Density Fluctuation and Edge Profile Measurements at the TAE Field Reversed Configuration Machine

EMIL RUSKOV, TAE Inc., LOTHAR SCHMITZ, LEI ZENG, TONY PEEBLES, UCLA, BIHE DENG, TAE Inc., TAE - UCLA COLLABORATION — Microwave reflectometry/Doppler Backscattering (DBS) is used for the first time to probe density fluctuations in a FRC plasma. A six channel tunable heterodyne system coupled to monostatic beam optics and a steerable parabolic mirror launches X/O-mode waves (26-90 GHz) towards the C-2 FRC plasma [1]. At oblique incidence, DBS is used to measure density turbulence with \( k_\theta \rho_i < 4 \). Turbulence levels increase with radius and are correlated with the density gradient: they are large in the SOL, and small near the field null. Recently, a dedicated, fast swept profile reflectometer was developed for measurement of the edge density profile in the 0.3-2.2x10^{13} \text{ cm}^{-3} range, with 2.5 \mu s maximum time resolution. The challenging requirements were solved with a bistatic two-band design, a specialized fast varactor-tuned source, and very fast data acquisition using a 1 Gs/s LeCroy oscilloscope. Sample edge density profiles, their comparison with the wings of CO2 interferometer profiles, and some physics implications will be discussed.