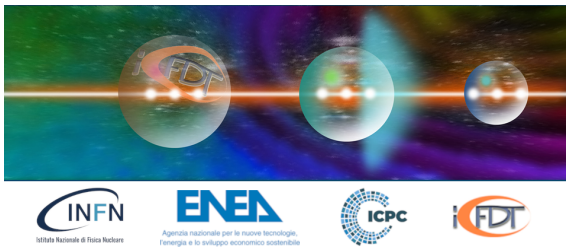

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New insights on the D(T,5He)γ reaction and prospects for D-T fusion power measurements on ITER

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Besides the well known emission of a 14 MeV neutron and a 3.5 MeV alpha particle, the D-T fusion reaction may also evolve with a secondary branch in which a 17 MeV gamma-ray is emitted together with a 5He nucleus. The physical properties of this secondary branch, though, were poorly known because of its very low probability to occur of about 10-5.
The second and third D-T experimental campaigns at the Joint European Torus allowed to investigate this radiative branch for the first time in a magnetic confined plasma, revealing unpredicted informations about its energetic distribution and occurrence rate with unparalleled accuracy [1-2]. For this purpose, a single line-of-sight LaBr3-based gamma-ray spectrometer was employed and an absolute counting of these fusion gamma-rays was performed.
These accurate determinations pave the way for a direct and neutron-independent measurement of the fusion power in magnetic confinement fusion reactors, based on the absolute counting of D-T gamma-rays.
In particular, the development of a gamma-ray spectrometer for fusion-power measurements is currently under investigation for ITER, promising to provide measurements with 1 s time resolution and less than 10% uncertainty for fusion powers in the [3 MW –500 MW] range.

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