DIII–D Thomson Scattering Diagnostic Data Acquisition, Processing, and Analysis Software[*]

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One of the diagnostic systems critical to the success of the DIII–D tokamak fusion research experiment is the Thomson Scattering Diagnostic. This diagnostic is unique in that it measures electron temperature and density: 1) at multiple locations within the tokamak plasma; and 2) at different times throughout the plasma duration.

Thomson "raw" data are actually counts of scattered photons measured at different times and locations on the laser beam paths fired into the plasma. Real-time acquisition of this data is performed by specialized hardware. Once obtained, the raw data are processed into meaningful temperature and density values which can be visualized and further analyzed.

This paper will provide an overview of the entire Thomson diagnostic software and will focus on the data acquisition, processing, and analysis software implementation.

The Thomson diagnostic software falls into three general categories:

1. SET-UP AND CONTROL. Initializes all Thomson hardware and software, sychronizes with other DIII–D computers, and invokes other Thomson software as appropriate.

2. DATA ACQUISITION AND PROCESSING. Obtains raw measured data from memory and processes it into valid temperature and density values.

3. ANALYSIS. Provides a graphical user interface in which to perform analysis and sophisticated plotting of temperature and density measurements.