

## **PICASSO: A Digital Detector for the SYRMEP Mammographic Beamline**

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The SYRMEP (Synchrotron Radiation for Medical Physics) Collaboration is active in Trieste (Italy) with the goal of optimizing the quality of radiological examinations operating both on the source and on the detector side.

An important milestone has been reached in March 2006, when the SYRMEP collaboration has performed worldwide unique clinical mammographic examinations using X-rays generated by one of the bending magnets of the synchrotron radiation (SR) facility Elettra. Such a SR source provides a monochromatic, laminar, high-flux X-ray beam and moreover allows to exploit the so-called phase contrast (PhC) effects.

While a conventional screen-film system has served as detector so far, major efforts has been pursued in order to develop a digital detector capable of exploiting the peculiar characteristics of the SR source, taking into account that mammographic images must be acquired in a few seconds, at low dose and with high spatial and contrast resolution.

A finely pitched linear array Silicon microstrip sensor, operated in the “edge-on” configuration and coupled with a fast single-photon counting read-out electronics has been regarded as the most appropriate detector, because of its high Detective Quantum Efficiency (DQE).

The PICASSO (Phase Imaging for Clinical Application with Silicon detector and Synchrotron radiation) Project, funded by the Italian Istituto Nazionale di Fisica Nucleare (INFN), uses Hamamatsu digital microstrip sensors (0.05 mm pitch, 0.3 mm height and 10 or 20 mm depth) equipped with the Mythen-II high-rate photon counting ASIC developed at the Swiss Light Source for powder diffraction experiments.

The latest released prototype features a total of 1536 channels covering a beam width of about 7.6 cm. The system, which can be modeled as a paralyzing single photon counter, enables X-ray imaging at the quantum limit for photon fluence up to 70 MHz/mm<sup>2</sup>.

This contribution presents the characterization of the device in terms of geometrical features and counting capabilities; images of standard, very low-contrast and high spatial resolution phantoms are recorded in conventional absorption and PhC imaging.

**KEYWORDS:** digital x ray detector clinical mammography Silicon microstrip detector