Correspondence

Comment on the “Zero-shift thimble ionization chamber” [Med. Phys. 37, 1161–1163 (2010)]

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To the Editor,

The recent publication on a zero-shift thimble ionization chamber by Tessier *et al.*¹ recalls to mind the zero displacement ionization chamber for which a U.S. Patent No. 4,362,940 was issued in 1982. The displacement factor “d” was associated with the 1971 AAPM SCRAD protocol.² In the TG21 1983 protocol,³ a related, but different factor, the replacement factor “P_{repl},” was introduced. This factor corrects for the replacement of a phantom material by the ionization chamber.

The genesis of the chamber was in a 1976 paper by Shapiro *et al.*⁴ on the displacement correction factor to be used for fast neutron dosimetry in which a computer program was described that calculated, based on geometrical considerations, the net amount of material displaced by an ion chamber in a liquid phantom. The calculated result was described as “missing phantom material” expressed in cm. In 1978 I used this program when commenting in the Communications section of Medical Physics⁵ on a paper from the Radiological Physics Center (RPC) on “Calibration in water versus calibration in air for cobalt-60 γ rays.”⁶ The missing phantom material was calculated for seven different chambers which allowed the appropriate displacement factor for the standard Farmer chamber to be determined, which was found to be independent of depth.

In doing this study I realized that a chamber could be designed, by adjusting the wall and central electrode dimensions and material, which would yield zero missing phantom material and therefore a displacement factor of 1, effectively making the point of measurement the center of the chamber.

This project was assigned to Richard Stark as a master’s degree project⁷ and was reported at the 1979 AAPM annual meeting.⁸ At that time, it appeared there might be some commercial application for such a chamber and a U.S. patent was applied for in 1980 and granted in 1982. The chamber was commercially manufactured as a Farmer-type chamber by PTW and sold by them as chamber number 233331 and Nuclear Associates as chamber number 30-36. By then, TG 21 had replaced the old SCRAD protocol and “displacement” had become “replacement,” and the chamber was advertised as a “replacement-free x-ray chamber.” The concept

was also explored for x rays in the 6–25 MV range and the results were presented at the 1983 AAPM annual meeting.⁹

Although the “effective point of measurement” used by Tessier *et al.*¹ is different from displacement and replacement, the factors are not unrelated and results in part from the fact that an ion chamber in a liquid phantom displaces some of the phantom material. Their approach to compensate for this by adjusting the chamber wall thickness is similar to the approach we used 30 years ago.

The authors of the original paper (Tessier, Hooten, and McEwen) are grateful to Dr. Almond for calling attention to this worthy precedent. They apologize without hesitation for omitting to cite his patent, of which they were not aware. The authors are impressed that Dr. Almond had such insight over 30 years ago from rather scant evidence, and find it interesting that his final results already hinged on simulation work.

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