

## **Electron Cyclotron Emission Measurements of Rotating and Interacting Magnetic Islands in DIII-D\***

F. Volpe,<sup>1</sup> M.E. Austin,<sup>2</sup> and R.J. La Haye,<sup>3</sup>

<sup>1</sup>*Max-Planck-Gesellschaft, Germany*

<sup>2</sup>*University of Texas, Austin, Texas, USA*

<sup>3</sup>*General Atomics, San Diego, California, USA*

2D images of rotating magnetic islands were resolved by fast electron cyclotron emission (ECE) measurements in the DIII-D tokamak. Islands of various poloidal/toroidal mode numbers  $m/n$  were identified, including modes that are ambiguous on the basis of magnetic measurements. For example, observations of an island on both the low and high field side allow the determination of its poloidal parity. Island O- and X-points were radially and toroidally localized by ECE. The shape and internal structure of magnetic islands was also measured in detail and transport and confinement within the island were inferred. It is shown that, when locked to each other, a well-developed  $3/2$  mode deforms the  $2/1$  island and gives rise to a  $4/2$  component. This is ascribed to the attraction between parallel filaments of current. Ergodization of the islands was also observed, in the very last stage before locking.

The first results from a new oblique ECE radial and phase detector of NTMs will also be presented. This diagnostic tracks the movement of the island directly along the ECCD launch direction. As a consequence, ECE experiences the same Doppler broadening and relativistic downshift as ECCD and can be used for its modulation, with no need for equilibrium reconstructions or complicated helical extrapolations.

\*Work supported by USDOE under DE-FG03-97ER54415 and DE-FC02-04ER54698.