

Comparison between two calibration systems for direct and attenuated radiation qualities, diagnostic radiology level

Ana Perini¹, Lucio Neves¹, Margarete Guimaraes², Paulo Oliveira²,
Vitor Vivolo¹, Teogenes Silva², Linda Caldas¹

¹ Radiation Metrology Center, Instituto de Pesquisas Energéticas e Nucleares, Comissão Nacional de Energia Nuclear (IPEN-CNEN/SP), Av. Prof. Lineu Prestes, 2242, Cidade Universitária, Sao Paulo, 05508000, Brazil

² Centro de Desenvolvimento da Tecnologia Nuclear, Comissão Nacional de Energia Nuclear (CDTN-CNEN/MG), Rua Prof. Mário Werneck, s/n – Campus da UFMG, Belo Horizonte, 30123970, Brazil

lcaldas@ipen.br

According to the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), medical exposures contribute about 20% of the average annual per caput dose to the global population. Annually there are approximately 3.1 billion diagnostic medical radiological examinations. Therefore, it is very important to develop and maintain a quality control program for the verification of x-ray systems. A very important step in a quality control program, at calibration laboratories, is the establishment of laboratory intercomparisons. In this work, a comparison between the calibration laboratories of IPEN, São Paulo, and CDTN, Belo Horizonte, Brazil, both from the Brazilian Nuclear Energy Commission, was carried out, as part of the quality control program in the metrological network established by the project "National Institutes of Science and Technology – Radiation Metrology in Medicine".

The comparisons were undertaken for direct and attenuated diagnostic radiology beams RQR and RQA. The comparison was based on the determination of calibration factors (N_k) of two ionization chambers and of the PPV quantity. The RQR radiation qualities were compared with a Radcal ¹⁰X5-6 ionization chamber and the RQA qualities with a Radcal RC60, both itinerant standards. The PPV quantity was measured for the RQR radiation qualities with a PTW diavolt non-invasive meter. The results showed a good agreement between both calibration laboratories. The results obtained showed a maximum difference of 3.0% for the N_k values and of 0.77% for the PPV quantity. It is possible to conclude that both laboratories are within an acceptable range for their calibration systems, at diagnostic radiology level.