# STABILIZATION AND SUPPRESSION OF TEARING MODES USING ELECTRON CYCLOTRON CURRENT DRIVE IN THE DIII-D TOKAMAK*

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Tearing modes that occur at high pressure have been suppressed under a variety of conditions in the DIII-D tokamak by the application of localized electron cyclotron current drive (ECCD). The suppression proceeds most efficiently when the driven current is generated at the location of the island and is in the same direction as the total plasma current. Both of these effects were predicted by theory. Feedback schemes have been used to optimize the suppression by varying the current drive location to maximize the suppression rate.

Recently, real-time MHD equilibrium reconstructions that include measurements of the internal magnetic fields using motional Stark effect (MSE) spectroscopy have provided a means to maintain the relative position of the ECCD and the magnetic surface where the mode appeared after the mode is suppressed. This capability has allowed operation free of 3/2 tearing modes up to the 2/1 mode onset and operation free of 2/1 modes up to the no-wall ideal n=1 stability limit. No instability was observed in the case of 2/1 suppression at the highest pressures attempted.

In addition to suppression of an existing mode, this ability to place the ECCD at the appropriate position in the absence of a tearing mode was applied to stabilize completely either the 3/2 or the 2/1 tearing mode. The ECCD was applied at relatively low pressure, but the modes were stabilized completely during a subsequent increase in pressure, up to the same limitations described above for the case of suppression. The mechanism for stabilization is not yet identified clearly. Modeling of suppression cases has indicated the importance of both the change in the classical stability index and the direct current drive in the island. Comparison of modeling, using the modified Rutherford equation, will be presented.

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