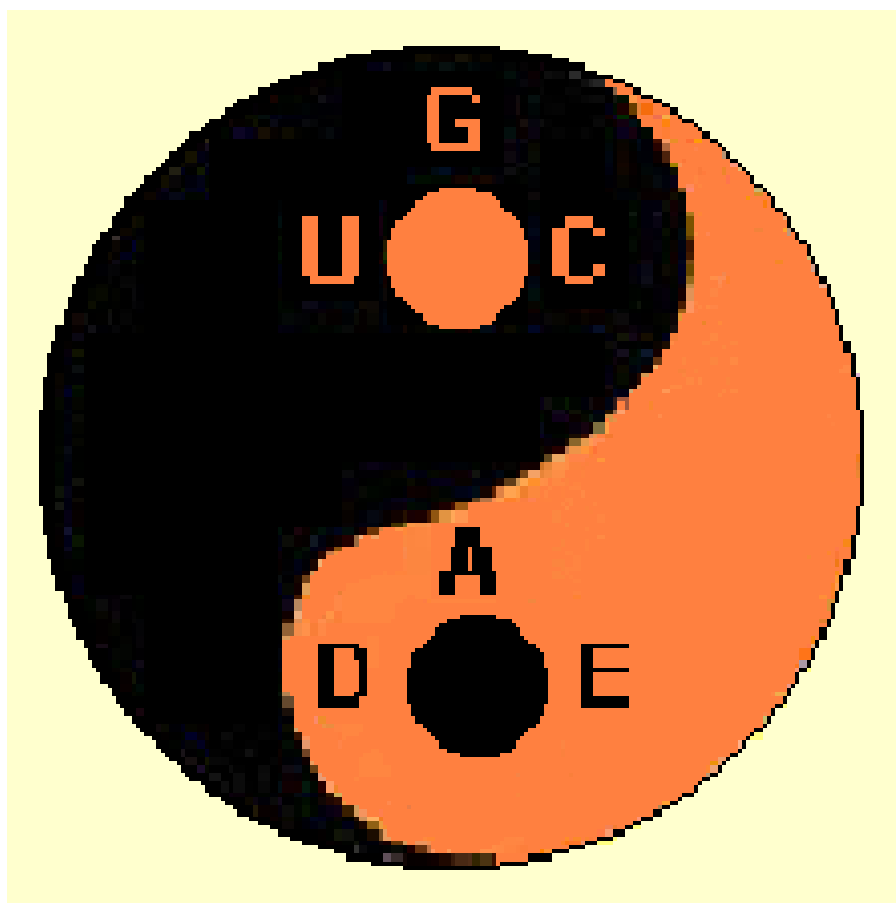


A Universal Algorithm for Calculating the Probability of Photoelectric Absorption

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probability of photoelectric absorption is of significance in multiple contexts such as in the **simulation** exercise of detector response, designing of **gamma-ray shielding**, development of **new shielding materials**

analytical equations available in the literature for the photoelectric absorption, such as

$$\frac{Z^n}{E_\gamma^{3.5}} \text{ [Davisson \& Evans (1952)] or } \frac{Z^3}{E_\gamma^3} \text{ [Anthony \& Boone (2005)]}$$

are of limited use in the representation of the photoelectric absorption cross-section data as available from the **XCOM** database (physics.nist.gov/PhysRefData/Xcom/html/xcom1.html)

this work proposes the following equation for the probability of photoelectric absorption based on the **mass absorption**

coefficient data from **XCOM**

$$KZ\left(\frac{1}{E_\gamma^3} + \frac{e^{-(E_\gamma-1)/2}}{2E_\gamma}\right)$$

the **simplistic equation** facilitates a **global representation** of the photoelectric absorption cross-sections across all elements & materials, and for the widest range of gamma-ray energies

the variation of the "**K** constant can also be represented through a polynomial of second-order in Z

that is. $K = a_0 + a_1Z + a_2Z^2$ with $a_0 = 1.73 \times 10^{-7}$, $a_1 = -2.23 \times 10^{-8}$ & $a_2 = 9.14 \times 10^{-9}$

(effective Z for compound materials/ alloys)

prospective applications in simulation frameworks

