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Fully Non-Inductive Current Drive Experiments Using 28 GHz and 8.2 GHz Electron Cyclotron Waves in QUEST

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28 GHz Electron Cyclotron Current Drive (ECCD) effect was clearly observed in Ohmically heated plasmas with feedback regulation of center solenoid coil current in 2nd harmonic inboard off-axis heating scenario. In non-inductive current drive experiments only by the 28 GHz injection, 54 kA plasma current was sustained for 0.9 s. Higher plasma current of 66 kA was non-inductively obtained by slow ramp-up of vertical field using the 28 GHz ECH/ECCD. Non-inductive high-density/ current plasma start-up, which is a key issue for fusion reactor design has been demonstrated using 2nd harmonic ECH/ECCD. Density jump across 8.2 GHz cutoff density was observed in superposed 28 GHz / 8.2 GHz injections. The 50 kA plasmas were sustained by the 8.2 GHz injection into the 28 GHz target plasma if the stable plasma shaping was obtained.

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