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Measurement of internal equilibrium and fluctuating magnetic field on DIII-D by using Radial Polarimeter-Interferometer JIE CHEN, WEIXING DING, DAVID BROWER, UCLA, REJEAN BOIVIN, General Atomics — A Faraday-effect based Radial Interferometer-Polarimeter (RIP) has been implemented on DIII-D for measurements of the magnetic equilibrium and the magnetic axis vertical position with fast time response that can be exploited for position and instability control. Furthermore, RIP can also measure internal radial magnetic fluctuations, e.g. internal kink - precursor to sawtooth crash, NTM seeding and plasma disruptions. By utilizing counter-rotating circular polarization technique, the diagnostic measures Faraday rotation and line-integrated electron density simultaneously with time response at microsecond scale and phase noise ˜0.01 degree/sqrt(kHz), corresponding to 1 Gs/sqrt(kHz) for typical DIII-D plasma conditions. Measurement errors has been assessed and minimized. Systematic comparison between RIP measurement and MSE-constrained EFIT using a synthetic diagnostic shows good agreement, manifesting consistency of internal magnetic field measurement between RIP and other magnetic diagnostics. **Supported by USDOE grants DE-FG03-01ER54615 and DE-FC02-04ER54698.*

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