Electron Temperature and Density Fluctuations During Improved Confinement Plasmas

Abstract

Recent upgrades to the MST Thomson scattering diagnostic have allowed detailed measurements at up to 250 kHz, dramatically expanding fast time scale fluctuations. These capabilities will allow investigations into correlated density and the planned addition of a fast laser system will improve maximum time resolution from observing remnant island structures between sawteeth events in standard plasmas.

Preliminary Results

• Reduced density fluctuations have been measured during improved confinement plasmas.
• Thermodynamic transport has been reduced by over an order of magnitude.
• MST Thomson diagnostic can observe fast electron dynamics.

Summary

• MST Thomson diagnostic can observe fast electron dynamics.
• Magnetic fluctuations drive significant particle transport during the sawtooth crashes.
• Thomson scattering diagnostic is not currently calibrated for absolute density measurement due to stray light at the laser wavelength.

Goals

• Measure magnetic fluctuations during improved Confinement
• Calibrate the Thomson scattering diagnostic for measurement of electron density fluctuations
• General Thomson-scattering density fluctuations with other diagnostic to obtain transport measurements

Motivation

• Background on transport properties of REPPs
• Magnetic fluctuations are primary transport in standard plasma confinement plasmas, remaining particle transport may be explained by electrostatic fluctuations.
• New MST Thomson scattering capabilities make it possible to measure fluctuations relevant to sawtooth triggering transport.
• Opposite to TF hardware have enabled temperature and density measurements of up to 250 kHz and below.
• New fast laser system (made possible by a new TF Hall, enabling improved range of fluctuations that can be measured by the TF diagnostic into kHz range)

Abstract

Transport in the Madison Symmetric Torus

Standard Plasmas

• Background on transport properties of REPPs

Improved Confinement

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