339(7): A Summary of Possible Colliding Processes

Consider the relativistic equation of a moving particle colliding with a stationary particle, respectively of masses m_1 and m_2. This is Eq. (62) of notes 4 for UPT 247:

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

based a conservation of total energy. The energy $\bar{E}$ is released in the collision, and in general the particles m_1 and m_2 transmute into m_3 and m_4. We adopt the notation of UPT247. Conservation of linear momentum means that:

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

Eqs (1) and (2) can now be adapted for various processes involving the vacuum particle, denoted vac. The vacuum anti-particle is denoted $\overline{\text{vac}}$. Therefore for example a vacuum particle and anti-particle can annihilate to give two photons:

$$\text{vac} + \overline{\text{vac}} \rightarrow \gamma + \gamma + E \quad -(3)$$

or an electron positron pair:

$$\text{vac} + \overline{\text{vac}} \rightarrow e^- + e^+ + \bar{E} \quad -(4)$$

Propulsion by the vacuum can be envisaged as a moving vacuum particle colliding with a static electron:

$$\text{vac} + e^- \rightarrow e^- + \text{vac} + \bar{E} \quad -(5)$$

In this process, the momentum gained by the electron is $\underline{p}' = \hbar \underline{k}'$, and the energy is:

$$\bar{E} = \hbar c k' \quad -(6)$$

$E(\text{electron}) = \gamma'' m c^2$ ... (6)

where γ'' is the Lorentz factor.

This is the simplest theory of collisions involving vacuum particles, & Compton type theory.

The evolution of the universe could be governed by annihilation of vacuum particles and anti particles to give energy and pairs of elementary particles and anti particles. These evolve into stars and galaxies as in the usual theory.

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