

TECHNICAL SPECIFICATIONS OF STORES AND DRAWINGS.

Technical Specifications for Supply, Pre-Dispatch Inspection Tests, Installation, Acceptance Tests and Training at IPR of Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis



INSTITUTE FOR PLASMA RESEARCH

GANDHINAGAR, GUJARAT

382428

Our 2 Part E-Tender No. IPR/TPT/TN/ET/F/18-19/58 dated 29-03-2019 for Supply, Pre-Dispatch Inspections Tests, Installation, Acceptance Tests and Training at IPR of Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis

Technical Specifications of Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis

MASS & ENERGY RESOLVE ANALYZER SYSTEM FOR PLASMA DIAGNOSIS

1. APPLICATION NOTE:

Quantitative analysis of ion bombardment energy/ ion flux at the substrate is necessary to optimize the radio-frequency driven sheaths and controlling the bulk plasma parameters for applications in technological plasmas.

The experiments will involve multiple ions/neutrals of both positive /negative charge species, confined by external magnetic field and powered by different heating schemes using radio-frequency and high voltage pulsed DC sources, operated in continuous and pulse mode.

The probe will be inserted inside a magnetized plasma chamber produced by external electromagnet coils

Temporal information of energy distribution of ions and neutral species inside plasma is necessary for the above studies.

2. Technical specification:

Find below the technical specifications:

Sr. No.	Specifications
1.	Mass Range: 1 amu to 200 amu or above (includes reactive gases)
2.	Sampling Range: Operating pressure range from 10 ⁻³ to 0.5 mbar
3.	Mass Resolution: Should be able to resolve masses with 1 amu resolution <ul style="list-style-type: none"> - 1 amu at 5% peak height throughout the mass range - The quadrupole mass filter should have a triple filter design with pre and post RF only filters for enhanced abundance sensitivity and contamination resistance
4.	Detector: <ul style="list-style-type: none"> - Should be able to detect both positive and negative ions - Count rate ~ 10⁷ counts/s
5.	Signal gating: <ul style="list-style-type: none"> - The detector should have integrated functionality for time-resolve measurements during pulsed operation of plasmas - It should be possible to synchronize/trigger with TTL pulses corresponding to a pulse-dc or pulse-rf discharges - The time resolution for obtaining the evolution of ion mass/ energy in time relative to a pulse-dc/rf discharge should be minimum of 50 ns or better
6.	Energy Analyzer: <ul style="list-style-type: none"> - Should be able to measure ion energies on the lower side 0.5 eV to a maximum of 1000 eV, – 1000 to + 1000 eV energy range. - Energy pass band 0.25 eV

Our 2 Part E-Tender No. IPR/TPT/TN/ET/F/18-19/58 dated 29-03-2019 for Supply, Pre-Dispatch Inspections Tests, Installation, Acceptance Tests and Training at IPR of Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis

	<ul style="list-style-type: none"> - 100%Transmission within pass band. - Able to detect and analyze different species including radicals/ neutrals and ionization cross-sections. - System should have capability for threshold ionization mass spectrometry, 0-150 eV electron energy and be software controllable.
7.	Vacuum protection: <ul style="list-style-type: none"> - Appropriate external / internal protection trip to be provided for safety, while operating the system in residual gas analyses mode.
8.	Mounting Flange: <ul style="list-style-type: none"> - The system should be portable and adaptable to existing plasma systems. - The preferable flange size: DN-63-CF 4½ inch (114 mm OD) Conflat type flange.
9.	Magnetic field shielding: <ul style="list-style-type: none"> - The instrument should be completely shielded from stray magnetic field up to a maximum field of 100 mTesla
10.	Probe insertion length inside plasma system <ul style="list-style-type: none"> - Approximately 700 mm from probe mounting flange inside the plasma/vacuum chamber
11.	Probe axial manipulation (Optional) <ul style="list-style-type: none"> - To vary the position of the probe head with respect to the plasma column, it is preferable to move the probe head assembly under the vacuum - Maximum stroke length of 100 mm is preferable
12.	RC 7 interface to PC <ul style="list-style-type: none"> - Up to 15 m with RS232 link. - Up to 750 m with unbridged Ethernet link. - 5 m Ethernet and 5 m RS232 cables.
13.	Software <ul style="list-style-type: none"> - Data-analysis software for mass and energy scan operated in continuous and time-resolve mode and data storage system.
14.	Power requirement: 100 - 240 Vac, 50 - 60 Hz, 1.0 kVA

3. PRE-DISPATCH INSPECTION (PDI)

Following test has to be carried during PDI in presence of IPR representative:

- Detection of mass scan in different plasma (example: argon, helium, oxygen or other molecular gases)
- Detection of energy scan (1000 eV)
- Time resolve measurement of ion energy distribution in pulse discharge (1-10 kHz, 10-50 % duty cycle)
- Detection of negative ions (in electro-negative gases such as oxygen or SF6)
- Vacuum protection test (safety interlock checks)
- Test for magnetic shielding ~ 100 mTesla
- Demonstration of threshold energy mass spectrometry (example: oxygen, argon, helium)

4. INSTALLATION AND ACCEPTANCE AT IPR

Installation and acceptance tests mentioned below shall be carried by the vendor at IPR in one of the dedicated plasma setups provided in IPR Lab:

Our 2 Part E-Tender No. IPR/TPT/TN/ET/F/18-19/58 dated 29-03-2019 for Supply, Pre-Dispatch Inspections Tests, Installation, Acceptance Tests and Training at IPR of Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis

- Mass and energy scan of the instrument with known gases argon or oxygen plasma
- Operation of the system in magnetized plasma setup.
- Mass and Energy scan of the instrument in time-resolve mode

5. TRAINING

Vendor shall give following trainings to IPR personnel (4-5 IPR Personnel) at IPR.

- Operational training of the instrument
- Safety /Maintenance training
- Mass and energy scan in argon/oxygen plasma
- Time-resolve measurements in pulse-DC and/or pulse RF-capacitive plasma
- Training in threshold energy mass spectrometry measurement

6. Delivery period: 6 – 8 months from the date of Purchase Order

Compliance Statement

Compliance Statement for Supply, Pre-Dispatch Inspection Tests, Installation, Acceptance Tests at IPR and Training Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis

Bidder must submit compliance statement dully filled with exact technical values of each specifications (Not with OK, CONFIRM, COMPLY, ACCEPTABLE) alongwith official seal and signature with their offer.

Sr. No	Parameters	Tender Specification	Vendor's Offered Specifications/V alues
1	Mass Range	1 amu to 200 amu or above (includes reactive gases)	
2	Sampling pressure range	10 ⁻³ to 0.5 mbar	
3	Mass Resolution	1 amu at 5% peak height throughout the mass range	
4	Mass Filter	The quadrupole mass filter should have a triple filter design with pre and post RF only filters for enhanced abundance sensitivity and contamination resistance	
5	Detector	Should be able to detect both positive and negative ions, and radicals with count rate 10 ⁷ count/s.	
6	Signal Gating	<ul style="list-style-type: none"> - The detector should have integrated functionality for time-resolve measurements during pulsed operation of plasmas - It should be possible to synchronize/trigger with TTL pulses corresponding to a pulse-dc or pulse-rf discharges 	
7	Temporal resolution	- The time resolution for obtaining the evolution of ion mass/ energy in time relative to a pulse-dc/rf discharge should be minimum of 50 ns or better	
8	Energy Analyzer	- Should be able to measure ion energies on the lower side 0.5 eV to a maximum of 1000 eV, – 1000 to + 1000 eV energy range.	
9	Energy resolution	<ul style="list-style-type: none"> - Energy pass band 0.25 eV - 100%Transmission within pass band. 	
10	Threshold ionization mass spectrometry	- System should have capability for threshold ionization mass spectrometry, 0-150 eV electron energy and be software controllable.	

Our 2 Part E-Tender No. IPR/TPT/TN/ET/F/18-19/58 dated 29-03-2019 for Supply, Pre-Dispatch Inspections Tests, Installation, Acceptance Tests and Training at IPR of Quadrupole Mass & Energy Resolve Analyzer System for Plasma Diagnosis

11	Vacuum protection	- Appropriate external / internal protection trip required for safety, while operating the system in residual gas analyses mode.	
12	Mounting Flange	- The system should be portable and adaptable to existing plasma systems. - The preferable flange size: DN-63-CF 4½ inch (114 mm OD) Conflat type flange.	
13	Magnetic field shielding	- The instrument should be completely shielded from stray magnetic field up to a maximum field of 100 mTesla	
14	Probe insertion length	- Approximately 700 mm from probe mounting flange inside the plasma/vacuum chamber	
15	Probe axial manipulation(Optional)	- To vary the position of the probe head with respect to the plasma column, it is preferable to move the probe head assembly under the vacuum - Maximum stroke length of 100 mm is preferable	
16	RC 7 interface to PC	- Up to 15 m with RS232 link. - Up to 750 m with unbridged Ethernet link. - 5 m Ethernet and 5 m RS232 cables.	
17	Software	Data-analysis software for mass and energy scan operated in continuous and time-resolve mode and data storage system.	
18	Power requirement	100 - 240 Vac, 50 - 60 Hz, 1.0 kVA	

Authorised Signatory

Official Seal

Date :-