Abstract Submitted
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**Two Dimensional Synthetic Electron Cyclotron Emission Imaging**[1] LEI SHI, ERNEST J. VALEO, BENJAMIN J. TOBIAS, GERRIT J. KRAMER, CHANG LIU, WILLIAM M. TANG, Princeton Plasma Phys Laboratory — Electron Cyclotron Emission (ECE) has been widely used as a measurement of the electron temperature profile in magnetically confined plasmas. The ECE Imaging (ECEI) system provides additional vertical resolutions, and is used to measure the electron temperature fluctuations. The vertical resolution is typically a few centi-meters which is sometimes comparable to the vertical wave length of the underlying fluctuations. The ray-tracing technique used in most synthetic ECE codes to determine the origin and spatial extent of the ECE radiations is not accurate when the refraction and diffraction due to the fluctuations are important. In this presentation, we introduce a new synthetic ECEI code which solves the wave propagation up to the 2nd order of the WKB approximation, and provides full 2D information of the ECE source. We'll show that when the ECE frequency is near the cutoff, the refraction due to the fluctuations is important. A "trapping" of the ECE source by the density fluctuations is identified, and is potentially useful for determining the cross phase between electron temperature and density fluctuations. The new formalism is also used to study the Runaway Electrons contribution to the ECE signal, and provides insights to the measured ECE spectrum on DIII-D.

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