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Assembly, installation and commissioning of the JET-EP Halo Current Sensors system

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The Halo Current Sensors (HCS) system has been developed under the JET-EP enhancement programme, to allow a more detailed study of the Halo Currents flowing in the upper part of the JET vessel. A better understanding of the origin, distribution and scaling of Halo Currents in tokamaks is one of the critical issues for any next step device, like the ITER project, in particular for the design of the plasma facing components and for a reliable plasma operation at high performances.

The HCS system includes four sets of probes located in four octants equally spaced along the toroidal coordinate, each containing up to eight Rogowski coils and two toroidal field pick-up coils. The Rogowski coils are designed to directly measure the current flowing through the tiles of the upper dump plate, whereas the toroidal field pick-up coils are conceived to give an estimate the total poloidal Halo Current flowing through the first wall structures.

The HCS system was installed in the JET vacuum vessel in March 2005 during the 2004/05 Shutdown and started the acquisition of signals during the restart phase of the machine in autumn 2005.

This paper will highlight and discuss the critical aspects and the lessons learned during the final phase of the procurement of the system; the in-vessel installation, accomplished by means of remote handling system, and the pre-commissioning tests executed on the system will be described in detail.

The paper will then focus on the analysis and interpretation of the data collected during the functional commissioning of the new system, carried out during the restart phase of the machine preceding the experimental campaigns.

Since the beginning of operation the HCS signals showed the effects of several noise sources, increased by the low sensitivity of the probes, due to design geometrical constraints. The expected pick-up of stray magnetic fields was quite easily compensated through a correlation with other existing magnetic diagnostics. Moreover the HCS signals exhibited anomalous drifts during plasma runs which can dramatically affect the measurement quality. This phenomenon required a careful analysis of the signals together with the cable layout and data acquisition circuits. The results of this analysis and the solutions adopted to overcome the problem will be presented.