

Hard X-ray imaging with Synchrotron Radiation

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Synchrotron Radiation (SR) with its peculiar characteristics of spatial coherence, tunable monochromaticity and high intensity is an incomparable research tool for many disciplines.

In the last decades, the development of new imaging techniques, the progress in X-ray instrumentation joined to the increased availability of imaging beamlines at third generation SR sources, brought to an important growth of applications of hard X-ray imaging both for Life and for Materials Science and in Cultural Heritage.

Phase contrast techniques exploiting the high source spatial coherence are highly requested, in particular for the imaging of biological tissues, polymers, soft materials, porous materials, foams, etc.

Particularly relevant are the applications exploiting the incomparable intensity of SR that allows images to be acquired at much greater rates than using any laboratory sources, and with improved signal-to-noise ratio, opening the possibility to perform dynamic Computed Tomography (CT) scans, the so-called *4DCT*. These approaches are used to study in real time dynamic processes, occurring, for instance, while the sample is subject to a given treatment (*in-situ* dynamic experiments), or to follow some processes in living organisms.

Another important opportunity offered by SR, particularly interesting for biomedical applications, regards the possibility to easily perform CT studies, on the same sample, at different resolution scales (*Zoom CT* protocols). These approaches are often applied on biological tissues as not destructive adjunct tools for histological analysis.

In the lecture some important applications and the main perspectives of hard X-ray imaging with SR will be presented.