Observations of filaments in the tuman-3m tokamak

1Yashin A.Yu., 2Askinazi L.G., 2Belokurov A.A., 1Bulanin V.V., 2Zhubr N.A., 2Krikunov S.V., 2Kornev V.A., 2Lebedev S.V., 1Petrov A V., 2Tukachinsky A.S.

1Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia
2Ioffe Institute, St. Petersburg, Russia

Some factors that limit the increase of the plasma pressure at the periphery of the tokamaks can arise when improved confinement is achieved in H-mode. It happens when edge localized modes (ELMs) develop in tokamaks, and the factors mentioned above are manifested in the form of quasi-periodic filamentary structures, or filaments. The formation of such structures results in an anomalous release of energy and particles at the first wall and divertor plates of tokamaks. Filament studies were previously performed on tokamaks with divertor configuration using various plasma diagnostic methods [1–4], including the Doppler backscattering method [5].

The report presents the first information about the filaments in tokamak TUMAN-3M with limiter discharge. The study of the filaments was carried out by Doppler backscattering method using dual-frequency probing by microwave radiation of the O-mode in the frequency range 18-37 GHz. The data were obtained in the H-mode, initiated by a pulsed gas injection, with the following plasma parameters: magnetic field B = 0.6-1 T, plasma current Ip = 110-150 kA, density <ne> = 1.5-3·1013 cm-3. The poloidal velocity of the filaments and their radial localization were determined, and the radial and poloidal size of the filaments were also estimated. The report discusses the possible causes of their occurrence, as well as the effect of these structures on the plasma discharge.

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References

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