Study of thegeodesic acoustic mode in tuman-3m tokamak by changing the working gas

A.A. Kharchevsky1, L.G. Askinazi2, V.V. Bulanin3, A.V. Petrov3, A.I. Smirnov2, A.S. Tukachinsky2, A.Y. Yashin3, and M.A. Petrov3

1Prokhorov Institute of General Physics, Russian Academy of Sciences, Moscow, Russia,  
 [89168766306@mail.ru](mailto:89168766306@mail.ru)  
2Ioffe Physical Technical Institute, Russian Academy of Sciences, Saint Petersburg, Russia  
3Peter the Great Saint Petersburg Polytechnic University, Saint Petersburg, Russia

The object of the study was the wide rotational speed of the plasma in a tokamak FOG-3M in the transition to improved confinement, with different ratios of deuterium and hydrogen as a working gas.

Speed ​​measurement was carried out by Doppler backscattering (DOR), microwave radiation at oblique incidence in poloidal plane [1]. Used for sensing both pairs of frequencies in the range 20 - 24 GHz for ordinary mode propagation. Velocity fluctuations of rotation of the plasma was determined from the Doppler shift of backscattered radiation [1]. With the simultaneous use of two frequency sensing [2], it was possible to estimate the speed of wide fluctuations in plasma, taking into account the differences in radii cutoffs. Changes in the percentage of working gas caused the frequency shift of the geodesic acoustic mode (GAM) observed with the help of diagnostic DOR [3]. Of course the relationship between the gas concentration was controlled by the analysis of exchange atoms. The measured frequencies were compared with theoretical estimates [4]. Chains GAM flashes at the beginning of the discharge is always had an average frequency greater than at the end. It was confirmed that the level of turbulence between GAM vyspyshkami growing, and during outbreaks chain falls under different mixtures of process gases.

This work was supported by RFBR (project 15-32-51190).

References

1. V.V. Bulanin, S.V. Lebedev, Reflectometry studies of plasma oscillations in the TUMAN-3M tokamak at oblique incidence probing radiation, Plasma Physics, 2000, Vol. 26, no. 10, p. 1–7.
2. V.V. Bulanin, L.G. Askinazi, The two-frequency Doppler reflectometer application for plasma sheared rotation study in the TUMAN-3M tokamak, 35th EPS Conference on Plasma Phys. Hersonissos, 9–13 June 2008 The ECA Vol. 32D, P-2.093.
3. A.Y. Yashin, L.G. Askinazi, GAM observation in the TUMAN-3M tokamak using Doppler reflectometry, 40th EPS Conference on Plasma Physics, 2013, P2.179.
4. Guo W., Wang S. and Li J. 2010 Phys. Plasmas 17 112510.