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Advances in utilisation of the JSI TRIGA Mark II reactor

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The TRIGA Mark II reactor at the Jozef Stefan Institute (JSI) is regularly used for Neutron activation analysis (NAA) in both instrumental (INAA) and radiochemical (RNAA) modes, radiation hardness studies, training of NPP staff and education of university students, and for benchmark experiments for validation of computer codes and nuclear data. In the last 5 years the scientific level as well as the intensity of these activities has increased significantly. The paper describes the latest advances in the utilisation of the JSI TRIGA Mark II reactor.

The reactor has been extensively used for irradiation of various components to study radiation hardness for the ATLAS detector in the European Organisation for Nuclear research (CERN) and other accelerators under the AIDA framework, for ITER and for some companies producing radiation tolerant products. Due to very good characterization of the irradiation facilities the reactor has become a reference centre for neutron irradiation of detectors developed for the ATLAS experiment.

Due to large flexibility and well defined irradiation condition the irradiation facility has recently been developed, which allows irradiation in a well thermalized (99.8 % of total neutron flux is thermal) neutron flux. In collaboration with the CEA/DAM Ile de France the facility is used for performing neutron irradiation of materials used for control of non-proliferation in nuclear safeguards by using the FT-TIMS method.

In 2010 a collaboration with CEA Cadarache Instrumentation, Sensors and Dosimetry Laboratory was established leading which lead to several experiments of benchmark quality; fission rate profile measurements, neutron dosimetry and spectra measurements, beta-effective measurements, gamma profile measurements, self-powered neutron and gamma measurements. These experiments were used for validation of computer codes and nuclear data and lead to better characterisation of irradiation conditions. In addition several CEAdeveloped detectors and data acquisition systems were tested within the collaboration.

In the field of education and training the reactor is used in regular laboratory exercises for graduate and post graduate students of physics and nuclear engineering at the Faculty of Mathematics and Physics, Ljubljana University and for training of operators at the JSI Nuclear training Centre. Since 2010 new advanced practical exercises for students and course attendees were designed and implemented; void reactivity coefficient measurements, the measurement of water activation, in-core flux mapping system, pulse mode operation, etc.

The reactor team takes active part in the Eastern Europe Research Reactor Initiative [EERRI] and the Mediterranean Research Reactor Network [MRRN], supported by the International Atomic Energy Agency (IAEA). The JSI TRIGA Mark II is a good example of a relatively small research reactor having a rather low neutron flux that can support a variety of high-level research and developments activities as well as education and training at a very high level.

In the paper the abovementioned activities are presented in more details.

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