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P4.036 Real Time Assessment of the Magnetic Diagnostic System in RFX-mod

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The magnetic diagnostic system in RFX-mod [1] includes local field probes, flux loops and saddle loops. It plays an important role in real time plasma control and in several off line studies of the plasma configurations and behaviours. The failure or malfunction of one or more components can cause negative consequences in several applications, including the plasma equilibrium and stability control.
Unfortunately, the accessibility of the diagnostic components is rather difficult; therefore, their assessment in RFX-mod is carried out by suitably operating the devices in dry discharges or in well controlled plasma conditions and suitable calibration coefficients are introduced.
Recently, a new procedure has been proposed [2] able to identify faults in a magnetic diagnostic system, to provide each component with a reliable confidence coefficient and to suggest reasonable corrections of the actual measuring. The procedure is able to operate also in presence of plasma. The methodology is based on a "mirror" operator performing two main actions; a first, inverse action models the unknown sources including the plasma equivalent currents and a latter, direct action reconstructs the magnetic field in the region of interest. The capability of the representation in the inverse step can be suitably calibrated to bring out, in the second direct step, the discrepancies to be interpreted as faults or malfunctioning.
The paper describes the use of the methodology to the RFX-mod and, in addition, discusses the performance achieved also in shots with fully 3D plasmas.

[1] P. Bettini, A.G. Chiariello, A. Formisano, F. Ledda, G. Marchiori, R. Martone, F. Pizzo, D. Terranova. "3D magnetic surfaces reconstruction in RFX-mod". Fusion Engineering and Design, 123, 546-550. (2017).
[2] A. Chiariello, A. Formisano, F. Ledda, R. Martone, F. Pizzo. "A Fast Reconstruction Approach for the Assessment of Magnetic Diagnostic Systems in Nuclear Fusion Devices". IEEE Tr MAG, DOI 10.1109/TMAG.2017.2771753

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