247(4): Relativistic Classical Treatment of LENR

Consider a particle of mass m_1 colliding with an initially stationary particle of mass m_2 to give particles m_3 and m_4 with release of energy E. The equations of conservation of energy and momentum are:

$$\gamma m_1 c^2 + m_2 c^2 = \gamma' m_3 c^2 + \gamma'' m_4 c^2 + E \quad -(1)$$

and

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

Denote eq. (1) by:

$$E_1 + E_2 = E_3 + E_4 + E \quad -(3)$$

i.e.

$$\omega + \omega_0 = \omega' + \omega'' + \frac{E}{\hbar} \quad -(4)$$

The energy released in the reaction is:

$$E = \hbar(\omega - \omega' + \omega_0 - \omega'') \quad -(5)$$

The ECE duality equations are:

$$E_1 = \hbar\omega = \gamma m_1 c^2 \quad -(6)$$

$$E_2 = \hbar\omega_0 = m_2 c^2 \quad -(7)$$

$$E_3 = \hbar\omega' = \gamma' m_3 c^2 \quad -(8)$$

$$E_4 = \hbar\omega'' = \gamma'' m_4 c^2 \quad -(9)$$

$$\underline{p} = \hbar\underline{\kappa} = \gamma m_1 \underline{v} \quad -(10)$$

$$\underline{p}' = \hbar\underline{\kappa}' = \gamma' m_3 \underline{v}' \quad -(11)$$

$$\underline{p}'' = \hbar\underline{\kappa}'' = \gamma'' m_4 \underline{v}'' \quad -(12)$$

2) Therefore:

$$v^2 = c^2\left(1-\left(\frac{x_1}{\omega}\right)^2\right); \quad v'^2 = c^2\left(1-\left(\frac{x_3}{\omega'}\right)^2\right); \quad v''^2 = c^2\left(1-\left(\frac{x_4}{\omega''}\right)^2\right) \quad -(13)$$

It follows ~~that~~:

$$\omega''^2 - x_4^2 = \omega^2 - x_1^2 + \omega'^2 - x_3^2 - 2\left(\omega^2-x_1^2\right)^{1/2}\left(\omega'^2-x_3^2\right)^{1/2}\cos\theta \quad -(14)$$

in which:

$$\omega'' = \omega - \omega' + x_2 - E/\hbar \quad -(15)$$

$$:= \omega - \omega' + x_5$$

So:

$$\omega^2 + \omega'^2 - 2\omega\omega' + 2x_5(\omega-\omega') + x_5^2 = x_4^2 - x_1^2 - x_3^2 + \omega^2 + \omega'^2 - 2\left(\omega^2-x_1^2\right)^{1/2}\left(\omega'^2-x_3^2\right)^{1/2}\cos\theta \quad -(16)$$

i.e.

$$x_5^2 + b x_5 + c = 0 \quad -(17)$$

where

$$b = 2(\omega-\omega') \quad -(18)$$

$$c = 2\left(\omega^2-x_1^2\right)^{1/2}\left(\omega'^2-x_3^2\right)^{1/2}\cos\theta - 2\omega\omega' - x_4^2 + x_1^2 + x_3^2 \quad -(19)$$

So:

$$x_5 = x_2 - \frac{E}{\hbar} = \omega' - \omega \pm \frac{1}{2}\left(b^2-4c\right)^{1/2}, \quad -(20)$$

$$E = x_2 + \hbar(\omega-\omega') \mp \left((\omega-\omega')^2 - c\right)^{1/2} \quad -(21)$$