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Recent developments from NeXT-Grenoble, the Neutron and X-ray Tomograph in Grenoble

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NeXT-Grenoble is the Neutron and X-ray Tomograph born in 2016 from the joint effort of Universitè Grenoble Alpes (UGA) and the Institut Laue-Langevin (ILL), and takes advantage of its world-leading cold neutron flux. Specifically, the flux peaks at $3x10^{8} n\ cm^{-2}\ s^{-1}$ for an L/D of 333 with an average wavelength above 3 Å.

The instrument relies on a suite of detectors ranging from fields of view above 170x[mm]x170[mm] to *true* resolutions below 10 µm. They are constituted by a range of scintillators ranging from 200 µm $ZnS/6LiF$: to 2.5µm $^{157}Gd_2O_2S : Tb$ and a set of high aperture lenses.

Thanks to the uniquely powerful flux, the instrument can perform high speed tomographies (below 10 seconds) at large fields of view as well as acquire high resolution (below 10 µm) tomographies in times comparable to those of microfocus x-ray setups.

A key feature of the instrument is the possibility to perform *simultaneous* x-ray and neutron tomography, in order to take advantage of the high complementarity of the attenuation coefficients of these two techniques.

The registration of the two volumes is made possible by recent mathematical developments which also provides phase identification, with much more ease than with either image individually.

A major upgrade of the instrument is foreseen in the forthcoming two years within the "Endurance 2" upgrade scheme of ILL to further improve its performances as well as to add further options (*e.g*, monochromation, polarised neutrons, grating interferometry).
This instrument is open for proposals through its dedicated website (https://next-grenoble.fr/).

This instrument is conceived with a wide range of both fundamental and engineering applications in mind and is capable of withstanding the weight of cells up to several hundred kilograms while remaining stable at high resolutions thanks to the granite exoskeleton. Correspondingly, the instrument allows for voluminous cells thanks to the movable detector and the abundant free space above (~ 1 m) and below the instrument (~ 1.5 m).

This, together with the aforementioned performances has already allowed a range of high pressure, high temperature and hydro-mechanical *in-situ* tests to be performed at high speeds.

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