1) 171(1): Theory of Electron Positron Collisions

The electron positron collision is the basis of claims made by particle colliders. However, as this note shows, the basic theory is wildly self inconsistent once the de Broglie Einstein relations are taken into account. This is the same type of fatal problem for modern physics as unravelled in UFT 158 to UFT 166. The only way forward is to adapt the R parameter of ECE theory.

Consider a positron of mass m colliding with a static electron of mass m. For simplicity of argument, and without loss of generalization, the collision produces two particles of mass m_1. In general these two particles of mass m_1 move at different velocities. The conservation of energy equation is:

$$\gamma m c^2 + m c^2 = \gamma' m_1 c^2 + \gamma'' m_1 c^2 \quad -(1)$$

Use the de Broglie Einstein equation:

$$\hbar\omega = \gamma m c^2 \quad -(2)$$

to find that eq. (1) is:

$$\omega + \omega_0 = \omega' + \omega'' \quad -(3)$$

where

$$\omega_0 = \frac{mc^2}{\hbar} = \omega' + \omega'' - \omega \quad -(4)$$

The conservation of momentum equation is:

$$\underline{p} = \underline{p}' + \underline{p}'' \quad -(5)$$

where $\underline{p}$ is the momentum of the positron and $\underline{p}'$ and $\underline{p}''$

2) are the momenta of the two particles of mass m_1.

Therefore:
$$p''^2 = p^2 + p'^2 - 2pp'\cos\theta \quad -(6)$$

Now use the Einstein / de Broglie equations:
$$\underline{p} = \hbar\underline{\kappa} = \gamma m\underline{v} \quad -(7)$$
$$\underline{p}' = \hbar\underline{\kappa}' = \gamma' m_1\underline{v}' \quad -(8)$$
$$\underline{p}'' = \hbar\underline{\kappa}'' = \gamma'' m_1\underline{v}'' . \quad -(9)$$

Eq. (6) becomes:
$$\kappa''^2 = \kappa^2 + \kappa'^2 - 2\kappa\kappa'\cos\theta \quad -(10)$$

with:
$$\kappa = \frac{\omega v}{c^2}, \quad \kappa' = \frac{\omega' v'}{c^2}, \quad \kappa'' = \frac{\omega'' v''}{c^2}. \quad -(11)$$

Therefore:
$$\omega''^2 v''^2 = \omega^2 v^2 + \omega'^2 v'^2 - 2\omega\omega' v v'\cos\theta. \quad -(12)$$

Now consider:
$$\hbar\omega = \gamma mc^2 = \left(1 - \frac{v^2}{c^2}\right)^{-1/2} mc^2 \quad -(13)$$
$$\hbar\omega' = \gamma' m_1 c^2 = \left(1 - \frac{v'^2}{c^2}\right)^{-1/2} m_1 c^2 \quad -(14)$$
$$\hbar\omega'' = \gamma'' m_1 c^2 = \left(1 - \frac{v''^2}{c^2}\right)^{-1/2} m_1 c^2. \quad -(15)$$

It follows that:
$$\omega''^2 v''^2 = c^2(\omega''^2 - x_1^2) \quad -(16)$$
$$\omega^2 v^2 = c^2(\omega^2 - x^2) \quad -(17)$$
$$\omega'^2 v'^2 = c^2(\omega'^2 - x_1^2) \quad -(18)$$

where:

$$x = \frac{mc^2}{\hbar}, \quad x_1 = \frac{m_1 c^2}{\hbar}. \quad -(19)$$

Therefore using eqns. (16) to (18) ~~$\hbar$~~ in (12):

$$\omega''^2 - x_1^2 = \omega^2 - x^2 + \omega'^2 - x_1^2 - 2\left(\omega'^2 - x_1^2\right)^{1/2}\left(\omega^2 - x^2\right)^{1/2}\cos\theta \quad -(20)$$

i.e.

$$\omega^2 + \omega'^2 - \omega''^2 = x^2 + 2\left(\omega'^2 - x_1^2\right)^{1/2}\left(\omega^2 - x^2\right)^{1/2}\cos\theta \quad -(21)$$

where

$$x = \omega'' + \omega' - \omega \quad -(22)$$
$$= mc^2/\hbar$$

In particle experiments the frequencies ω, ω' and ω'' are known experimentally. Therefore:

$$2\left(\omega'^2 - x_1^2\right)^{1/2}\left(\omega^2 - x^2\right)^{1/2}\cos\theta \quad -(23)$$
$$= \omega^2 + \omega'^2 - \omega''^2 - \left(\omega'' + \omega' - \omega\right)^2$$
$$= 2\left(\omega\omega' - \omega''\left(\omega + \omega' + \omega''\right)\right)$$

$$\boxed{\left(\omega'^2 - x_1^2\right)^{1/2}\left(\omega^2 - x^2\right)^{1/2}\cos\theta = \omega\omega' - \omega''\left(\omega + \omega' + \omega''\right)} \quad -(24)$$

If, for the sake of argument, x is fixed at:

4)

$$x = \omega_0 = mc^2/\hbar \quad -(25)$$

then:

$$(\omega'^2 - x_1^2)^{1/2} = \frac{\omega\omega' - \omega''(\omega + \omega' + \omega'')}{(\omega^2 - \omega_0^2)^{1/2}\cos\theta} \quad -(26)$$

so:

$$x_1^2 = \omega'^2 - A^2 \quad -(27)$$

where

$$A = \frac{\omega\omega' - \omega''(\omega + \omega' + \omega'')}{(\omega^2 - \omega_0^2)^{1/2}\cos\theta} \quad -(28)$$

Although mathematically correct, eq. (27) is an absurd result because x_1 depends on various frequencies, and also the scattering angle θ. For example:

1) If $\omega = \omega_0$, $A \to \infty$.
2) If $\theta = \pi/2$, $A \to \infty$.
3) If $\omega\omega' = \omega''(\omega + \omega' + \omega'')$, $A = 0$.
4) In the obsolete standard model:

$$x_1 = ?\ 0 \quad -(29)$$

because photons produced from electron positron collision are massless. If eq. (29) is true then:

$$\omega'^2 = A^2 \quad -(30)$$

i.e.

$$\omega' = \frac{\omega\omega' - \omega''(\omega + \omega' + \omega'')}{(\omega^2 - \omega_0^2)^{1/2}\cos\theta} \quad -(31)$$

The incorrectness of eq. (31) is revealed if

5) it is assumed that two photons are produced by the electron positron collision, and that:

$$\omega' = \omega'' \quad -(32)$$

then eq. (31) gives

$$\omega' = \frac{-2\omega'^2}{(\omega^2 - \omega_0^2)^{1/2}\cos\theta} \quad -(33)$$

i.e. $$\omega' = -\frac{1}{2}(\omega^2 - \omega_0^2)^{1/2}\cos\theta \quad -(34)$$

and in general ω' is negative or imaginary, an absurd result if the photon mass is zero.

Conclusion

The basic theory of electron positron collision is entirely incorrect. The only known method of addressing the problem is to use R theory.