Contribution ID: **41** Type: **Mini Oral and Poster**

Measurement Module of Dispersion Interferometer for Real-Time Plasma Density Control at Globus-M2 Tokamak

Thursday 25 April 2024 12:35 (20 minutes)

The report is dedicated to a measurement module of a dispersion interferometer for plasma density control at Globus-M2 tokamak (St. Petersburg, Russia). The system provides measuring of integral plasma density with resolution of 4·10ˆ15 mˆ-2 every 20 μs. Such characteristics of the device allow using the results of its measurements in a feedback loops to real time plasma density control. The main elements of the measurement module are analog-to-digital converters and a digital data processing node based on SoC FPGA. The algorithm for plasma density calculating is implemented in the digital node. This algorithm bases on harmonic analysis of interferometer signals and it is resistant to noise and changes of modulation depth. The dispersion interferometer combined with the measurement module was installed at Globus-M2 in 2022. During the year operation, this system was proven to be reliable and robust diagnostic for line-integrated electron density measurements. The first experiments for controlling the electron density using dispersion interferometer as a detector were carried out at Globus-M2 in November 2023.

Minioral

Yes

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Yes

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Session Classification: Poster B

Track Classification: Real Time Diagnostics, Digital Twin, Control, Monitoring, Safety and Security