Collimator design for ESRF-EBS

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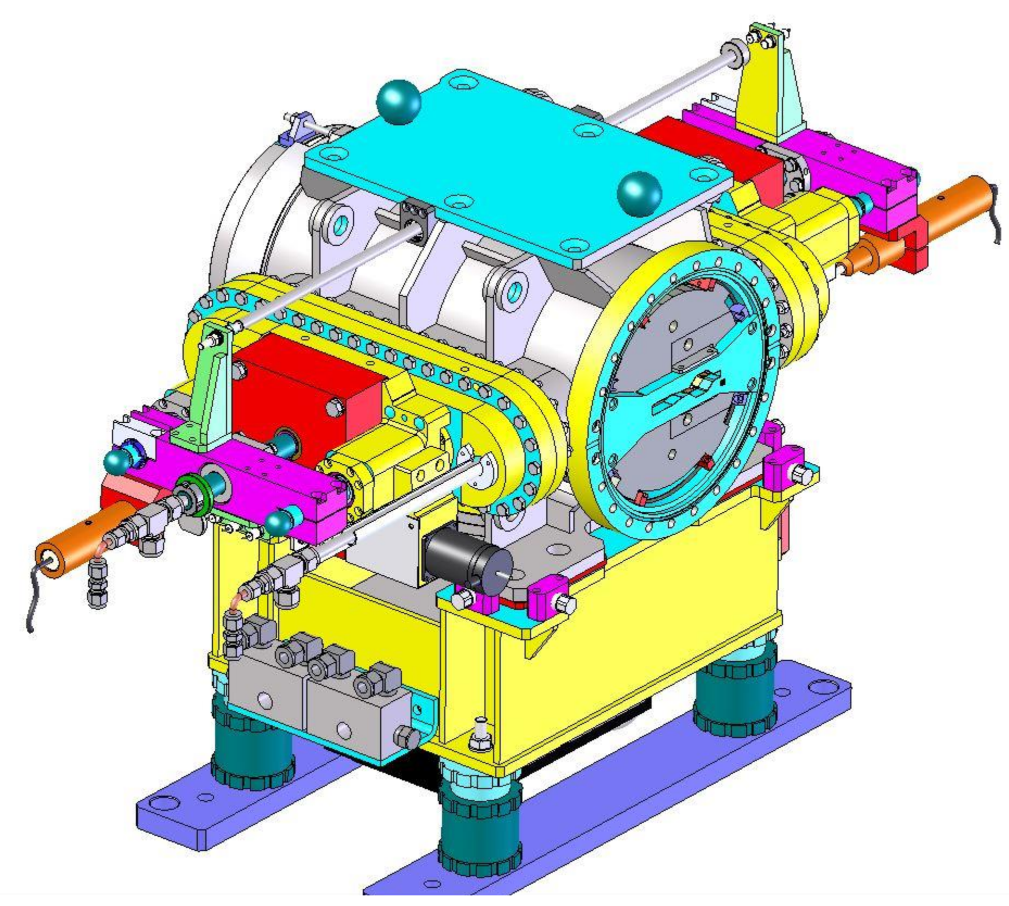
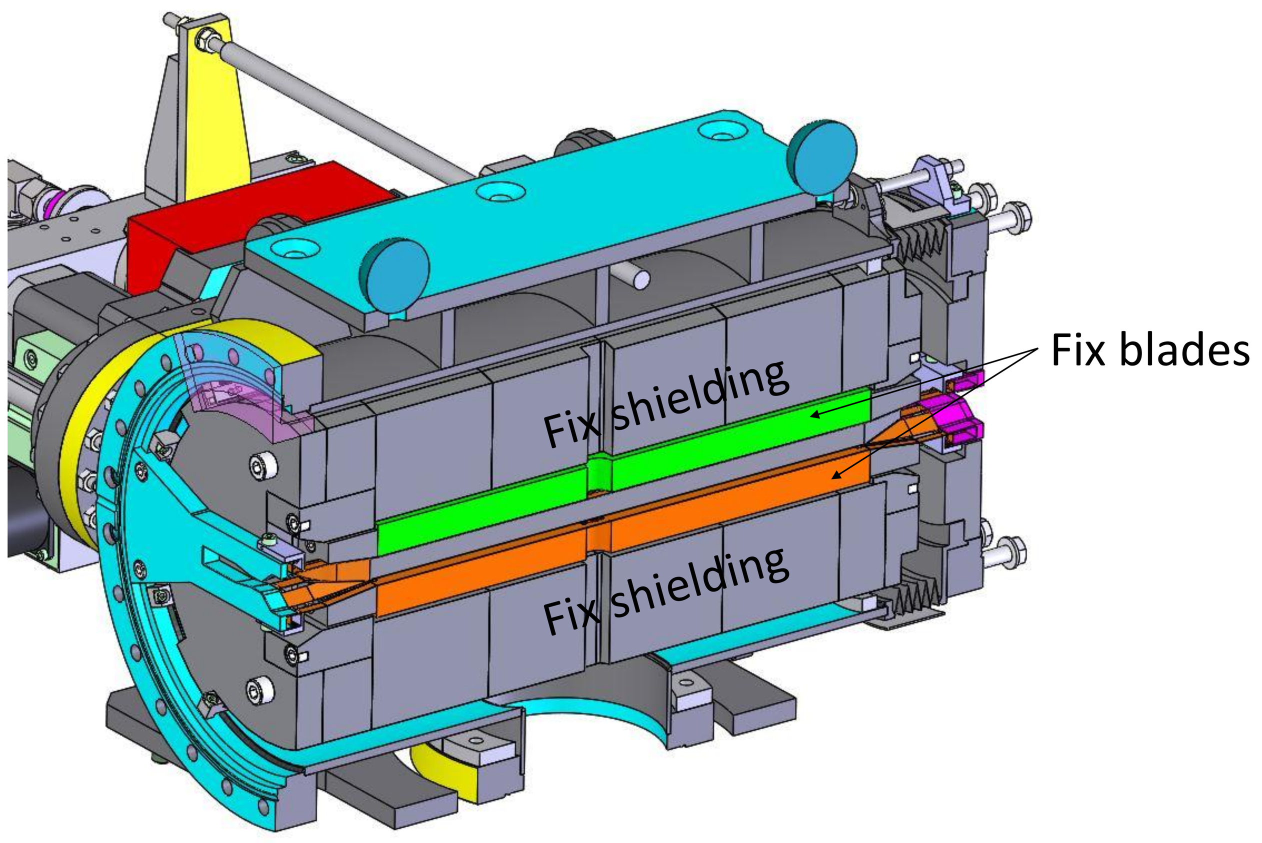
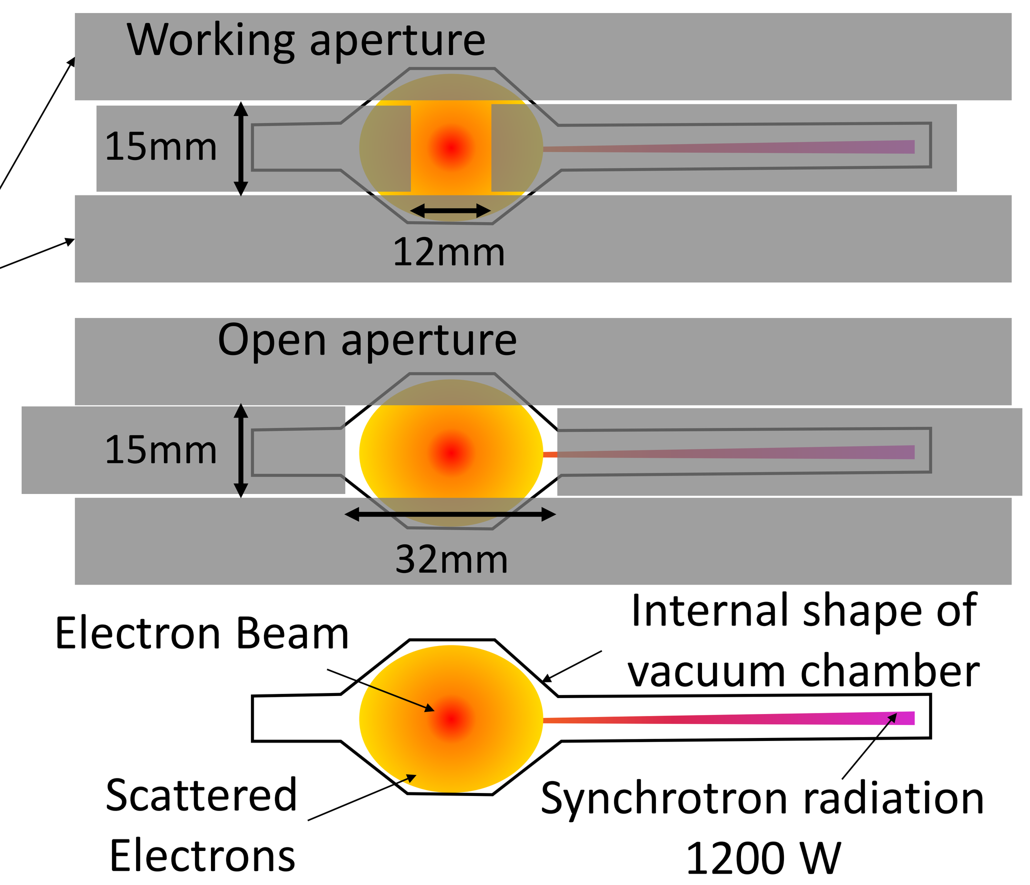
The function of the collimator is to localize the majority of the electron losses in the ESRF-EBS storage ring (SR). In addition, the collimator of the ESRF-EBS should absorb about 1200 W of synchrotron radiation. For ESRF-EBS, the electron losses due to intra bunch scattering (Touschek scattering) will be higher than in the current ESRF SR. To limit the level of radiation outside the storage ring, and the activation level of the vacuum chambers, it is more efficient to localize the electron losses and block the radiations at one place rather than reinforce all of the SR tunnel shielding. Once the collimator will be put on line with the electron beam at nominal intensity, it won't be possible anymore to intervene on it (due to the activation of the materials). As a consequence, a high level of reliability is required.

The design take into account all the diverse requirements from a safety, accelerator physics, thermic and mechanical point of view.

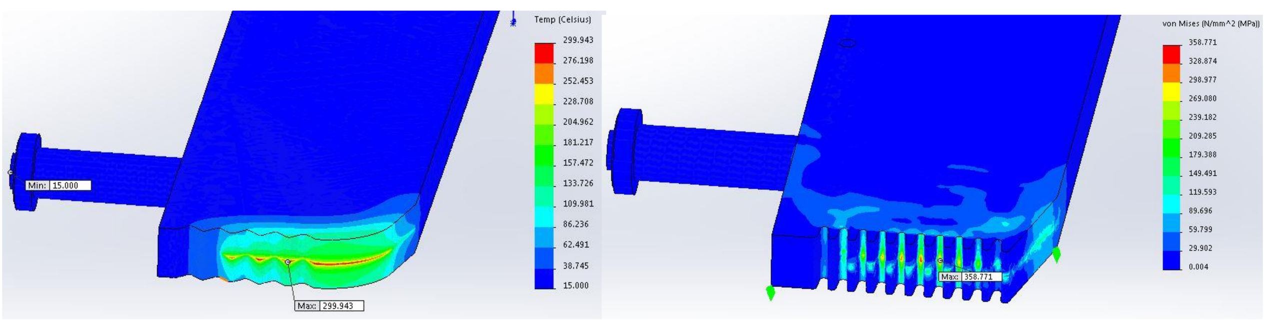




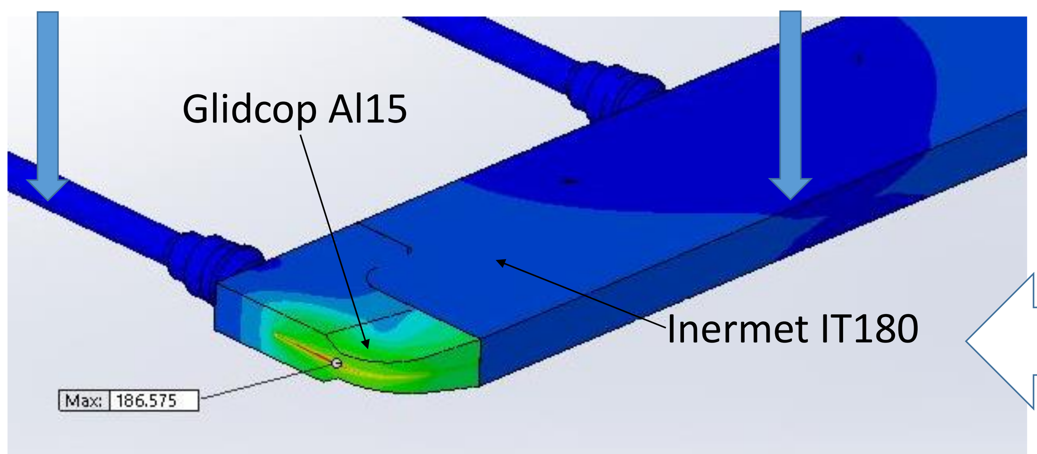
Schematic of collimator working principle



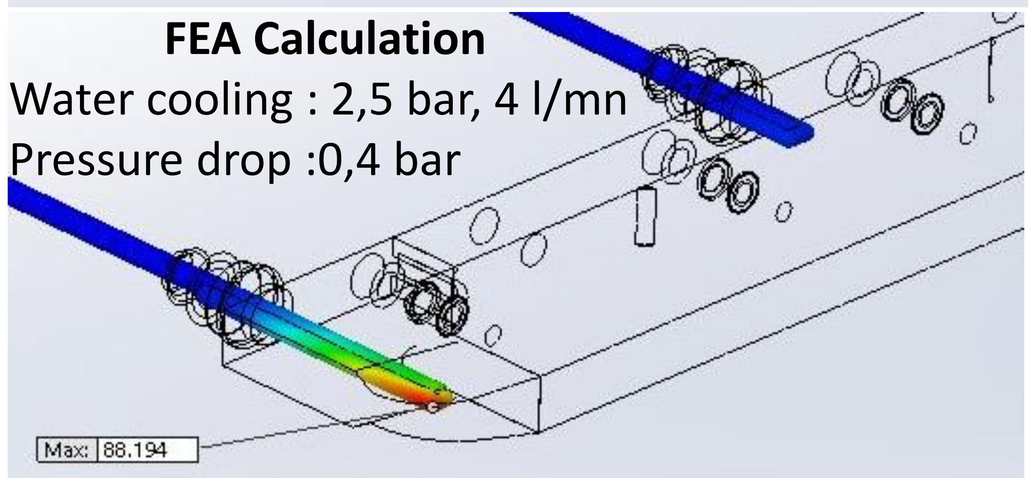
Preliminary design : blade & absorber material were Inermet IT180

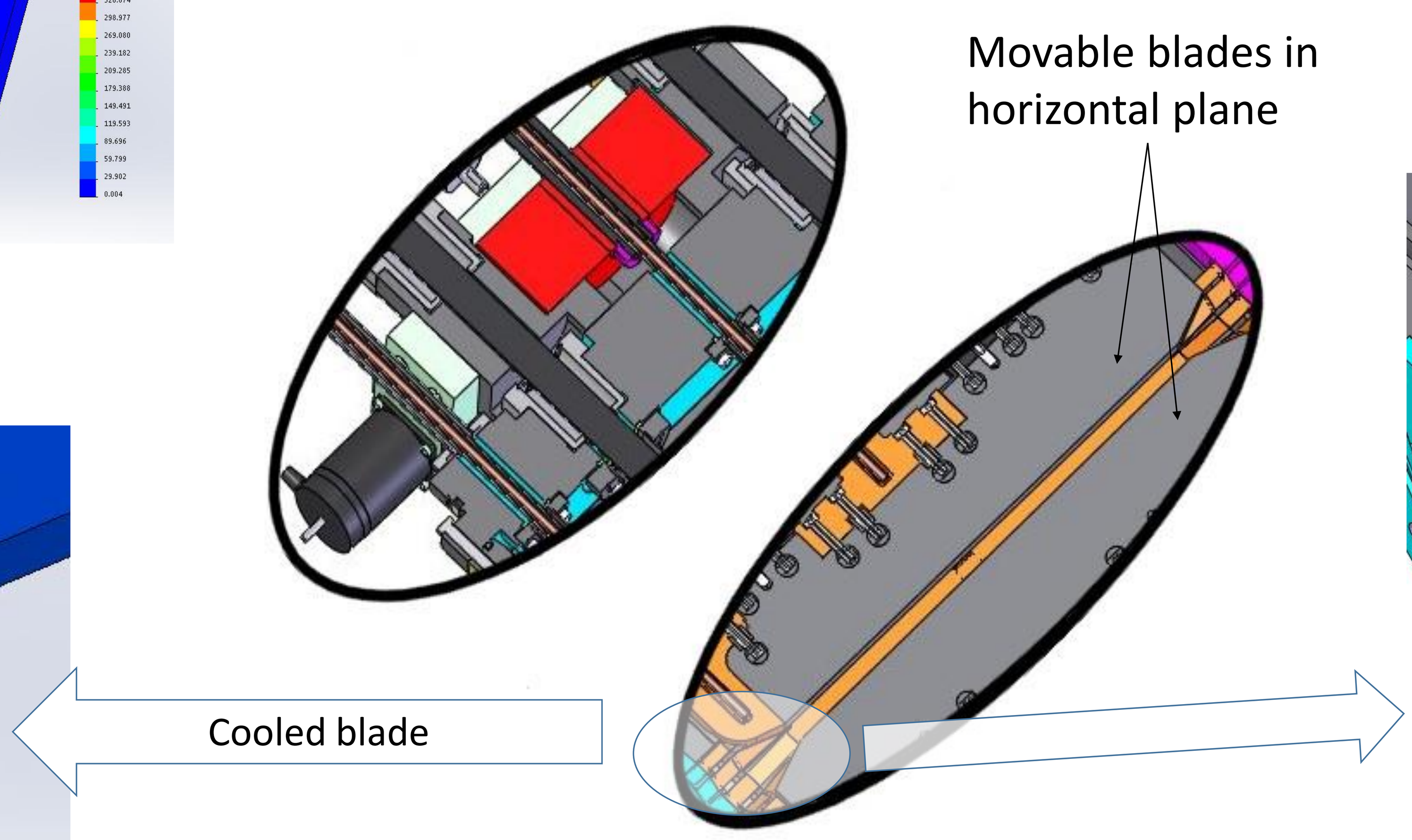


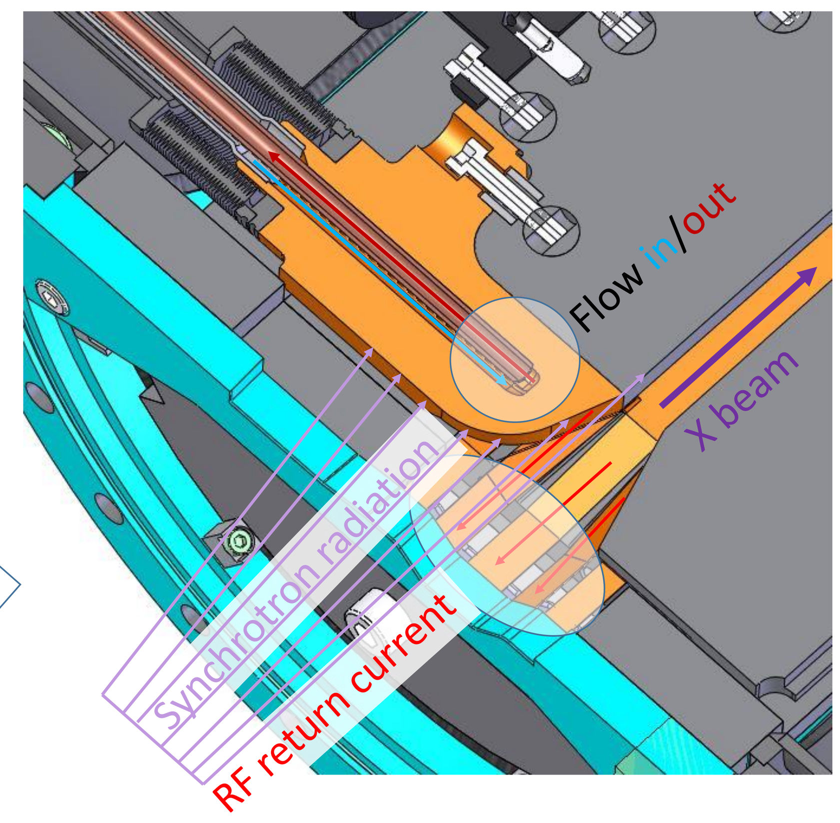
Final design : Blade material is in Inermet IT180 and absorber material is in Glidcop Al15



FEA Calculation
Water cooling : 2,5 bar, 4 l/mn
Pressure drop :0,4 bar



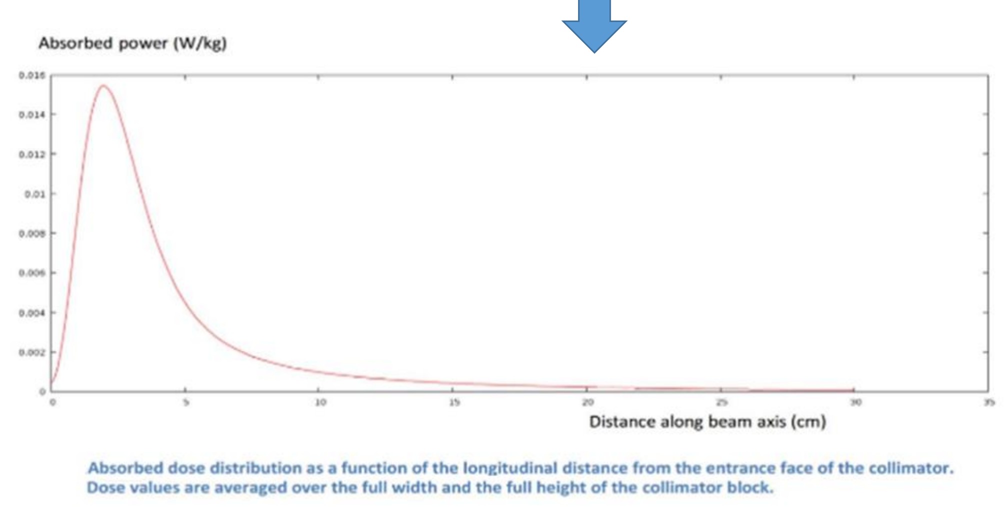


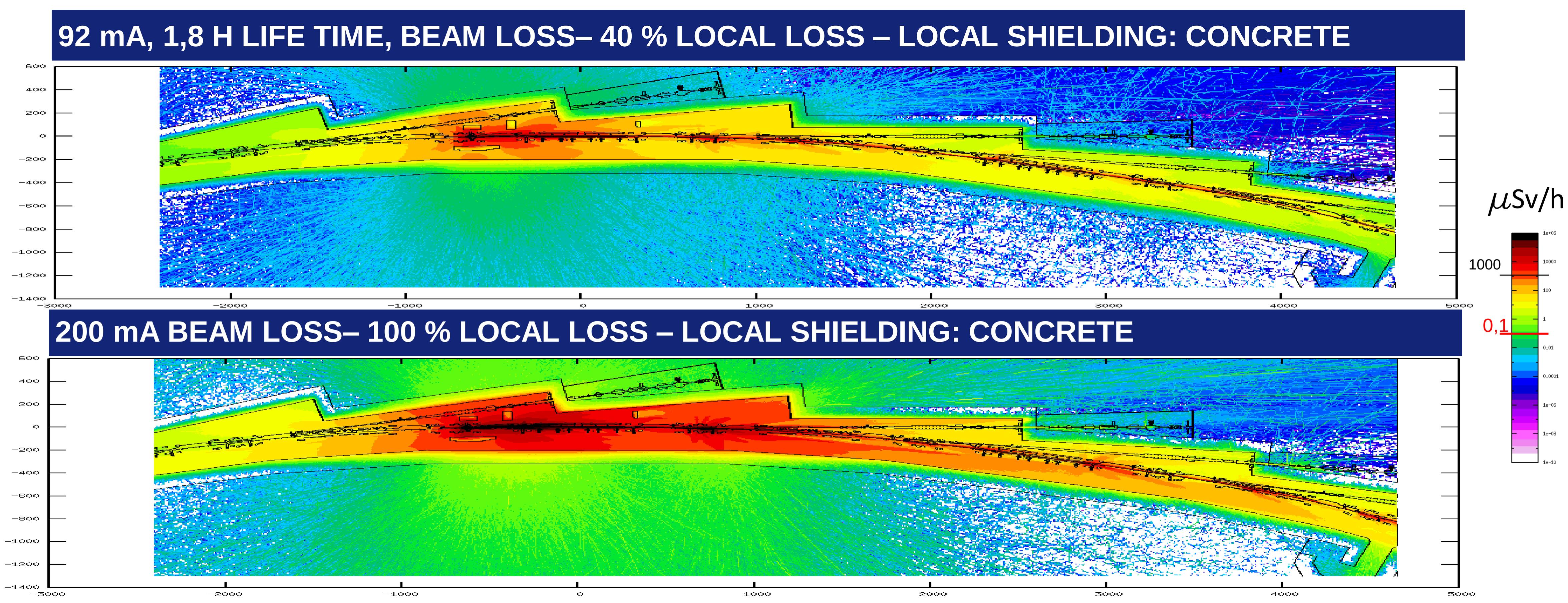


Detail of beam entrance of the collimator : Transition between double omega shape of the normal inner shape of the SR chamber to the square shape of the collimator is made with specific RF fingers.

Main characteristics
Cooled absorber material : GLIDCOP Al15©
Shielding & blade material : Inermet IT180©
Over all dimensions : lengh 430mm (-14/+2), internal Ø200mm, Shielding Ø200 x L 360 (120Kg)
Total stroke of blade movement : 20mm

Safety simulation of power absorption by the blades (Inermet IT180) and radiations around the collimator





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