

Tokamak GOLEM for fusion education - chapter 5.

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Tokamak GOLEM is one of the oldest tokamaks still in operation. Its main purpose at the moment is to serve as an educational device making tokamak operation accessible to students worldwide via a web application. Moreover, tokamak GOLEM team consists mainly of students who participate in the operation and further development of the tokamak and its diagnostics, such as operating software, data mining, analysis of plasma position, bolometer measurements, runaway electrons etc.

This contribution addresses recent achievements in the past year: 1. A set of 32 Mach probes covering the whole poloidal angle has been designed and manufactured. Their purpose is to measure the poloidal distribution of flows in the scrape-off layer of tokamak GOLEM. First measurement results are presented. 2. The operating software of the device has undergone significant modifications in order to make it more secure, easily extensible and accessible for students. 3. Plasma radiation (HXR, SXR, visible, IR) has been measured to study the production of runaway electrons in the tokamak during the start-up phase and disruptions. 4. The vast discharge database has been used to investigate the relevance of various operational parameters for longer plasma confinement time. Discovered optimal parameters were tested in real experiments. 5. A virtual model of tokamak GOLEM with real physical core has been made and is compatible with all dominant web browsers. 6. Plasma position estimation by Mirnov coils and the radiation profile measured by fast visible light cameras and bolometers have been correlated to each other in order to investigate possibilities of use of radiation sensors for fast position measurements. 7. Tokamak is now used in a practical course in the basic physics curriculum. Undergraduate students engage in tokamak operation, probe measurements and analysis of measurements with basic tokamak diagnostics.

References

- [1] Svoboda V., et al., Multi-mode Remote Participation on the GOLEM Tokamak. *Fusion Engineering and Design*, 86(6-8):1310–1314, 2011.