

Biomedical imaging with Synchrotron Radiation

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Due to its high intensity, spatial coherence, and tunable monochromaticity, synchrotron X-ray imaging has become an essential tool across various scientific disciplines.

Over recent decades, advancements in X-ray instrumentation, the development of novel imaging techniques, and the expanded availability of imaging beamlines have driven significant growth in biomedical applications enabling non-destructive, three-dimensional visualization of complex biological structures at micro- and nano-scales. This progress has successfully bridged the gap between the Life Sciences community and synchrotron-based research.

The lecture is divided into three sections:

Part I introduces phase-sensitive X-ray imaging techniques that exploit source coherence and are used for biomedical imaging.

Part II highlights key experimental achievements and prospective applications of synchrotron radiation across resolution scales, ranging from virtual histology to preclinical and clinical imaging.

Part III presents SYRMEP-LS, the new beamline for Life Sciences imaging currently under development as part of the Elettra 2.0 upgrade, outlining its main experimental setups and foreseen research directions.