GAM radial structure in the OH and ECRH plasmas
at the T-10 tokamak

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Zonal flows and their high-frequency counterpart, the Geodesic Acoustic Modes
(GAMs) are considered as a possible mechanism of the plasma turbulence self-regulation.
In the T-10 tokamak GAM has been directly studied by the heavy ion beam probing
(HIBP).

Regimes with Ohmic and auxiliary on-axis and off-axis electron cyclotron resonance
heating (ECRH) were studied \(B = 1.5–2.4\) T, \(I_p = 140-250\) kA, \(n_e = (0.6 – 3) \times 10^{19}\) m\(^{-3}\),
\(P_{EC} < 1.2\text{MW}\). The regimes with the carbon limiter and tungsten limiter located at
\(a = 33\) cm were explored. The influence of the additional rail limiter inserted to \(a = 30\) cm
was studied. The recent advances in the HIBP allow us to get the local data in several
spatial points simultaneously and perform the correlation analysis.

GAMs are more pronounced during ECRH, when the typical frequencies were seen in
the narrow band from 22 to 27 kHz for the main peak and 25–30 kHz for the higher
frequency satellite peak. GAM characteristics and limits of GAM existence were
investigated as functions of density, magnetic field, safety factor and ECRH power.

It was shown that both GAM and satellite have radially homogeneous structure and wide
radial extension on T-10. The main GAM peak has wider outer limit at the plasma edge
than satellite. At the edge the quasicoherent electrostatic mode with frequency from 50 to
120 kHz coexists with GAM and satellite. It was shown that the GAM frequency follows
the theoretical expectations \(f_{GAM} \sim \sqrt{T / m_l / R}\) for both OH and ECRH regimes in the wide
temperature area, which covers the whole operational limit of the machine.

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