

HTPD 2018



Contribution ID : 233

Type : not specified

## 4.51 Ultra Fast Charge Exchange Recombination Spectroscopy Detector Upgrade for Ion Turbulence Measurements

Monday, 16 April 2018 20:31 (120)

A new actively cooled detector array and several recently implemented optimizations for the Ultra Fast Charge Exchange Recombination Spectroscopy (UF-CHERS) diagnostic on DIII-D have resulted in improved sensitivity to ion fluctuations. UF-CHERS measures carbon ion temperature ( $T_i$ ) and toroidal velocity ( $v_\theta$ ) fluctuations associated with long-wavelength turbulence and other plasma instabilities by observing the charge exchange (CX) reaction between injected Deuterium neutrals and intrinsic Carbon impurity with 1  $\mu$ s time resolution and  $\sim 1$  cm radial resolution. The upgrades resulted in a two-fold increase in signal levels and improved distinction between active CX and background emissions compared to a previous higher noise detector array, especially at the spectral line's edge, which are critical for curve fitting with sparse wavelength bins (8 bins/channel).  $T_i$  and  $v_\theta$  fluctuations up to  $\sim 230$  kHz have been measured with the new array. The cross-phase of Carbon density and temperature ( $n_C \times T_i$ ) associated with the Edge Harmonic Oscillations (EHO) in QH-mode, important to understanding increased energy confinement while allowing particle transport, were also measured. This work was supported by U.S. DOE grants DE-FG02-08ER54999, DE-FC02-04ER54698, and NSF GRFP grant DGE-1256259.

Primary author(s) : TRUONG, Dinh (University of Wisconsin - Madison)

Co-author(s) : MCKEE, George (University of Wisconsin - Madison); YAN, Zheng (University of Wisconsin - Madison); FONCK, Raymond (University of Wisconsin - Madison)

Presenter(s) : TRUONG, Dinh (University of Wisconsin - Madison); MCKEE, George (University of Wisconsin - Madison); YAN, Zheng (University of Wisconsin - Madison); FONCK, Raymond (University of Wisconsin - Madison)

Session Classification : Session #4, Monday Night Poster Session