STUDies OF THE RADIAL STRUCTURE OF QUASICOHERENT VIBRATIONS ON T-10 TOKAMAK using HEAVY ION BEAM PROBE

1,2Drabinskiy M.A., 1Eliseev L.G., 1,2KhabanovF.O., 1,3Melnikov A.V., 1Shelukhin D.A., 1Vershkov V.A., 1,3Sergeev N.S., 1,2Zenin V.N., 1,4Kharchev N.K., 1Grashin S.A.

1National Research Center «Kurchatov Institute», Moscow, Russia  
2Moscow Institute of Physics and Technology (State University), Dolgoprudny, Russia  
3National Research Nuclear University MEPhI, Moscow, Russia  
4Prokhorov General Physics Institute Russian Academy of Science, Moscow, Russia

One of the main problems in tokamak physics is the anomalous heat flux from plasma to wall. Recently, it was shown that main part of the turbulent energy flux is due to quasicoherent (QC) oscillations [1]. Quasicoherent oscillations are the broadband fluctuations with a half-width of the order of mean frequency in the range of 50–150 kHz. Radial structure of QC should be studied in various tokamak regimes for deep understanding the turbulent energy flux physics.

The QC radial structure was studied via HIBP (heavy ion beam probing) [2] in the wide spatial range of the T-10 plasma wire (0.2 < r/a < 1) with maintaining field В0 = 2.2 Т and plasma current Ipl = 230 кА. In OH phase of discharge two amplitude peaks were discovered – main in the region of 25–29 cm (about 3–5%) and secondary in the region of 8-14 cm (about 1%) with minimum in the region of gradient zone of plasma wire (16–21 cm, <1%). QC mean frequency stays unchanged in the whole measurements range (see fig. 2). ECRH phase radial distributions presented as well.   
QC characteristics obtained by HIBP and correlation reflectometry compared.

Radial structure of QC was obtained in tokamak series of similar pulses. Radial location of HIBP sample volume varied shot by shot via change of beam energy. In such a way spectrograms of central plasma, gradient zone and periphery (including SOL) were obtained. QC characteristics were compared with LP data in peripheral zone.

References

1. L.G. Eliseev et al Evaluation of Turbulent Particle Flux by Heavy Ion Beam Probe in the T-10 tokamak // Plasma Fusion Research. Vol. 13 (2018) 3402106 (4p) DOI: 10.1585/pfr.13.3402106.
2. A.V. Melnikov et al. Heavy ion beam probing—diagnostics to study potential and turbulence in toroidal plasmas // Nuclear Fusion/ Vol. 57 (2017) 072004 (13p) DOI: [10.1088/1741-4326/aa5382](https://doi.org/10.1088/1741-4326/aa5382).