Energy Profile of Faster-than-Light Particles : A New Approach to The Special Theory of Relativity

Matradji[1], Tutug Dhanardono[1], Heri Justiono[1]

Abstract – It is known that neutrinos propagate faster than light. For that reason the Einstein's special theory of relativity cannot be applied to these phenomena. On the other hand the Matscie's special theory of relativity based on the Matscie's transformation is valid for any velocity including the velocities greater than the velocity of light in free space. The relativistic phenomena consisting of the length contraction and the time dilation can be verified successfully by the Matscie's special theory of relativity. In this case, the velocity of light in free space acts as the critical velocity. Only about 81.6% of the rest mass of a body can be converted into energy. At very low velocities, the kinetic energy of a moving body is practically the same as that in the classical mechanics. And also at velocities of much higher than the critical velocity, it almost reduces to the classical expression. For moderate velocities, the Matscie's special theory of relativity reduces to the Einstein's special theory of relativity. For velocities close to (below or above) the velocity of light in free space, the kinetic energy of a moving body differs from that predicted by the classical mechanics.

Index Terms – Critical Velocity, Length Contraction, Rest Mass, Time Dilation.

INTRODUCTION

It is known that neutrinos propagate faster than light. But the Lorentz transformations cannot be applied to the faster-than-light particles. Thus it is required to develop a new transformation applicable to the aforesaid scientific fact . In this case the Matscie's transformations hold for any velocities including the velocities greater than the critical velocity. These transformations still maintain the first and the second postulates of special relativity. The first postulate of special relativity states that the laws of physics may expressed in equations having the same form in all frames of reference moving at constant velocity with respect to one another. While the second postulate states that the speed of light in free space has the same value for all observers. In developing the Matscie's transformations it is introduced the so-called relativistic relative velocity between object and light.

RESULT AND DISCUSSION

The Relativistic phenomena

Based on the Matscie's transformations, the length contraction is formulated as

$$L_o = kL \tag{1}$$

where $k = k_\alpha$ for $v \le v_\alpha$, $k = k_\beta$ for $v \ge v_\beta$, and $k = k_c$ for $v_\alpha < v < v_\beta$. In this case L_o is the length of a body at rest and L is the length of the body at velocity v.

To verify this phenomena, consider the μ mesons traveling at speed $2.994 \times 10^8 m/sec$. The μ mesons are created high in the sky by fast cosmic-ray particles arriving at the earth from space, and reach sea level in profusion. The distance in which the mesons can travel during $t_o = 2 \times 10^{-6} sec$, the meson's mean lifetime, is presented in table 1. It is seen from this table, that the prediction by the Matscie's special theory of relativity is the most reasonable.

Table 1. The distance in which the mesons can travel during their mean lifetime

Prediction by	Distance
Newtonian mechanics	0.6 km
Einstein's special theory of relativity	9.5 km
Matscie's special theory of relativity	300 km

The time dilation phenomena according to the Matscie's transformations is formulated as

$$t = kt_o \tag{2}$$

where t_o is the time according to observer at rest and t is the time as measured by a moving observer at speed v. To verify this phenomena consider the following information written in the Holy Koran. The first information is implied in Al-Maarij 4 of the Holy Koran: "To the God Allah, angel and spirit went up for one day which equivalent to fifty thousand years". This is a time dilation phenomena informed by the Holy Koran in the sixth century. In this case $t/t_o = 50{,}000 \ \ years/1\ day = 18{,}250{,}000$. The second information is inserted in As-Sajdah 5 of the Holy Koran: "The God Allah arranged business from heavens to earth, and then it went up to the God for one day which equivalent to one thousand years according to your count". This is also a time dilation phenomena. But in this case $t/t_o = 1{,}000 years/1\ day = 365{,}000$. These informations are included in the following table.

Table 2. The time dilation phenomena [2]

$\frac{v}{c}$	$\frac{t}{t_o} = k$		$\frac{c}{v}$	$\frac{t}{t_o} = k_\beta$
	Einstein	**Matscie**		
0.9	2.29	9.1	0.9	10.1
0.999	22.37	999	0.999	1000.001
0.999 999	707.11	999 998.5	0.999 999	999 999.5
0.999 999 999	223 60.68	999 999 998.5	0.999 999 999	999 999 999.5

[1]Matradji, Tutug Dhanardono, Heri Justiono are with Department of Engineering Physics, Faculty of Industrial Engineering, Institut Teknologi Sepuluh Nopember, Surabaya. Email: matradji@ep.its.ac.id; tutugdh@ep.its.ac.id; heriyus@ep.its.ac.id.

Clearly from table 2, that the Einstein's special theory of relativity fails to provide the value of t/t_o as required. On the other hand the Matscie's special theory of relativity succeeds to find the values.

A. The Profile of Energy

For $v < c$ the kinetic energy T of a moving body is expressed as

$$T = E - E_o \tag{4}$$

where

$$E = m_o c^2 \begin{bmatrix} \alpha k_\alpha + \frac{1}{2}\ln\{1-(2+\sqrt{3})\alpha^*\} \\ +\frac{\frac{\sqrt{3}}{4}}{1-\alpha^*} + \frac{3}{8}\ln(1-\alpha^*) - \frac{1}{8}\ln(1+\alpha^*) \end{bmatrix} \tag{5}$$

$$\alpha^* = \frac{2\alpha-1}{\sqrt{3}+\sqrt{3+(2\alpha-1)^2}} \tag{6}$$

and

$$E_o = m_o c^2 \begin{bmatrix} \frac{\sqrt{3}+1}{8} + \frac{1}{2}\ln 2 \\ +\frac{3}{8}\ln(3-\sqrt{3}) - \frac{1}{8}\ln(\sqrt{3}-1) \end{bmatrix} \tag{7}$$

or approximately

$$E_o \approx 0.816 m_o c^2 \tag{8}$$

If E is interpreted as the total energy of the body, it follows that, when the body is at rest and $T = 0$, it nevertheless possesses the energy E_o. Accordingly E_o is called the rest energy of a body whose mass at rest is m_o. It can be interpreted that only about 81.6% of the rest mass of a body that can be converted into energy. This prediction differs from that of the Einstein's special theory of relativity which states that all of the rest mass m_o can be converted into energy, that is $E_o = m_o c^2$.

If $V \ll c$ then

$$T \approx \left(\frac{3}{4} - \frac{1}{8}\sqrt{3}\right) m_o c^2 \approx 0.533 m_o c^2 \tag{9}$$

Hence at low speeds the Matscie's relativistic expression for the kinetic energy of a moving particle reduces to the classical one. The kinetic energy T at $v = c$ is [4]

$$T = 999\,999\,987.6\, m_o c^2 \tag{10}$$

Thus the total energy of the body at the critical velocity is

$$E = 999\,999\,988.4\, m_o c^2 \tag{11}$$

The kinetic energy of the body at velocities greater than the critical velocity is expressed as

$$T = 1\,000\,000\,030\, m_o c^2 + \frac{k_\beta}{\beta} m_o c^2 - 2\sqrt{3} m_o c^2 \times \begin{bmatrix} \frac{1-\frac{1}{2}\sqrt{3}}{\beta^*+2-\sqrt{3}} - \frac{1}{8}\sqrt{3}\ln(\beta^*+2-\sqrt{3}) \\ -\frac{1}{24}\sqrt{3}\ln(2+\sqrt{3}-\beta^*) + \frac{1}{6}\sqrt{3}\ln(2-\sqrt{3}-\beta^*) \end{bmatrix} \tag{12}$$

where,

$$\beta^* = \frac{2\beta-1}{\sqrt{3}+\sqrt{3+(2\beta-1)^2}} \tag{13}$$

For very large v or $v \gg c$ then equation (12) becomes

$$T = 2 m_o v^2 - 1\,928\,203\,276\, m_o c^2 \tag{14}$$

This expression is valid only for v be much higher than 31 049.986 12 c. The first term on the right side of equation (31) indicate that at very high speeds, namely $\gg c$, the Matscie's relativistic expression for the kinetic energy of a moving particle reduces almost to the classical one. While the second term on the right side of the equation acts as a correction to make the kinetic energy expression closer to the classical one.

REFERENCES

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