The Fifth Dimension

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ABSTRACT

Assume mass is the fifth dimension in Special Relativity and Redefinition of the point as a circle. According to Einstein's first hypothesis only ،it can be reached to transfer formats between reference frames in the special theory of relativity and find the mass limit for any body is moves

Keywords

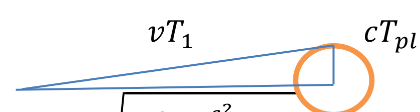
The fifth dimension, the mass limit for any body

Introduction

Redefinition of the point

Redefinition of the point as a circle the length of it the radius Equal the length of the Planck cT_{pl}

SO $X_1 = vT_1\sqrt{1 - \frac{v^2}{C^2}(1 - (\frac{X_{PL}^2}{X_1{}^2})}$



$$X_1 = v\sqrt{T_1{}^2 - \frac{c^2}{v^2}(T_{pl}^2)}$$

$$X_1 = vT_1\sqrt{1 - \frac{c^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}$$

$$X_1 = vT_1\sqrt{1 - \frac{v^2}{C^2}(1 - (\frac{X_{PL}^2}{X_1{}^2})}$$

contribution

Consider two observers A , B *in both frames* S_1 , S_2

At first $T_1 = T_2 = 0$

T_1 *The time at frame* S_1 *and* T_2 *the time at frame* S_2

Let A and B in the same place and at the same time, they each send a light signal

Let S_2 and (observer B) moving respect to S_1 and (observer A) with uniform Velocity $\vec{V}$

At the direction of the axis $\overrightarrow{ox}$

In this case the signal is spread as a spherical wave

Measurements A:

At moment T_1 of his watch, the wave equation appears in the Formula:

$X_1{}^2 + Y_1{}^2 + Z_1{}^2 - C_1{}^2 T_1{}^2 - \frac{G_1{}^2}{C_{M1}{}^4} M_1{}^2 = 0$ -------------------------------- *(1)*

C_1 *Speed of light and* C_{M1} *Speed of light at mass dimension at frame* S_1

Measurements B:

At moment T_2 of his watch, the wave equation appears in the Formula:

$X_2{}^2 + Y_2{}^2 + Z_2{}^2 - C_2{}^2 T_2{}^2 - \frac{G_2{}^2}{C_{M2}{}^4} M_2{}^2 = 0$ -------------------------------- *(2)*

C_2 *Speed of light and* C_{M2} *Speed of light at mass dimension at frame* S_2

Notice $C_1 \neq C_2$

Then

$X_1{}^2 + Y_1{}^2 + Z_1{}^2 - C_1{}^2 T_1{}^2 - \frac{G_1{}^2}{C_{M1}{}^4} M_1{}^2 = X_2{}^2 + Y_2{}^2 + Z_2{}^2 - C_2{}^2 T_2{}^2 - \frac{G_2{}^2}{C_{M2}{}^4} M_2{}^2$ -------------------------------- *(3)*

Let $Y_1 = Y_2$ and $Z_1 = Z_2$ So

$\boldsymbol{X_1{}^2 - C_1{}^2 T_1{}^2 - \frac{G_1{}^2}{C_{M1}{}^4} M_1{}^2 = X_2{}^2 - C_2{}^2 T_2{}^2 - \frac{G_2{}^2}{C_{M2}{}^4} M_2{}^2}$ **-------------------------------- *(4)***

Let

$X_2 = G_{11} X_1 + G_{14} T_1 + G_{15} M_1$ -------------------------------- *(5)*

$T_2 = G_{41} X_1 + G_{44} T_1 + G_{45} M_1$ -------------------------------- *(6)*

$M_2 = G_{51} X_1 + G_{54} T_1 + G_{55} M_1$ -------------------------------- *(7)*

Where G_{11}, G_{14}, G_{41}, $G_{44} G_{51}$, $G_{54.}$, G_{55} are constants

Consider the moving of origin point O_2 respect to S_1

(Ordinates O_2) is X_2=0

So from equation (5) $X_2 = G_{11} X_1 + G_{14} T_1 + G_{15} M_1$

$0 = G_{11} X_1 + G_{14} T_1 + G_{15} M_1$

$G_{14} T_1 = -G_{11} X_1 - G_{15} M_1$

$G_{14} = -G_{11} \frac{X_1}{T_1} - G_{15} \frac{M_1}{T_1}$- *And* $\frac{X_1}{T_1} = v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}$

So $G_{14} = -G_{11}\, v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})} - G_{15} \frac{M_1}{T_1}$ -------------------------------- *(7)*

Consider the moving of origin point O_1 *respect to* S_2

(Ordinates O_1 *) is* X_1*=0*

So from equation (5)

$X_2 = G_{11} X_1 + G_{14} T_1 + G_{15} M_1$-------------------------------- *(5)*

$X_2 = 0 + G_{14} T_1 + G_{15} M_1$

$X_2 = G_{14} T_1 + G_{15} M_1$-------------------------------- *(8)*

From equation (6)

$T_2 = G_{41} X_1 + G_{44} T_1 + G_{45} M_1$ -------------------------------- *(6)*

$T_2 = 0 + G_{44} T_1 + G_{45} M_1$

$T_2 = G_{44} T_1 + G_{45} M_1$ -------------------------------- *(9)*

From equation (8) and (9)

$\frac{X_2}{T_2} = \frac{G_{14} T_1 + G_{15} M_1}{G_{44} T_1 + G_{45} M_1}$ *And* $\frac{X_2}{T_2} = -v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}$

So $\frac{G_{14} T_1 + G_{15} M_1}{G_{44} T_1 + G_{45} M_1} = -v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}$

From equation (7) $G_{14} = -G_{11}\, v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})} - G_{15} \frac{M_1}{T_1}$ -------------------------------- *(7)*

So $\frac{-G_{11}\, v T_1 \sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})} - G_{15} M_1 + G_{15} M_1}{G_{44} T_1 + G_{45} M_1} = -v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}$

$$\frac{-G_{11}\, vT_1 \sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}}{G_{44}\, T_1 + G_{45}\, M_1} = -v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}$$

$$\frac{G_{11}\, T_1}{G_{44}\, T_1 + G_{45}\, M_1} = 1$$

$$G_{44}\, T_1 + G_{45}\, M_1 = G_{11}\, T_1$$

$G_{44} = G_{11} - G_{45}\, \frac{M_1}{T_1}$-------------------------------- *(10)*

From equations (6), (7)

$T_2 = G_{41}\, X_1 + G_{44}\, T_1 + G_{45}\, M_1$ -------------------------------- *(6)*

$M_2 = G_{51}\, X_1 + G_{54}\, T_1 + G_{55}\, M_1$ -------------------------------- *(7)*

$$X_1 = 0$$

$$T_2 = G_{44}\, T_1 + G_{45}\, M_1$$

$$M_2 = G_{54}\, T_1 + G_{55}\, M_1$$

So

$\frac{M_2}{T_2} = \frac{G_{54}\, T_1 + G_{55}\, M_1}{G_{44}\, T_1 + G_{45}\, M_1}$ *And* $\frac{M_2}{T_2} = \frac{M_1}{T_1}$

$$\frac{M_1}{T_1} = \frac{G_{54}\, T_1 + G_{55}\, M_1}{G_{44}\, T_1 + G_{45}\, M_1}$$

$$\frac{M_1}{T_1} = \frac{G_{54} + G_{55}\, \frac{M_1}{T_1}}{G_{44} + G_{45}\, \frac{M_1}{T_1}}$$

From

$G_{44} = G_{11} - G_{45}\, \frac{M_1}{T_1}$-------------------------------- *(10)*

$$\frac{M_1}{T_1} = \frac{G_{54} + G_{55}\, \frac{M_1}{T_1}}{G_{11} - G_{45}\, \frac{M_1}{T_1} + G_{45}\, \frac{M_1}{T_1}}$$

$$\frac{M_1}{T_1} = \frac{G_{54} + G_{55}\, \frac{M_1}{T_1}}{G_{11}}$$

$$G_{54} + G_{55}\frac{M_1}{T_1} = G_{11}\frac{M_1}{T_1}$$

$$G_{54} = G_{11}\frac{M_1}{T_1} - G_{55}\frac{M_1}{T_1} \text{-------------------------------- (11)}$$

From (5) , (7)

$$X_2 = G_{11}X_1 + G_{14}T_1 + G_{15}M_1 \text{-------------------------------- (5)}$$

$$G_{14} = -G_{11}\,v\sqrt{1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)} - G_{15}\frac{M_1}{T_1} \text{ -------------------------------- (7)}$$

$$X_2 = G_{11}X_1 + -G_{11}\,vT_1\sqrt{1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)} - G_{15}M_1 + G_{15}M_1$$

$$X_2 = G_{11}X_1 + -G_{11}\,vT_1\sqrt{1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}$$

$$X_2 = G_{11}\left[X_1 - vT_1\sqrt{1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}\right] \text{ -------------------------------- (12)}$$

From (6) , (10)

$$T_2 = G_{41}X_1 + G_{44}T_1 + G_{45}M_1 \text{ -------------------------------- (6)}$$

$$G_{44} = G_{11} - G_{45}\frac{M_1}{T_1} \text{-------------------------------- (10)}$$

$$T_2 = G_{41}X_1 + G_{11}T_1 - G_{45}M_1 + G_{45}M_1$$

$$T_2 = G_{41}X_1 + G_{11}T_1 \text{-------------------------------- (13)}$$

$$M_2 = G_{51}X_1 + G_{54}T_1 + G_{55}M_1 \text{ -------------------------------- (7)}$$

$$G_{54} = G_{11}\frac{M_1}{T_1} - G_{55}\frac{M_1}{T_1} \text{-------------------------------- (11)}$$

$$M_2 = G_{51}X_1 + G_{11}M_1 - G_{55}M_1 + G_{55}M_1$$

$$M_2 = G_{51}X_1 + G_{11}M_1 \text{-------------------------------- (14)}$$

$$\boldsymbol{X_1{}^2 - C_1{}^2T_1{}^2 - \frac{G_1{}^2}{C_{M1}{}^4}M_1{}^2 = X_2{}^2 - C_2{}^2T_2{}^2 - \frac{G_2{}^2}{C_{M2}{}^4}M_2{}^2} \text{ -------------------------------- (4)}$$

From(12) , (13) , (14)

$$X_2 = G_{11}\left[X_1 - vT_1\sqrt{1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}\right] \text{ -------------------------------- (12)}$$

$$T_2 = G_{41}X_1 + G_{11}T_1 \text{-------------------------------- (13)}$$

$$M_2 = G_{51}X_1 + G_{11}M_1 \text{-------------------------------- (14)}$$

$$\boldsymbol{X_1}^2 - \boldsymbol{C_1}^2\boldsymbol{T_1}^2 - \frac{\boldsymbol{G_1}^2}{\boldsymbol{C_{M1}}^4}\boldsymbol{M_1}^2$$

$$= \left(G_{11}\left[X_1 - vT_1\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}\right]\right)^2 - \boldsymbol{C_2}^2(G_{41}X_1 + G_{11}T_1)^2 - \frac{\boldsymbol{G_2}^2}{\boldsymbol{C_{M2}}^4}(G_{51}X_1 + G_{11}M_1)^2$$

-------------------------------- *(15)*

Compare the coefficient of X_1^2

$$1 = G_{11}^2 - C_2^2(G_{41})^2 - \frac{\boldsymbol{G_2}^2}{\boldsymbol{C_{M2}}^4}(G_{51})^2$$

$$G_{11}^2 = 1 + C_2^2(G_{41})^2 + \frac{\boldsymbol{G_2}^2}{\boldsymbol{C_{M2}}^4}(G_{51})^2$$

-------------------------------- *(16)*

Compare the coefficient of X_1T_1

$$0 = -2v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}G_{11}^2 - 2C_2^2(G_{41}G_{11})$$

$$0 = v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}G_{11}^2 + C_2^2(G_{41}G_{11})$$

$$v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}G_{11}^2 = -C_2^2(G_{41}G_{11})$$

$$v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}G_{11} = -C_2^2(G_{41})$$

$$G_{11} = \frac{-C_2^2}{v\sqrt{1 - \frac{\boldsymbol{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}}(G_{41})$$

$$G_{41} = \frac{-v\sqrt{1 - \frac{C_1^2}{v^2}\left(\frac{T_{PL}^2}{T_1^2}\right)}}{C_2^2}(G_{11})$$ -------------------------------- *(17)*

$T_2 = G_{41}X_1 + G_{11}T_1$-------------------------------- *(13)*

$$T_2 = \frac{-v\sqrt{1-\frac{C_1{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})}}{C_2{}^2}(G_{11}) \quad X_1 + G_{11}\, T_1$$

$$T_2 = G_{11}\,(T_1 - \frac{v\sqrt{1-\frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}}{C_2{}^2}X_1) \text{ -------------------------------- } (18)$$

Compare the coefficient of $T_1{}^2$

$$-C_1{}^2 = G_{11}{}^2(-v\sqrt{1-\frac{\boldsymbol{C_1}{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})})^2 - C_2{}^2(G_{11})^2$$

$$-C_1{}^2 = G_{11}{}^2\left[v^2\left(1-\frac{\boldsymbol{C_1}{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)-C_2{}^2\right)\right]$$

$$1 = G_{11}{}^2[\frac{-\boldsymbol{v}^2}{\boldsymbol{C_1}{}^2}\left(1-\frac{\boldsymbol{C_1}{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)+\frac{\boldsymbol{C_2}{}^2}{\boldsymbol{C_1}{}^2}\right)]$$

$$G_{11} = \frac{1}{\sqrt{\frac{C_2{}^2}{C_1{}^2}-\frac{v^2}{C_1{}^2}(1-\frac{C_1{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})}} \text{ -------------------------------- } (19)$$

Compare the coefficient of M^2

$$-\frac{\boldsymbol{G_1}{}^2}{\boldsymbol{C_{M1}}{}^4} = -\frac{\boldsymbol{G_2}{}^2}{\boldsymbol{C_{M2}}{}^4}G_{11}{}^2$$

Compare the coefficient of MX

$$\mathbf{0} = -\mathbf{2}\frac{\boldsymbol{G_2}{}^2}{\boldsymbol{C_{M2}}{}^4}G_{51}\,G_{11}$$

$\boldsymbol{C_{M2}} \neq 0$, $\boldsymbol{G_2} \neq \mathbf{0}$, $G_{11} \neq 0$

SO $\quad G_{51} = 0$

$M_2 = G_{51}\,X_1 + G_{11}\,M_1$ -------------------------------- *(14)*

$M_2 = G_{11}\,M_1$ -------------------------------- *(20)*

From Equation (16)

$$G_{11}{}^2 = 1 + C_2{}^2(G_{41})^2 + \frac{\boldsymbol{G_2}{}^2}{\boldsymbol{C_{M2}}{}^4}(G_{51})^2$$

-------------------------------- *(16)*

$G_{51} = 0$

---------------------------------- *(16)*

So $\quad G_{11}{}^2 = 1 + C_2{}^2 (G_{41})^2$

$$G_{41} = \frac{-v\sqrt{1-\frac{C_1{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})}}{C_2{}^2}(G_{11}) \quad \text{---------------------------------- } (17)$$

$$G_{11}{}^2 = 1 + C_2{}^2 (\frac{-v\sqrt{1-\frac{C_1{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})}}{C_2{}^2}(G_{11}))^2$$

$$G_{11}{}^2 = 1 + G_{11}{}^2 \frac{v^2}{C_2{}^2}(1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right))$$

$$G_{11}{}^2 (1 - \frac{v^2}{C_2{}^2}(1 - \frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)) = 1$$

$$G_{11} = \frac{1}{\sqrt{1-\frac{v^2}{C_2{}^2}(1-\frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}} \text{------------------------ } (21)$$

From (18), (20)

$$G_{11} = \frac{1}{\sqrt{\frac{C_2{}^2}{C_1{}^2}-\frac{v^2}{C_1{}^2}(1-\frac{C_1{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})}} \quad \text{---------------------------------- } (19)$$

$$G_{11} = \frac{1}{1-\sqrt{1-\frac{v^2}{C_2{}^2}(1-\frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}} \text{------------------------ } (21)$$

$$\frac{1}{\sqrt{\frac{C_2{}^2}{C_1{}^2}-\frac{v^2}{C_1{}^2}(1-\frac{\boldsymbol{C_1}{}^2}{v^2}(\frac{T_{PL}^2}{T_1{}^2})}} = \frac{1}{\sqrt{1-\frac{v^2}{C_2{}^2}(1-\frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)}}$$

$$\frac{C_2{}^2}{C_1{}^2}-\frac{v^2}{C_1{}^2}(1-\frac{\boldsymbol{C_1}{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right) = 1-\frac{v^2}{C_2{}^2}(1-\frac{C_1{}^2}{v^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)$$

$$\frac{C_2{}^2}{C_1{}^2}-\frac{v^2}{C_1{}^2}-\left(\frac{T_{PL}^2}{T_1{}^2}\right) = 1-\frac{v^2}{C_2{}^2}-\frac{C_1{}^2}{C_2{}^2}\left(\frac{T_{PL}^2}{T_1{}^2}\right)$$

Compare the coefficient of $\left(\frac{T_{PL}^2}{T_1{}^2}\right)$

$$\frac{{C_1}^2}{{C_2}^2} = 1$$

$$Then \quad {C_1}^2 = {C_2}^2$$

$$So \quad C_1 = \pm C_2$$

$$Let\ {C_1}^2 = {C_2}^2 = C^2 \text{--------------------------------} (22)$$

$$And \quad G_{11} = \gamma$$

$$G_{11} = \frac{1}{\sqrt{\frac{{C_2}^2}{{C_1}^2} - \frac{v^2}{{C_1}^2}(1 - \frac{{C_1}^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}} \quad \text{--------------------------------} (19)$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{C^2}(1 - \frac{C^2}{v^2}(\frac{T_{PL}^2}{{T_1}^2})}}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{C^2}(1 - (\frac{X_{PL}^2}{{X_1}^2})}} \quad \text{--------------------------------} (23)$$

$$X_2 = G_{11}\,[X_1 - vT_1\sqrt{1 - \frac{{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{{T_1}^2}\right)}] \text{ --------------------------------} (12)$$

$$T_2 = G_{11}\,(T_1 - \frac{v\sqrt{1 - \frac{{C_1}^2}{v^2}\left(\frac{T_{PL}^2}{{T_1}^2}\right)}}{{C_2}^2} \quad X_1) \text{ --------------------------------} (18)$$

$$M_2 = G_{11}\,M_1 \text{--------------------------------} (20)$$

$${C_1}^2 = {C_2}^2 = C^2 \text{--------------------------------} (22)$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{C^2}(1 - (\frac{X_{PL}^2}{{X_1}^2})}} \quad \text{--------------------------------} (23)$$

$$X_2 = \gamma[X_1 - vT_1\sqrt{1 - \frac{X_{PL}^2}{{X_1}^2}}] \text{ --------------------------------} (24)$$

$$T_2 = \gamma(T_1 - \frac{v\sqrt{1 - \frac{X_{PL}^2}{{X_1}^2}}}{{C_2}^2} X_1) \text{ --------------------------------} (25)$$

$$M_2 = \gamma M_1 \text{--------------------------------} (26)$$

Conclusion

Lorentz Transformations

$$X_2 = \gamma[X_1 - vT_1\sqrt{1 - \frac{X_{PL}^2}{{X_1}^2}}] \text{ -------------------------------- (24)}$$

$$T_2 = \gamma(T_1 - \frac{v\sqrt{1-\frac{X_{PL}^2}{{X_1}^2}}}{{C_2}^2}X_1) \text{ -------------------------------- (25)}$$

$$M_2 = \gamma M_1 \text{-------------------------------- (26)}$$

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{C^2}(1-(\frac{X_{PL}^2}{{X_1}^2})}} \quad \text{-------------------------------- (23)}$$

If $v = C$

Then $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{C^2}(1-(\frac{X_{PL}^2}{{X_1}^2})}} = \frac{1}{\sqrt{1-1+(\frac{X_{PL}^2}{{X_1}^2})}} = \frac{1}{\sqrt{(\frac{X_{PL}^2}{{X_1}^2})}} = \frac{X_1}{X_{pl}}$

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