2(2): Interaction of Two Particles in m Theory

The force magnitude in m theory is:

$$F = -\frac{dm(r)}{dr}\left(\frac{m(r)}{2m(r) - r\frac{dm(r)}{dr}}\right)^{1/2} E \quad -(1)$$

where

$$E^2 = p^2c^2 + m(r)m^2c^4 \quad -(2)$$

The force magnitude in Eq. (1) is that of the most general spherically symmetric space defined by the infinitesimal line element:

$$ds^2 = c^2d\tau^2 = m(r)c^2dt^2 - \frac{dr^2}{m(r)} - r^2d\phi^2 \quad -(3)$$

the plane polar coordinate frame (r, ϕ) or equivalently the spherical polar coordinate system.

When considering the interaction of two particles 1 and 2, the combined m force is:

$$F_1 + F_2 = -\frac{dm(r)}{dr}\left(\frac{m(r)}{2m(r) - r\frac{dm(r)}{dr}}\right)^{1/2}(E_1 + E_2) \quad -(4)$$

here

$$E_1^2 = p_1^2c^2 + m(r)m_1^2c^4 \quad -(5)$$

$$E_2^2 = p_2^2c^2 + m(r)m_2^2c^4 \quad -(6)$$

For example, when considering the interaction of proton p with the ^{64}Ni nucleus, then:

p_1 = relativistic proton momentum

m_1 = proton mass

p_2 = ^{64}Ni relativistic momentum

m_2 = mass of ^{64}Ni

2) Therefore $E_1 + E_2$ is always positive, but $F_1 + F_2$ may be positive (repulsive) or negative (attractive). The force $F_1 + F_2$ is attractive if

$$2m(r) > r\frac{dm(r)}{dr} \quad -(7)$$

The force $F_1 + F_2$ is repulsive if:

$$2m(r) < r\frac{dm(r)}{dr} \quad -(8)$$

Under condition (7), the attractive force becomes negative infinity as $2m(r)$ becomes very close to $r\,dm(r)/dr$. Under condition (8), the repulsive force becomes positive infinity as $2m(r)$ becomes very close to $r\,dm(r)/dr$.

The Coulomb repulsion in m space between p and ^{64}Ni is the force:

$$F_c = \frac{m(r) Z_1 Z_2}{4\pi\epsilon_0 r^2} \quad -(9)$$

The total force is therefore:

$$F = F_1 + F_2 + F_c. \quad -(10)$$

More accurately Q_i is the total magnitude of the force between ^{64}Ni and p.

Total energy is conserved:

$$E_1 + E_2 = E_1' + E_2' \quad -(11)$$

and total momentum is conserved:

$$\underline{p_1} + \underline{p_2} = \underline{p_1}' + \underline{p_2}'' \quad -(12)$$

If the force of attraction between p and ^{64}Ni

3) exceeds the force of repulsion, then a transient complex $^{64}Ni - p$ can be formed.

The m force does not exist in the old physics, in which the only force considered was

$$F_c = \frac{Z_1 Z_2 m(r)}{4\pi \epsilon_0 r^2} \quad -(13)$$

known as "the Coulomb barrier". In m theory, even if p and ^{64}Ni are static, there still exists the m force:

$$F_1 + F_2 = -\frac{dm(r)}{dr}\left(\frac{m(r)(m_1+m_2)c^2}{2m(r) - r\frac{dm(r)}{dr}}\right) \quad -(14)$$

and this can overcome the Coulomb barrier.

This can occur in a mixture of ^{64}Ni and hydrogen gas, the type of mixture used in devices such as E Cat. In m theory the formation of the ($^{64}Ni\,p$) complex is due to the nature of space itself. The formation of $^{64}Ni\,p$ can be achieved under the right conditions.

If the nucleus is modelled as a charged sphere of radius R, then the total force (10) is defined by:

$$r \geq R \quad -(15)$$

Once the $^{64}Ni\,p$ complex is formed, the repulsive potential is defined for

$$r \leq R \quad -(16)$$

and in m space is given by:

$$U_c = \frac{Z_1 Z_2 e^2}{R}\left(\frac{3}{} - \frac{1}{m(r)}\left(\frac{r}{R}\right)^2\right) \quad -(17)$$

and

$$r \leq R \quad -(18)$$

The force from Eq. (17) is:

$$F_c = -\frac{\partial U_c}{\partial r} = \frac{Z_1 Z_2 e^2}{R^3}\frac{\partial}{\partial r}\left(\frac{r^2}{m(r)}\right) \quad -(19)$$

$$= \frac{Z_1 Z_2 e^2 r}{R^3 m(r)^2}\left(2m(r) - r\frac{dm(r)}{dr}\right)$$

In m theory this can be repulsive, under the condition:

$$2m(r) > \frac{r\,dm(r)}{dr} \quad -(20)$$

and also attractive if

$$r\frac{dm(r)}{dr} > 2m(r) \quad -(21)$$

Inside the $^{64}Ni\,p$ complex, the total force between protons and neutrons is:

$$\boxed{F = -\frac{dm(r)}{dr}\left(\frac{m(r)}{2m(r) - r\frac{dm(r)}{dr}}\right)(m_1 + m_2)c^2 + \frac{Z_1 Z_2 e^2 r}{R^3 m(r)^2}\left(2m(r) - r\frac{dm(r)}{dr}\right)} \quad -(22)$$

for $r \leq R$. $\quad -(23)$

5) If the force in Eq. (22) is positive, the $^{64}Ni\,p$ complex is unstable. It is observed experimentally that the complex transmutes into ^{63}Cu + other products. The total mass of the products of transmutation is less than the mass of $^{64}Ni\,p$. So the energy released is:

$$\Delta E = \Delta m c^2 \quad -(24)$$

Experimentally, this is released as heat and intense visible and ultraviolet radiation. However, no γ rays are produced in a low energy nuclear reaction. The visible and ultra violet frequency radiation is the broad band emission spectrum of ^{64}Ni. The emitted radiation is found to be in the visible ultra violet range:

$$\omega = (2.938 \text{ to } 4.838) \times 10^{15} \text{ radians } s^{-1} \quad -(25)$$

The mass loss associated with visible emission is:

$$\Delta m = \frac{\hbar\omega}{c^2} = 5.23 \times 10^{-35} \text{ kgm} \quad -(26)$$

When ^{64}Ni transmutes into ^{63}Cu it loses one proton of mass: $m_p = 1.67265 \times 10^{-27}$ kgm

so only a very small amount of ^{64}Ni is transmuted into ^{63}Cu.

This is why only traces of ^{63}Cu are found.

The percentage of ^{64}Ni transformed to ^{63}Cu

) is roughly:

$$\frac{5.23 \times 10^{-35}}{1.67265 \times 10^{-27}} \times 100 \%$$

$$= 3.13 \times 10^{-6} \%$$

If all the ^{64}Ni were transmuted to ^{63}Cu gamma rays would be emitted at a frequency corresponding to the loss of one proton. This is because ^{63}Cu has one less proton than ^{64}Ni. The frequency corresponding to the loss of one proton is:

$$\omega = \frac{1.67265 \times 10^{-27} \times 9 \times 10^{16}}{1.05459 \times 10^{-34}}$$

$$= m_p c^2 / \hbar$$

$$= 1.427 \times 10^{24} \text{ radians per second}$$

and this is in the gamma ray range.

Gamma rays would be emitted if all the ^{64}Ni were transmitted to ^{63}Cu.