

**Abstract Submitted for the 50th Annual Meeting
Division of Plasma Physics
November 17–21, 2008, Dallas, Texas**

Category Number and Subject:

Theory Experiment

Synergy in Two-Frequency Fast Wave Cyclotron Harmonic Absorption in DIII-D,* R.I. Pinsky, M. Choi, *General Atomics*, M. Porkolab, *MIT*, W.W. Heidbrink, Y. Zhu, *UCI*, F.W. Baity, *ORNL*, J.C. Hosea, *PPPL* – Fast waves (FWs) at 60 MHz and at 90 MHz are coupled to DIII-D discharges for central heating and current drive at net FW power levels up to 3.5 MW. The primary absorption mechanism is intended to be direct electron damping in the plasma core. In 2 T discharges with fast deuteron populations from neutral beam injection, 4th and 6th deuterium cyclotron harmonic absorption on the fast ions competes with direct electron damping. Previous experiments have shown that the 6th harmonic absorption of the 90 MHz FWs is weaker than the 4th harmonic absorption of 60 MHz FWs, in agreement with a model that includes unspecified edge losses. Recent experiments have shown that if the fast deuterons are accelerated by absorption of 60 MHz (4th harmonic) FWs, adding 90 MHz power (6th harmonic) can increase the fusion neutron rate by a larger increment than is obtained with 90 MHz power alone. Details of this synergy between 4th and 6th harmonic absorption are presented.

*Work supported by the US DOE under DE-FC02-04ER54698, DE-FG02-90ER54084, SC-G903402, DE-AC05-00OR22725, and DE-AC02-76CH03073.