Single crystal diamond detectors for nuclear spectroscopy measurements on DT plasmas at JET

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**See the author list of "Overview of T and D-T results in JET with ITER-like wall" by CF Maggi et al. to be published in Nuclear Fusion Special Issue: Overview and Summary Papers from the 29th Fusion Energy Conference (London, UK, 16-21 October 2023)*

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In the last decade, single crystal diamond detectors have been extensively used at JET for neutron spectroscopy measurements along collimated lines of sight. Although diamonds can measure 2.5 MeV neutrons, their use is optimized for 14 MeV neutrons. This is due to the exploitation of the $^{12}C(n\text{-}\alpha)^{9}Be$ nuclear reaction channel which results in a well-defined gaussian peak in the recorded energy spectrum. Beyond their use as 14 MeV neutron spectrometer, in the last two JET deuterium-tritium (DT) experimental campaigns, diamonds have been exploited as DT neutron yield monitor. Furthermore, they can spectrally separate 2.5 MeV and 14 MeV neutrons providing a challenging DT fusion power measurement in trace tritium plasmas, when the neutron contribution due to deuterium-deuterium fusion reactions is important.

Diamonds have been cross-calibrated with the standard neutron yield diagnostics at JET and demonstrated to be reliable over the whole DT campaigns. Results from the JET DT campaigns will be described.

This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them. (Please mind the addendum 2019-2020)