PhD Thesis title: 'Investigation of thermal and temporal responses of ionization chambers in radiation dosimetry**'**

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ABSTRACT: The ionization chamber is a primary dosimeter that is used in radiation dosimetry. Generally, the ion chamber response requires temperature/pressure correction according to the ideal gas law. However, this correction does not consider the thermal volume effect of chambers. The temporal and thermal volume effects of various chambers (CC01, CC13, NACP parallel-plate, PTW) with different wall and electrode materials have been studied in a water phantom. Measurements were done after heating the water with a suitable heating system, and chambers were submerged for a sufficient time to allow for temperature equilibrium. Temporal results show that all chambers equilibrate quickly in water. The equilibration time was between 3 and 5 min for all chambers. Thermal results show that all chambers expanded in response to heating except for the PTW, which contracted. This might be explained by the differences in the volumes of all chambers and also by the difference in wall material composition of PTW from the other chambers. It was found that the smallest chamber, CC01, showed the greatest expansion. The magnitude of the expansion was ~ 1, 0.8, and 0.9 % for CC01, CC13, and parallel-plate chambers, respectively, in the temperature range of 295–320 K. The magnitude of the detected contraction was < 0.3 % for PTW in the same temperature range. For absolute dosimetry, it is necessary to make corrections for the ion chamber response, especially for small ion chambers like the CC01. Otherwise, room and water phantom temperatures should remain within a close range.

References to author publications that relate specifically to the dissertation:
AlMasri H, Funyu A, Kakinohana Y, and Murayama S. Investigation of thermal and temporal responses of ionization chambers in radiation dosimetry. Radiol Phys Technol (2012) 5:172–177