Erratum:
Assessing the effect of electron density in photon dose calculations

Joao Seco, Francis H Burr Proton Therapy Center, Massachusetts General Hospital,
Harvard Medical School, 30 Fruit Street, Boston, Massachusetts 02114

Philip M Evans, Joint Department of Physics, Institute of Cancer Research and The Royal
Marsden NHS Foundation Trust, Downs Road, Sutton, Surry, SM2 5PT United Kingdom

We would like to point out that there is a typing error in Equations 9 and 10 of the published
paper. The authors studied the energy dependence of the Compton interaction and pair
production for various materials (from hydrogen, Z=1, to copper, Z=30) obtained from XCOM
for photon energies between 1–20 MeV\textsuperscript{22}. The XCOM fitted energy dependence for
Compton and pair production cross sections obtained were approximately the following:

\[ \mu^{\text{Compton}} \propto E^{-0.65} \]
\[ \mu^{\text{pair production}} \propto E^{+0.35} \]

However, the energy dependence referred to in the paper for Compton and pair production
were respectively, \( \mu^{\text{Compton}} \propto E^{-0.50} \) and \( \mu^{\text{pair production}} \propto \ln(E) \), as
published in reference 24 and correspond to approximate estimates for the energy
dependence of the cross sections.

All the studies in the paper were performed using the XCOM fitted energy dependence of the
Compton and pair production. Since the energy dependence of the ratio of the pair
production to the Compton cross section is:

\[ \frac{\mu^{\text{pair production}}}{\mu^{\text{Compton}}} \propto \frac{\ln(E) E^{+0.35}}{E^{-0.65}} \propto \ln(E) E, \]

Equations 9 and 10 should read:

\[ \frac{E_{\text{EPL}} / l_{\text{med}}}{\rho_{e_{\text{med}}}} = \left( \frac{\rho_{e_{\text{H2O}}} (1+\alpha_{\text{fit}}(1+<Z>_{\text{med}}) \ln(E)}{\rho_{E_{\text{H2O}}} (1+\alpha_{\text{fit}}(1+<Z>_{\text{H20}}) \ln(E)} \right) \]

Equations 9 and 10 should read:

\[ \rho_{\text{eff}} = \rho_{e_{\text{med}}} (1+\alpha_{\text{fit}}(1+<Z>) \ln(E) \]

This error is only in the published equations and does not affect any of the results and the
conclusions of the paper. We apologize for any inconvenience to the reader.

Photon cross sections database,” National Institute of Standards and Technology (NIST).
Accelerators (Medical Physics, Madison, WI, 1997).