247(7): Electron positron Annihilation in the Standard Model

The usual view of annihilation in the standard physics is that the moving positron collides with the moving electron and in the course of the collision both particles are at rest instantaneously, so the result in the simplest case is two photons moving away in opposite directions, with γ ray frequencies. Each photon is said to have the rest energy of the electron or positron. During the collision the total energy, total linear momentum, total angular momentum and total charge are all conserved. This is not a point of view that has much merit in it. Using keyword "electron positron annihilation kinetic energy", the second site that comes up makes a crude attempt to describe the process using the same type of equation as used in Compton scattering. In particle physics if

$$A + B = C + D \quad -(1)$$

then:

$$A + \bar{C} = \bar{B} + D \quad -(2)$$

where the bar denotes antiparticle. Compton scattering is described as:

$$\gamma + e^- = \gamma + e^- \quad -(3)$$

where γ denotes photon and e^- denotes electron. Electron positron annihilation is described as:

$$e^+ + e^- = \gamma + \gamma \quad -(4)$$

It is seen that eq. (4) is generated from eq. (3) by:

2)

$$\gamma \rightarrow e^{+} \quad (B \rightarrow \bar{C}) \quad -(5)$$

$$e^{-} \rightarrow \gamma \quad (C \rightarrow \bar{B}) \quad -(6)$$

The photon in standard physics is regarded as its own antiparticle.

Therefore in standard particle physics the process of electron positron annihilation is generated from the process of Compton scattering by cross over symmetry. In the CERN teaching site mentioned above the two processes are therefore described by the same equation:

$$E_1 + mc^2 = E_2 + E_3 \quad -(7)$$

and by

$$\underline{p_1} = \underline{p_2} + \underline{p_3} \quad -(8)$$

In Compton scattering, E_1 is the energy of the incoming photon, mc^2 is the rest energy of a static electron, E_3 is the energy of the scattered photon, and E_2 is the energy of the scattered electron. In Compton scattering, $\underline{p_1}$ is the momentum of the incoming photon and $\underline{p_2}$ and $\underline{p_3}$ are the momenta of the scattered photon and electron respectively. The energy of the incoming photon in the Compton effect

) is

$$E_1 = \hbar\omega_1 = \gamma_1 m_1 c^2 \quad -(9)$$

where m_1 is the photon mass. In the standard physics

$$E_1 = \hbar\omega_1 \quad -(10)$$

because there is no photon mass. The energy of the scattered photon in the Compton effect is:

$$E_2 = \hbar\omega_2 \quad -(11)$$

and the energy of the scattered electron is:

$$E_3 = \hbar\omega_3 = \gamma_3 m c^2 \quad -(12)$$

The momentum of the incoming photon is:

$$\underline{p}_1 = \hbar \underline{\kappa}_1 = \gamma_1 m_1 \underline{v}_1 \quad -(13)$$

and the momenta of the scattered photon and electron are respectively:

$$\underline{p}_2 = \hbar \underline{\kappa}_2 = \gamma_2 m_1 \underline{v}_2 \quad -(14)$$

and

$$\underline{p}_3 = \hbar \underline{\kappa}_3 = \gamma_3 m \underline{v}_3 \quad -(15)$$

Therefore the same type of theory must apply to electron positron annihilation. If so E_1 refers to the moving electron and mc^2 to the initially static positron. So:

$$E_1 = \gamma_1 m c^2 = \hbar\omega_1 \quad -(16)$$

4) and:

$$\gamma_1 mc^2 + mc^2 = E_2 + E_3 \quad -(17)$$

where

$$E_2 = E_3 = \hbar\omega_2 = \hbar\omega_3 . \quad -(18)$$

It follows that:

$$\boxed{\begin{aligned} E_2 + E_3 &= (\gamma + 1) mc^2 \\ &\neq 2mc^2 \end{aligned}} \quad -(19)$$

This is another fundamental paradox in the standard physics because the sum $E_2 + E_3$ is not twice the rest energy.

The correct eq. (17) is:

$$\boxed{\gamma_1 mc^2 + mc^2 = \hbar\omega_2 + \hbar\omega_3 + E} \quad -(20)$$

where

$$\begin{aligned} E &= (\gamma - 1) mc^2 \quad -(21) \\ &= T \end{aligned}$$

and where T is the relativistic kinetic energy of the incoming electron. The energy E is transmuted into many processes, as observed experimentally.