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Recent progress in developing Gamma Spectrometer in ITER

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Gamma-spectrometry is used at many nowadays tokamaks due to its ability to provide unique data on fast ions and runaway electrons in hot plasma [1]. Current report dedicated to the Gamma Ray Spectrometer that will operate as a part of the ITER Neutral Particles Analyzer complex –one of the leading diagnostic systems in development progress. Conceptual and Preliminary projects were approved after reviewing; preparation of detailed documentation with justifications of solutions for associated challenges –agenda for current works. Earlier development stages were regularly reported, particularly at IAEA FECs 2010-2016 [2]. Current phase of the works included components mockups manufacturing and various tests. Firstly it was studied radiation resistance using fast neutrons from ^9Be(d, ngamma)^1^0B reaction induced on SPBPu cyclotron beam. Study demonstrated high performance of the diagnostic Port Cell components during and after irradiation with the fluence of 1.1·10^1^3 cm^-^2, that corresponds to the whole lifetime of the system on ITER. Another successfully completed task –development and tests of the approaches for transmitting signals and power lines to the Diagnostic Building –reliable system operation while using long (100 m) cables. Connection schemes were tested together with newly developed DAQ solutions capable in proceeding with 400 s acquisition without data losses. New fast/realtime streaming, preprocessing and compression codes tried proved reliable collection and storage of events lists and raw data, particularly while using DAQ hardware from ITER catalog. Preliminary studies of processing parameters optimization for high count rate modes typical for active ITER scenarios were carried out as well. Finally, updated MCNP models simulated to reveal possible deviation of the signal and background levels due to the alterations in design and estimated worst case defects in the radiation protection.

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1. Kiptily, V.G., et al. Plasma Physics and Controlled Fusion, 2006. 48(8): p. R59-R82.
2. Gin, D., et al. in 26th Fusion Energy Conference. 2016. Kyoto, Japan.

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Author: Dr GIN, Dmitry (RuIoffe)

Co-authors: Mr SHEVELEV, Alexander (RuIoffe); Dr DOINIKOV, Dmitri (RuIoffe); Mr KHILKEVITCH, Evgeniy (RuIoffe); Dr CHUGUNOV, Igor (RuIoffe); Mr POLUNOVSKII, Igor (RuIoffe); Ms ILIASOVA, Margarita (RuIoffe); Prof. NAIDENOV, Viktor (RuIoffe)

Presenter: Dr GIN, Dmitry (RuIoffe)

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