

Tokamak GOLEM for fusion education - chapter 12

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The GOLEM tokamak is the oldest still operational tokamak. Its main mission is to train future fusion specialists. One of the GOLEMs unique feature is its remote-control system[1], which allows remote performing a plasma discharge and instantly processing the experimental data remotely. This contribution is devoted to the current experimental projects of the students:

Using ball-pen and Langmuir probes, the **position of the edge plasma** is detected and compared to a simple equilibrium magnetic reconstruction. The aim is benchmark various diagnostics methods and to gain insights into the edge plasma physics (velocity shear layer, blob birth zone etc.). A probe head with **flush-mounted rail probe** [2], standard Langmuir probe and ball-pen probe has been designed for the tokamak GOLEM. The probe can be tilted, facilitating studies of its behaviour under varying magnetic field line impact angle. Rail probes can sustain very high heat fluxes, and thus are suitable for measurements in the tokamak divertor region. Swept ball-pen probe is used for uniquely **fast ion temperature measurements** in the edge plasma. Obtained values with 10 μ s temporal resolution are used to reconstruct typical I-V characteristics of a retarding field analyzer with low (ms) temporal resolution and the radial profile of ion to electron energy ratio is constructed. **Lithium coating of the tokamak first wall** is going to be conducted, resulting in a decrease of effective ion charge. The magnitude of this effect will be measured by plasma resistivity decrease and lower presence of impurities such as oxygen. **Measurement of HXR radiation** emitted by runaway electrons by a set of various scintillation detectors. **2D3V cylindrical PIC code is used for tunnel probe calibration** on ion saturation currents ratio. The calibration allows to measure electron temperature with high temporal resolution. **Two arrays of toroidally separated Langmuir probes** were used to measure long-range correlations in the edge plasma of GOLEM tokamak, both V_{fl} and I_{sat} .

References

- [1] Tokamak GOLEM, Czech Technical University in Prague, <http://golem.fjfi.cvut.cz/> [online]
- [2] A. Q. Kuang et al., Rev. Sci. Instrum. 89, 043512 (2018)