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Fast X-ray micro-tomography with a multi-scale approach at the ALBA synchrotron

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The BL31-FaXToR is the new beamline currently under construction at the third generation synchrotron facility ALBA, dedicated to hard x-ray micro-tomography. The beamline will provide the opportunity to perform 3D imaging within sub-seconds time resolution, working under mono- or white-beam conditions. Absorption and phase-contrast (mostly based on free propagation and grating interferometry) image contrast modalities [1] will be available to the user community.
This work focused on the innovative FaXToR experimental station. The hutch mostly includes: the beam conditioning table (holding a custom fast shutter), the tomography stage, and the detection optics table. Its novel design is foreseen in view of a beamline operative for multi-resolution dynamic X-ray imaging prone to a range of applications. The fast shutter, whose in-house design is currently ongoing, will be installed on the beam conditioning elements table. Its role will be to minimize the unwanted radiation exposure on the sample and other sensitive elements and to reduce the eventual artefacts linked to process dynamics by adequate synchronization with the detection camera. Samples will be located on the top of the rotary head of the tomography tower, capable to reach up to 800 rpm at its maximum speed. The stage presents a flexible design and it is equipped with slip rings, allowing the use of complex sample environments. The peculiar optics table includes a dual detection system and a multipurpose platform. The two indirect detection optics, based on the combination of X-ray scintillation screens and visible optics lens systems will be provided of different magnifications, selectable according to experimental needs. Their distances with respect to the sample stage can be set remotely. FaXToR will make use of CMOS detection technology [2] to satisfy the requirements in terms of image quality, efficiency and speed. The multi-purpose platform will host a set of in-situ devices and will accommodate future upgrades of the beamline.
The beamline IT infrastructure will be dimensioned in order to be able to cope with a maximum data flow of 10 GB/s towards ALBA high-performance computing system. Existing software packages like [3], [4] will be used for the data reconstruction, analysis [5] and visualization [6].

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