Spectroscopy detector needs for X-ray nanoprobes within the ESRF Upgrade

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A number of different beamlines at the ESRF offer X-ray analysis and imaging capabilities from the microscale to the nanoscale. Each beamline developed a specific focus in terms of application fields, experimental techniques and energy range. These capabilities are currently strongly enhanced by the ESRF Upgrade Programme [1]. It aims to enable scientists using the ESRF to access a new generation of beamlines providing routine use of intense X-ray nano-beams for the analytical study of mesoscopic structures with nanometer spatial resolution. These studies require unique combinations of real space imaging end microscopy X-ray techniques with established X-ray diffraction, scattering and spectroscopy methods.

Phase I of the ESRF Upgrade Programme (2009-2015) mainly involves the construction of 11 new generation beamlines (with a focus on X-ray analysis for six of them) and the refurbishment of most other beamlines. The enhanced capabilities are associated to new optical schemes for the beamline and the nano focusing, and to novel detector instrumentation. The extended experimental hall buildings along with a satellite building for ID16A/ID16B allowed building longer beamlines with smaller beams and/or longer working distances.

Phase II of the ESRF Upgrade Programme (2015-2022) focuses on a major upgrade of the ESRF storage ring and a strong instrumentation development programme [2]. The envisaged new source will deliver a huge reduction (about 30) of the horizontal emittance and, correspondingly, an increase of the brilliance and coherence of the delivered beams. Very importantly, ‘coherent’ beams will become routinely available also at high energies. The direct benefit for most X-ray analysis/imaging beamlines is an increase in the useful flux by a factor 50 or more. Therefore a (r)evolution towards much faster time-resolved X-ray imaging and analysis is anticipated.

Within this context we will focus on the energy resolving detector systems presently in use at the X-ray nanoprobe beamlines, their current limitations and the detector needs to exploit fully the future source.

References

[1] http://www.esrf.eu/about/upgrade
[2] http://www.esrf.eu/home/about/upgrade/documentation/orange-book.html

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