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Measurements of impurity toroidal momentum balance equation for the C-2 FRC plasma DEEPAK GUPTA, Tri Alpha Energy, Inc., Rancho Santa Margarita, CA 92688, USA, L. SCHMITZ, Department of Physics, UCLA, CA 90095, USA, B. DENG, S. GUPTA, D. OSIN, L. STEINHAUER, K. ZHAI, Tri Alpha Energy, Inc., Rancho Santa Margarita, CA 92688, USA, THE TAE TEAM — In C-2 plasma [1], the direction of impurity-ion toroidal rotation is observed to be in the electron diamagnetic direction, which is opposite to the majority-ion toroidal rotation (in the ion diamagnetic direction). Theory/simulation suggests that the opposite rotation of impurity-ions may be explained based on the balance between ExB velocity and diamagnetic drift of impurity-ions. Even with identical radial pressure gradient profiles, the effect arises due to higher charge state (Z) of impurity ions, e.g., O^{4+} in a Deuterium plasma. To better understand this and further quantify the toroidal momentum balance across the separatrix, experiments have been performed with different mixtures of Helium and Deuterium. Microwave Doppler Backscattering (DBS) is used to measure ExB velocity. Ion Doppler spectroscopy is used to measure the He^+ impurity-ion temperature and velocity profiles. The density/pressure gradient is estimated from the absolute He^+ line intensity radial profile. These measurements help to understand the observed impurity rotation in the electron diamagnetic direction, and may also provide information about the majority-ion toroidal rotation and transport across the separatrix.

[1] M. Tuszewski et al., Phys. Rev. Lett. 108, 255008 (2012)

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