

## **CO<sub>2</sub> Laser Polarimeter for Faraday Rotation Measurements in the DIII-D Tokamak\***

M.A. Van Zeeland, R.L. Boivin, T.N. Carlstrom, T.M. Deterly

General Atomics, P.O. Box 85608, San Diego, California 92186-5608, USA

Email: vanzeeland@fusion.gat.com

A tangential viewing, 10.59  $\mu\text{m}$  CO<sub>2</sub> laser polarimeter for electron density measurements based on plasma induced Faraday rotation has been installed on DIII-D. The system uses co-linear right and left-hand circularly polarized beams with a difference frequency of 40 MHz to generate the necessary beat signal for heterodyne phase detection. The high-resolution phase information necessary to adequately resolve degree level polarization rotation is obtained using an all digital “real-time” phase demodulation scheme based on modern Digital Signal Processing techniques. Initial application of the system to DIII-D disruption mitigation experiments utilizing “massive gas jet” injection exhibit reliable operation and excellent agreement with CO<sub>2</sub> interferometer measurements.

---

\*This work supported by the U.S. Department of Energy under DE-FC02-04ER54698.