

# Pioneer 120 Advanced Pulsed Laser Deposition System

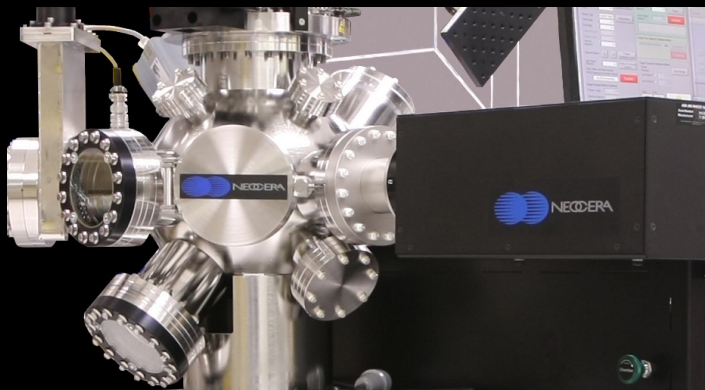


- Stand-alone turn-key PLD System.
- Deposition of epitaxial films, multilayer heterostructures and Superlattices.
- Deposition of nanoscale thin films using *insitu* RHEED diagnostics.
- Oxygen compatibility for oxide film depositions.
- Upgrades: Load-lock, Laser Heater, RF/DC Sputtering, Combinatorial PLD,
- Integration with XPS and ARPES UHV Cluster tools.



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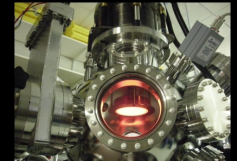
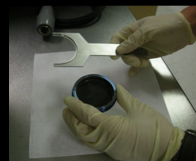
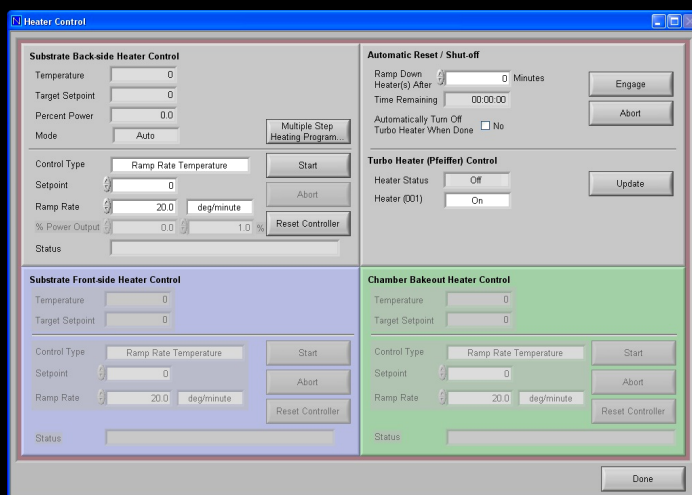


## Deposition Chamber

- 12" diameter spherical chamber
- 4.5" CF UV grade silica laser port.
- 4.5" CF port for RHEED gun.
- 6" CF port for RHEED screen.
- 6" CF pumping port.
- 6" CF port ( for RF / DC Sputtering)
- 2.75" CF port for vacuum gauge.
- 8" CF port for substrate heater stage.
- 8" CF port for target carousel stage.
- Additional 2.75" and 1.33" CF ports.
- Access door on hinges (non-UHV).

## Programmable Radiative Substrate Heater

- Substrate temperature: 850°C (max).
- Substrate rotation: 1-30 RPM (360° substrate rotation, compatible with future RHEED upgrade).
- Substrate size: 2-inch diameter (max), minimum dimension : 10 x10 mm<sup>2</sup>.
- Substrate sizes compatible with future load-lock upgrade.
- Heater temperature is controlled by a programmable PID controller
- Heater is oxygen compatible up to 1 atmosphere of oxygen.
- Heater is top-mounted with substrate surface facing and parallel to ground.
- Pre-ablation shutter is included.
- K-type thermocouple provides input to the PID controller.
- The controller is integrated with Neocera System software (Labview 2013).



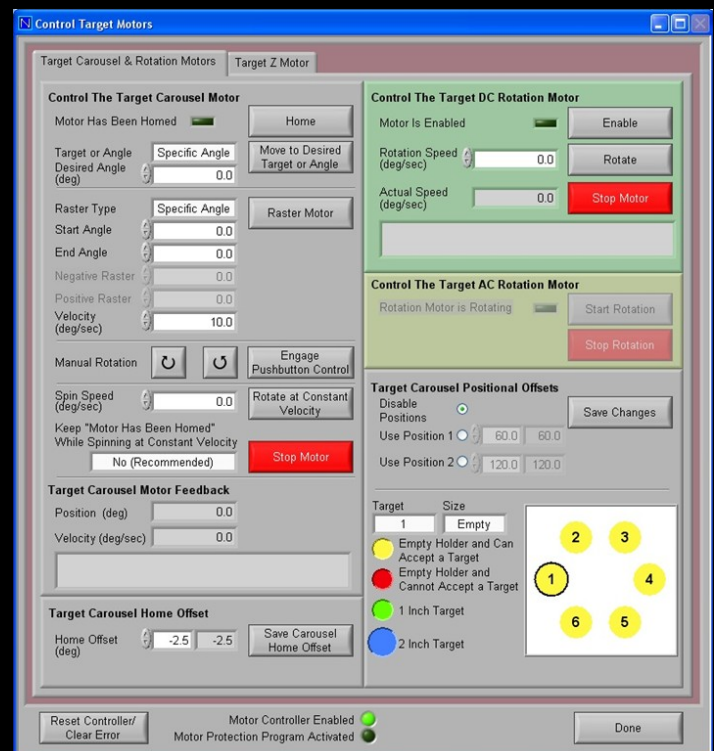
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## Multi-target Carousel

- Six 1-inch diameter targets or three 2-inch diameter targets.
- Target rotation, 360 degrees continuous (1-20 RPM).
- Target rastering (max 100 degrees/sec) for uniform ablation over the entire target surface.
- Target indexing for multilayers.
- Target height is adjustable (manual adjustability)
- Target shield protects targets from cross-contamination.
- Ideal for depositing epitaxial films, multilayers and superlattices.
- Unique target rastering protocol. Unique carousel design will facilitate Continuous Composition Spreads/ Combinatorial PLD.

- Target indexing, target rastering and target rotation are controlled by LabVIEW 2013 software, facilitating multilayers and superlattice depositions.
- Software controls external triggering of the laser-facilitates nano-scale thin film growth control.
- Software provides continuous composition spread of binary and ternary phase spreads (optional).



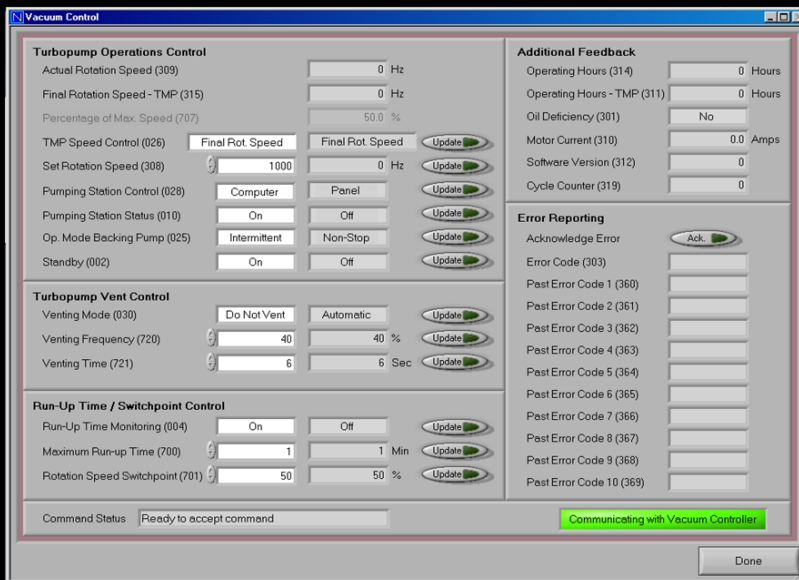


## Vacuum Pumping Package

- All-dry vacuum pumps: Turbomolecular pump backed by dry mechanical pump.
- Minimum base pressure:  $8 \times 10^{-8}$  Torr in standard PLD systems,  $5 \times 10^{-9}$  Torr in UHV PLD systems.
- Turbo-speed is controlled by software.

## Pressure Measurement and Control

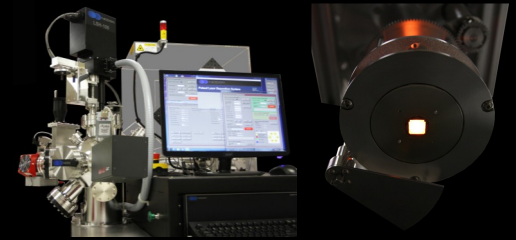
- Wide range vacuum gauges for pressure measurement from atmosphere to  $5 \times 10^{-9}$  Torr.
- MKS Mass Flow Controllers are integrated with PLD System software. Flow rate ~100 SCCM for Oxygen.
- Closed loop deposition-pressure control.



P120 Advanced PLD System with Load-lock



P120 Advanced PLD System with Laser heater



## PLD System Software

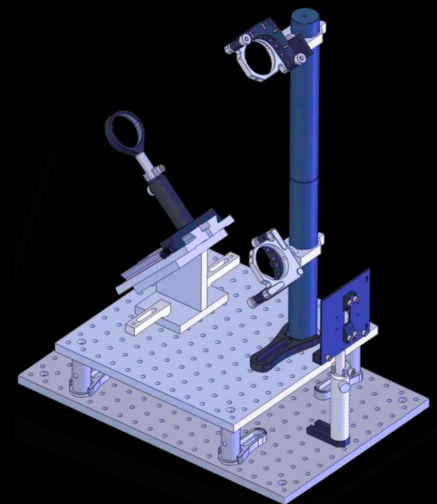
- Windows 7, LabVIEW 2013
- Controls substrate heating stage.
- Controls target carousel stage.
- Controls vacuum pumping stage.
- Controls Mass Flow Controllers.
- External laser triggering.
- Optional process automation.

## PLD System Utilities:

- Power: 110/220V, 20A, 1 Phase.
- Water: 1 gallon/minute at 20C.

## PLD Optics Package (KrF Excimer Laser)

- 45° and 22.5° degree Laser Mirrors for 248nm.
- Plano-convex Lens for 248nm. The focal length is approximately 50 cm.
- Adjustable Aperture.
- Anodized aluminum breadboard for mounting optics.
- Stable kinematic mounts for laser mirrors and lens with maximum clear aperture and wide angular range.
- A complete set of mounting rods, base plates.
- Light-tight enclosure to protect users from laser radiation.



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