Optical Diagnostic Suite (Schlieren, Interferometry, and Grid Image Refractometry) on OMEGA EP Using a 10-ns 263-nm Probe Beam


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**Project Overview**
- A 10-ns, 263-nm probe laser is the heart of the system.
- An F4 collection system provides access to the plasma via illumination.
- The system is initially configured for:
  - Schlieren/schlierenography
  - Interferometry
- It is designed for experiments on OMEGA EP.
- A 10-ps, 20-mJ, 263-nm probe laser will provide access.

**The Optical Collection System**
- Provides access to high density laser-produced plasmas.
- For experimental setup and analysis.
- Provides synthetic diagnostic images.

**Long-Pulse Plasmas**
- 200-μm resolution in the plasma plane.
- Interferometry is designed for a 5-μm resolution.
- A magnification of 4 provides a 5-mm field of view.

**Grid-Imaging Refractometry (GIR)**
- Measures the refraction of beamlets at three locations within the plasma.
- GIR extends the density measurement to 10^21 cm^-3.
- The system is designed to have a 2.5-mm field of view.

**Optical Modeling**
- A complete analysis package is being developed to provide experimental design and data reduction.

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**Laser System**
- Laser energy: 30 mJ at 263 nm.
- Average calculated background: < 40 W cm^-2.
- Pulse width: 10 ns.
- Provides temporal resolution via time-of-flight measurements.
- Use of the laser for temporal resolution: 10 ps.

**Experimental Diagnostic System**
- A 50-mg/g diagnostic table provides access for diagnostic expansion.

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**Optical Diagnostic Suite**
- Interferometry is limited to electron densities below 4 × 10^{20} cm^-3.
- Grid imaging/refractometry is limited to 10^{21} cm^-3.

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**Summary**
- A novel diagnostic platform for detailed plasma modeling.
- Optical diagnostics will provide temporal resolution.
- Grid imaging/refractometry will provide synthetic diagnostic images.