



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

MATERIALS MANAGEMENT DIVISION

Powai, Mumbai 400076

Reference No. 10000015464 (For RFx No. 6100000640)

Technical Specifications of **Spare parts of RF Plasma Source for Nitrogen of MBE System**

Application: Growth of high-quality GaN and related III-Nitride material for electronic and optoelectronic application.

RF Plasma Source for Nitrogen should perform precise and controllable growths resulting in high-quality electronic and optoelectronic devices.

Plasma Bulb:

- The plasma source should be of brazed bulb design. Brazing the bulb to the plasma source leads to the best seal; drastically lowering the possibility of leakage and greatly improving the plasma control.
- A plasma chamber should be constructed of all PBN (Pyrolytic Boron Nitride) to lower the risk of oxidation inside the bulb. \
- The plasma chamber should be constructed with a single piece PBN gas inlet tube and plasma bulb to eliminate gas leakage around the bulb.

Nozzle

- **Nozzle should be designed Using competent (e.g. Monte Carlo) Software.** The software must take many variables into account, like source to substrate distance, gas flow, system geometry, etc. so as to produce the best uniformity and end device quality.
- Plasma source should provide field Replaceable Nozzle facility. This is essential to change flux profile with another customized nozzle.
- The exit hole design should be such that it minimizes ion content in the beam while the active and neutral species (atomic and molecular) are directed toward the substrate.
- Nozzles should be applicable for most commercial MBE systems and ensure typical uniformity of $\pm 1\%$.

Water Cooled RF Feedthrough

RF Plasma source should have water cooled **RF Feedthrough**. The water cooled RF Feedthrough on the Nitrogen Plasma Source effectively takes heat away from sensitive in-vacuum to out-vacuum transition areas.



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Demonstrated Performance

The manufacturer must have proven its competence by already demonstrating state of the art results. Legitimate proofs must be provided so as to establish the following results.

- Demonstrated growth of AlGa_N/Ga_N two-dimensional electron gas structures with record high mobility greater than 150,000 cm²/V.sec below 20K and >50,000 cm²/Vsec at 77K
- Demonstrated production of AlGa_N/Ga_N PI-HEMTs which show small signal RF performance and DC breakdowns as a function of gate length that are as good as the best transistors made by MOVPE
- Ga_N growth rates as high as 2.5μm/hr.
- The metastable molecules to exhibit a high incorporation rate in Ga_N growth and stabilize the growth rate at high substrate temperatures (approx. 700-750°C.)

Specification for RF Power supply/RF Generator and AUTOTUNER

1. **RF Power Supply/RF Generator:** 600 W RF Generator (13.56MHz), with 7m cable.
2. **Autotuner should** Consists of a controller, matching unit, and required cables to connect the Nitrogen plasma source compatible power supply
3. The auto tuner should automatically control RF Power Supply/RF Generator with auto tuner set adjust and maintains the plasma source conditions without the need for manual adjustments during experiments.
4. Autotuner should be included to ensure stable growth conditions and to optimize power efficiencies.
5. Scope of Supply:
 - DC power supply module and power supply controller and should be configured for RF Plasma Source for generating Nitrogen plasma
 - DC Power Module
 - **RF** - Plasma Source RF Generator
 - RF Power Connector Option
6. RF Autotuner – RF auto matching unit configured for Nitrogen Plasma Source.
7. RF Power Supply/RF Generator with auto tuner set should be compatible with RF source for Nitrogen.
8. Supplier should show demonstration and working RF Power Supply/RF Generator with auto tuner set with the RF Plasma source for Nitrogen.



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9. Warranty: One year or longer.

10. Power Supply: Single Phase 220V, 50Hz. Indian power supply compatible.

General Information:

1. India power supply: 220V Single phase 50Hz.
2. Warranty: One year or longer.