What is Thomson Scattering?

- Thomson Scattering experiment on MST: Does not perturb the plasma, which allows other experiments and diagnostics to be run simultaneously.
- Photons are created by high power lasers.
- Shined through a window on the top of the vacuum vessel.
- Scattered photons are collected with a large collection lens on the side.
- Distribution of electron energies in the plasma: corresponding distribution of wavelengths in the scattered photons.

What is MST and what is it used for?

- A plasma is an ionized gas containing enough particles to behave differently from an ordinary neutral gas. In a plasma, charged particles are free to move—they act collectively, and react to electric and magnetic fields.
- One area in which a lot of recent progress has been made is in the application of plasma physics to energy generation. The most promising approach in the quest for fusion energy is confining hot, dense plasma in a magnetic field—this is one goal of MST.
- Thomson Scattering Diagnostic: Efficiency (source at 1 kHz), adjusted to simulate pulse shape.
- Find the ratio of noise enhancement factor (F) to quantum efficiency.
- Data zeroed by subtracting off background noise levels.
- Relative efficiency of fiber optics determined.

Basic Setup:

- Lasers: Two 1064 nm Nd:YAG lasers that can be triggered to fire independently (two modes).
- Polychromators: 21 four-channel polychromators fitted with avalanche photodiodes (APDs).
- Diagnostics: Monitor 21 spatial points at once with 34 possible positions.
- Spatial resolution: ± 2 cm.

Detector Light Calibration:

- Purpose: to establish the gain and noise levels of the pulsed and DC outputs of the avalanche photodiode detectors (APDs).
- Lasers: Two 1064 nm Nd:YAG lasers that can be triggered to fire independently (two modes).
- Polychromators: 21 four-channel polychromators fitted with avalanche photodiode detectors (APDs).

D.C. Light Calibration—In progress:

- Light source: LED in DC mode.
- Source: DC Light Calibration.
- Data zeroed by subtracting off separate dark scans taken under same conditions as background noise levels.

Spectral Calibration of Polychromators:

- Purpose: to determine the spectral transmission of each polychromator.
- Light waves transmitted through each polychromator:
  - 1064 ± 4nm.
  - 1033 ± 4nm.
  - 1027 ± 4nm.
  - 1020 ± 4nm.

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