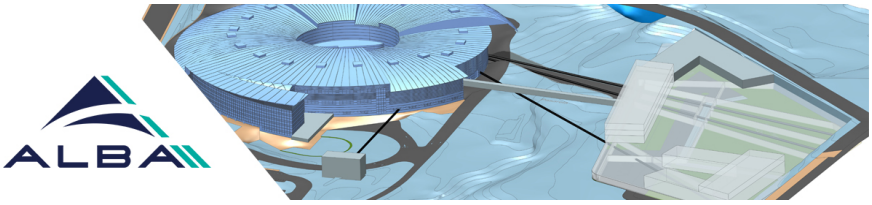

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CORUS: a cryo nano bio-imaging beamline for ALBA-II

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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.

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