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Effects of external 3D fields on the core of high-beta hybrid tokamak plasmas PAOLO PIOVESAN, L MARRELLI, L PIGATTO, D TERRANOVA, T BOLZONELLA, Consorzio RFX, V IGOCHINE, M SERTOLI, C ANGIONI, A BOCK, A GUDE, M MARASCHEK, R MCDERMOTT, W SUTTROP, IPP Garching, AF MARTITSCH, SV KASILOV, Uni. Gratz, YQ LIU, GA, ASDEX UPGRADE TEAM, EUROFUSION MST1 TEAM — The core of high-beta hybrid tokamaks is sensitive to 3D fields, due to the response of a marginally-stable kink with large m=1/n=1 component as the minimum safety factor approaches unity. Helical core displacements of 1-2cm impact various quantities, as found in ASDEX Upgrade by probing the plasma with n=1 fields: central electron and ion temperature is reduced, causing confinement degradation; core rotation is braked, leading to performance-limiting 2/1 modes as rotation is roughly halved; outward W transport occurs, a potentially beneficial effect. Due to n=1 field amplification, these effects are largest near beta limits and error field correction is applied to minimize them. A modelling effort is ongoing to explain these results. Rotation braking is compared to neoclassical toroidal viscosity predicted by the MHD-kinetic hybrid code MARS-K. The drift-kinetic code NEO-2 is used to evaluate both NTV and the neoclassical W transport in the helical core, represented by a 3D equilibrium from V3FIT-VMEC.

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