Modulation frequencies	4 kHz to 100 kHz, full range of signal channel
Sensitivity	Absolute $5*10^{9}$ spins/G

O_2 in air 200:1 or its equivalent with respect to Tempo Signal

All parameters of the bridge should be software controlled.

EPR-X band and Q band generator	Should be compatible for room temperature, liquid nitrogen and helium temperatures (using Closed Cycle Helium Cryostat)
Frequency Tuning	• AFC lock range: 4 MHz

	• AFC stability: 10^{-8}
Microwave Power Setting	Attenuation: 63 dB max
Signal Amplifier	Low noise preamplifier, 20 Hz to 400 kHz or better Two 50 Ohm signal outputs
Magnetic Field Control	• 13 kG or ot equivalent • 500 mG / ±5 mT, or ±0.1% or better • Magnet sweep over full magnet field range
Resonator Tuning and Matching	With "auto tuning" and "auto matching"
Signal Channel	• Frequency range: 25 kHz, 50 kHz, 100 kHz or 10 kHz to 100 kHz, settable in 10 Hz to 100 kHz steps • Source: synthesizer Harmonic: first and second • Modulation phase: 0/90 with simultaneous detection • ADC integrating type time constant settable: 1ms to 5 sec. • High linearity Modulation amp module 25 kHz, 50 kHz, 100 kHz or 500 Hz to 120 kHz
Probe Head	**High sensitivity probe head** • Standard resonator for high sensitivity CW-EPR • 10 mm sample access • 10-20 G at 100 kHz maximum modulation amplitude automatic iris control with optical window for light (laser) access compatible for high and low temp work unloaded Q>15000 • Sensitivity weak pitch 1500:1 or better • Absolute no. of detectable spins: 2 $x10^{+9}$ spins/G
Resonance Cavity	Universal cylindrical resonance cavity with unloaded Q value 18,000 or more along with reference marker and compatible for variable temperature
Temperature control systems	• Nitrogen VT unit: Console plug-in digital temperature control unit for variable temperature using liquid/gaseous nitrogen (80 K or less – 500 K or more) • Complete Accessories for the VT System should be quoted. • Optical access: Optical grid window at X-band and Q-band • Dewar for X band and Q band resonator • Cavity for room and nitrogen temperature • **Storage Dewar 25-30 lit. (~113 K or less – 480 K or more) with thermocouple/heater assembly** • **Dewar should have Dewar insert holder; transfer dewar; nitrogen evaporator, glass version digital control unit etc.**
Personal Computer	• Make: Dell or Lenovo • Processor: i7, H510 Mother Board, RAM: 8 GB DDR4, System Type: 64-bit, Windows 10 Pro, 256 GB NVMe + 1TB SATA HDD, P-

4 Cabinet with SMPS, Keyboard & Mouse, Graphics Card 2GB, Monitor: 21", LaserJet color Printer or equivalent

EPR Software package

- Acquisition Program for field sweeps, time sweeps, 2D power sweeps, 2D goniometer sweeps, 2D temperature sweeps.
- Full software control of all external devices via System Ethernet Network, Spectra Manipulation and Analysis Program, featuring baseline correction (up to 9th order), single and double integration, differentiation, smoothing, addition and subtraction of spectra, peak picking, cursor read-out for position, amplitude and distance, line, dot and cross display, file handling and printing.
- Spectra Simulation Program for liquids and powders with isotropic, axial and rhombic symmetry.
- A simulation suite to perform EPR simulation with the following possibilities full matrix diagonalization for liquids, powders and single crystals including g-tensors, hyperfine interaction, D and E parameters.

Accessories

- X-band and Q-band Calibration set up (strong pitch, weak pitch)
- Single line reference marker for quantitative EPR with g factor = 1.98
- Tissue cell
- Finger Dewar
- One-axis Goniometer for resonator and low temperature equipment
- 10 sample tubes minimum of 2 mm ID / 3 mm OD CFQ quality.
- 10 sample tubes minimum of 3 mm ID / 4 mm OD CFQ quality
- 10 sample tubes 4 mm ID/ 5 mm OD CFQ quality
- 100 sample tubes 1 mm ID/ 1.6 mm OD Quartz one end beaded
- 10 Aqueous Solution Cell (130 mL, OD 12 mm, ID 10 mm) and cell holder for both X-band and Q-band
- Accessory for recording X-band and Q-band spectrum in organic solvents
- Sample Angular Rotation Device (Manual) for ESR measurement of single crystals
- Programmable One axis goniometer

Training

Complete training course/workshop (minimum three trainings with minimum three sessions each) for usage and maintenance of the complete system detailed application

Optional Items:

1. **Cryogen free VT System**: For both X and Q band frequencies, Temperature Range: **4 K – 325 K**, Complete Accessories for the VT System should be quoted.

Parameter	X-Band Resonator	Q-Band Resonator
Cryocooler nominal power at 4.2 K	1.0 W	1.0 W
Sample environment	Cold helium gas	Flowing gas or liquid
Sample Space Access		Ø40 mm
Sample height below top flange Sample column external width between electro-magnet pole-pieces		310 mm 55 mm
System cool-down to operational readiness		< 6 hour
Sample cool-down time 300 K to 10 K		~40 min
Operating Temperature range		2 K to 300 K
Typical temperature stability		±10 mK from 2 K to 10 K
Operating time		Continuous
Optical window (if option selected)		Ø15 mm diameter outer window Ø12 mm diameter inner window
Expected operating temperature range	≤4 K to 300 K	
Operating time	Continuous	
Cryocooler		
Cooling powers at 50Hz / 60 Hz	1st Stage: 40 W @ 45 K, 2nd Stage: 1.0 W @ 4.2 K	1st Stage: 40 W @ 45 K, 2nd Stage: 1.0 W @ 4.2 K
Base temperature	<3 K	<3 K
Orientation	Vertical Only	Vertical Only
Typical maintenance interval	20,000 hrs	20,000 hrs
Ambient temperature	5°C to 35°C	5°C to 35°C
Compressor – F70H (Water Cooled)		
Mains power @ 50Hz	≤6.6 – 6.9 kW 3-phase; F70L: 200V F70H: 380 – 415 V	≤6.6 – 6.9 kW 3-phase; F70L: 200V F70H: 380 – 415 V
Mains power @ 60Hz	≤7.5 – 7.8 kW 3-phase; F70L: 200V F70H: 480 V	≤7.5 – 7.8 kW 3-phase; F70L: 200V F70H: 480 V
Water cooling	6.8 – 9 L/min	6.8 – 9 L/min
Ambient temperature	4°C to 40°C	4°C to 40°C
Typical maintenance interval	30,000 hrs	30,000 hrs
Flexible gas lines	20 A × 20 m	20 A × 20 m
Compressor dimensions	532*443*493 mm	532*443*493 mm
Weight	100 kg	100 kg

2. Electrolytic cell with electrodes and power supply
3. UV/vis Irradiation System
4. Tesla Meter
5. W-ENDOR System for X- Band consisting of ENDOR Cavity for RT/LNT with Q-value of 7000 and operating Frequency of 9.4 GHz
6. ENDOR Cavity for RT/LNT with Q value of 7000 and operating Frequency of 9.4 GHz, Variable Temperature accessory for both X- and Q-Band (All accessories to be included) Temperature range RT-100K (using Liquid Nitrogen) RT- 4.3K (using Liquid Helium) Compatibility For X- and Q-Band resonators and cryostats. Goniometer for Crystal Rotation using X-Band: Manual/Automated Goniometer for crystal Rotation – quote separately LNT Setup for X-Band measurements only Large Volume Dewar insert Quartz Dewar (finger type) 150 mL capacity
7. System should have the capability to expand to EDMR; Pulse EPR and Time Resolved EPR or other possible future updates.

Section 4 - Terms and Conditions

1) Comprehensive 3 years minimum on-site warranty on all parts from the date of successful installation including Liquid Nitrogen Cryostat.
2) The vendor must quote for a non-comprehensive Annual Maintenance Contract (AMC) price beyond the 3-year warranty, with a price lock in for 3 years beyond the standard 3-year warranty period, 2/3 services per year should be included in the AMC. AMC should be clearly mentioned after the warranty period.
3) The tender document should also indicate what kind of service/maintenance is required for the system. Also mention that whether the service has to be carried out by a company engineer or it can be carried by trained service personnel within India.
4) Power requirement: 220/240 Volts AC with frequency 50 Hz.
5) Operation and service manual in English (electronic and hard copy) with complete circuit diagram and PCB layout for all equipment should be provided with the instrument.
6) Standard samples (if required) to be provided by the company for testing the instruments at the time of installation on site to the quoted accuracy in the given technical specification for the demonstration of the performance of equipment.
7) Pre-installation site preparation requirements to be indicated and specified along with the bid.
8) Installation and on-site training of our staff (minimum three trainings with minimum three sessions each) in operation and maintenance is essential by factory trained personal free of cost.
9) Please provide the segmented quotation for each optional measurement capabilities. Depending upon the budgetary provision and priority, the items to be purchased will be decided.
10) Bid should include all other essential auxiliary equipment and spares for its operation, even which are not explicitly specified above (please provide list with details).
11) All sample handling kits/consumables should also be provided.
12) The vendor is responsible for the installation of the system at the institute.
13) The price quotation should include the cost of installation and training of potential users.
14) GST is applicable as per Govt. of India GST law and must be mentioned in the price bid. In case due to any error / oversight, the GST quoted by the bidder is less than the actual rate as per tariff, the bidder will not be permitted to rectify the error/oversight. The orders / contract will

be placed for the total amount including the (lower) rate/s quoted by the bidder, with reduced basic amount to the extent of difference in tax/duty amount, so that the total amount (basic + actual rate as per tariff), remains same (quoted basic + quoted rate). The difference amount payable, if any, between the quoted rate and actual rate as per tariff shall be borne by the bidder.

15) The vendor should have a track record of having previously supplied at least five identical instruments in CFTIs such as JNCASR, IITs, IISERs, NITs with above mentioned specifications. **Details of such systems should be provided.** Vendor must provide the user list (with contact details including emails and phone numbers) of at least 5 customers from Indian Institutes/Labs where similar measurement systems are installed. Vendor must provide the detailed publications list (minimum 5 publications) comprising X band, Q band and temperature dependent data from 4 K to 400 K.
16) The committee reserves the right to reject the technical bid if above condition is not satisfied.
17) The vendor should have qualified technical service personnel for the equipment basedin India and should assure a response time of <48 hours.
18) The lead-time for the delivery of the equipment should not be more than 6 months from the date of receipt of our purchase order.
19) If the supplier fails to Supply, Install and Commission the equipment as per the specifications mentioned in the PO within the due date, the Supplier is liable to pay a penalty of @0.5% of order value per week of delay subject to a maximum of 10% beyond the due date. IISc reserves the right to cancel the order in case of excessive delay.
20) The indenter reserves the right to withhold placement of final order. The right to rejectall or any of the quotations and to split up the requirements or relax any or all of the above conditions without assigning any reason is reserved.
21) Wherever requested data must be supplied along with technical compliance documents. Technical bids without supporting data will be deemed technically non-compliant.
22) All guaranteed specifications may have to be demonstrated at the time of installation. Any necessary standard samples for that purpose should be brought by the service engineers.
23) The vendor must provide a compliance statement in a tabular form concerning each technical specification in the tender document duly supported by the manufacturer's literature and published papers. Any other claim will not be accepted and may lead to rejection of the bid.
24) Technical evaluation by the institute may include a demonstration to verify functionalities and capabilities of the system quoted. The institute reserves the right to provide samples after opening the technical bids for verification of promised specifications. Any discrepancy between the promised specifications and measurements will be deemed as technical non-compliance. Committee also reserves the right to modify the stipulated eligibility criteria at any time during the tenure of procurement.
25) The quote should also include additional spares sufficient for 3 years.
26) For INR Payment by NEFT – 100% against delivery, Installation, commissioning, acceptance by IISc and submission of Performance Bank Guarantee within 30 Days.
27) **Payment:** - No Advance payment will be made for Indigenous purchase. However, 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved. In case of import supplies the payment will be made only through 100% Letter of Credit i.e., (90% payment will be released against shipping documents and 10% after successful installation wherever the installation is being done). Any loss due to fluctuation in foreign exchange rates will be at the beneficiary account.

Annexure 1:

Details of the Bidder: The Bidder must provide the following mandatory information & attach supportingdocuments wherever mentioned:

Sr. No.	Type	Details
1.	Name of the Bidder	
2.	Nature of Bidder (Attach attested copy of Certificate of Incorporation/ Partnership Deed)	
3.	Registration No/ Trade License, (attach attested copy)	
4.	Registered Office Address	
5.	Address for communication	
6.	Contact person- Name and Designation	
7.	Telephone No	
8.	Email ID	
9.	Website	
10.	PAN No. (attach copy)	
11.	GST No. (attach copy)	

Signature of the Bidder

Name: Date:

Designation, Seal

Annexure 2:

Declaration regarding experience

To,
Dr. Abhishake Mondal,
Solid State and Structural Chemistry Unit,
Chemical Sciences Building,
Indian Institute of Science,
Bangalore – 560012, India

Ref: Tender No: XXXXXXXXX

Dated: XXXXX

Supply and installation of EPR Spectrometer with X and Q band frequencies down to Liquid Nitrogen temperature along with Liquid Nitrogen Cryostat

Sir,

I have carefully gone through the Terms & Conditions contained in the above referred tender. I herebydeclare that my company / firm has years of experience in supplying and installing EPR Spectrometer with X and Q band frequencies down to Liquid Nitrogen temperature along with Liquid Nitrogen Cryostat.

(Signature of the Bidder)

Printed Name Designation, Seal Date:

Annexure 3:

Declaration of track record

To,
Dr. Abhishake Mondal,
Solid State and Structural Chemistry Unit,
Chemical Sciences Building,
Indian Institute of Science,
Bangalore – 560012, India

Ref: Tender No: XXXXXXXXX

Dated: XXXXX

Supply and installation of EPR Spectrometer with X and Q band frequencies down to Liquid Nitrogen temperature along with Liquid Nitrogen Cryostat

Sir,

I have carefully gone through the Terms & Conditions contained in the above referred tender.

I hereby declare that my company / firm is not currently debarred / blacklisted by any Government / Semi-Government organizations / institutions in India or abroad. I further certify that I am competent officer in my company / firm to make this declaration.

OR

I declare the following:

Sr. No.	Country in which the company is debarred/ blacklisted / having pending case	Blacklisted / debarred by Government / Semi Government Organizationsor Institutions / having pending case	Reason	Time Period

(Note: In case the company / firm was blacklisted previously, please provide the details regarding period for which the company / firm was blacklisted and the reason/s for the same).

(Signature of the Bidder)

Printed Name Designation, Seal Date:

Annexure 4:

Declaration of acceptance of terms and conditions

To,

Dr. Abhishake Mondal,
Solid State and Structural Chemistry Unit,
Chemical Sciences Building,
Indian Institute of Science,
Bangalore – 560012, India

Ref: Tender No: XXXXXXXXX

Dated: XXXXX

Supply and installation of EPR Spectrometer with X and Q band frequencies down to Liquid Nitrogen temperature along with Liquid Nitrogen Cryostat

I have carefully gone through the Terms & Conditions contained in the above referred tender document.I declare that all the provisions of this tender document are acceptable to my company. I further certify that I am an authorized signatory of my company and am, therefore, competent to make this declaration.

Yours faithfully
(Signature of the
Bidder)

Printed Name Designation, Seal Date:

Section 5 - Checklist

The following items must be checked before the bid is submitted.

1. Sealed Envelope “A”: Technical Bid
   Technical bid (each page signed by the authorized signatory and sealed) with the below annexures:
   a. Annexure 1: Bidders details
   b. Annexure 2: Declaration regarding experience
   c. Annexure 3: Declaration of track record
   d. Annexure 4: Declaration of acceptance of terms and conditions
   e. Annexure 5: Details of item quoted.

2. Sealed Envelope “B”: Commercial Bid

Your quotation must be submitted in two separate sealed envelopes: Technical Bid (Envelope A) and Commercial Bid (Envelope B) super scribing on both the envelopes with Tender No. and due date and both in sealed covers and put in a bigger cover which should also be sealed and duly super scribed with Tender No., Tender description & Due Date.