Tokamak GOLEM for fusion education - chapter 9

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The GOLEM tokamak (R = 0.4 m, a = 0.085 m, $B_{tor} < 0.5$ T, $I_{pl} < 8$ kA) is the oldest tokamak in the world still operational. Its main mission is education of future fusion specialists in the Czech Republic. Furthermore, the GOLEM tokamak serves also as a training facility of students throughout the world, because of its unique fully remote control system [1]. This contribution is devoted to description of several students′ projects, related mainly to diagnostics development, investigation of selected issues of tokamak physics and plasma performance on GOLEM:

- Design of new amplifiers for two linear AXUV arrays of 20 photodiodes. This detection system will be implemented to a pinhole camera and integrated to the GOLEM diagnostics system. By using tomography methods, the temporal evolution of the plasma radiation and the plasma position in the poloidal cross section will be determined.
- A research on runaway electrons (RE) physics is focused on generation mechanisms of RE, detection of HXR radiation and investigation of RE losses. Furthermore, some selected features of runaway discharges are investigated. In particular, the combined probe head composed of the Ball Pen and Langmuir probe [2] is exploited to measure the radial profiles of plasma potential and the electron temperature during the Anomalous Doppler Instability.
- Investigation of plasma radiation by using spectroscopy methods and applying the coronal-radiative model. Ratio of helium and hydrogen spectral lines are used to determine the electron temperature. Results are compared with other methods of T_e measurements on GOLEM.
- Improvement of plasma performance. A table-top experiment modelling power supplies circuits of the GOLEM tokamak is designed to test the plasma current control without interfering tokamak operation. It is shown that by adding precisely selected resistors to the primary circuit, a flat-top phase of plasma current can be achieved. Furthermore, a guideline for discharge scenarios for different values of electron density is now being created.

References

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[2] J. Adamek, et al., Rev. Sci. Instr. **87**, 043510 (2016)