

BEAMLINE COMPONENTS

X-RAY OPTICS COOLING

Purpose

The thermal problem is one of the most severe to be solved for an efficient use of the high brilliance X-ray source since mirrors lose their optical performances under heat load due to surface distortion.

IRELEC has developed an optimised cooling system for high heat load X-ray mirror. This cooling system is validated by thermo-mechanical FEM simulation and is compatible with bending system.

Description of the cooling system for high heat load mirror

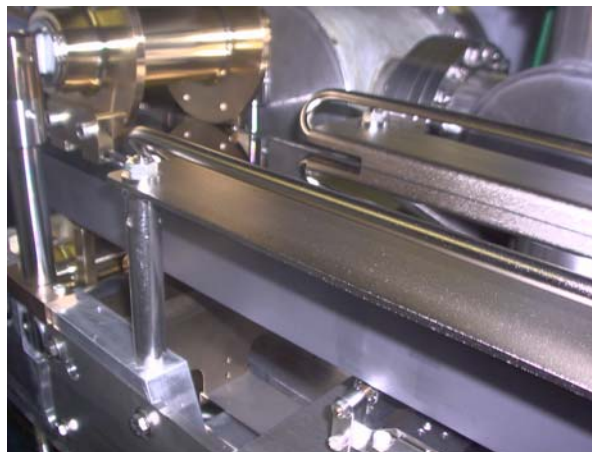
The cooling system is made of two copper blades on which is brazed a copper tube with water circulation. These blades lay inside grooves ground along the mirror bulk and filled with In/Ga eutectic. Thanks to this design, thermal contact is insured between the mirror and the cooling loop, and the mirror is insulated from external stresses and vibrations.

The advantage of such a cooling system design is that the mirror is mechanically insulated from vibrations induced by water turbulent flow. Moreover, it does not introduce stresses to the mirror and thus is compatible with a bended mirror.

To be compatible with most of the synchrotron recommendations, the cooling loop is manufactured with no brazed joint between water and vacuum.

Special attention is brought to the design of the cooling system in order to avoid any alteration of the performances of the bender (suppression of the mechanical contact between blade and mirror) and to allow a safe mounting of the cooling loop on the mirror.

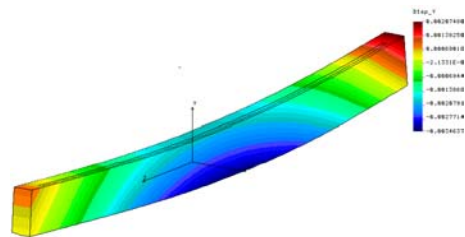
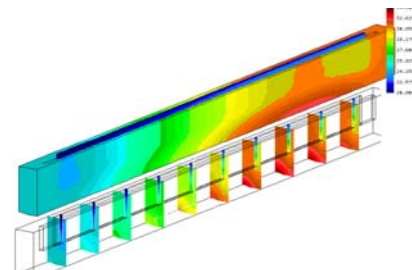
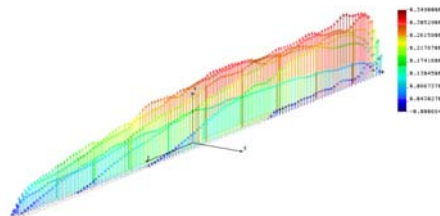
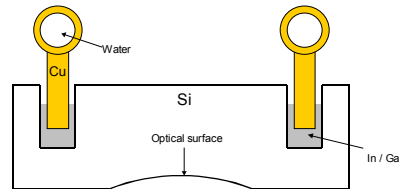
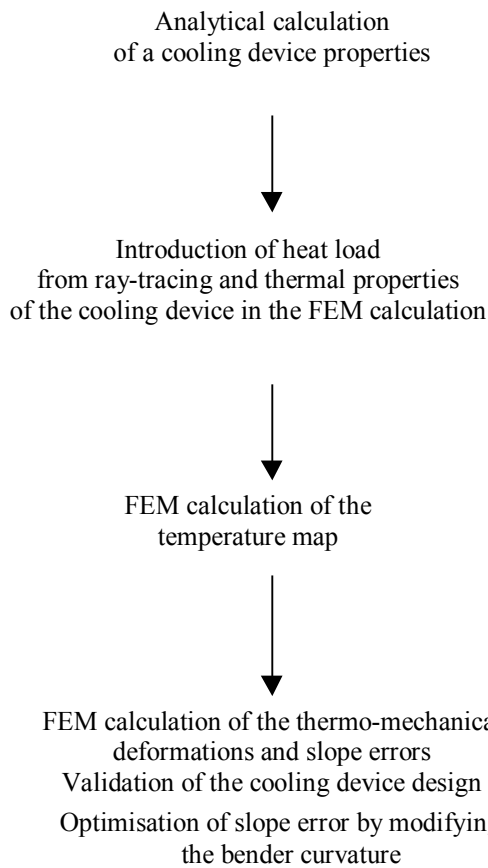
Copper blades are nickel coated for material compatibility.



Optimisation of the cooling system

IRELEC has developed a whole expertise including :

- optical ray-tracing
- FEM thermo-mechanical calculation
- optimisation of the cooling system for mirrors



IRELEC is specialised in the supply of :

- components for beamlines (mirror-holders, bending systems, mirrors, control systems, ...) and complete beamlines
- scientific equipment

IRELEC reserves the right to change these specifications without prior advice in the scope of the improvement of the product