TANDEM COLLIMATORS FOR THE JET TANGENTIAL GAMMA-RAY SPECTROMETER

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The tangential gamma-ray spectrometer (TGRS) of the JET tokamak fusion facility is an important diagnostics for investigating the fast particle evolution in the tokamak plasma configuration. A well defined field of view for the TGRS diagnostics is essential for its proper operation and this is to be determined by a rather complex system of collimators and shields both for the neutron and gamma radiations. A conceptual design for this system has been carried out [1] with the main design target set to maximise the signal-to-background ratio at the spectrometer detector, the ratio being defined in terms of the plasma emitted gamma radiation and the gamma-ray background.

As a first phase of the TGRS diagnostics upgrade a set of two tandem collimators has been designed with the aim of determining a quasi-tangential field of view through then JET tokamak plasma. A modular design of the tandem system has been developed in order to allow for the construction of different configurations for deuterium and deuterium-tritium discharges. The internal structure of the collimators consists of nuclear grade lead and high density polyethylene slabs arranged in an optimised pattern.

The performance of a simplified geometry of the tandem collimator configuration has been evaluated by neutron and photon transport calculations and the numerical results show that the design parameters can be attained.

[1] V. Zoita et al., Symposium on Fusion Engineering, San Diego, June 2009

*See Appendix of F. Romanelli et al., Proc. 22nd IAEA Fusion Energy Conference, Geneva, Switzerland, 2008