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Fast wave density and species mix diagnostic (abstract)^{a)}

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(Presented on 19 June 2000)

Since fast Alfvén waves propagate across a plasma at the Alfvén speed, the plasma mass density can be determined through interferometry. In previous measurements on the DIII-D tokamak,¹ fast waves (~ 100 MHz, ~ 5 W) were launched from an antenna at the outer midplane, but detection of the signal was hampered by poor sensitivity of the receiving antenna, which was mounted behind protective graphite tiles on the inner wall. We modified several graphite tiles to act as more sensitive receiving antennas. At lower frequencies (~ 25 MHz), fast waves can reflect from the ion-ion hybrid cutoff layer. The position of this layer is sensitive to the ratio of hydrogen to deuterium in the plasma. Receiving antennas on the outer wall will measure the hydrogen concentration through reflectometry. Launching other frequencies may yield impurity density ratios as well. These techniques may be useful for measuring relative densities of D, T, and α particles in burning plasmas. © 2001 American Institute of Physics. [DOI: 10.1063/1.1323471]

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¹H. Ikezi, *Rev. Sci. Instrum.* **78**, 68 (1997).