

No Superluminal Phenomena

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Abstract: In 1962, Sudarshan and his coworkers proposed a hypothesis that particles whose rest mass is imaginary can travel by inception, faster than light^[1-3]. After that, several thousands of papers on tachyons have been written, hundreds of Ph.Ds were minted and a remarkable number of conferences have been conducted. But until this date, nobody is able to show either tachyons are consistent or are not consistent. In this work, the author attempted to establish that the chances for superluminal phenomena are not bright.

Key words: Einstein, special relativity, light velocity, Sudharshan's tachyon hypothesis .

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Results

Einstein's variance of mass with velocity equation is given by, $m = m_0 / (1 - v^2/c^2)^{1/2}$ (1)

Where m = moving mass, m_0 = rest mass,

v = velocity of the object, c = light velocity

Squaring (1), $m^2 = m_0^2 / (1 - v^2/c^2)$

i.e $m^2 (1 - v^2/c^2) = m_0^2$

i.e $m^2 (c^2 - v^2) / c^2 = m_0^2$

i. e $m^2 (c^2 - v^2) = m_0^2 c^2$ (1a)

Let us assume $v = c + a$ (2)

and $m_0 = ia$ where i is imaginary unit (3)

Putting (2) and (3) in (1a), and replacing i^2 by -1 we get that,

$$m^2 (a^2 + 2ca) = c^2 \quad (3a)$$

$$\text{i.e } a^2 + 2ca - c^2 / m^2 = 0 \quad (4)$$

(4) is quadratic in c.

Therefore , $c = -2a + \text{or} - [4a^2 + 4a^2 / m^2]^{1/2}$

$$\text{i . e } c = -2a + \text{or} - 2a [1 + 1/ m^2]^{1/2}$$

$$\text{-----}$$

$$- 2/ m^2$$

Multiplying by $- 2/ m^2$, $2c / m^2 = -2 a + \text{or} -2a [1 + 1/ m^2]^{1/2}$

$$\text{i , e } c / m^2 = - a + \text{or} -a [1 + 1/ m^2]^{1/2}$$

$$\text{i . e } c / m^2 + a = + \text{or} -a [1 + 1/ m^2]^{1/2}$$

$$\text{Dividing by a , } c / m^2 a + 1 = + \text{or} - [1 + 1/ m^2]^{1/2} \quad (5)$$

$$\text{Let us once again assume that } nc^2 = v^2 \quad (6)$$

Putting (6) in (1b) and replacing $m_0^2 [i^2]$ by $- 1$, $m^2 (n - 1) = 1$

$$\text{i . e } m^2 n - m^2 = 1 \quad \text{i.. e } m^2 n = m^2 + 1, \text{ i . e } n = 1 + 1/ m^2 \quad (7)$$

$$\text{Applying (7) in (6) , } v^2 / c^2 = 1 + 1/ m^2 \quad (8)$$

$$\text{Assuming (8) in (5), , } c / m^2 a + 1 = + \text{or} - [v^2 / c^2]^{1/2}$$

$$\text{i . e } , c / m^2 a + 1 = + \text{or} - [v / c] \quad (8a)$$

Putting (2) in RHS, and choosing positive value, $c / m^2 a + 1 = 1 + a / c$

$$\text{i . e } c / m^2 a = a / c$$

$$\text{Multiplying both sides by } c / a \text{ we obtain that } c^2 / m^2 a^2 = 1, c^2 / m^2 a^2 = 1 \quad (9)$$

$$\text{i . e } c^2 = m^2 a^2 \quad (10)$$

$$\text{Putting (10) in (4) we have, } 2ca = 0 \quad (11)$$

$$\text{Since } c \text{ is the light velocity, we obtain that } a = 0 \quad (12)$$

Putting (2) in RHS, and taking negative value, $c / m^2 a + 2 + a / c = 0$

$$\text{Multiplying through out by } c / a , c^2 / m^2 a^2 + 2c / a + 1 = 0$$

Applying (3a) in the first factor, $2c / a + 1 + 2c / a + 1 =$

i. e $2c / a + 1 = 0$

Multiplying by a we get that $2c + a = 0$

Assuming (2) we obtain that , $v + c = 0$, i.e $v = - c$ (13)

Discussion

Needless to say , both (12) and (13) are contradictions. These negative results establish once and for all that our assumption that the rest mass is imaginary and velocity v is greater than light velocity c in Einstein's variance of mass with velocity equation is NOT acceptable.

Consequently this makes us arrive at a conclusion that Sudershan's tachyon hypothesis is inapplicable. The square root of two [2] is always irrational, the polynomial quadratic equation cannot have more than two roots, there is no general solution formula for a fifth degree algebraic equation - trisecting the given general angle without using the protractor is not possible, squaring the circle, duplicating the cube and drawing a regular heptagon are impossible. And it is not possible to prove the fifth Euclidean postulate as a theorem. These are famous mathematical impossibilities. Like these, the existence or the generation of tachyons are not possible.

References

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Further Reading:

- [4] <http://www.wbabin.net/physics/kalimuthu13.pdf>

