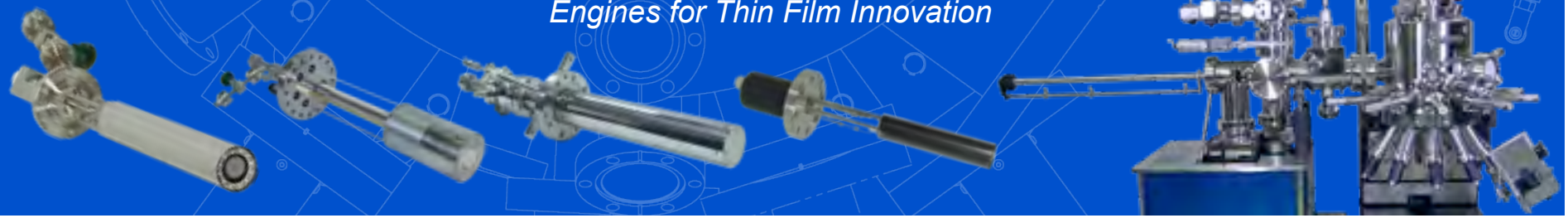
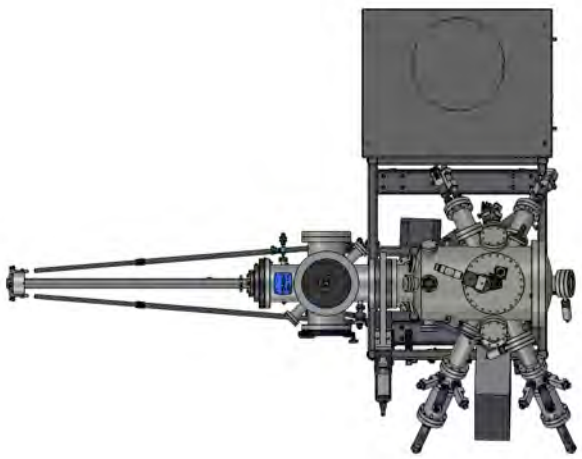
SVT MBE

We Are Complete MBE

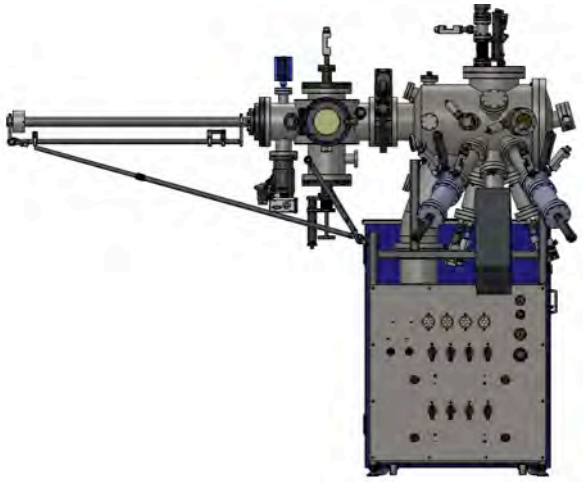
Engines for Thin Film Innovation



SMART NanoTool MBE System



- Features
  - Cost Effective Research and Development Tool
  - Large Capability in a Small Package
  - Able to Grow a wide variety of Materials
  - Capacity for Eight Deposition Sources
  - Up to 2" Substrates with Rotation
  - Heating to 850 °C *(Flash Heating to 1,000 °C)*
  - RoboMBE Software/Real Time PLC Controller
  - Plasma Sources for Nitrogen, Oxygen, and Hydrogen
  - RHEED and RHEED Image Analysis



SVT MBE

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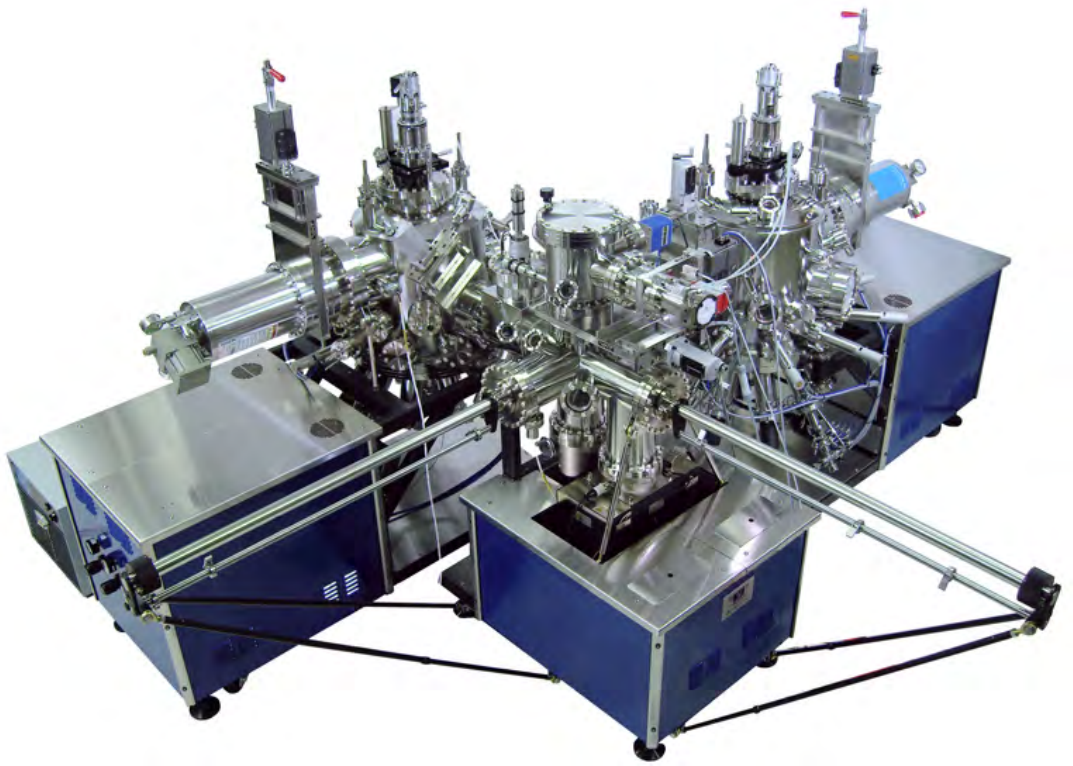
MBE Systems Engineered For Your Application

- III-V and II-VI Compounds
- Nitrides, Oxides, SiGe
- Metals and other Material Configurations Available
- Up to 8" Sample Size
- RoboMBE Automation Software
- Seamless Integration for In-Situ Metrology Tools



Multiple Material Nitride and Oxide MBE Configuration

SVT Associates MBE Systems

Oxide MBE System

Nitride MBE System

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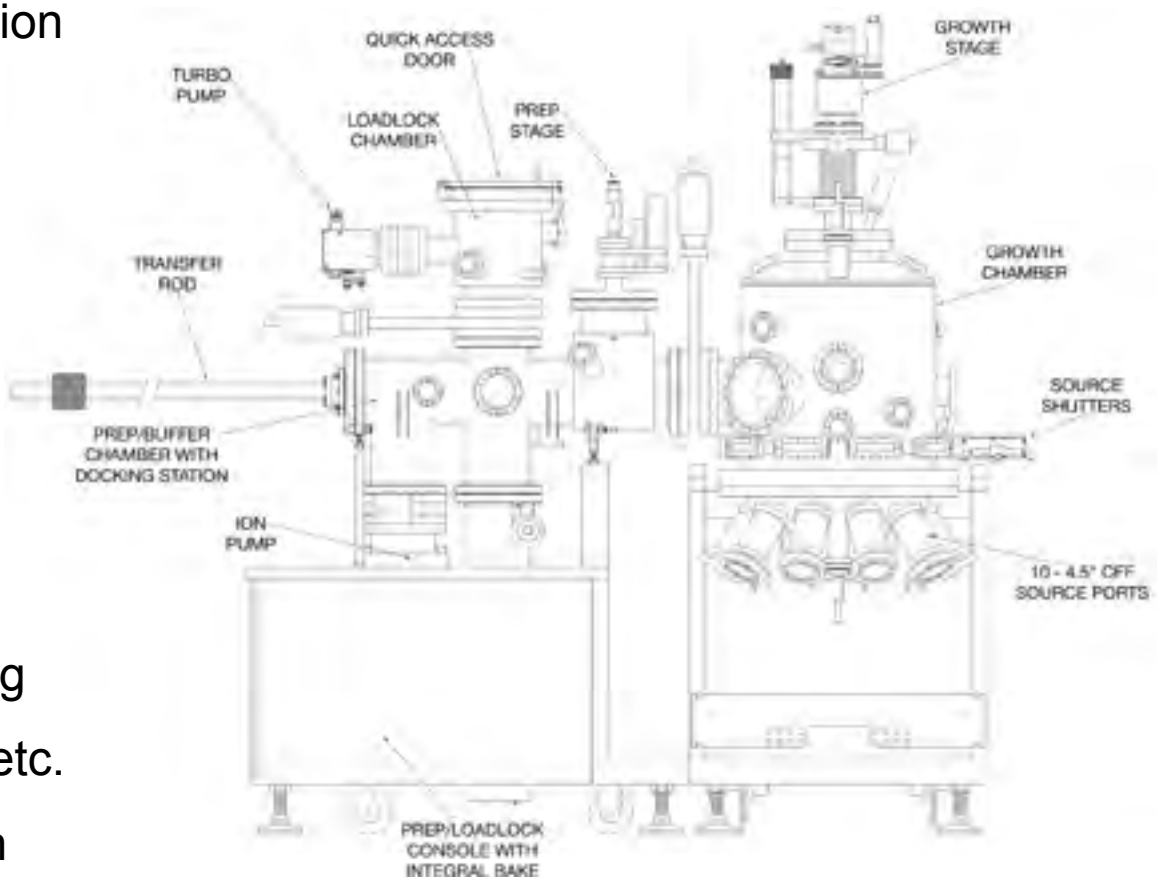
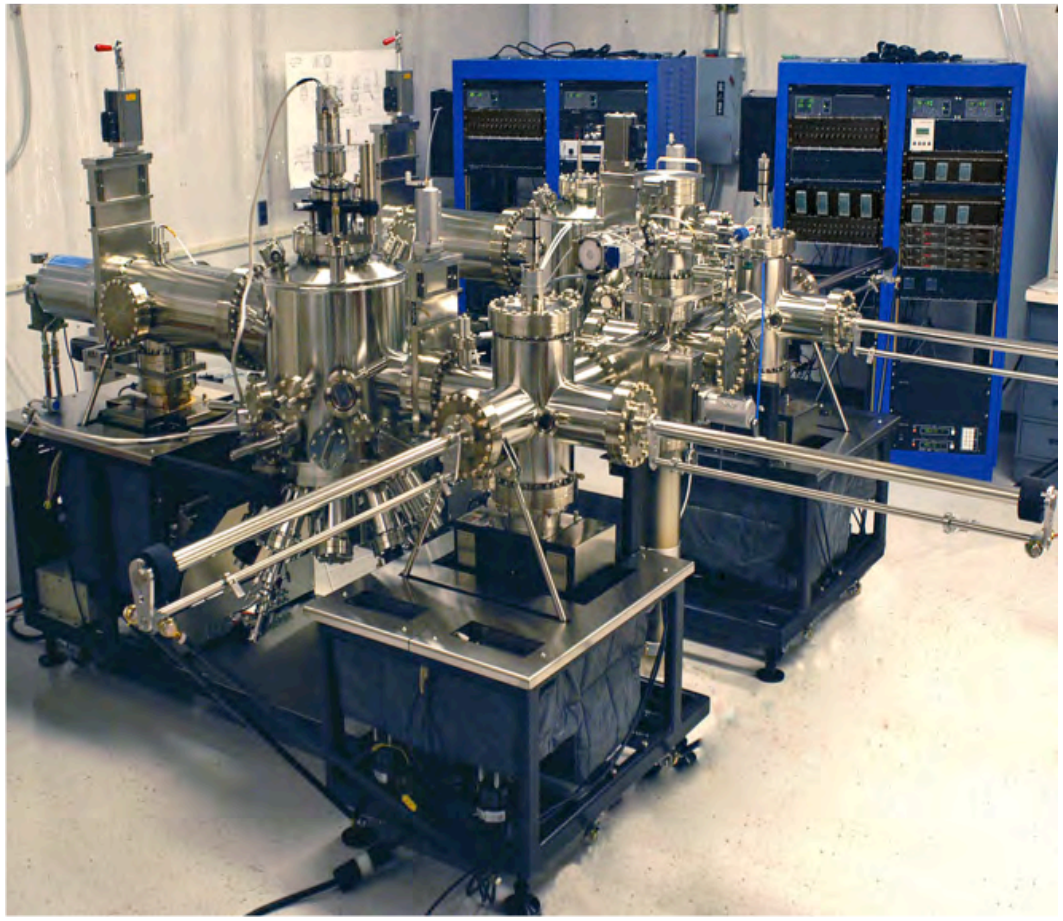
Standard System Configuration

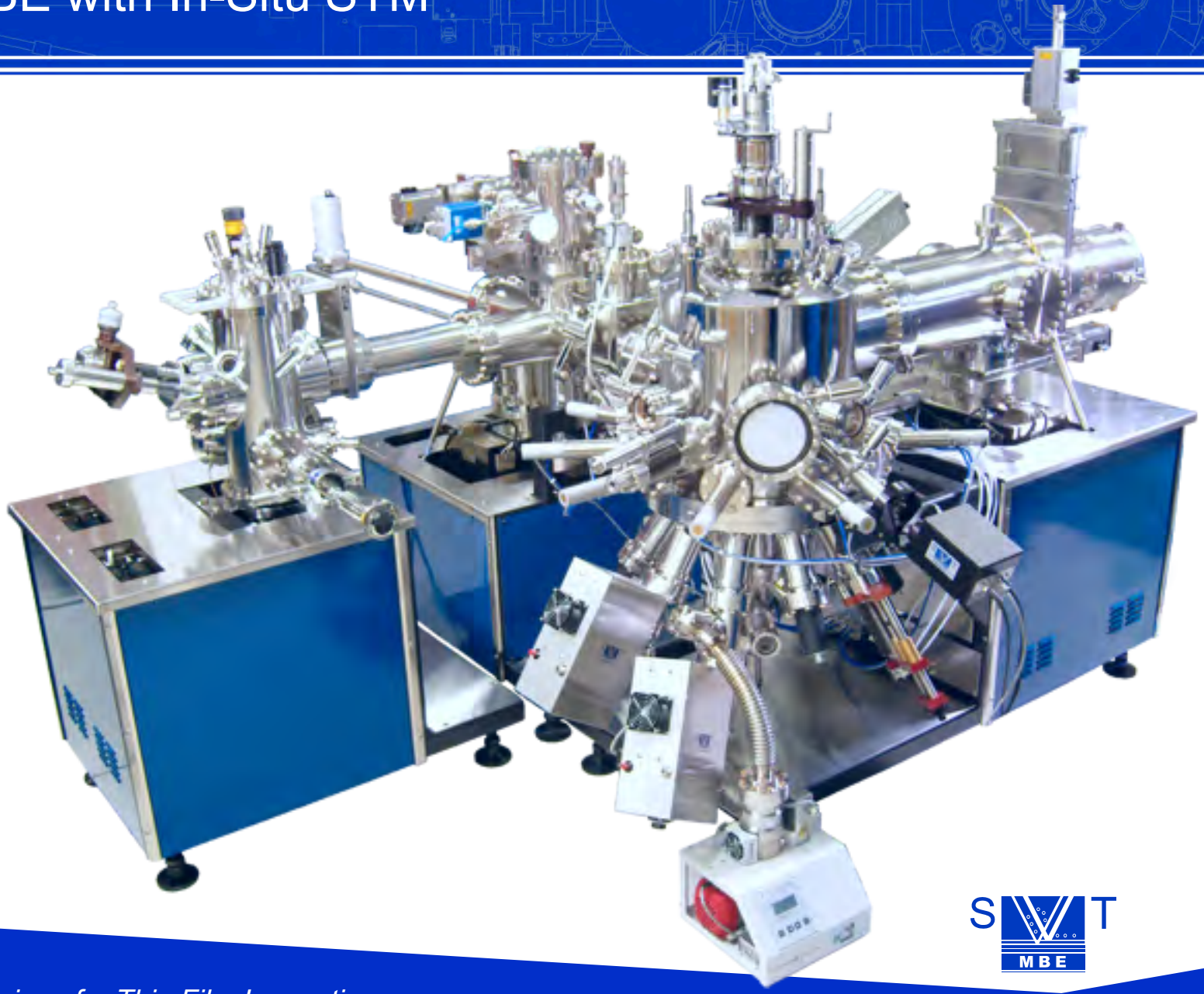
- Horizontal Substrate Orientation
- 10 source ports
- Easy access to source ports
- Linear motion shutters
- Robust Sample Heater
- High Flow LN2 lines
- Integral Bake
- 6" CF viewport normal to substrate for in-situ monitoring
- RHEED, Ellipsometry, BFM, etc.
- Atomic Absorption Integration



Multiple MBE System Transfer Rod Configuration



MBE with In-Situ STM



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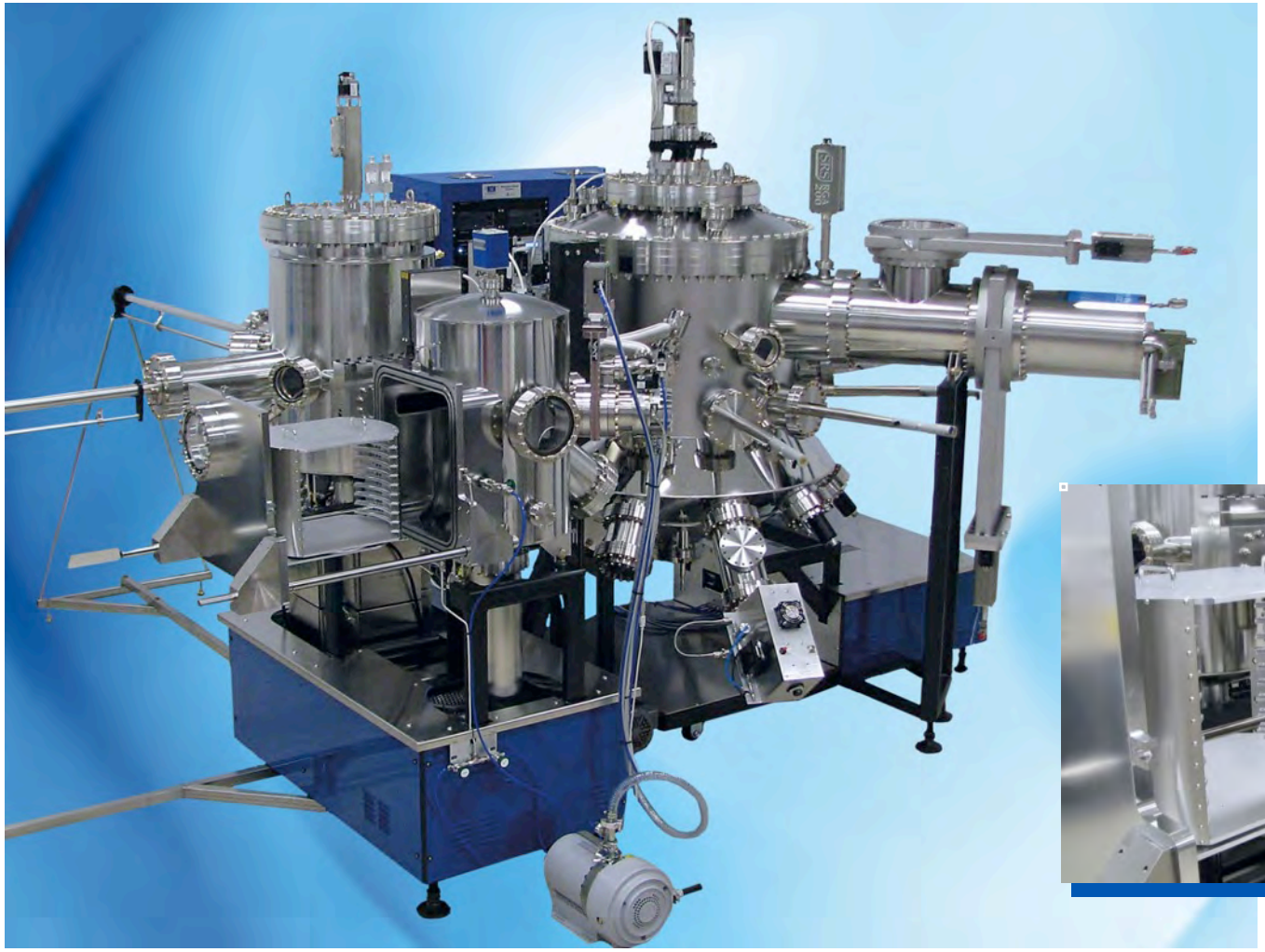
Pulsed Laser MBE

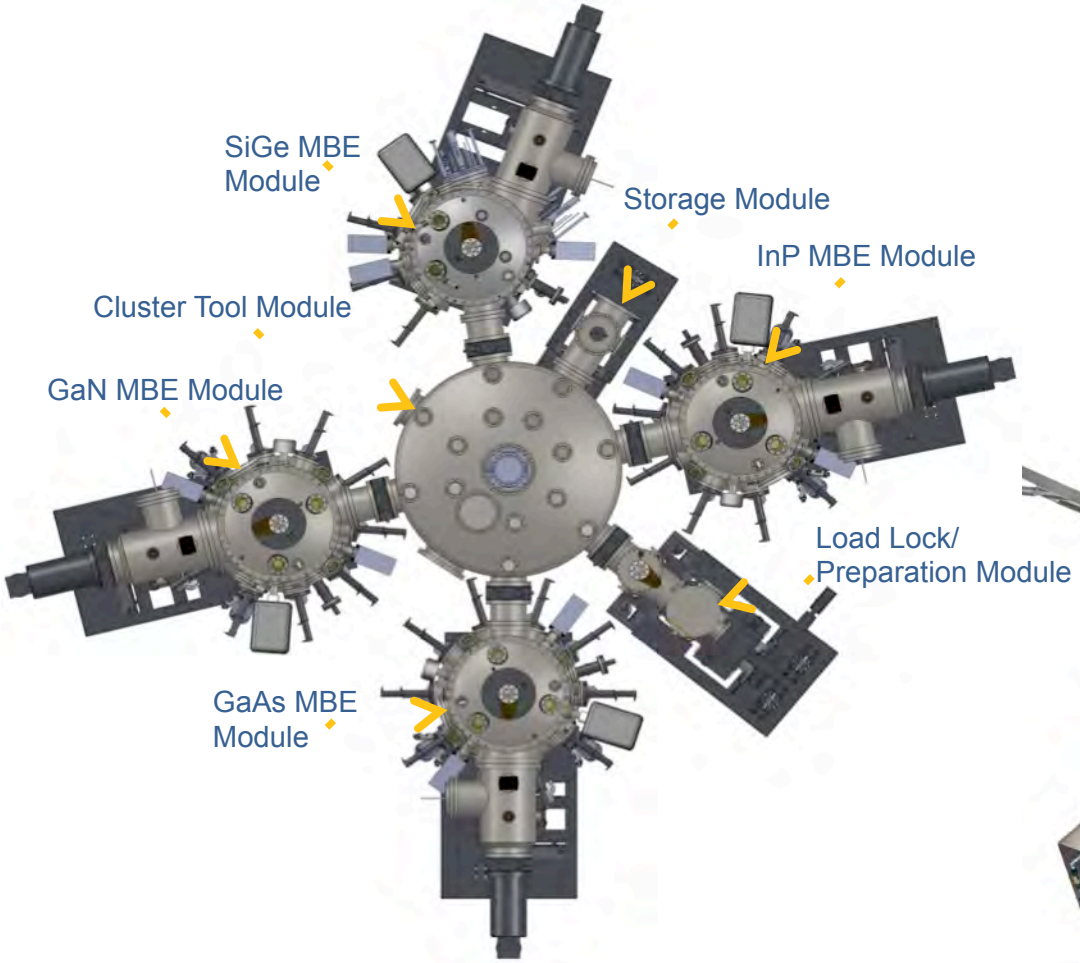
- The Benefits of MBE Combined with PLD
  - Full UHV (1 x 10^{-10} Torr)
  - Laser Ablation of Low Vapor Pressure Materials
  - Multiple Target Indexing and Rotation
  - Reactive Oxygen Injection
  - RHEED and Other In-Situ Metrology Tools
  - Variety of Deposition Sources

Large Scale Production MBE



Engines for Thin Film Innovation

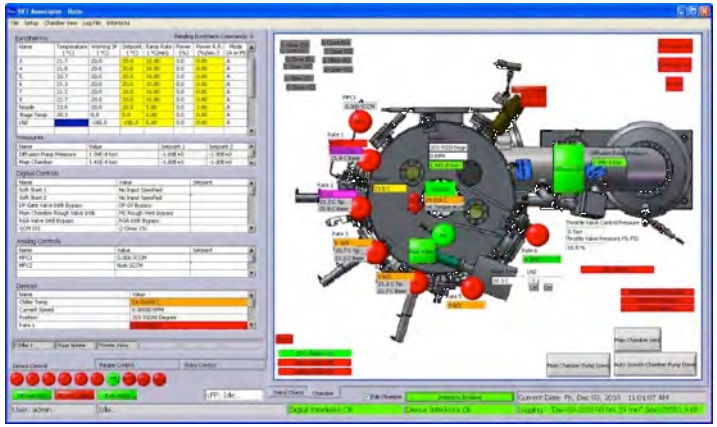
Cluster Tool with Four Modules

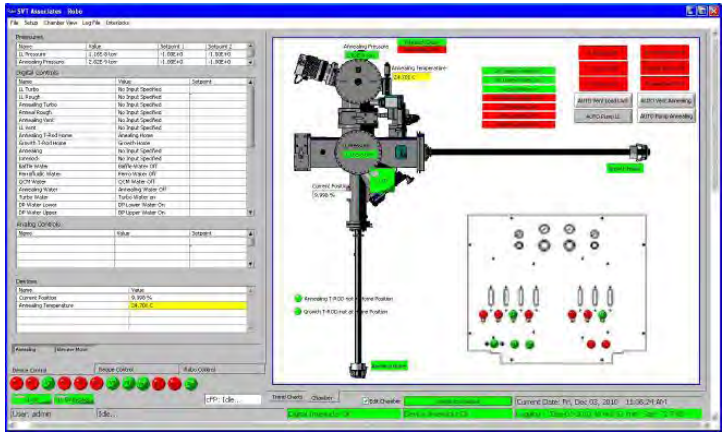


Engines for Thin Film Innovation

Robo MBE Control Package

- For automated MBE growth and process control
  - Rack Mounted PLC Controller
  - RoboMBE Process Control Firmware & Software
  - Recipe Generation and Control
  - Control Substrate Temperature and Rotation
  - Effusion Cell Temperature and Rate
  - RF Plasma Source Auto Tuning and Control
  - E-Beam Evaporator Control
  - Shutter Control
  - Gas Control
  - Logging of parameters during recipe run
  - Compute Rate and Thickness
  - Automated Pumpdown and Venting
  - System Bakeout
  - Differential Pumping
  - RHEED Analysis



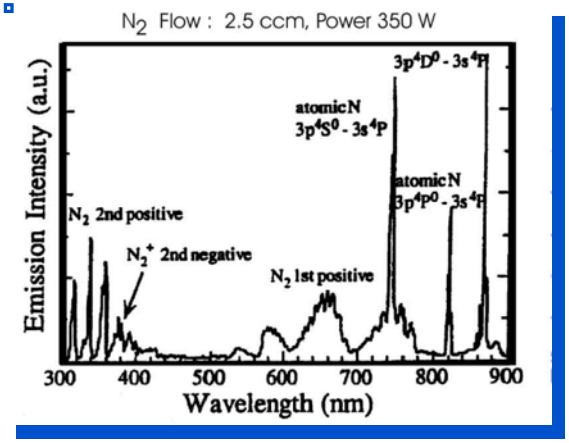


Sample Manipulators

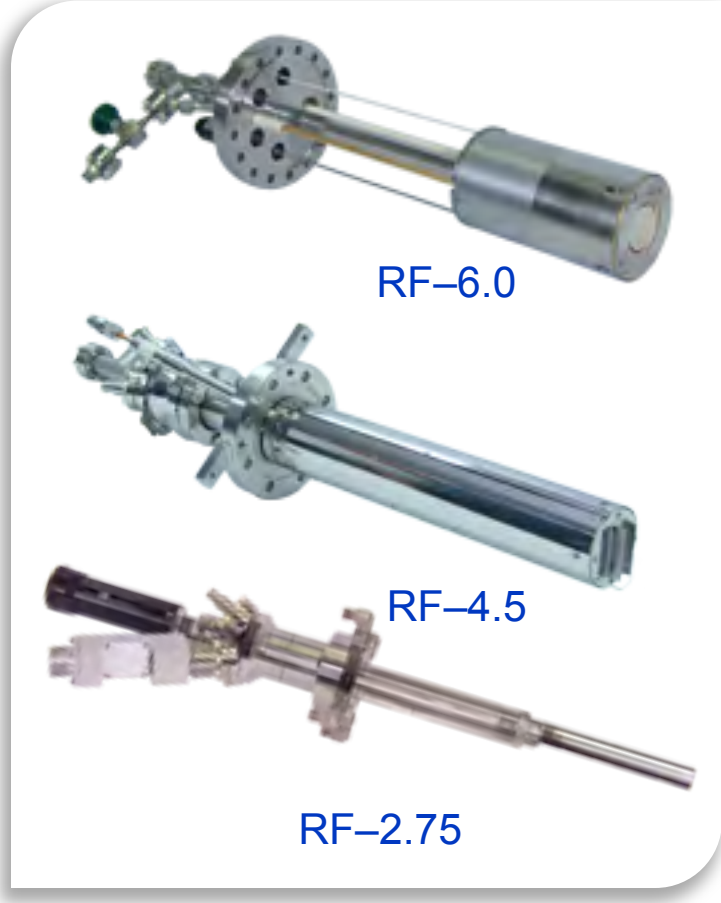
- Up To 1,200 °C Sample Temperature
- Continuous Rotation – Magnetic coupling
- Water cooling for bearings
- X, Y, and Z Translation
- Up to 14" Sample Size
- Oxygen and Ammonia Compatible Models
- Simple Sample Transfer

RF Plasma Source 4.5

- High Dissociation Efficiencies
- Active Ion Removal for High Quality Growth
- Nitrogen, Oxygen, and Hydrogen Configurations Available
- 2.75", 4.5", and 6.0" Sources Available



Nitrogen Plasma Spectrum for RF–4.5



Effusion Cells

Hot-Lip
Effusion Cel

Low-Temperature
Effusion Cell

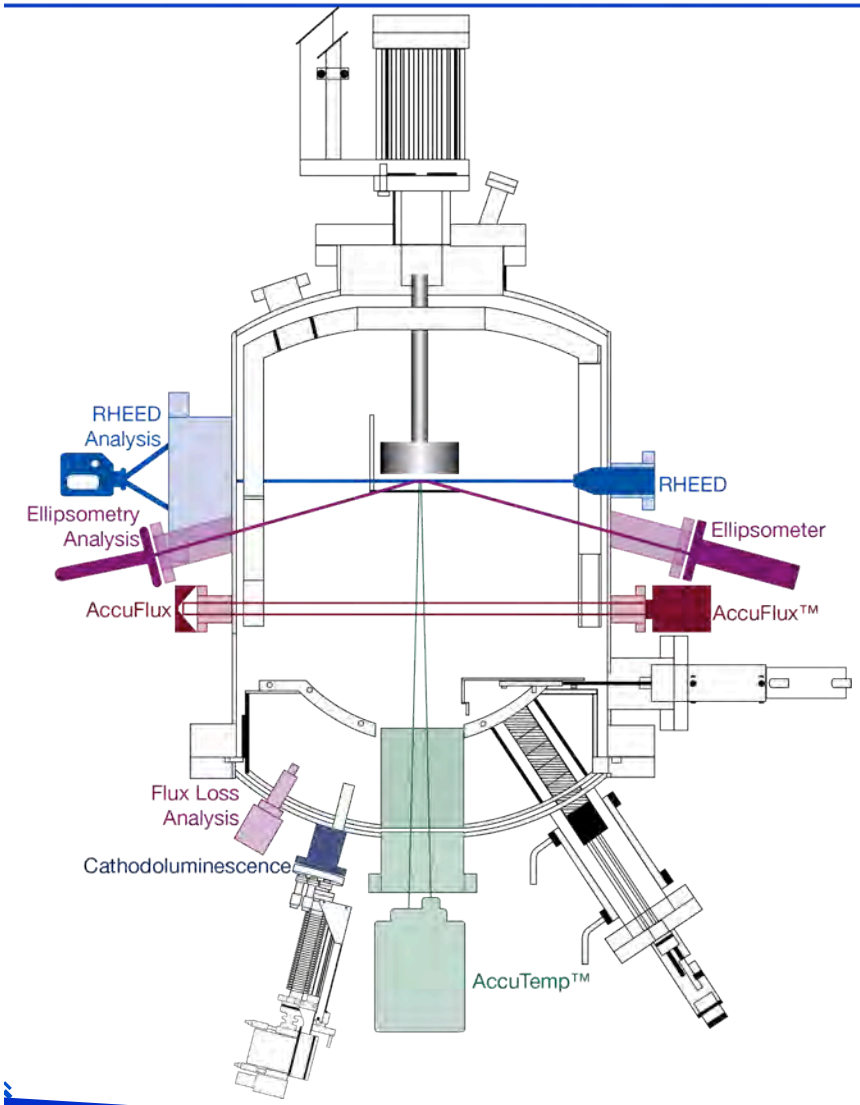
Dual Filament
Effusion Cell

Cold-Lip
Effusion Cell

Valved Cracker

- Ambient to 2,000 °C Temperature Range
- Oxygen and Ammonia Compatible Effusion Cells
- Integrated Shutter Option
- Integrate Water Cooling Shrouds Available
- 2 cc to Larger Than 7,500 cc Capacities Available
- Material Specific Designs
- Dual Filament Effusion Cell

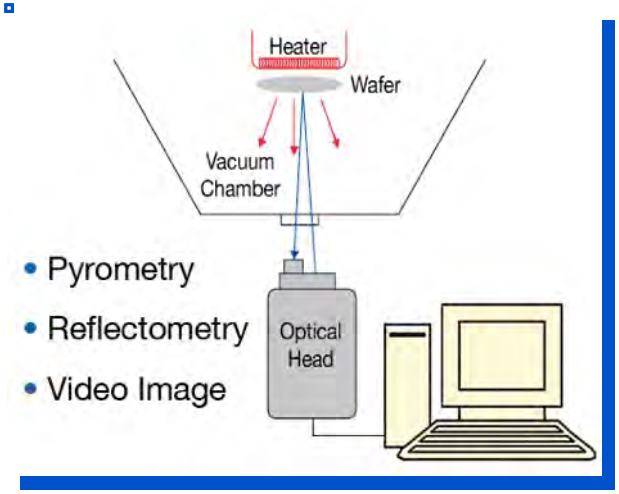
In-Situ Metrology

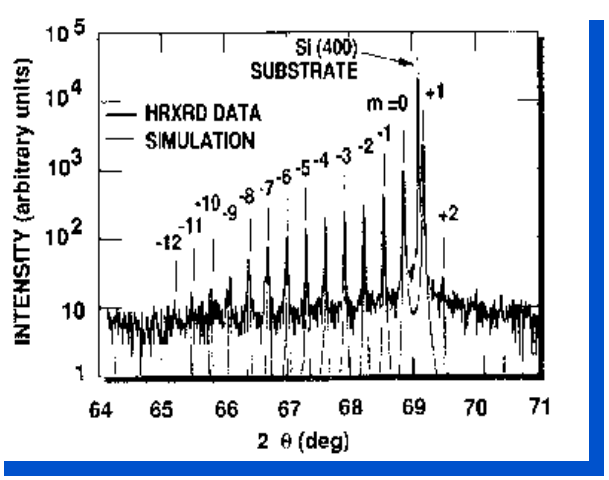


- SVTA Process Monitoring Tools
  - AccuTemp™ Process Monitor
  - AccuFlux™ Process Monitor
  - RHEED Image Analysis
  - Beam Flux Monitor
  - In-Situ Cathodoluminescence
  - Quartz Crystal Monitor
  - Residual Gas Monitor
  - In-Situ Ellipsometry

AccuTemp™ Process Monitor

- Growth Rate and Temperature From a Single Tool
  - Non-Intrusive Optical Design
  - Window Coating and Sample Wobble Compensated
  - New Low Temperature Monitor

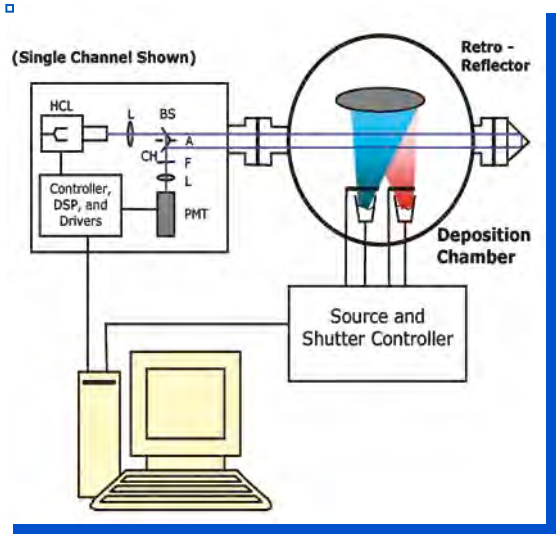


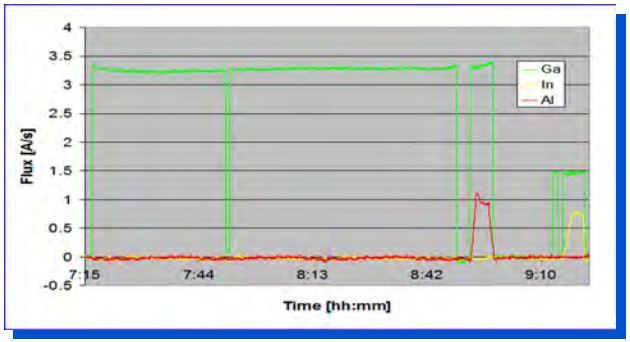


MBE

AccuFlux™ Process Monitor

- Increase Process Reproducibility
  - Non-Intrusive Optical Design
  - Material Specific Atomic Absorption
  - Monitor Up To 4 Materials Simultaneously
  - Precise Flux Measurement/High Sensitivity
  - Production Proven Performance
  - Drift Free Operation



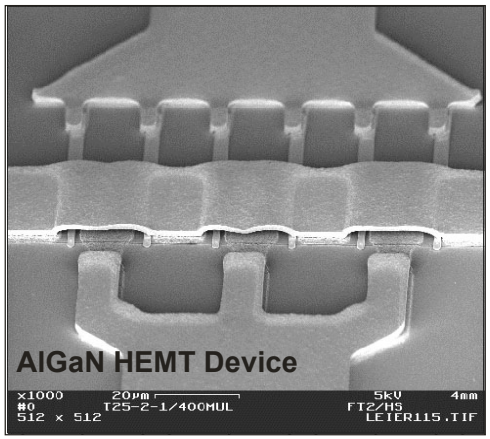


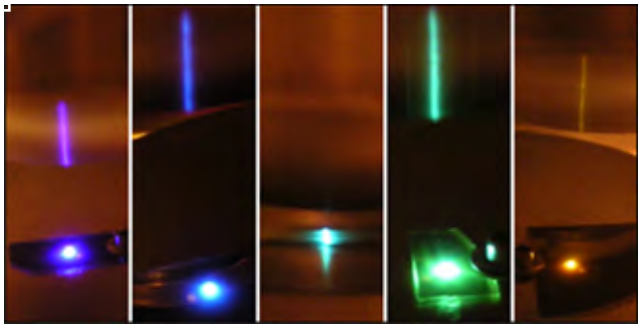
Data Taken from a Production 7x6" Wafer HBT Deposition (1 Hz sampling)

Typical AccuFlux™ Configuration

SVT Associates Epi Laboratory

- MBE and ALD Applications Lab
- Specializing in Nitride and Oxide Materials
- Full Characterization Laboratory
- Contract Services Available
- Epi Wafer Products





MBE System Summary

SVT Associates MBE System is a high performance tool which can be configured and customized for a wide range of material applications. SVT Associates manufactures the MBE systems, deposition sources, and the essential process monitors. This vertical integration results in superior quality and in-house process knowledge that the competition cannot offer.