EC 12

12th Joint Workshop on Electron Cyclotron Emission and Electron Cyclotron Resonance Heating

PRE-REGISTRATION FORM
(to be returned to V. Poli by January 15, 2002)

Please, mark the checkboxes corresponding to your case.

✔ **I plan to participate in the EC-12 Workshop**

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✔ **I intend to submit an abstract**

Subject : ☐ **Theory** ✔ **Experiments** ☐ **Technology**

Topic : ☐ **ECE** ✔ **ECRH / ECCD**

I prefer : ✔ **oral presentation** ☐ **poster**

Special needs or questions:

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DETAILED MEASUREMENTS OF ECCD EFFICIENCY ON DIII–D FOR COMPARISON WITH THEORY*

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Recent experiments on the DIII–D tokamak have focused on determining the effect of trapped particles on the electron cyclotron current drive (ECCD) efficiency. Using internal magnetic measurements from the motional Stark effect (MSE) diagnostic, driven currents as small as 1% of the total plasma current can be accurately measured. As a result, the physics of ECCD can be explored in unprecedented detail since the ECCD efficiency can be determined over a wide range of plasma conditions. Two separate methods have been used to deduce the ECCD from the MSE signals. In the first method, the measured MSE signals were compared to simulations of the MSE evolution using a model of the ECCD profile. The parameters of the model – location, width, and magnitude – were adjusted until a best fit between the measured and simulated MSE signals was obtained. In the second method, the non-inductive current drive was determined from the evolution of the poloidal magnetic flux obtained from a magnetic equilibrium reconstruction constrained by the MSE data. The ECCD location determined from these methods was in agreement with ray tracing calculations. In addition, the width of the ECCD profile appeared to be at least as narrow as the ray tracing predictions, indicating that current profile broadening by the transport of energetic electrons was minimal, although more study is required in this area. The ECCD efficiency was measured for co, counter, and radial injection, with little current drive observed for the latter case as expected. The ECCD efficiency was measured to increase with increasing electron beta, which can be explained due to reduced electron trapping effects. The beta dependence was stronger for more off-axis ECCD since the trapped particle fraction increased with radius. Additional experiments on the effect of electron trapping have measured the ECCD efficiency as a function of the plasma radius and poloidal location (magnetic field strength). For all of these cases, the measured ECCD has been compared to both the linear theory (i.e., TORAY) as well as a Fokker-Planck calculation including the effect of the parallel electric field (i.e., CQL3D). The experimental ECCD was found to be in better agreement with the more complete Fokker-Planck calculation.

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