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Impurity-ion rotation dynamics in C-2W MARCEL NATIONS, DEEPAK GUPTA, LOTHAR SCHMITZ, HANNES LIENWEBER, THE TAE TEAM, TAE Technologies, Inc. — The C-2W experimental device (also called "Norman") produces and sustains advanced beam-driven field-reversed configuration (FRC) plasmas in steady state. Edge biasing of annular electrodes in the divertor region is routinely utilized as a boundary control technique to stabilize the FRC in the confinement vessel. The potential difference between open-field lines in the scrape-off layer creates a local radial electric field near the FRC separatrix and, consequently, $\boldsymbol{E}\times\boldsymbol{B}$ shear flow which suppresses the plasma turbulence. Recently deployed charge-exchange recombination spectroscopy (ChERS) diagnostics are used to measure rotation velocities of high charge-state oxygen impurity ions at 343.4 nm as well as deuterium main ions at 656 nm. Radial momentum balance gives $\boldsymbol{E}\times\boldsymbol{B}$ velocities near the separatrix which dominates the rotation dynamics of the oxygen impurities and are in good agreement with measured main-ion rotation and results from an independent Doppler Backscattering diagnostic. Results show a strong correlation between applied electrode bias voltage and inferred radial electric fields in the confinement vessel of C-2W.

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