# mm-wave Optical System of the ITER Upper Port EC Launcher

*M.A. Henderson*[1], *R. Chavan*[1], *R. Bertizzolo*[1], *A. Bruschi*[2], *S. Cirant*[2], *A. Collazos*[1], *F. Dolizy*[1], *D. Farina*[2], W. Kasparek[3], *J.-D. Landis*[1], *A. Moro*[2], *P. Platina*[2], *B. Plaum*[3], *E. Poli*[4], *G. Ramponi*[2], *G. Saibene*[5], *F. Sanchez*[1], *H. Shidara*[1], *V.S. Udintsev*[1]

[1] CRPP, EURATOM – Confédération Suisse, EPFL, CH-1015 Lausanne Switzerland
[2] Istituto di Fisica del Plasma, EURATOM- ENEA- CNR, 20125 Milano, Italy
[3] Plasmaforschung der Universtät Stuttgart, D-70569 Stuttgart, Germany
[4] Max Planck-Institute für Plasmaphysik, EURATOM-IPP, D-85748 Garching, Germany
[5] EFDA Close Support Unit, Boltzmannstrasse 2, D-85748 Garching, Germany

First Author e-mail: mark.henderson@epfl.ch

The mm-wave system of the ITER upper port EC launcher (UL) is approaching completion of the detailed design phase. During the past year, the design has been revised aiming at improving performance, reliability, maintenance access and reducing procurement costs. The UL has now adapted to the enhanced performance (EPL) launcher configuration that provides access into $\rho_t$~0.3 (where $\rho_t$ is the square root of the normalised toroidal flux) for control of the sawtooth oscillation. The EPL maintains a large safety margin for stabilising the NTM ($1.8 \leq j_{CD}/j_{BS} \leq 3.6$) and reduces the overall rotation of the steering mechanism reducing the engineering constraints.

Additional modifications under considerations include: replacing the in-port mitre bends with free space mirrors for improved beam focusing and reducing power loading on mirrors, analysis of the beam propagation after mirror aperturing and limited passage through the shield blocks, revision of the waveguide components forming the primary tritium barrier prior to the launcher for improved maintenance access, prototype steering mirror design optimised for minimising induced currents during a plasma disruption while maintaining good thermal properties, and optimisation of the steering mirror ensemble.

The critical component of the FS launcher is the steering mechanism, which will be a frictionless and backlash free mechanical system based on the compliant deformation of structural components to avoid the invessel tribological difficulties. An inert gas pressure controlled bellows system provides accurate angular positioning of the steering mirror. Three steering mechanism (SM) designs are currently under investigation: 1) manufacturing prototype, 2) balanced and 3) cantilevered SMs. The balanced and cantilevered SMs refer to the position of the mirror relative to the two flexure pivots. The balanced configuration has the mirror centred between two flexure pivots minimizing the forces on the flexure pivots due to induced forces during a plasma disruption. The cantilevered configuration has the two flexure pivots to one side of the steering mirror, this simplifies the installation process of the SM and provides a more compact assembly but induces a larger force on the flexure pivots during plasma disruptions. The manufacturing SM prototype has been designed and in the process of being assembled in collaboration with APCO SA. The aim is modify the SM design to simplify subcomponent manufacturing and assembly. The three designs will then be analysed leading a revised SM design planned for early 2008.

A general review of the above designs and future steps associated with the mm-wave system will be given.