corrections for air density for all quantities defined in 10 mm depth in tissue for nominal tube potentials varying from 10 kV to 30 kV (inclusive). In this work, we used Monte Carlo method to evaluate the influence of atmospheric air climate parameters on the air kerma measurements, for the ISO low energies, series N and L. Simulations were performed using the MCNPX code version 2.7.d, running under MPI (Message Passing Interface) on a computational cluster. We simulated the air with different humidity levels, and consequently, different densities and elemental compositions. The ISO 4037 reference beams of the Dosimeters Calibration Laboratory of the Nuclear Technology Development Center (LCD / CDTN) were used to validate the Monte Carlo simulations. The correction factors, calculated in this work, for the majority of the ISO qualities, were more sensitive to the density variations than the factors provided by the ISO 4037-4.

Performance of TL and OSL Techniques Using CaSO4 and Al2O3 Dosimeters for Mean Glandular Dose (MGD) and Entrance Surface Skin Dose (ESD) Determination in a Digital Mammographic Unit as Alternative Dosimeters

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The mammography is the most important and simple tool in the diagnosis of breast diseases in women. In digital mammography, the process of image acquisition, display and storage are separated which allows optimization of each. Despite the innumerous advantages of this technique, such as an accurate diagnosis for women with dense breast, it was noticed an increase of radiation doses to obtain the images by the new system. As with any examination that includes x-rays, there is always a small stochastic risk of inducing cancer. It is therefore important to evaluate the risk from the dose delivered to the patient during the screening process. The mean glandular dose within the breast is the recommended quantity to evaluate the risk from radiation to the breast. To guarantee proper conditions of protection for patients, the radiation dose should be as low as reasonably achievable possible and simultaneously compatible with image

quality requirements. Thus, this work proposes the use of the thermoluminescent (TL) CaSO4:Dy sintered discs, produced at IPEN, widely used in individual, environmental and area monitoring in Brazil, and Al2O3:C optically stimulated luminescence (OSL) 'dot' dosimeters, manufactured by Landauer® Inc., as application as easy-to-use and low cost alternative dosimeters to evaluate the entrance skin doses (ESD) delivered to patients, the half value layer (HVL) and the mean glandular doses (MGD) in a mammographic digital unit, comparing these two techniques with the results obtained using an All-in-one QC meter. The results obtained demonstrated that the TL and OSL dosimetry systems and the CaSO4 and Al2O3 dosimeters used are able to evaluate the entrance skin dose as well as mean glandular doses in a digital mammographic unit accurately within the requirements, and they can be considered a practical, simple, easy-to-use and low cost tools for verification of these items in a Quality Assurance Program.

Application of a Tandem System for HVL evaluation in Computed Tomography

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Computed Tomography (CT) is a method of imaging used for diagnosis and diseases treatment. In CT equipment due to its geometry, the determination of the HVL is a difficult task and is usually determined only by the manufacturer. By definition, the energy of a beam is determined by the value of HVL. When HVL values are not easily determined, as in the case of CT, it is possible to evaluate the effective energy of the beam through a system consisting of the use of different energy dependent dosimeters, where the ratio between the calibration curve responses in Energy can provide the effective energy of the beam (Tandem System). The application of this system was proposed by Kenney and Cameron1 and Gorbics and Attix2 that used thermoluminescent materials to determine energy of gamma and X radiation. In 2004, Maia3 studied the application of a Tandem System obtained through a set formed by an ionization chamber of the Type pencils and cylindrical absorber sleeves made of aluminum, PMMA and copper, as a non-invasive method for the determination of HVL values in computed tomography beams. Although the proposed Tandem System initially consists of two dosimeters with different energetic dependencies, the sets formed by the ionization chamber and the cylindrical absorber layers of different materials can also be considered a Tandem System. Taking as a reference the System built by Maia3, a Tandem System was developed at the Institute of Energy and Nuclear Research