



Contribution ID: 159

Type: Poster

Instrumentation for experiments in quantum materials at ALBA XMCD&XRMS beamline BOREAS, present status and vision

Tuesday, 17 May 2022 18:50 (1h 10m)

BOREAS beamline 29 at ALBA Synchrotron Light Facility is a soft X-ray beamline dedicated to polarization-dependent spectroscopic investigations of advanced materials, enabling techniques such as x-ray magnetic circular and linear dichroism (XMCD, XMLD), and soft x-ray resonant scattering (including reflectometry, gisaxs, holography and coherent imaging) [Barla et al., J. Synchrotron Rad. 23,1507 (2016)]. The beamline provides a rather broad photon energy range (80 eV to above 4000 eV) with full polarization control for experiments at two endstations for spectroscopy and scattering approaches, both implementing high field (6 and 2 Tesla) and low temperature capabilities (4-380 K and 18-400K). This allows atomic level investigation of magnetic and electronic properties of quantum materials, among which ferromagnets, antiferromagnets, superconductors, ferroelectrics, multiferroics or topological insulators. Investigated samples have the form of isolated atoms, nanoparticles and powders, organic molecules, van-der-waals layers, thin films or bulk specimens. Operative since mid 2012, along the past few years we have largely enhanced the instrumentation available. In this contribution, we will provide details on the new available instrumentation, highlights of recent experiments, and outline some ideas for the future upgrade of the instrumentation in the frame of ALBA II project and the evolution of the scientific context.

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Session Classification: POSTER SESSION 2 - Cheese and wine