158(11): Mass of the Photon from the Compton Effect.

This is given by:

$$m = \frac{\hbar\omega}{c^2}\left(1 - \frac{v^2}{c^2}\right)^{-1/2} \quad -(1)$$

where:

$$v^2 = \frac{1}{2a}\left(-b \pm \left(b^2 - 4ac'\right)^{1/2}\right) \quad -(2)$$

$$a = \frac{1}{c^2}\left(1 - \cos^2\theta\right) \quad -(3)$$

$$b = \left(1 - \left(\frac{\omega'}{\omega}\right)^2\right)\cos^2\theta - \frac{2B}{c^2\omega^2} \quad -(4)$$

$$c' = \left(\frac{B}{c\omega^2}\right)^2 \quad -(5)$$

$$B = \frac{1}{2}\left(A - c^2\left(1 - \left(\frac{\omega}{\omega'}\right)^2\right)\omega'^2\right. \quad -(6)$$

$$A = \Omega^2\omega^2c^2\left(1 + \frac{2Mc^2}{\hbar\omega\Omega}\right) \quad -(7)$$

$$\Omega = 1 - \frac{\omega'}{\omega} \quad -(8)$$

Here:

M = mass of electron

ω' = scattered angular frequency

ω = incident angular frequency

θ = angle of scatter.

$\hbar$ = reduced Planck constant.

c = velocity of light of standards laboratories*

v = velocity of light at ω.

* In de Broglie / Einstein c is the maximum velocity of special relativity.