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P3.005 A new upper divertor with internal coils for ASDEX Upgrade - status of the project

Wednesday, 19 September 2018 11:00 (2 hours)

ASDEX Upgrade is a tokamak that can be operated with the strike lines in the upper and/or the lower divertor. In 2016 a project was started to develop and install a new upper divertor with internal coils and an in-vessel cryo pump. The aim is to investigate advanced magnetic configurations that may facilitate the access to detachment via an enhanced flux tube expansion and/or connection length. To realize the envisaged magnetic configurations two internal coils operated with up to 52 kAt will be installed. The conceptual design was presented in [1]. Since then critical aspects of the project were identified and investigated in detail. These are the coil concept, the forces, in particular during disruptions, an intrinsic save power supply and last but not least, operation with co and counter magnetic field.
The coil concept and the forces are linked. Whereas the resulting forces during disruptions can be handled, a short cut due to an arc between two windings of a coil can result in excessive forces which require at least a hardening of the vessel. At present two cable designs are tested that can avoid or reduce the risk of arcing between windings. The conceptual design has shown that the two coils have to be operated anti-parallel with about 20 % imbalance in maximumo reducing the forces between the divertor- and the control coils. This will be ensured by an intrinsically save power supply. The concept of the new divertor combines the stiff coil support structure and the target support. This allows installing flat target tiles with a gap size of 1 mm and +/- 0.2 mm assembly tolerances minimizing leading edge effects. Thus, physics investigations with both directions of the toroidal magnetic field are possible.
[1] A. Herrmann, et al., Fusion Engineering and Design 123 (2017) 508-512.

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