Contribution ID: **201** Type: **Oral Presentations**

Towards high sensitivity and low dose breast radiography with laser-driven X-ray sources

Thursday 10 July 2025 16:15 (15 minutes)

Interferometric X-ray imaging based on differential phase contrast offers greater sensitivity to soft tissue differences than conventional absorption-based radiography. This makes it a promising technique for the early detection of breast lesions, including those with minimal contrast, such as micro-calcifications. Additionally, since grating-based interferometry utilizes transmitted radiation and is effective at higher X-ray energies, where soft tissue becomes nearly transparent, it can enable a significant reduction in radiation dose. The grating interferometry method is the most clinically feasible form of X-ray phase imaging. However, current setups utilize interferometers about a meter long and relatively high radiation doses to produce clinical-quality images. We show that by extending the interferometer length to several meters and using gratings with micrometer-scale periods, the sensitivity of the system can be improved while further decreasing the dose. Such long interferometers need highly coherent and intense X-ray beams, which are beyond the capabilities of standard X-ray tubes. High-power (100-200-TW class) laser systems can meet these requirements by generating directional, bright X-rays through laser-plasma interactions. Finally, we introduce the Dr. LASER project at ELI-NP, which will develop a laser-driven X-ray source optimized for high-sensitivity, low-dose interferometric breast radiography, having the potential to improve breast cancer detection by combining advanced laser technology with X-ray interferometry.

Primary author: SAFCA, Nicoleta (Extreme Light Infrastructure –Nuclear Physics, Bucharest-Magurele, Romania)

Co-authors: STUTMAN, D. (Extreme Light Infrastructure –Nuclear Physics, Bucharest-Magurele, Romania); ANGHEL, E. (Extreme Light Infrastructure –Nuclear Physics, Bucharest-Magurele, Romania); CIOBANU, I. (Extreme Light Infrastructure –Nuclear Physics, Bucharest-Magurele, Romania)

Presenter: SAFCA, Nicoleta (Extreme Light Infrastructure –Nuclear Physics, Bucharest-Magurele, Romania)

Session Classification: Biophysics, Life Sciences, Medical Physics

Track Classification: S02 –Biophysics, Life Sciences, Medical Physics