Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

A parallelized Python based Multi-Point Thomson Scattering analysis in NSTX-U JARED MILLER, Northeastern University, AHMED DIALLO, BENOIT LEBLANC, Princeton Plasma Physics Laboratory — Multi-Point Thomson Scattering (MPTS) is a reliable and accurate method of finding the temperature, density, and pressure of a magnetically confined plasma. Nd:YAG (1064 nm) lasers are fired into the plasma with a frequency of 60 Hz, and the light is Doppler shifted by Thomson scattering. Polychromators on the midplane of the tokamak pick up the light at various radii/scattering angles, and the avalanche photodiode's voltages are added to an MDSplus tree for later analysis. This project ports and optimizes the prior serial IDL MPTS code into a well-documented Python package that runs in parallel. Since there are 30 polychromators in the current NSTX setup (12 more will be added when NSTX-U is completed), using parallelism offers vast savings in performance. NumPy and SciPy further accelerate numerical calculations and matrix operations, Matplotlib and PyQt make an intuitive GUI with plots of the output, and Multiprocessing parallelizes the computationally intensive calculations. The Python package was designed with portability and flexibility in mind so it can be adapted for use in any polychromator-based MPTS system.

Jared Miller
Northeastern University

Date submitted: 11 Jul 2014 Electronic form version 1.4