3D modeling and optimization of the ITER ICRH antenna

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The prediction of the coupling properties of the ITER ICRH antenna necessitates the accurate evaluation of the resistance and reactance matrices. The latter are mostly dependent on the geometry of the array and therefore a model as accurate as possible is needed to precisely compute these matrices. Furthermore simulations have so far neglected the poloidal and toroidal profile of the plasma, and it is expected that the loading by individual straps will vary significantly due to varying strap-plasma distance. To take this curvature into account, some modifications of the alignment of the straps with respect to the toroidal direction are proposed. It is shown with CST Microwave Studio® [1] that considering two segments in the toroidal direction, i.e. a "V-shaped" toroidal antenna, is sufficient. A new CATIA model including this segmentation has been drawn and imported into both MWS and TOPICA [2] codes. Simulations show a good agreement of the impedance matrices in vacuum. Various modifications of the geometry are proposed in order to further optimize the coupling. In particular we study the effect of the strap box parameters and the recess of the vertical septa.

[1] CST MICROWAVE STUDIO®, User Manual Version 2009, Sep. 2008, CST AG, Darmstadt, Germany, www.cst.com.
[2] Lancellotti V. *et al* . Nucl. Fusion, S476–S499, 2006.