AbstractID: 11816 Title: Study of a well-type ionization chamber by Monte Carlo simulation

Purpose: Study the linearity of response of a well-type ionization chamber for different activities and radioisotopes used in Nuclear Medicine by means of experimental procedures and Monte Carlo simulation. **Method and Materials:** The well-type ionization chamber being developed has a multi-layer brass electrode configuration with stainless steel walls (0.5mm-thickness inner wall). High pure argon at 0.3MPa is used in the sensitive volume. PENELOPE simulation package was used to study the linearity of response with activity for ^{131}I, ^{99m}Tc and ^{201}Tl. In the simulations the sources were assumed to be volumetric and an specific glass vial used in Nuclear Medicine services was simulated. The ionization current per photon emission was simulated for the three previously cited nuclides. **Results:** For the linearity study, the comparison between simulated and experimental results showed agreement better than 98% for ^{131}I, 95% for ^{99m}Tc and 96% for ^{201}Tl. For the radionuclides and range of activities used both the simulated and the experimental results showed a linear (better than R=0.995) behavior with activity. The experimental relative sensitivity is 0.245, 0.155 and 3.45 nA/mC for ^{99m}Tc, ^{201}Tl and ^{131}I, respectively. Using the normalized response for these radionuclides, a maximum difference in sensitivity between simulation and experimental data was 6% for ^{131}I. **Conclusion:** The agreement between simulated and experimental results obtained in this work suggests the feasibility of using PENELOPE Monte Carlo package to study the construction features of well-type ionization chambers.