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4.27 Conceptual design of the radial gamma ray spectrometers for ITER

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A set of gamma ray spectrometers have been designed for ITER under the Radial Gamma Ray Spectrometer (RGRS) project. Aim of this project is the design of a system integrated with the ITER Radial Neutron Camera able to measure the gamma rays emitted from the plasma with a good energy resolution (about 1.5% at 4.44 MeV) and at high rates (about 1 MHz). RGRS will be able to operate both in the D phase and in the full-power DT phase and will measure gamma rays from i) reactions between fast ions, such as α particles, and light impurities and ii) bremsstrahlung emission occurring when runaway electrons hit the tokamak edge or the bulk plasma. The RGRS detectors are arranged in 9 Lines of Sight (able to cover a radial region with $r < a/3$), each featuring a large LaBr₃ scintillator crystal (3"x6") coupled to a Photo Multiplier Tube. Due to high neutron flux and magnetic field several solutions have been adopted to guarantee a good Signal to Background ratio and counting capabilities. In this work the main RGRS features and performances will be illustrated. As it is designed, RGRS is capable to combine space and energy distribution measurements of a particle and runaway electrons, that will help, together with other diagnostics, the study of the fast ions physics in a burning plasma.

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