First results from the new TOFOR neutron spectrometer at JET

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As part of JET's enhanced capabilities programme, two new neutron emission spectrometry (NES) systems have been installed. One of these, TOFOR, is based on the time- of- flight (TOF) technique, which offers the best prospects for high- performance diagnosis of the 2.5- MeV neutron emission from D plasmas. The new instrument has been developed for operation at high count- rate; indeed, it represents a design for optimized rate (OR). The unique design of TOFOR offers significant improvements in data quality (count rate, statistics, time resolution, sensitivity) as compared to earlier TOF instruments. Another novelty with TOFOR is the first use of fast, free- running time- digitizing electronics in the data acquisition system, which also includes on- board analysis capabilities. Not only is this technique essential for the performance of the present TOFOR but further developments in this direction holds the key for the next step of significant performance enhancement.

The very first plasma neutrons were recorded with TOFOR in November 2005. Albeit the flux levels were very low, they were sufficient to perform certain steps of the commissioning of the new instrument; these results will be used to illustrate the function of TOFOR, besides some of the special calibration techniques used for the first time to determine the neutron energy accuracy of the measured spectra.

In this contribution we will describe the TOFOR instrument and discuss the principal features of its key elements and their importance for the NES diagnostic results. The information that can be obtained for D plasmas at JET will be described and illustrated with commissioning results as well as data obtained during the forthcoming experimental campaigns. The main focus of these NES studies will be the effect of auxiliary heating on fuel ion velocity distributions and their manifestation in the neutron yield components due to thermal and supra- thermal velocity contributions.

* See the Appendix of J.Pamela et al., Fusion Energy 2004 (Proc. 20th Int. Conf. Vilamoura, 2004) IAEA, Vienna (2004)