

# Materials Metrology at synchrotrons and its extension to X-ray lab sources

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A progress with the development of intense and stable laboratory X-ray sources in the XUV and soft X-ray energy ranges triggers the broadening of the research fields allowed in the lab and intensify an activity not only in e.g. lithography and spectrometry, but also in many other domains of the materials research; especially in those, which are dedicated to different nanostructured functional systems. Complemented by XUV, soft and hard X-rays from brilliant synchrotron sources, the static and dynamic characteristics of different types of materials would be effectively probed in a much larger extent with an appropriate space/time resolution and keeping an element-specificity of studies.

Meanwhile, an increased complexity of the novel materials and the desired precision in exploring of their functionality requires a very high accuracy in performing even routine experiments either in the lab or at synchrotrons, and would need an implementation of established procedures for standardized and validated measurements including e.g. SI-units traceable quantities in addition to advanced instrumentation. An expected partial interconnectedness and complementarity of X-ray lab sources and synchrotrons would further strength a demand for developing the standardized measurements protocols that would take into account the peculiarities of each type of measurements.

Some challenges within Materials Metrology tasks expected at synchrotron sources are currently actively discussed in a context of new functional materials studies for e.g. quantum information technology, effective solar cells manufacture, batteries improvement, smart coatings, etc., and will be addressed during the development towards a new BESSYIII@HZB integrated facility to offer more possibilities for trustworthy and reliable studies for the User community and Industry partners. A strong collaboration with the laboratories that actively use X-ray sources for complementary studies would be a great step for such an integration.