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P3.074 The ITER radial neutron camera in-port system: nuclear analyses in support of its design development

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The ITER Radial Neutron Camera (RNC) is a multichannel detection system hosted in the Equatorial Port Plug 1 (EPP 1). It is designed to measure the uncollided neutron flux from the plasma, providing information on the neutron emissivity profile and total neutron strength. The RNC structure consists of two sub-systems based on fan-shaped arrays of cylindrical collimators: the ex-port system, covering the plasma core with 2 sets of lines of sights lying on different toroidal planes, and the in-port system, enclosed in a dedicated cassette within the EPP1 diagnostic shielding module, for the measurement of neutrons generated in the plasma edge. Due to the harsh environment in which it has to operate, the design of the in-port RNC system is particularly critical both from the measurements point of view (low signal to noise ratio induced by the high level of scattered neutrons at the detector positions) and from the structural point of view.
The paper presents the results of the neutronic analyses performed with the MCNP Monte Carlo code with the aim of optimizing the in-port RNC design in order to enhance the diagnostic measurement performance and evaluating the nuclear loads that have to be withstand by its structural elements, detectors and associated components.

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