The Investigation OF THE SPATIAL STRUCTURE OF ELMs ON the GLOBus-M2 TOKAMAK USING DOPPLER BACKSCATTER METHOD [[1]](#footnote-1)\*)

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The transition to the improved confinement mode in tokamaks is accompanied by the development of edge-localized modes (ELMs) [1] which limit the plasma pressure in the pedestal region. The formation of ELMs is accompanied by a significant increase in the transport of particles from the confinement area towards the plasma facing components of the tokamak structure, which can lead to their damage. Therefore, the study of ELM properties and characteristics is an important task for the future development of thermonuclear fusion.

On the spherical tokamak Globus-M it was found that large saw-tooth crashes in the improved confinement mode are accompanied by ELMs [2]. Work [3] proposed a mechanism describing the initiation of ELMs by excessive parallel current density resulting from sawtooth oscillations and making the peeling-ballooning instability unstable. The connection of ELMs observed on the Globus-M tokamak with the peeling-ballooning instability was experimentally demonstrated using Doppler backscattering (DBS), which demonstrated that the edge-localized mode was a series of filaments stretched along the magnetic lines located on the periphery of the plasma, having a toroidal fashion number of order 10 and moving in the poloidal direction [4].

The ELMs initiated by sawtooth oscillations were studied in improved confinement experiments using the DBS method on the new Globus-M2 tokamak with increased magnetic field and plasma current values. The new and improved multi-frequency DBS system allowed to study the properties of ELMs in more detail. Their radial localization has been determined and the dynamics of their development have been investigated. The simultaneous use of eight probing frequencies made it possible to determine the characteristic radial distribution rates of ELMs. A comparison of the parameters of ELM-filaments on the old (Globus-M) and new (Globus-M2) tokamaks was made.

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References

1. Zohm H., 1996, Plasma Phys. Control. Fusion, 38, 105–128
2. Yashin A.Y., et al, 2020, Plasma Phys. Rep. 46, 683–688
3. Bulanin V.V., et al, 2021, Plasma Phys. Control. Fusion, 63, 122001
4. Bulanin V.V., et al, 2019, Nucl. Fusion, 59, 096026
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Mu/ru/BB-Ponomarenko.docx) [↑](#footnote-ref-1)