



Design of Monochromatic and White Beam Fluorescence Screen Monitors for XAIRA Beamline at the ALBA Synchrotron

José María Álvarez, Carles Colldelram, Nahikari González, Judith Juanhuix, Josep Nicolas and Igors Šics ALBA Synchrotron Light Source, Cerdanyola del Vallès, Spain

Abstract

The optical layout of XAIRA, the hard X-ray microfocus beamline of ALBA, includes three monochromatic fluorescence screens and one water cooled white beam monitor, mounting respectively YAG:Ce and polycrystal CVD as scintillator screens. All monitors share the same design scheme, with a re-entrant viewport for the visualization system that allows reducing the working distance to the minimum, and the scintillator screen held by this CF63 flange itself, making the whole system very compact and stable. The flange is driven by a stepper motor actuated linear stage in order to position or retract the screen with respect to the beam path. In addition, in order to cope with the high incoming flux (18,6 W/m2) at the 100 μ m CVD diamond of the white beam monitor, a novel InGa-based cooling system has been developed. The general design of the new fluorescence screens, to be used also in ALBA's upcoming beamlines, with particular detail on the water-cooled white beam monitor is described here.

System description



Cooling design and simulations



FEA Thermal simulations Coupled FEA thermal-mechanical simulation: Absorbed heat power: Max density 18.56 W/mm² Total power 116.8 W Sliding between CVD Screen and damping elements with 0.2 friction coefficient. Thermal Contact Conductance (TCC) of 160 W/mm² among CVD Screen-InGa-Copper. CVD polycrystalline 35x21x0,1 mm fracture stress 350 MPa. Only minor differences in some structural parts dimensions and arrangement of

Max. Principal Stress 123,7 MPa

– Specifications

The new sample stage must comply with the following specifications:

- Beam envelope in each Fluorescence Screen Monitor should represent ~ 25% of Field of View (FOV) to allow severe beam misalignment absorption.
- Partial beam transmission through diagnostic device is not required.
- Each beam dimension should be made at least of 100-200 pixels to allow identification of beam shape pathologies.
- Two different configurations of screen-imaging system are proposed for white beam fluorescence screen (FSWB) or monochromatic fluorescence screen (FSM1/FSM2).





Summary

- Three models of Fluorescence Screen have been developed for XAIRA, the X-ray microfocus beamline at ALBA.
- The design has been guided to build a compact instrumentation that aims to become a standard Fluorescence Screen Monitor at ALBA light source.
- The project is currently being assembled and tested before final installation at beamline during the next months.



ALBA-CELLS

www.albasynchrotron.es

structural parts.