HTPD 2018

Contribution ID : **179** Type : **not specified**

2.55 Non-Inductive Vertical Position Measurements by Faraday-effect Polarimetry On EAST tokamak

Monday, 16 April 2018 10:46 (120)

The vertical position for elongated, long-pulse tokamak plasmas has to be precisely controlled to optimize performance and prevent disruptions. For a steady-state tokamak reactor, integration of voltage signals arising from flux change is extremely challenging due to zero-offset drift as the measurement is intrinsically inductive. The vertical position of the plasma core current density is defined as the position where radial magnetic field is zero, making this parameter critical to investigating vertical instability. A Faraday-effect POlarimeter-INTerferometer system has been developed for measuring the internal radial magnetic field in EAST. Horizontally-viewing chords at/near the midplane allow us to determine plasma vertical position non-inductively with sub-centimeter spatial resolution and 1 ⊠s time response. The polarimeter-based position measurement, which does not require equilibrium reconstruction, is benchmarked against conventional flux loop measurements for EAST discharges. Non-inductive vertical position measurements are very promising for future steady-state plasmas and fast time response allows for direct feedback on plasma vertical displacement instabilities. Work supported by US DOE through grants DE-FG02-01ER54615 and DC-SC0010469.

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Session Classification : Session #2, Monday Morning Poster Session