

# Electron Temperature Measurements from Optically Gray Third Harmonic Electron Cyclotron Emission in the DIII-D Tokamak

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## *Abstract*

In many high performance discharges in the DIII-D tokamak [J.L. Luxon and L.G. Davis, *Fusion Technol.* **8**, 441 (1985)] high electron density prevents determining the electron temperature from the second harmonic electron cyclotron emission (ECE). A technique for obtaining central electron temperatures from optically gray third harmonic ECE is presented which does not require knowledge of the reflective properties of the vessel wall. The temperature values derived from ECE spectra measured with an absolutely calibrated Michelson interferometer agree with independent measurements by Thomson scattering. As part of this work, a method of determining the optical depth of third harmonic frequencies in a low aspect ratio tokamak is also demonstrated. The optical depth measurements are in agreement with calculations correct to first order in Larmor radius.

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