Purpose:

To correct for the deviations of the detector response when typical radiation detectors are used under non-reference conditions, factor kNR was calculated from the known energy dependence of the detector response at photon energies from 10 keV upwards and from clinical photon spectra within a large water phantom beneath a Siemens Primus 6/15 MV linac. A Farmer type ion chamber (NE2571), two TLD detector types and two diodes were investigated.

Methods:

Factor kNR was obtained as the ratio of the weighted responses Yt of a given detector t under reference conditions xref (axial distance r = 0 cm, depth d = 10 cm, field size 10 ‘— 10 cm² and SSD = 100 cm) and that under non-reference conditions x (off-axis points and depths for various field sizes); kNR = Yt(xref)/Yt(x). For small field (SF) dosimetry, we evaluated correction factor kNRSF, which refers to small field reference conditions (4 ‘— 4 cm² field).

Results:

For all detectors investigated, the deviations of kNR from unity were highest outside the field, due to prevailing low-energy scatter contributions. For the Farmer chamber and EDP-10 diode, the kNR deviations did not exceed 2%, but were up to 60% for the EDD-5 diode, while kNR values for LiF: Mg,Cu, P and LiF: Mg,Ti deviated at most 15% and 5% respectively. kNR values appear as unique functions of the mean photon energy at the point of interest.

Conclusions:

Air-filled ion chambers show only small kNR variations, while for non-water equivalent detectors, kNR variations depend on the detector response at low photon energy. kNR can be presented as a unique function of the mean photon energy at the point of interest. A 4 x 4 cm² reference field is recommended for small fields, with correction factor kNRSF varying almost negligibly from kNR except for unshielded Si diodes.