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P4.025 Approaching final design of the ITER EC H&CD Upper Launcher

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The ITER ECRH system consists of 24 gyrotrons and their associated power supplies providing up to 24 MW millimeter wave heating power at a frequency of 170GHz, a set of transmission lines connecting the gyrotrons with the equatorial and the four upper launchers. With its high frequency this heating system provides the unique capability of driving locally current due to the small beam focus of just a few centimeters. While the equatorial launcher mainly acts for central current drive and current profile shaping, the upper launchers aim on suppressing MHD instabilities, especially neoclassical tearing modes (NTM) to avoid plasma disruptions triggered by NTMs.

The Upper Launchers inject the millimeter waves through a quasi-optical section consisting of three fixed mirror sets and the front steering mirror set. The eight overlapping beams have focal points optimized for suppression of the $q=3/2$ and $q=2/1$ NTMs.

Due to several project change requests the Upper Launchers and the connected ex-vessel system were re-designed. The changes include a new boundary geometry of the launchers as well as a newly designed cooling system for the Blanket Shield Module (BSM), a modified flange of the BSM to the structural main frame and a refined optical design. Additionally shield blocks with integrated in-vessel waveguides were redesigned as well as the closure plate with waveguide and supply line feedthroughs. The changes further include newly designed ex-vessel waveguide components with a reduced aperture and redesigned ultra low-loss CVD diamond windows. Finally several components originally foreseen as off-the-shelf components have become part of the design scope.

The new launcher design status is presented with selected results on numerical design validation.

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