

Modeling of Synergy Between 4th and 6th Harmonic Absorptions of Fast Wave on Fast Ions in DIII-D Tokamak*

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In previous DIII-D experiments, it has been clearly observed that damping of 60 MHz fast wave (FW) power on injected deuteron beam fast ions at the 4th harmonic is much stronger than that of 90 MHz FW at the 6th harmonic under the similar conditions. As evidenced, larger stored energy, stronger neutron emission rates and acceleration of injected beam ions from fast ion D_α (FIDA) spectroscopy were measured in the 60 MHz FW experiment.

In recent DIII-D experiments [1], where 60 and 90 MHz FW powers are applied simultaneously in the plasma, the synergy effect was observed. Measured neutron rates from the two combined FW powers are much stronger than the sum of those from separate 60 and 90 MHz FW powers.

To understand the synergy effect theoretically, we will attempt to model simultaneous interaction of injected beam ions with two FWs using the 5-D Monte-Carlo code ORBIT-RF coupled with the 2-D full wave AORSA. First simulation results will be presented with comparisons of FIDA signals and measured neutron rates.

[1] R.I. Pinsky et al., in *Radio Frequency Power in Plasmas (Proc. 18th Top. Conf., Gent, Belgium, 2009)* (AIP, New York, 2009), p. 77.

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