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P4.059 Refurbishment of JET magnetic diagnostics

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In a tokamak device magnetic diagnostics play a key role in the understanding of plasma physics, for control and safe operation. JET tokamak has hundreds of magnetic sensors distributed over the torus, designed to withstand neutron fluence. By the end of 2016 experimental campaign C36B, JET lost several pick-up coils used both for equilibrium reconstruction (slow coils) and MHD analysis (fast Mirnov coils). Slow coils are based on a MIC (Mineral Insulated Cable) wound around a stainless steel former, while the Mirnov coils are based on non-insulated cable wound around a ceramic alumina former. In order to restore the JET MHD modes analysis capability for the coming DT campaign, 27 faulty in-vessel coils were refurbished. A new design was proposed to try to diminish the failure rate, mitigating the possible cause that led to those coil failures. New sensors will use Glidcop® wire wound around a ceramic former, to withstand chemical reaction coming from gas species used in the experiments and to better transfer heat load. The wire diameter was increased and a ceramic coating inside the coil casing was introduced to improve electrical insulation. To reduce cost of future intervention all new coils are remotely-handleable (RH) and no in-vessel manned intervention is required. Prior to installation a calibration procedure and electrical tests were carried out in the laboratory. The calibration was performed using a Helmoltz coil together with a known reference coil to determine NA at 0 Hz (DC) and the transfer function amplitude, with respect to the reference coil, up to 200KHz. Two of the 27 newly manufactured coils could not be installed due problems on the existing in-vessel cabling. The commission of new coils will use dedicated pulses and a FEM 2D axial-symmetric code to predict the waveform and compare it with the experimental ones.

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