

Fault analysis and improved design of JET in-vessel Mirnov coils

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Abstract: In vessel Mirnov coils are an essential diagnostic in present day tokamaks. Their use in ITER and future Fusion reactors presents some disadvantages linked to the high radiation environment. Furthermore large Electro Magnetic (EM) forces can be experienced by the coil, due to the pulsed operation of the tokamak device (Van Nieuwenhove and Vermeeren, 2003, Vayakis et al., 2011 [1,2]), and disruptions (Gerasimov a al., 2015 [3]). Since the operation with the ITER-like wall, JET has experienced severe faults in the high-bandwidth Ti wire coils. During 2016-17 new coils have been designed and installed. These can be replaced using remote handling, and they use Cu alloy wire. The presented work includes the failure analysis and modelling, motivating the design differences between old and new coils. The latter will provide valuable information on the long term effects of EM loads during disruptions, as well as chemical degradation processes that will be encountered for ITER High Frequency (HF) coils, which are characterized by the same materials.