Excitation Of GAW in TCABR With Low RF Power And Parity Selection

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Recent results of Global Alfvén wave (GAW) excitation driven by two external antennae fed by low radio-frequency (RF) power (≤1kW) in tokamak TCABR are presented. The goal of this work is to develop a diagnostic tool for mass number identification that is based on the excitation of Alfvén waves ($\omega_A = V_A/R\,(N + M/q)$, $V_A = B/\sqrt{\mu_0 n m_H A_{eff}}$) using low power RF generators when the waves can be excited without disturbing the basic plasma parameters. This method named MHD diagnostics has already been developed on other tokamaks using toroidicity induced Alfvén eigenmodes as well for GAW [1-4]. Two magnetic probes are used for measurements of the magnetic field perturbations. Two regimes of excitation are used, in the first regime that is mainly used, the fixed RF frequency is combined with density rise and relaxation approximately from 10^{13} to 2×10^{13} /cm^3 to meet the GAW resonance, and RF frequency sweeps of ≈2-4 MHz are applied in the second case. Analyzed plasma discharges are accompanied by saw-tooth (ST) oscillations, which simplify registration of the resonances due to sawtooth density oscillation that changes the GAW phase and frequency at the resonance.

To resolve difficulties of the identification of the toroidal mode number using the magnetic probe signals, we fed two antennas in opposite toroidal location by RF current with phase φ= 0 or π. Depending on the phase between the RF current in the two antennas, we can choose the parity of the excited toroidal mode number (odd or even). That has given us the chance to identify the mode number of the excited GAWs. Finally, the obtained experimental results will be discussed and the dependency of the GAW frequency with respect to the plasma density is shown.

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