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Pseudo-decoupler approach to error field correction in RFX-mod
PAOLO PIOVESAN, MARCO GOBBIN, LUCA GRANDO, GIUSEPPE MARCHIORI, LIONELLO MARRELLI, LIDIA PIRON, ANTON SOPPELSA, DAVID TERRANOVA, Consorzio RFX, Euratom-ENEA Association — An optimal design of feedback schemes for error field and mode control in fusion plasmas has to take into account the electromagnetic effects of real walls. The 3D wall structure introduces significant couplings among the plasma modes, affecting their stability and the feedback performance. A dynamic decoupling scheme, based on the experimentally identified mutual inductances among active coils and sensors, has been developed in the RFX-mod reversed-field pinch. RFX-mod is equipped with an advanced feedback system made of 192 saddle coils and 192 sensors fully covering the torus. A large subset of the 192×192 mutual inductances was identified from vacuum shot measurements and a decoupling scheme based on a pseudo-inverse of this matrix was developed. Control schemes based on this approach were tested in the experiment. Error fields due to the non-uniform penetration of the vertical magnetic field through the shell gaps have been reduced. A similar strategy is being developed for tearing mode control, which may allow reducing their edge radial magnetic field component.

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