AAPM's TG–51 Protocol for Clinical Reference Dosimetry of High-Energy Photon and Electron Beams

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Abstract

This is the figures from TG-51 in a large scale and colour format. pdf version is available at http://www.physics.carleton.ca/~drogers/pubs/papers/tg51_figures.pdf

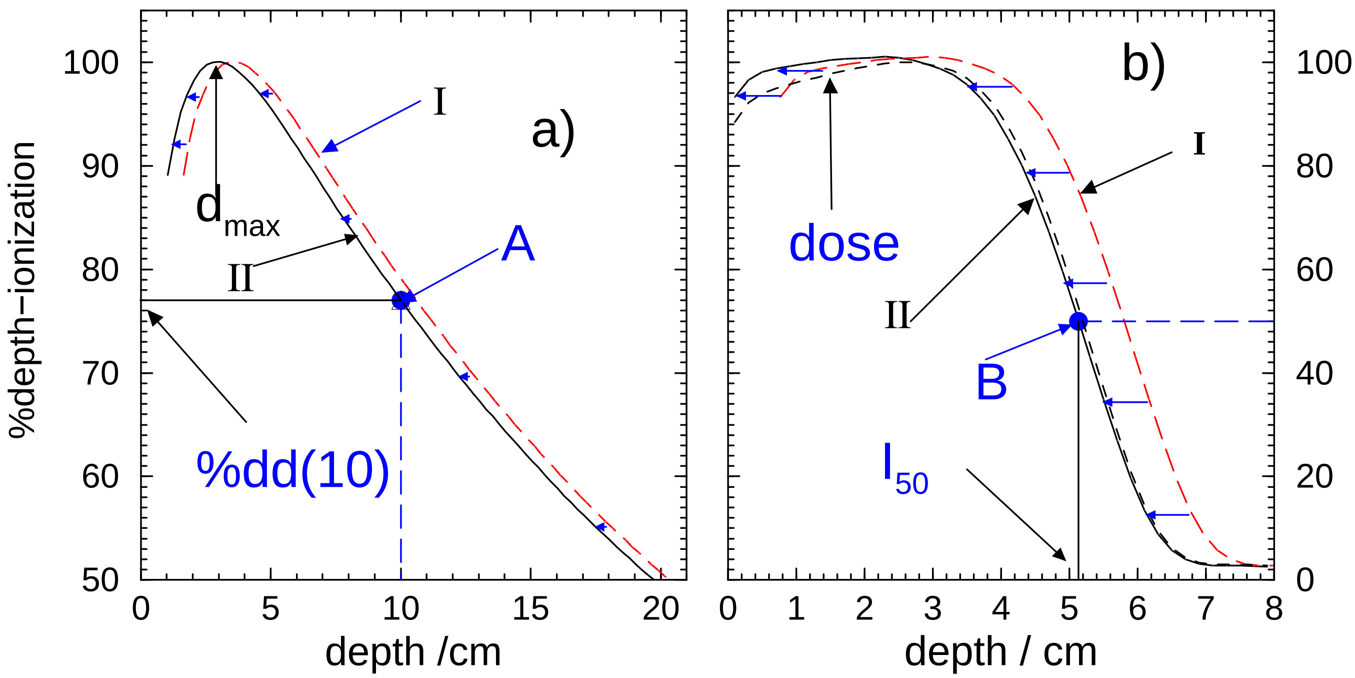

Figure 1: Effect of shifting depth-ionization data measured with cylindrical chambers upstream by 0.6 $r_{\rm cav}$ for photon beams (panel a) and 0.5 $r_{\rm cav}$ for electron beams (panel b) (with $r_{\rm cav}$ = 1.0 cm). The raw data are shown by curve I (long dashes) in both cases and the shifted data, which are taken as the depth-ionization curve, are shown by curve II (solid line). The value of the % ionization at point A (10 cm depth) in the photon beam gives $\%dd(10)$ and the depth at point B (solid curve, 50% ionization) in the electron beam gives I_{50} from which R_{50} can be determined (see section VIII.C). For the photon beams, curve II is effectively the percentage depth-dose curve. For the electron beams, curve II must be further corrected (see section X.D) to obtain the percentage depth-dose curve shown (short dashes - but this is not needed for application of the protocol).

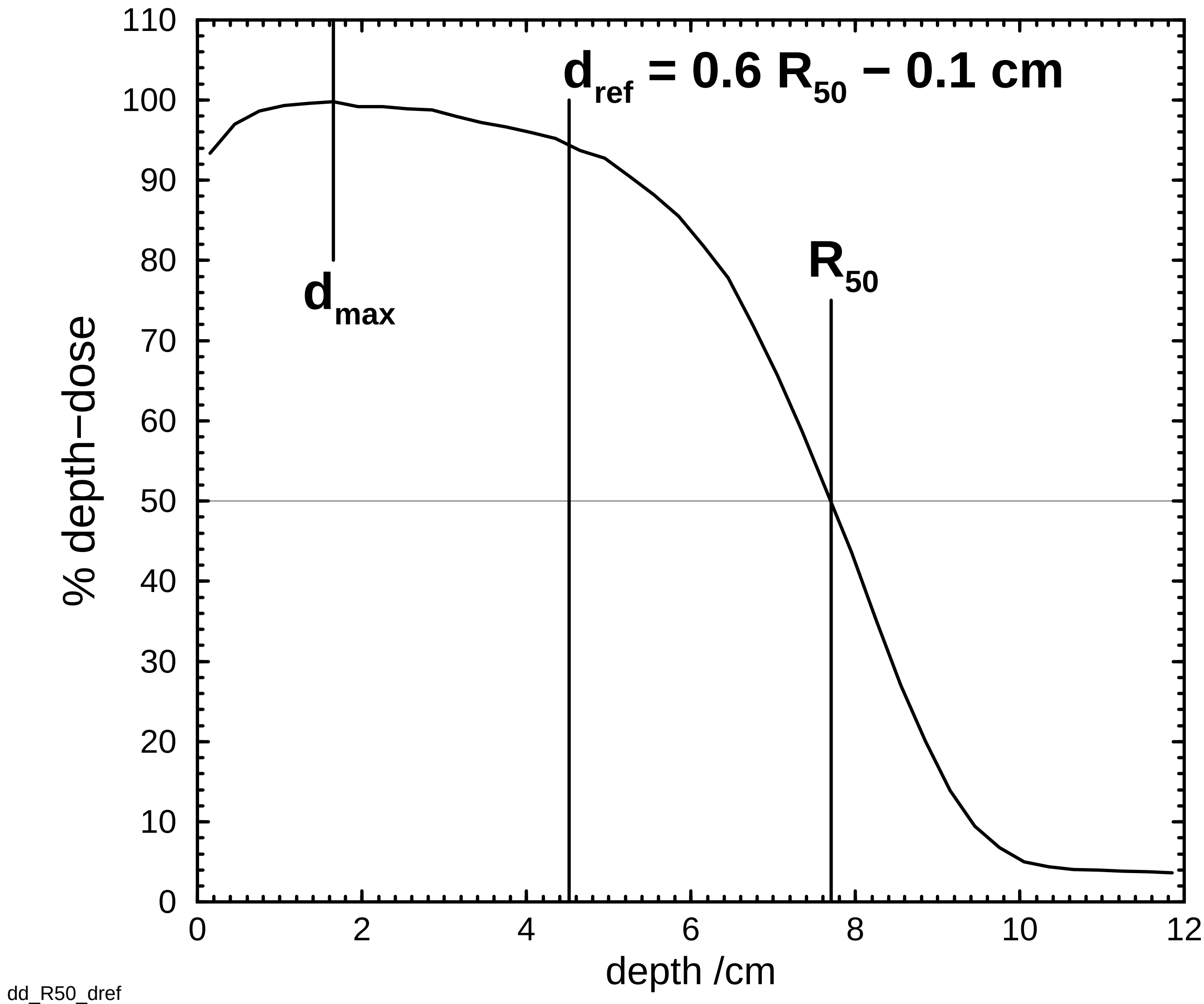

Figure 2: R_{50} is defined as the depth, in cm, at which the absorbed dose falls to 50% of its maximum value in a $\geq 10 \times 10$ cm^2 ($\geq 20 \times 20$ cm^2 for $R_{50} > 8.5$ cm) electron beam at an SSD of 100 cm. The depth for clinical reference dosimetry is $d_{\mathrm{ref}} = 0.6R_{50} - 0.1$ cm, in the same sized beam at an SSD between 90 and 110 cm. Note that for low-energy beams, d_{ref} is usually at d_{max}.

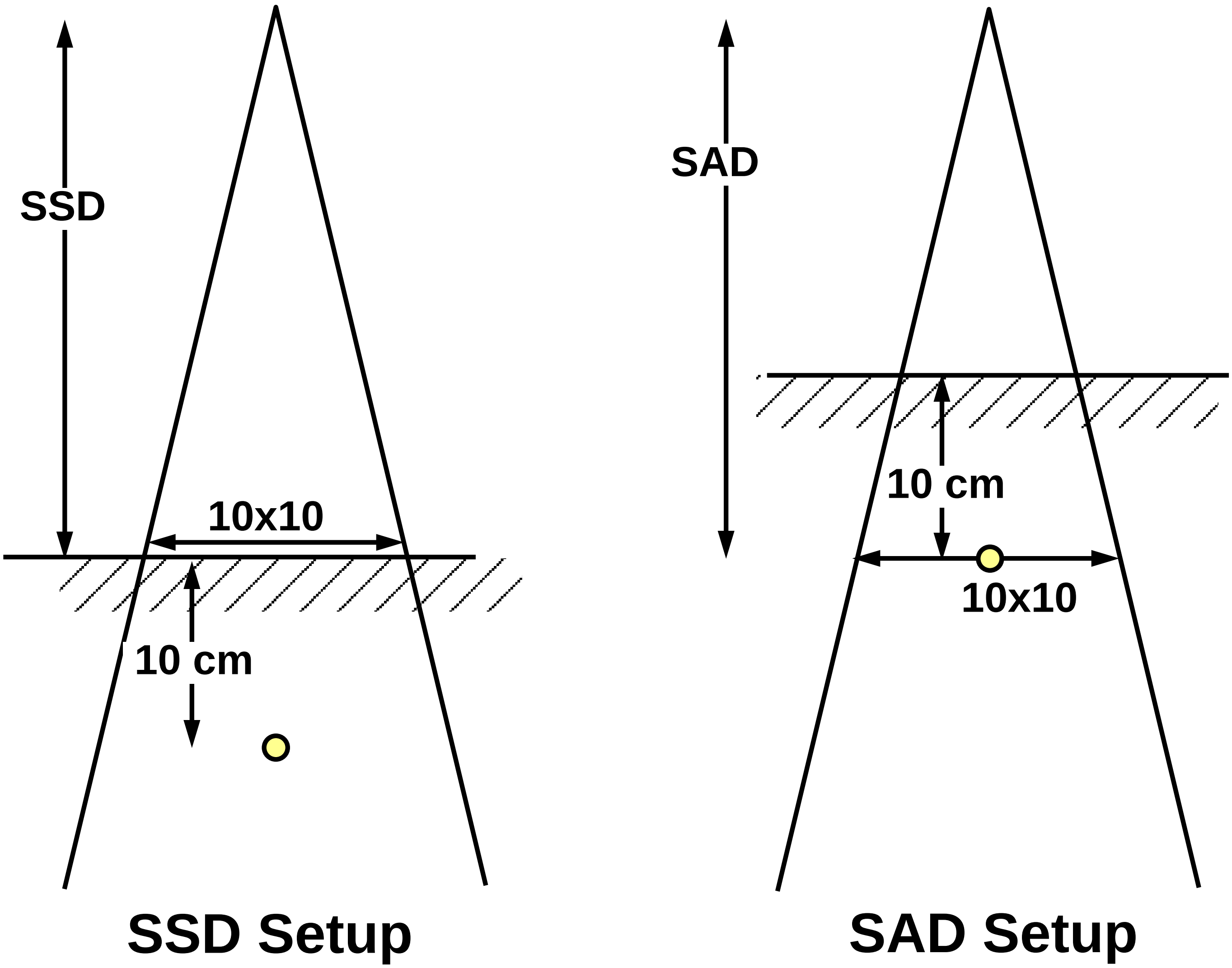

Figure 3: Schematic of the SSD or SAD setups which may be used for photon beam reference dosimetry. In both cases the ion chamber is at a water equivalent depth of 10 cm in the water phantom. The actual value of SSD or SAD is that most useful in the clinic (expected to be about 100 cm).

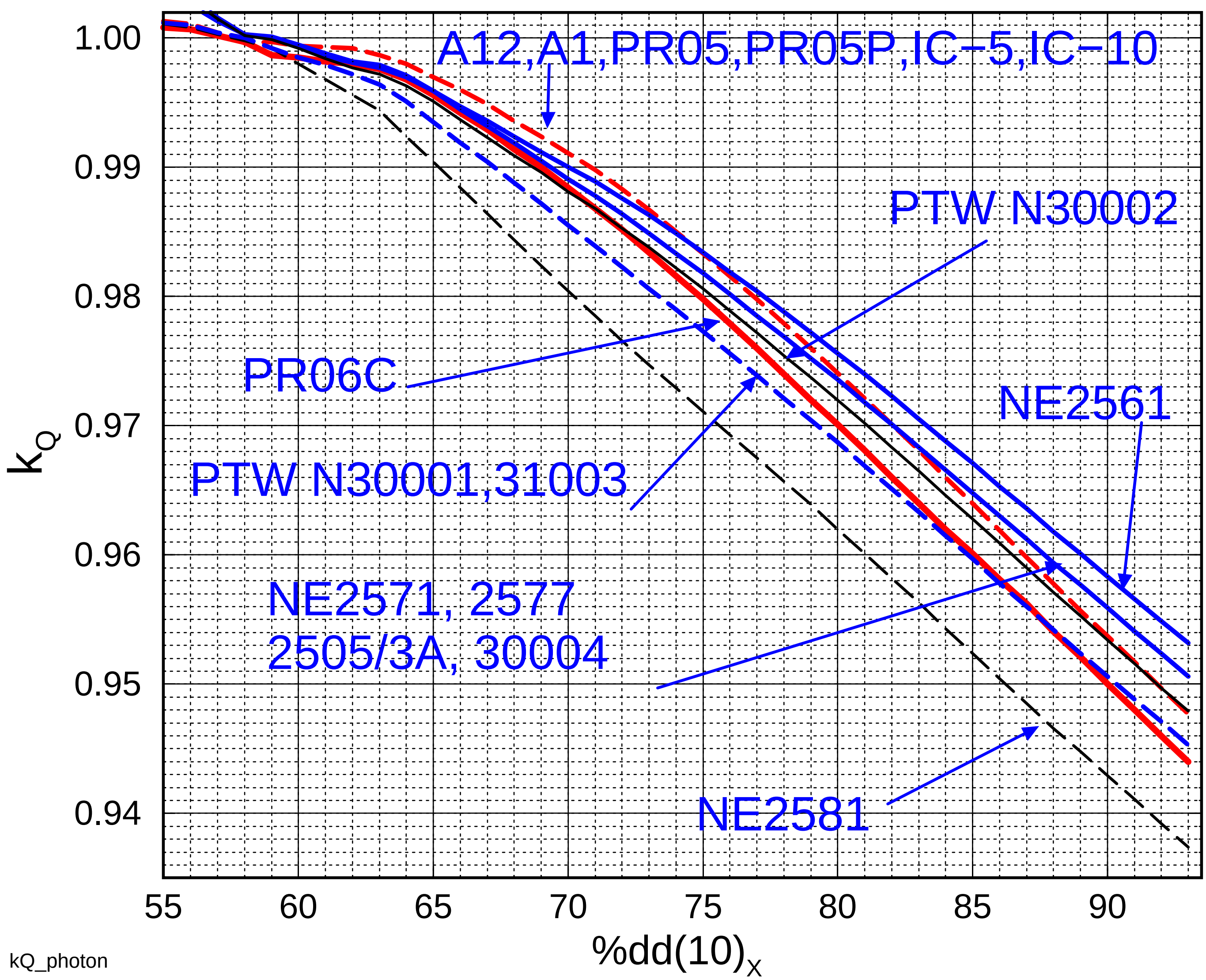

Figure 4: Values of k_Q at 10 cm depth in accelerator photon beams as a function of $\%dd(10)_x$ for cylindrical ion chambers commonly used for clinical reference dosimetry. When values were the same within 0.1%, only one curve is shown. Explicit values are given in Table I, as is a list of equivalent chambers. For ^{60}Co beams, $k_Q = 1.000$.

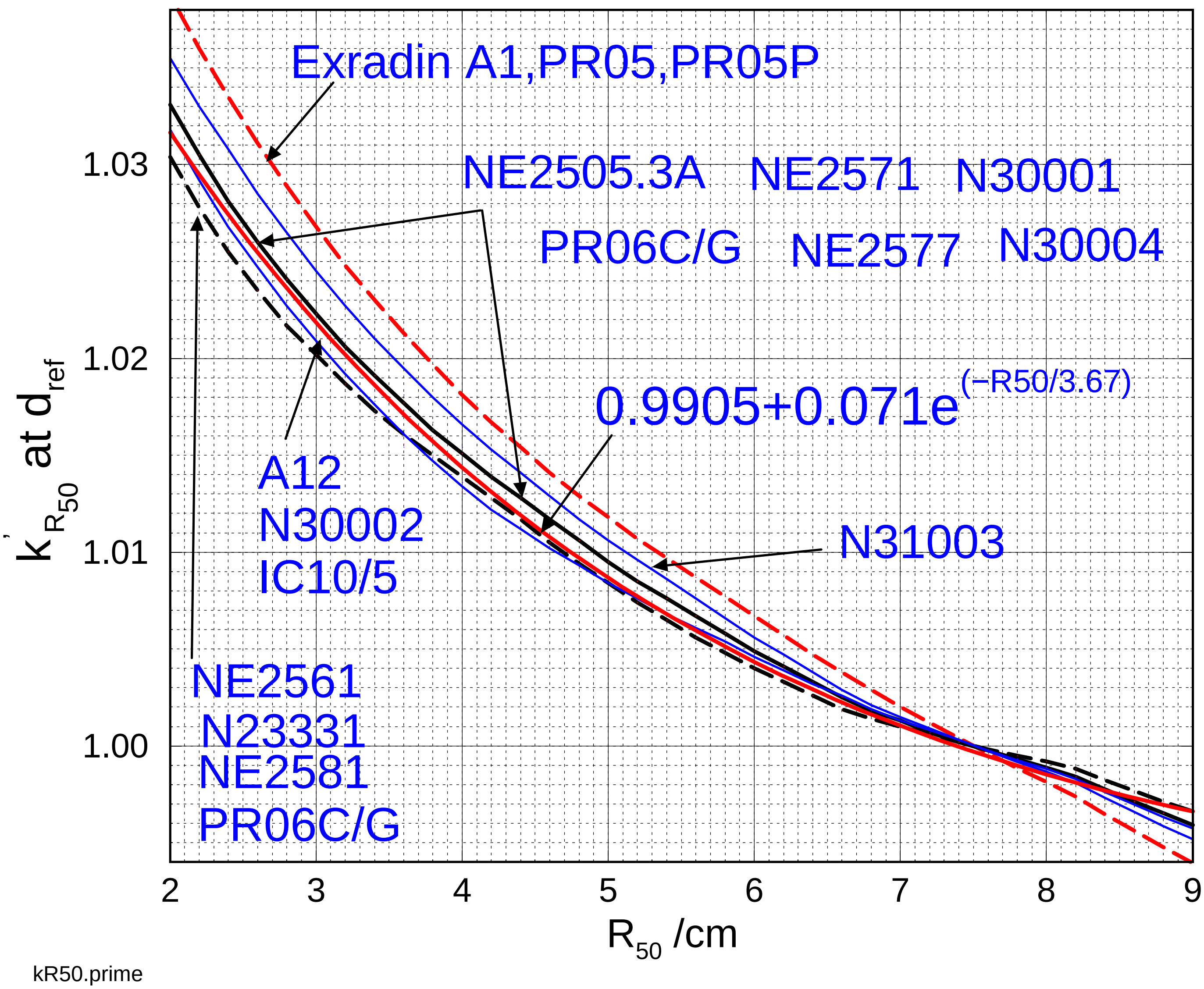

Figure 5: Calculated values of $k'_{R_{50}}$ at d_{ref} as a function of R_{50} for several common cylindrical ion chambers. These values can be used with Eq.(6), (with a measured value of P_{gr}^{Q} and a k_{ecal} value from Table III) to determine the absorbed dose to water at the reference depth of $d_{\text{ref}} = 0.6R_{50} - 0.1$ cm.

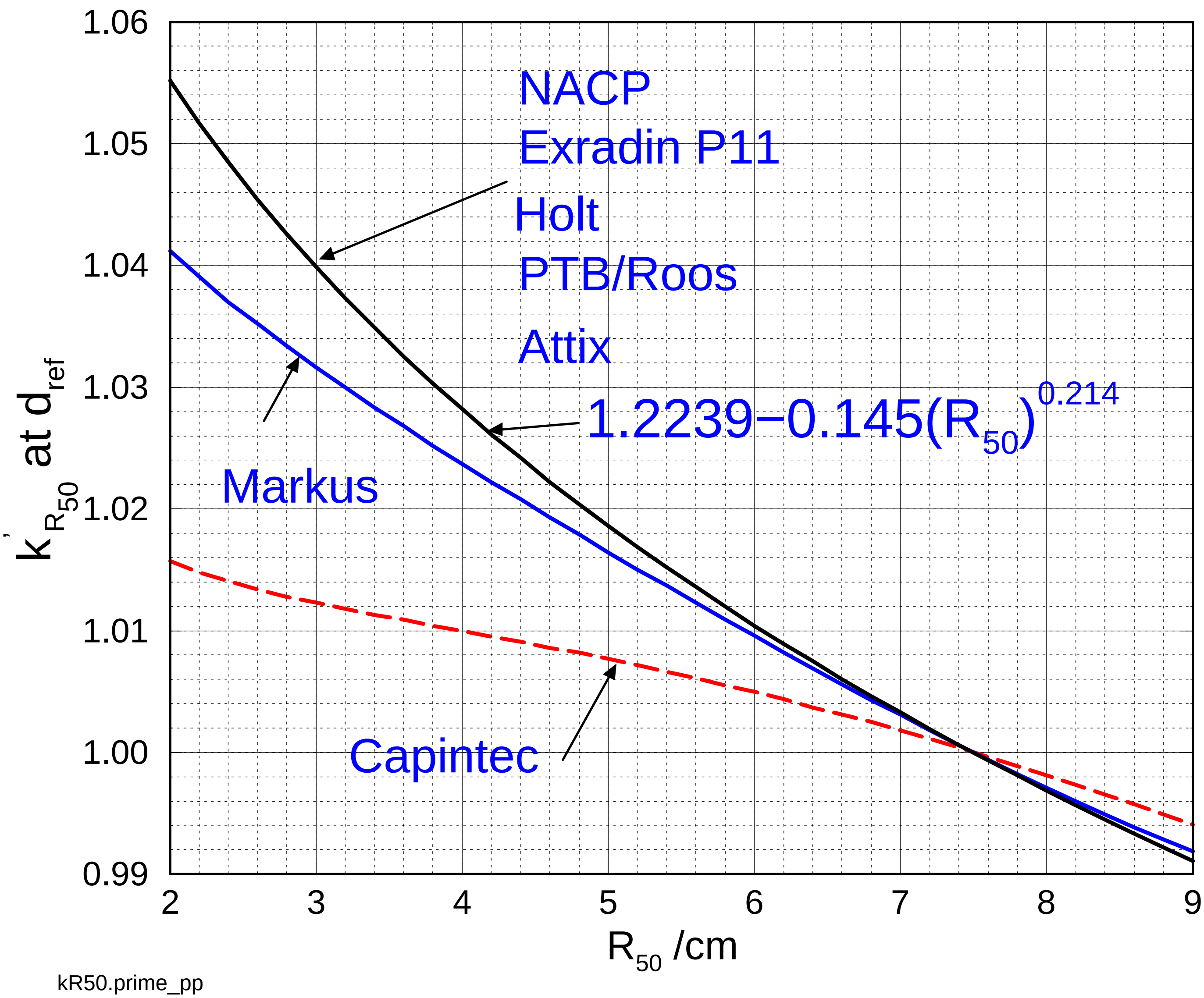

Figure 6: Calculated values of $k'_{R_{50}}$ at $d_{\rm ref}$ as a function of R_{50} for several common plane-parallel chambers. Note that the values for the 5 well-guarded chambers lie on the same line in the figure. These values can be used with Eq.(6) (with P_{gr}^{Q} = 1.0) to determine the absorbed dose to water at the reference depth of $d_{\rm ref} = 0.6R_{50} - 0.1$ cm.

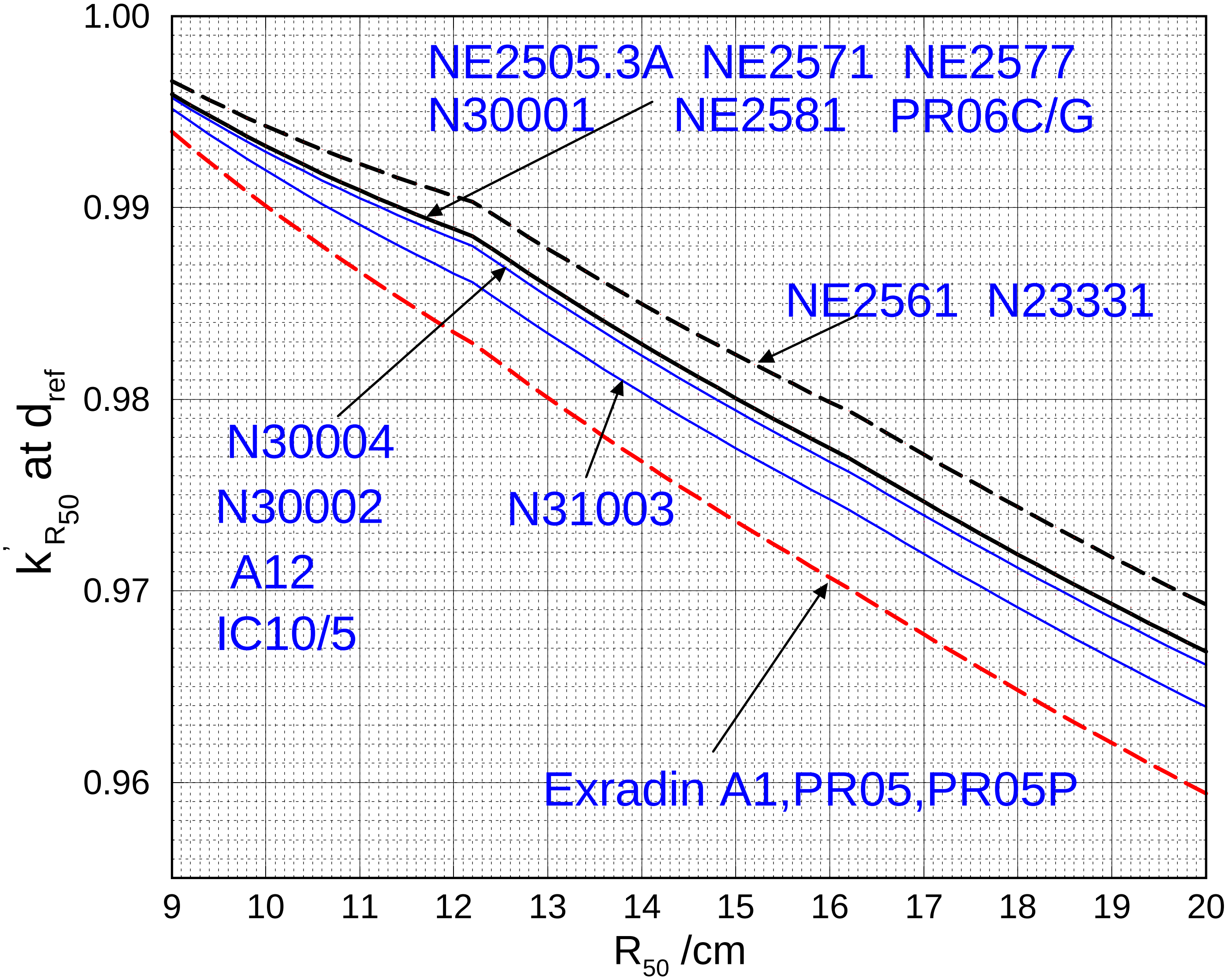

Figure 7: Calculated values of $k'_{R_{50}}$ at d_{ref} for high-energy electron beams, as a function of R_{50} for cylindrical ion chambers. These values can be used with Eq.(6), (with a measured value of P_{gr}^{Q} and a k_{ecal} value from Table III) to determine the absorbed dose to water at the reference depth of $d_{\mathrm{ref}} = 0.6R_{50} - 0.1$ cm.

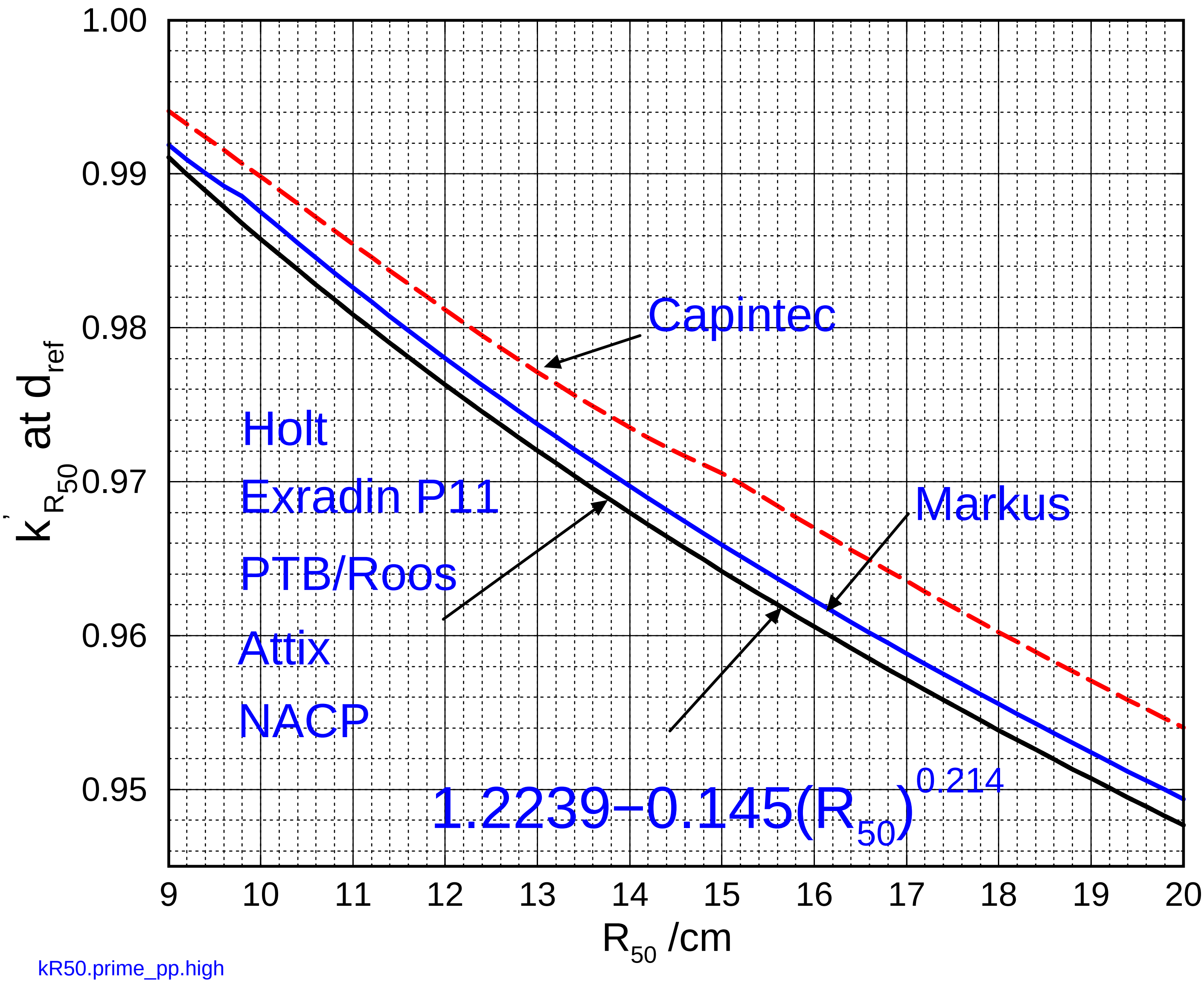

Figure 8: Calculated values of $k'_{R_{50}}$ at d_{ref} for high-energy electron beams, as a function of R_{50} for plane-parallel chambers. Note that the values for the 5 well-guarded chambers lie on the same line in the figure. These values can be used with Eq.(6) (with $P^Q_{gr} = 1.0$ and a k_{ecal} value from Table II) to determine the absorbed dose to water at the reference depth of $d_{\mathrm{ref}} = 0.6R_{50} - 0.1$ cm.