diagnostics OF PLASMA Effective charge at the Globus-m2 tokamak

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The traditional method to determine the effective charge Zeff plasma is based on measuring the bremsstrahlung intensity in spectral intervals that are free of line radiation. Despite the well-known approach, the definition of Zeff requires to take into aacount the features of each plasma device – the elemental composition of impurities, the specific features of plasma configuration.

The present work is the first step in designing of a plasma diagnostic for measuring the effective Zeff charge on the Globus-M2 tokamak.

The development took into account the experience of implementation of such diagnostics on MAST [1], ASDEX Upgrade [2], EAST [3], T-10 [4] tokamaks. The calculations of the expected bremsstrahlung intensity were made for various regimes of the Globus-M2 tokamak. The geometry of the experiment was chosen taking into account the intensity estimates, two diagnostic channels were developed and manufactured with two types of detectors – the photodiode FPU100-2 and APD Hamamatsu S11519-30 for operation in the NIR spectral region. In addition, the design provides the installation of a Hamamatsu H10721 photomultiplier for measurements in the visible region. The sensitivity of the measuring channels was absolutely calibrated using the integrating sphere Labsphere USLR-V12F-NMNN.

The measurement channels of the diagnostic were used for test measurements of Zeff (t) on the Globus-M, Globus-M2, and Tuman-3M tokamaks in different observation geometries and spectral intervals. For discharges on the Globus-M tokamak, the Zeff (t) modeling was performed using the ASTRA transport code, which demonstrated good agreement with the experimental results.

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References

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