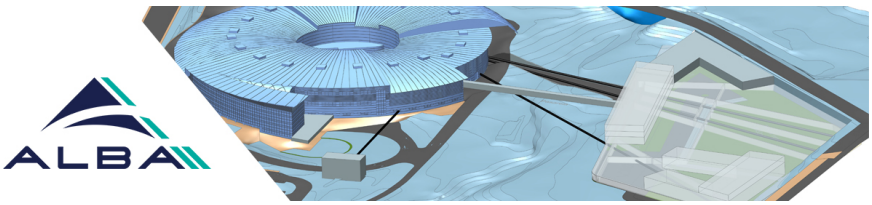
ALBA II Long Beamlines Workshop



Report of Contributions

https://indico.cells.es/e/1259

Contribution ID: **1** Type: **not specified**

Introduction to the workshop

Monday, 14 November 2022 14:15 (5 minutes)

Presenter: BISCARI, Caterina

Contribution ID: **2** Type: **not specified**

X ray Microscopy in life science

Monday, 14 November 2022 14:50 (30 minutes)

Presenter: SUSINI, Jean (Soleil Synchrotron)

Contribution ID: **3** Type: **not specified**

X ray Microscopy in material science

Monday, 14 November 2022 15:20 (30 minutes)

Presenter: HUANG, Xiaojing (Brookhaven National Lab.)

Contribution ID: **4** Type: **not specified**

Opportunities in imaging

Monday, 14 November 2022 14:20 (30 minutes)

Presenter: BONNIN , Anne (PSI)

Contribution ID: **5** Type: **not specified**

How does a hard X-ray nano probe work

Monday, 14 November 2022 16:40 (20 minutes)

Presenter: WRIGHT, Jonathan (ESRF, Grenoble, France)

Contribution ID: **6** Type: **not specified**

How does a soft X-ray nano probe work

Monday, 14 November 2022 17:00 (20 minutes)

Presenter: GIANONCELLI, Alessandra (Elettra Sincrotrone)

Contribution ID: **7** Type: **not specified**

Imaging under extreme conditions

Monday, 14 November 2022 16:10 (30 minutes)

Presenter: LIERMANN, Hanns-Peter (DESY)

Contribution ID: **8** Type: **not specified**

Overview of proposals

Tuesday, 15 November 2022 09:30 (15 minutes)

Presenter: NICOLÀS ROMAN, Josep

Contribution ID: **9** Type: **not specified**

Close out

Tuesday, 15 November 2022 12:00 (30 minutes)

Presenter: ATTENKOFER, Klaus

Contribution ID: **10** Type: **not specified**

Probing matter at the nano-to-mesoscale in the real and reciprocal space with chemical and bond-orientation sensitivity

Tuesday, 15 November 2022 10:15 (10 minutes)

A beamline with two endstations is envisaged. One of the endstations will be devoted to Resonant Soft X-ray Scattering (RSoXS) and the other one to Scanning Transmission X-ray Microscopy (STXM) + ptychography.
Scanning Transmission X-ray Microscopy and Resonant Soft X-ray scattering are complementary techniques to probe the nano-to-mesoscale structure of soft condensed matter, in the real and reciprocal space, respectively. It has been demonstrated that by using variable wavelength X-ray probes around the light element absorption edges of carbon, nitrogen and oxygen, the resonant behavior of chemicals containing these elements can be used as fingerprints of the molecular bonding environment, including the molecular orientation. The unique chemical and orientational sensitivities of both, RSoXS and STXM, arise from the energy- and polarization-dependent X-ray interaction with molecules. While usual non-resonant scattering techniques have difficulty for distinguishing organic materials in a sample because they all have very similar electron densities, due to chemical sensitivity, RSoXS can increase the contrast between these materials orders of magnitude.
RSoXS and STXM techniques can address scientific cases like: organic electronics, liquid crystals, polyelectrolyte solutions and gels, membranes and porous materials, self direct assembly, polymers, nanocomposites, interfacial structures, low Z catalysis, biology, etc. Some examples will be pointed out.

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Presenter: GARCÍA-GUTIÉRREZ, Mari Cruz (Instituto de EStructura de la Materia IEM-CSIC)

Session Classification: Presentation of preproposals

Contribution ID: **12** Type: **not specified**

Soft x-ray RIXS. A new long beamline at ALBA

Tuesday, 15 November 2022 10:25 (10 minutes)

The current needs generated by the race towards understanding and tailoring properties of quantum materials and the urgent social demand of greener and/or sustainable energies has boosted the demand of mapping weak excitations in matter. Resonant Inelastic X-ray Scattering, RIXS, is a unique tool that can return full energy and momentum resolved maps of such excitations, and has provided new insights in many different areas, from superconductivity, magnetism and energy harvesting (batteries, data storage,...). There is an exceeding large demand of beam time at RIXS beamlines that cannot be covered by the large scale facilities (ERSF, Diamond, NSLS II, Soleil,⋯). There is also the need to develop tools that could allow mapping micrometric samples and devices, and perform analysis under flexible variety of external stimuli. These are the goals that the new long beamline aims to offer to the scientific community.

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Session Classification: Presentation of preproposals

Contribution ID: **13** Type: **not specified**

CORUS: a cryo nano bio-imaging beamline for ALBA-II

Tuesday, 15 November 2022 09:45 (10 minutes)

The complexity of biological systems requires monitoring them at "work"to link molecular processes in the native cellular environment with structural and functional information. Molecular location and quantification in close-to-native conditions, avoiding chemical fixation and dehydration artefacts, are therefore of outmost importance for instance in metallomics, drug delivery, nano-biomedicine and infection, among others. To this aim, we propose CORUS as a cryogenic bio nanoprobe beamline with two complementary end-stations that will allow performing nano X-ray fluorescence (XRF) and phase contrast-based imaging (PCI) in one of them and nano-XANES in the other, in cryopreserved cells, organoids and tissues to respond to current and future societal challenges. NanoImag, the first end-station, will deliver a focal spot of 30 nm at 10, 20 and 27 keV with high flux to allow ppm sensitivity, as well as revealing structural information of the sample by PCI. This end-station will be optimized for the study of endogenous elements (10 keV), sub-optimally tackled at higher excitation energies, but will also be capable of probing the most common exogenous elements used for biomedical and biotechnological applications. Moreover, NanoImag will be complementary to NanoSpec, the second end-station, which will focus on spectroscopic capabilities from 4 to 25.5 keV at cryo with a 50-100 nm focus. CORUS will complete the ALBA-II portfolio enabling multimodal and correlative research with current operational beamlines such as MISTRAL, FAXTOR and MIRAS, but will also be complementary to the cryo-epifluorescence and cryo-3D Structured Illumination microscopes and the cryo-EM facilities. Remarkably, this beamline array would be unique in Europe, and could place ALBA-II into an outstanding position as a powerhouse for correlative multi-technique approaches involving all three cryo-visible light, EM and X-ray imaging.

Primary author: CONESA, Jose Javier (CNB-CSIC)

Co-authors: MITTONE, Alberto; PATERA, Alessandra; SÁNCHEZ-CANO, Carlos (DIPC); PEREIRO LÓPEZ, Eva; JAMME, Frederic (SOLEIL); JUANHUIX GIBERT, Judith

Presenter: CONESA, Jose Javier (CNB-CSIC)

Session Classification: Presentation of preproposals

Contribution ID: **14** Type: **not specified**

From mammalian circuits to synapses: correlative multimodal imaging using hard X-rays

Tuesday, 15 November 2022 09:55 (10 minutes)

Integrating physiology and structure at the neuronal circuit scale can provide a mechanistic understanding on how that circuit works. A correlative multimodal imaging pipeline that combines in vivo 2-photon microscopy (2P), synchrotron X-ray computed tomography with propagation-based phase contrast (SXRT) and serial block-face electron microscopy generates these multimodal maps reliably. In it, SXRT brings subcellular context of multi-mm3 landscapes non-destructively. SXRT also enables a bridging use: 2P and SXRT datasets can be warped at single-cell accuracy, informing on optimal specimen trimming strategies. Finally, this pipeline is compatible with other complementary hard X-ray imaging modalities: X-ray nano-holotomography resolves lateral dendrites of mitral and tufted neurons of known physiological profiles, and X-ray ptychographic tomography could resolve 60% of the synaptic contacts with an 80% precision. Altogether, this approach enables harnessing the resolving power of multiphoton, hard X-ray and volume electron microscopy technologies to create detailed multimodal maps of brain circuits.

Primary author: BOSCH PIÑOL, Carles (The Francis Crick Institute, London, UK)

Co-authors: ZHANG, Yuxin (The Francis Crick Institute, London, UK); PACUREANU, Alexandra (ESRF, The European Synchrotron Radiation Facility); ACKELS, Tobias (The Francis Crick Institute, London, UK); DIAZ, Ana (Paul Scherrer Institut, Villigen, Switzerland); BONNIN, Anne (Paul Scherrer Institut, Villigen, Switzerland); HOLLER, Mirko (Paul Scherrer Institut, Villigen, Switzerland); PEDDIE, Chris (The Francis Crick Institute, London, UK); BERNING, Manuel (Department of Connectomics, Max Planck Institute for Brain Research, Frankfurt am Main, Germany); RZEPKA, Norman (scalable minds GmbH, Potsdam, Germany); ZDORA, Marie-Christine (Department of Physics and Astronomy, University College London, London, UK); STORM, Malte (Diamond Light Source, Harwell Science and Innovation Campus, Didcot, UK); MÜLLER, Elisabeth (Paul Scherrer Institut, Villigen, Switzerland); WHITELEY, Isabell (The Francis Crick Institute, London, UK); RAU, Christoph (Diamond Light Source, Harwell Science and Innovation Campus, Didcot, UK); MARGRIE, Troy (Sainsbury Wellcome Centre, University College London, London, UK); COLLINSON, Lucy (The Francis Crick Institute, London, UK); SCHAEFER, Andreas T. (The Francis Crick Institute, London, UK)

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Session Classification: Presentation of preproposals

Contribution ID: **15** Type: **not specified**

Introduction to the project

Monday, 14 November 2022 17:20 (20 minutes)

Presenter: BISCARI, Caterina

Contribution ID: **16** Type: **not specified**

CoDI, Coherence Diffraction Imaging

Tuesday, 15 November 2022 10:05 (10 minutes)

CoDI will be the coherence diffraction end station at ALBA II. This station will be intended to investigate materials in strategic sectors for the European Union (biotechnology and agri-food; energy transition and decarbonization; active and healthy ageing; circular economy and sustainable raw materials), which complement ALBA strategic research lines. The main technique at CoDI will be ptychographic-tomography in forward direction, making possible the imaging of thick (< 500 ⊠m) nanostructured materials (e.g. nanocatalysts, nanocrystals, nanoparticles) and biological samples. The setup will be compatible with tele-ptychography (a new variant of ptychography that use an analyzer to reconstruct complex wave fronts after the sample, this simplifies in-situ experiments), scanning approaches, near-field ptychograpy, Bragg-CDI and Bragg-ptychography. A tailored setup for tele-ptychography will make CoDI at ALBA II an unique instrument in the world.
CoDI beamline perfectly suits within the societal challenges defined at European level, as well as in the ALBA strategic research lines. This will help to the different national and international academic and industrial community to profit about this highly advanced beamline.
Scientific communities that will benefit from imaging thin and thick samples till 500 ⊠m, such as biology, catalysis, electrocatalysis, energy related materials and general material science.

Primary authors: DIAZ, Ana (Paul Scherrer Institut, Villigen, Switzerland); RODRIGUEZ FERNANDEZ, Angel (European XFEL Facility GmbH); SOLANO MINUESA, Eduardo; Prof. SOLLA, J. (Universidad de Alicante, Spain); Prof. BLANCO, J.A. (Universidad de Oviedo, Spain); GARCÍA ARANDA, Miguel Ángel; Prof. VILLANUEVA-PÉREZ, P. (Universidad de Lund, Sweden); DE LA PEÑA O'SHEA, Víctor Antonio (IMDEA Energía)

Presenter: Prof. VILLANUEVA-PÉREZ, P. (Universidad de Lund, Sweden)

Session Classification: Presentation of preproposals

Contribution ID: **17** Type: **not specified**

Discussion: working group Life Science

Tuesday, 15 November 2022 10:45 (30 minutes)

Contribution ID: **18** Type: **not specified**

Discussion: working group Materials Science

Tuesday, 15 November 2022 11:15 (30 minutes)