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#9-37 Traceability in terms of average glandular dose to primary national references of CEA-List LNE LNHB for numerical mammography

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Introduction: A significant advancement in mammography examinations is tomosynthesis, which allows for the three-dimensional reconstruction of breast images and improves detection sensitivity. However, it also leads to an increase in the absorbed dose to the breast. The accuracy of the estimation of the average glandular dose is crucial to ensure the optimal functioning of mammography equipment and the safety of patients. Following the Dance and Boone model, the Average Glandular Dose is derived from air kerma measurement multiplied by conversion factors obtained through Monte Carlo simulations. This Average Glandular Dose is used for the optimization of examinations but only imperfectly represents the absorbed dose to the breast. We propose to present the methodology for measuring and modeling X-ray spectra, resulting in the production of clinical mammography beams on the X-Rays generators of the French national metrology Laboratory, the National Laboratory Henri Becquerel. Materials and Methods: Our methodological approach is based first on the measurement of spectra emitted by the Hologic Selenia Dimensions® digital mammographer (Hologic Inc., Bedford, MA, USA; Software version: V1.11.0.8) at the Hôpital Européen Georges Pompidou, using a Cadmium/Tellure spectrometer. The following anode/filtration pairs were studied: tungsten/rhodium, tungsten/silver, and tungsten/aluminium, with tube voltages ranging from 22 kVp to 49 kVp. These measurements were complemented by Half-Value Layer measurements, used as an indicator of beam quality, using a PTW 23342 ionization chamber. The measured spectra were compared to those obtained in the National Laboratory Henri Becquerel generator beams for the same anode/filtration pairs and high volatge. The Half Value Layers were then measured with the primary reference free air chamber. The variation of the calibration coefficients in terms of air kerma for a PTW 2334 ionization chamber was measured in National Laboratory Henri Becquerel beams reproducing those of Hôpital Européen Georges Pompidou. The air kerma at Hôpital Européen Georges Pompidou was measured with a PTW23344 chamber placed 60 mm from the edge of the potter, with the compression paddle in place, for the different radiation qualities studied and for each pair of polymethyl methacrylate and polyethylene equivalent phantoms used for quality control of the mammographer. Results: The comparison of spectra measured at Hôpital Européen Georges Pompidou and National Laboratory Henri Becquerel shows excellent agreement. The measurements and calculations of the Half-Value Layer highlight minor discrepancies between Hôpital Européen Georges Pompidou and National Laboratory Henri Becquerel. These discrepancies are accounted for by the monotonic variation of the calibration coefficient of a PTW 23344 ionization chamber. Perspectives: The calibration beams available at National Laboratory Henri Becquerel will allow for the testing of the principle and later the prototype of an instrumented breast phantom planned for the continuation of this study.

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