Abstract Submitted
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Synthetic analysis results for Microwave Imaging Reflectometry on the DIII-D Tokamak XIAOXIN REN, CHRISTOPHER MUSCATELLO, University of California-Davis, Davis, California, USA, BENJAMIN TOBIAS, Princeton Plasma Physics Laboratory, Princeton, New Jersey, USA, CALVIN DOMIER, XING HU, NEVILLE LUHMANN, University of California-Davis, Davis, California, USA — Microwave Imaging Refletometry (MIR) is a radar like system to measure the density fluctuations of the plasma in both poloidal and radial directions. A fully synthetic analysis of MIR based on a DIII-D plasma is conducted by applying sophisticated simulation tools. The 2D full-wave reflectometry code FWR2D is coupled to optical design software to propagate the probe beam and to detect the instrumental response of the reflected signal. The transmitting optics are designed such that the wavefront of the probing beam matches the shape of the cutoff surface to keep the best imaging quality. Correlation between the cutoff fluctuation and the measured phase fluctuation is calculated to check the imaging quality. The simulation results reveal that MIR has the ability to decode fluctuations with wavenumbers less than 2.5 cm^{-1} and radial density variations up to 3%, with a distance correlation value equal to or above 0.6. MIR is proven to be a robust density fluctuation measurement tool based on a series of sensitivity studies, for example incidence angle of receiver sightlines and focal position offset from the cutoff.

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