

**Abstract Submitted for the Forty-Eighth Annual Meeting  
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Category Number and Subject:

Theory     Experiment

**Second Harmonic Electron Cyclotron Pre-Ionization in the DIII-D Tokamak,\*** G.L. Jackson, J.S. deGrassie, J. Lohr, C.P. Moeller, and R. Prater, *General Atomics* – Second harmonic pre-ionization, i.e. the production of plasma before the application of a toroidal electric field,  $E_\phi$ , has been successfully demonstrated in the DIII-D tokamak using both the previously installed 60 GHz gyrotrons ( $B_\phi \leq 1.05\text{T}$ ) and the present 110 GHz system ( $B_\phi \approx 1.9\text{ T}$ ). Pre-ionization and electron cyclotron (EC) assisted startup may be important in future devices such as ITER (at reduced toroidal magnetic field) and K-STAR where thicker vacuum liners and superconducting coils limit the maximum  $E_\phi$  to values which are marginal for plasma initiation and burnthrough. In the DIII-D experiments the X-mode 2nd harmonic pre-ionization was reproducible, initially occurred at the 2nd harmonic EC resonance, and then filled the vessel volume. We will present the characteristics of these pre-ionized plasmas and parameter scans of EC power, neutral pressure, and toroidal field. The pre-ionization scenario will be discussed including modeling of single electron collisionless heating.

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