Special Plasma Physics Seminar

UCLA College | Physical Sciences Physics & Astronomy

Physics & Astronomy Building (PAB) Room 4-330
Tuesday, June 2nd at 12:30 PM
https://ucla.zoom.us/j/97949507903?pwd=6baP0AcJHVnC7mbi50HPWXSnepx5jd.1

The high-power helicon program at DIII-D

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Steady-state advanced tokamak fusion reactors require external off-axis current drive sources to enable fully non-inductive operation. Helicon current drive, also called fast wave current drive in the lower hybrid range of frequencies, has long been regarded as a promising current drive tool for reactor grade plasmas, but the technology remained unproven in experiments until recently. This talk focuses upon measurements of helicon heating and current drive in plasmas where the other wave polarization, i.e., the slow wave, cannot propagate in the core, avoiding confusion about which polarization is responsible for the observations. Results were obtained at DIII-D with a MW-level 476 MHz system featuring a novel load-resilient comb-line traveling wave antenna. The concept of the traveling wave antenna and its operational advantages will be discussed. Electron heating was observed in both L- and H-mode plasmas. Estimates of the absorbed power in L-mode indicate that the observed heating scales with the first-pass absorption predicted by GENRAY ray-tracing modeling. Evidence of current drive was seen in L-mode plasmas. Local measurements of the magnetic field pitch angle using the motional Stark effect (MSE) diagnostic showed reproducible changes in L-mode plasmas with helicon power compared to L-mode plasmas without helicon power. A much earlier observed onset of sawteeth is further independent evidence of current drive. The experimental results at DIII-D provide the first experimental observation of current drive due to helicon waves in tokamaks.

Host: Chris Niemann