1) 161(4): Some Suggestions on the Use of Curvature

Take the fundamental result:

$$x_2 = \frac{\omega\omega'}{\omega-\omega'} - \frac{\left(x_1^2 + (\omega^2 - x_1^2)^{1/2}(\omega'^2 - x_1^2)^{1/2}\cos\theta\right)}{\omega-\omega'} \quad -(1)$$

The experimental data on the Compton effect are reproduced in the limit:

$$x_1 \rightarrow 0 \quad -(2)$$

when

$$x_2 \sim \frac{\omega\omega'}{\omega-\omega'}(1-\cos\theta) \quad -(3)$$

Suggested Method

1) Use the electron mass to determine x_2 and keep it constant. Choose a given ω, ω' and θ.
2) Increase x_1 from zero numerically and find the effect on eq. (3).

The de Broglie Einstein equations are valid for

$$x_1 << x_2 \quad -(4)$$

i.e.

$$m_1 << m_2. \quad -(5)$$

The assumption that has been made is that x_1 and x_2 are constants, determined by the limit:

$$R_1 = \left(\frac{m_1 c}{\hbar}\right)^2, \quad R_2 = \left(\frac{m_2 c}{\hbar}\right)^2 \quad -(6)$$

More generally R_1 and R_2 are variables,

2) From the definition of x_1 and x_2:

$$x_1 = m_1 c^2 / \hbar , \quad x_2 = m_2 c^2 / \hbar \quad - (7)$$

it follows that:

$$x_1 = \frac{\hbar}{m_1} R_1 , \quad x_2 = \frac{\hbar}{m_2} R_2 \quad - (8)$$

In eq. (8) take m_1 and m_2 as the mass of the elementary particles as recorded in the standard labs. However, regard R_1 and R_2 as variables. So eq. (6) becomes:

$$\frac{\hbar}{m_2} R_2 = \frac{\omega\omega'}{\omega - \omega'} - \frac{A}{\omega - \omega'} \quad - (9)$$

$$- (10)$$

where:

$$A = \left(\frac{\hbar}{m_1}\right)^2 R_1^2 + \left(\omega^2 - \left(\frac{\hbar}{m_1}\right)^2 R_1^2\right)^{1/2} \left(\omega'^2 - \left(\frac{\hbar}{m_1}\right)^2 R_1^2\right)^{1/2} \cos\theta$$

The reverse formula is:

$$x_1^2 = \frac{1}{2a}\left(-b \pm \left(b^2 - 4ac'\right)^{1/2}\right) \quad - (11)$$

$$a = 1 - \cos^2\theta,$$
$$b = (\omega'^2 + \omega^2)\cos^2\theta - 2A$$
$$c' = A^2 - \omega^2\omega'^2 \cos^2\theta$$
$$A = (\omega\omega' - x_2)(\omega - \omega')$$

where again:

$$x_1 = \frac{\hbar}{m_1} R_1 , \quad x_2 = \frac{\hbar}{m_2} R_2 \quad - (12)$$

3) For given m_1 and m_2 from the standard Lagrangians, R_1 and R_2 from eq. (10) must be the same as R_1 and R_2 from eq. (11). Also, for the photon/electron Compton effect they must be such that eqs. (2) and (3) are true.

The energy conservation equation is:

$$m_2 = \frac{\hbar}{c^2}\left(\omega' + \omega'' - \omega\right) \quad -(13)$$

where

$$R_2 = \left(\frac{m_2 c}{\hbar}\right)^2 \quad -(14)$$

so

$$m_2 = \frac{\hbar}{c} R_2^{1/2} \quad -(15)$$

in the limit (14). More generally m_2 is proportional to $R_2^{1/2}$ and m_1 proportional to $R_1^{1/2}$.

Experimentally in the Compton effect eq. (3) is true to a very good approximation, so the problem simplifies to:

$$x_2 \sim \frac{\omega\omega'}{\omega - \omega'}\left(1 - \cos\theta\right) - (16)$$

and from eq. (14):

$$b^2 - 4ac' = b^2,$$

$$4ac' \sim 0, \quad -(17)$$

$$\text{i.e. either } a = 0 \text{ or } c' = 0 \quad -(18)$$

4) Therefore if $c' = 0$, then

$$(\omega\omega' - xc_2)(\omega - \omega') = \omega\omega' \cos\theta$$

$$x_2 = \frac{\omega\omega'}{\omega - \omega'}(1 - \cos\theta) \quad -(19)$$

which is the same as eq. (16), Q.E.D.

Therefore the two equations (1) and (11) are perturbations of eq. (19).

Suggested Numerical Procedure

Use a two variable least means squares fitting program to find x_2 and x_1 from eqs (1) and (11), with x_1 and x_2 as variables, with the regarding constraint:

$$x_1 \ll x_2 \quad -(20)$$

programmed in.

Modified Einstein de Broglie Equations

$$E = \hbar\omega = \frac{\hbar}{c}\gamma R^{1/2} \quad -(21)$$

i.e.

$$\boxed{\omega = R^{1/2}\gamma c} \quad -(22)$$

$$\underline{p} = \hbar\underline{\kappa} = \gamma\frac{\hbar}{c}R^{1/2}\underline{v} \quad -(23)$$

$$\boxed{\underline{\kappa} = R^{1/2}\gamma\frac{\underline{v}}{c}} \quad -(24)$$

5) Eqs. (23) and (24) are based on:

$$m = \frac{\hbar}{c} R^{1/2} \quad -(25)$$

More generally:

$$m = \frac{\hbar}{c} x R^{1/2} \quad -(26)$$

where x is a new parameter of physics.

So:

$$\boxed{\begin{aligned} \omega &= x R^{1/2} \gamma c \\ \underline{k} &= x R^{1/2} \gamma \frac{\underline{v}}{c} \end{aligned}} \quad -(27)$$