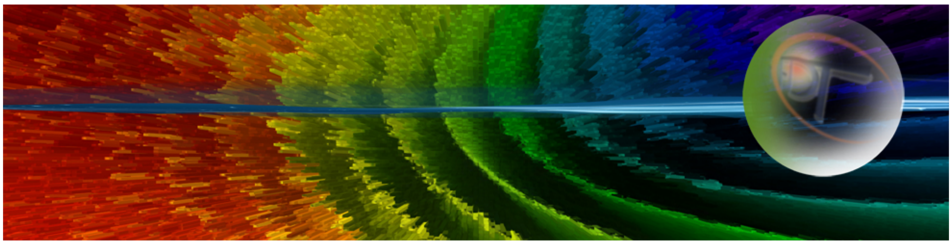

Contribution ID: **49** Type: **not specified**

Dr

JET next D-T campaign is presently scheduled for the year 2019. The main scientific objectives include the assessment of the isotopic effects on various plasma aspects: mainly on confinement, on the threshold to access the H mode and on ELM behaviour. From a technical point of view, the total yield of the entire D-T phase is expected to be 1.7 1021 neutrons, about a factor of six higher than the previous main D-T campaign on JET, DTE1. Therefore the radiation field will be quite relevant for next step devices, since the neutron flux at the first wall (~1016n/cm2s), for example, will be comparable to the one in ITER behind the blanket.
In terms of diagnostics developments, for many years JET diagnostics have been upgraded in order to provide adequate support for the scientific exploitation of a D-T campaign. The main efforts have concentrated on improving three main aspects of JET measuring capability: 1) the quality of the measurements to support the plasma physics programme 2) the diagnostic for the fusion products 3) diagnostic technologies for ITER and DEMO.
In terms of general diagnostic capability, compared to the previous DTE1, JET diagnostics have a much better spatial and temporal resolution of both the ion and electron fluid (about one order of magnitude improvement for each parameter). The consistency of the various independent measurements of the same parameters has also increased significantly; the three independent measurements of the electron temperature, for example, agree now within 5%. Moreover, solutions are being addressed to operate some cameras, both visible and IR, even during the full D-T phase to provide imaging of the plasma and the first wall. Various upgrades of neutral particle analysis are being considered, mainly to measure the isotopic composition.
With regard to the fusion products, JET now can deploy a consistent set of techniques to measure the neutron yield and neutron spectra and to diagnose the fast particles. A full calibration of the neutron diagnostics with a 14 MeV source is being prepared, after the recent very successful calibration for the 2.45 MeV neutrons. Vertical and horizontal lines of sight are foreseen for neutron and gamma spectrometry, in order to better determine the thermal neutron yield and to separate the trapped and passing components of the alphas. Various gamma ray spectrometers are being developed to cover all the various operational scenarios, from trace tritium to 50-50 D-T operation. The redistribution of the alphas will be measured with the gamma ray cameras, recently upgraded with full digital electronics; new detectors are being considered to bring the time resolution of the system in the ten of ms range. The lost alphas will also be diagnosed with improved spatial and temporal resolution, using Faraday cups and a scintillator probe.
From a technological perspective, the D-T campaign will provide a unique opportunity to test ITER and DEMO relevant technologies. From radiation hard detectors, for example Hall probes, to neutron absorbers and to shielding concepts, the potential of various solutions in a realistic 14 MeV radiation field will be assessed. The effects of neutrons and gamma on ancillary technologies and systems, such as fibre optics and electronics circuits, are also expected to be sufficiently high to derive useful information about the competitive advantage of various alternatives.

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