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Externally driven global Alfvén eigenmodes applied for effective mass number measurement on TCABR

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ABSTRACT

The excitation and detection of Global Alfvén Eigenmodes on TCABR for diagnostic purposes are presented. The modes can be excited with one or two in-vessel antennae, with up to 15 A of current in each, in the frequency range from 2 to 4 MHz. This scheme allows the estimation of the effective mass number at the plasma center, which value is affected by impurity concentration in the core. An amplifier based on MOSFETs is used to excite the waves driven by low power, in order to not change the basic plasma parameters. The variation of the GAE with density is verified and the location of the mode resonance at the plasma center is confirmed by the sawtooth beating, so that the correspondingly beating phase inversion improves the precision on the resonant condition determination. The toroidal parity of the modes N = 1,2 is determined by use of two opposite located antennae with different phase of the RF current. Knowledge of toroidal mode number is important as it identifies GAE location and defines the estimated effective mass value. The estimated value for A_{eff} is ~1.4–1.5, corresponding to 5–7% of carbon impurity concentration. The measured value of A_{eff} is used to estimate Z_{eff}, which is compared to older TCA experiments and the value obtained by the Spitzer conductivity.

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