evolution of the radial characteristics of the gam and quasicoherent mode in discharghes with ohmic and ecr-heating in the t-10 tokamak plasmas [[1]](#endnote-1)\*)

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One of the main unsolved question of the nuclear fusion is the gap between theoretically predicted and experimentally measured thermal and particle flows. This gap indicates the incompleteness of the physical picture described by the modern theory. At the present, a small-scale plasma turbulence is believed to be the origin of the abnormally (compared to theoretical predictions) high flows. On the T-10 tokamak it was shown that most of the turbulent particle flow in the ohmic plasma is induced by the quasi-coherent mode (QC) [1].

Zonal flows (ZF) affect the magnitude of thermal and particle flows [2]. Geodesic acoustic mode (GAM) and its satellite are the high-frequency oscillatory branch of the ZF. The interaction of GAM and its satellite with broadband turbulence in a wide range of frequencies up to 250 kHz and above was shown [3].

In order to create a complete physical theory capable of predicting the magnitude of heat and particle flows, a detailed experimental study of the properties of turbulence and ZF is needed. This study should include radial characteristics of turbulence and ZF in ohmic and ECR-heated plasma with different levels of the input power.

Such work can be performed by Heavy ion beam probe (HIBP). HIBP is the unique tool that allows simultaneously and independently measuring the average value of the plasma potential, its fluctuations, as well as fluctuations of the plasma density and poloidal magnetic field. It is also possible to obtain the plasma density using the HIBP data [4]. The authors previously studied the radial characteristics of GAM [5] and QC [6] in the ohmic plasma of tokamak T-10. In this paper, detailed attention is paid to the evolution of the radial characteristics of GAM and QC in the T-10 ECR-heated plasma.

Properties of GAM and QC which are common for ohmic and ECR-heated plasma were established. Alongside, GAM and QC properties which appear only at a high level of ECRH input power were discovered as well. In particular, GAM and its satellite have indistinguishable frequencies with heating power PECRH > 1.7 MW and low plasma density ne < 1.0∙1019 m-3. The average frequency of quasi-coherent mode in the central regions of plasma, r <15 cm, in plasma with PECRH > 1.7 MW decreases from 70-80 kHz to 20-30 kHz. Such a substantial decrease in the QC frequency is apparently due to a change in the electric field which occurs when the plasma is heated with large ECR power.

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