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Engineering and integration design risks arising from advanced magnetic divertor configurations

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The divertor configuration defines the power exhaust capabilities of DEMO as one of the major key design parameters and sets a number of requirements on the tokamak layout, including port sizes, PF coil positions, and size of TF coils. It also requires a corresponding configuration of plasma-facing components and a remote handling scheme to be able to handle the cassettes and associated in-vessel components the configuration requires.

There is a risk that the baseline ITER-like single-null (SN) divertor configuration cannot meet the PFC technology limits regarding power exhaust and FW protection while achieving the target plasma performance requirements of DEMO or a future fusion power plant. Alternative magnetic configurations - double-null, snowflake, X-, and super-X - exist and potentially offer solutions to these risks and a route to achievable power handling in DEMO. But these options impose significant changes on machine architecture, increase the machine complexity and affect remote handling and plasma physics and so an integrated approach must be taken to assessing the feasibility of these options.

In this paper we describe the work being undertaken, and main results so far, in assessing the impact of incorporating these alternative configurations into DEMO whilst respecting requirements on remote handling access, forces on coils, plasma control and performance, etc.

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