159(15): Momentum Conservation Relation in Electron - Electron Interaction.

Consider an electron with momentum $\underline{p}$ colliding with another stationary electron. Momentum conservation means:

$$\underline{p} = \underline{p}' + \underline{p}'' \quad -(1)$$

where $\underline{p}'$ and $\underline{p}''$ are the scattered momenta. So:

$$\underline{p}'' = \underline{p} - \underline{p}' \quad -(2)$$

$$p''^2 = p^2 + p'^2 - 2pp'\cos\theta \quad -(3)$$

$$\kappa''^2 = \kappa^2 + \kappa'^2 - 2\kappa\kappa'\cos\theta \quad -(4)$$

At $\theta = 90°$, $\cos\theta = 0$

$$\kappa''^2 = \kappa^2 + \kappa'^2 \quad -(5)$$

The de Broglie hypothesis is:

$$E = \gamma \underline{m} c^2, \quad p = \gamma \underline{m} v \quad -(6)$$

so:

$$\omega''^2 v''^2 = \omega^2 v^2 + \omega'^2 v'^2 \quad -(7)$$

From Note 159(14):

$$\omega''^2\left(1-\left(\frac{\omega'-\omega}{\omega''}+1\right)^2\right) = \omega^2\left(1-\left(\frac{\omega'+\omega''}{\omega}-1\right)^2\right) + \omega'^2\left(1-\left(\frac{\omega''-\omega}{\omega'}+1\right)^2\right) \quad -(8)$$

i.e.

$$\omega''^2\left(1-\left(\frac{mc^2}{\hbar\omega''}\right)^2\right) = \omega^2\left(1-\left(\frac{mc^2}{\hbar\omega}\right)^2\right) + \omega'^2\left(1-\left(\frac{mc^2}{\hbar\omega'}\right)^2\right) \quad -(9)$$

2)

i.e.

$$\boxed{\left(\frac{mc^2}{\hbar}\right)^2 = \omega^2 + \omega'^2 - \omega''^2} \quad -(10)$$

From the energy conservation laws of note 159(14):

$$\frac{mc^2}{\hbar} = \omega' + \omega'' - \omega \quad -(11)$$

Denote:

$$x = mc^2/\hbar \quad -(12)$$

then

$$x^2 = \omega^2 + \omega'^2 - (x - \omega' + \omega)^2 \quad -(13)$$

$$= \omega^2 + \omega'^2 - \left(x^2 + (\omega - \omega')^2 + 2x(\omega - \omega')\right)$$

$$2x^2 + 2x(\omega - \omega') = \omega^2 + \omega'^2 - \omega^2 - \omega'^2 + 2\omega\omega'$$

$$\boxed{x^2 + (\omega - \omega')x - \omega\omega' = 0} \quad -(14)$$

So

$$x = \frac{1}{2}\left(\omega' - \omega \pm \left((\omega - \omega')^2 + 4\omega\omega'\right)^{1/2}\right)$$

$$= \frac{1}{2}\left(\omega' - \omega \pm \left(\omega^2 + \omega'^2 + 2\omega\omega'\right)^{1/2}\right)$$

$$x = \frac{1}{2}\left(\omega' - \omega \pm (\omega + \omega')\right)$$

i.e.

$$\frac{mc^2}{\hbar} = \omega'$$

$$\boxed{m = \hbar\omega'/c^2} \quad -(15)$$

$$\boxed{\omega'' = \omega} \quad -(16)$$

$\Rightarrow$

This agrees with the computer algebra. The result (15) makes no sense because ω' is not constant. The de Broglie Einstein theory fails.