Calculation of Impurity Poloidal Rotation from Measured Poloidal Asymmetries in the Toroidal Rotation of a Tokamak Plasma

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To improve capabilities to measure plasma poloidal rotation on the DIII-D tokamak, new chords for the charge exchange recombination spectroscopy diagnostic have been installed. Charge exchange recombination (CER) spectroscopy is a routine method for measuring impurity rotation in tokamak plasmas. These new chords make measurements of toroidal rotation on the high-field side of the plasma and are arranged in pairs that view a co-neutral-beam and a counter-neutral-beam. This design allows for the measurement of atomic physics effects that are significant in CER measurements [1]. Combining these rotation measurements with previously existing and similarly designed chords on the low-field side of the plasma allows poloidal asymmetry in the toroidal rotation to be measured without any need for the calculation of atomic physics corrections. The measured asymmetry is used to calculate poloidal rotation of the main impurity in the plasma. New hardware installed on Czerny-Turner spectrometers [2] and CCD cameras [3] allowed for more chords to be placed within existing optics and detector areas without sacrificing any diagnostic capabilities. Measurements with this new system were made throughout the 2011 DIII-D experimental campaign. Results are compared with neoclassical calculations of poloidal rotation.

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