

HTPD 2018



Contribution ID : 27

Type : not specified

10.12 First step towards a synthetic diagnostic for magnetic fluctuation measurements using cross-polarization scattering on DIII-D

Wednesday, 18 April 2018 10:31 (120)

Cross-polarization scattering (CPS) provides localized magnetic fluctuation measurements in fusion plasmas based upon the process where magnetic fluctuations scatter electromagnetic radiation into the perpendicular polarization. The CPS system on DIII-D utilizes the probe beam of the Doppler backscattering (DBS) diagnostic and a crossing CPS receive beam, which allows simultaneous density and magnetic fluctuation measurements with good spatial resolution and wavenumber coverage. The interpretation of the signals is challenging due to the complex propagation of the DBS probing beam and CPS receive beam in plasmas. A synthetic diagnostic for CPS is therefore essential to interpreting data and detailed validation tests of non-linear turbulence simulations. This work reports a first step towards a synthetic diagnostic for CPS, utilizing GENRAY, a 3-D ray tracing code, to simulate the propagation of the DBS probing and CPS receive beam centers within the plasma. Results of probed wavenumbers in the current CPS system on DIII-D, and optimization of antenna locations and orientations for future system upgrades are presented. Work supported by USDOE Grants DE-FG02-08ER54984 and DE-FC02-04ER54698.

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Session Classification : Session #10, Wednesday Morning Poster Session