Three Major Inconsistencies of the Lorentz Transformations

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The Lorentz Transformation equations are suffering from at least three major inconsistencies. These are: 1) a logic error [1] appears in Einstein's light speed postulate, 2) the LTs are intransitive [2] and 3) they yield the experimentally refuted [4] transverse Doppler Shift.

1. Introduction

The Lorentz Transformations (LTs) have been derived from Einstein's light speed postulate by assuming that light speed is isotropic in all inertial frames of reference [1]:

$$x^2 + y^2 + z^2 - c^2t^2 = 0 = x'^2 + y'^2 + z'^2 - c^2t'^2 \tag{1}$$

They Lorentz Transformations derived from (1) read:

$$x' = \frac{x - vt}{\sqrt{1-(v/c)^2}}, \quad y' = y, \quad z' = z, \quad t' = \frac{t - xv/c^2}{\sqrt{1-(v/c)^2}} \tag{2}$$

However, the author has shown in [2] that a severe logical error appears in the light speed postulate (1) due to the fact that the Lorentz Transformations (2) predict identical light flashes in two frames when only one flash has been generated in one frame. This is logically and physically impossible.

The second inconsistency is easily detectable by inserting a third Lorentz Transformation between two Lorentz Transformations as will be shown in section 2). It is found that the third LT is not a Lorentz Transformation [3]. The third inconsistency is that the transverse Doppler shift derived from the LTs has been refuted experimentally [4].

2. The LTs are Not Transitive

When three inertial coordinate systems are in motion wrt each other it should be possible to link all three systems together by using proper transformations. In classical mechanics one would use Galilei Transformations (GTs) and it can easily be shown that these transformations are transitive. If the Principle of Relativity is assumed to be valid for electro-magnetic fields Lorentz Transformations must be used instead of GTs. However, as will be shown below, one of the three Lorentz Transformations linking together the three inertially moving coordinate systems (x,y,z,t), (x',y',z',t') and (x'',y'',z'',t'') are not Lorentz Transformations:

$$x'' = \frac{x' - vt'}{\sqrt{1-(v/c)^2}}, \quad y'' = y', \quad z'' = z', \quad t'' = \frac{t' - x'v/c^2}{\sqrt{1-(v/c)^2}} \tag{3}$$

The LTs linking (x'',y'',z'',t'') to (x,y,z,t) is obtained by inserting (2) into (3) which yields:

$$x'' = \frac{x(1+v^2/c^2) - 2vt}{1 - v^2/c^2}, \quad y'' = y, \quad z'' = z,$$

$$t'' = \frac{t(1+v^2/c^2) - 2xv/c^2}{1 - v^2/c^2} \tag{4}$$

These equations are clearly no Lorentz Transformations QED. However, by putting c equal to infinity in Eqs. (4), the expected Galilei Transformations are obtained as the GTs are known to be transitive.

3. Absence of Transverse Doppler Shift

The relativistic Doppler Effect has been derived [1] by assuming that a signal emitted far away from the origin of an inertial coordinate system S will exhibit the same phase when measured in another inertial system S' moving at v wrt to the system S. The two waves thus should satisfy the equation:

$$\Phi(r,t) = \Phi_o e^{j(\omega t - \vec{k}\bullet\vec{r})} = \Phi'(r',t') = \Phi'_0 e^{j(\omega' t' - \vec{k}'\bullet\vec{r}')} \tag{5}$$

By inserting the LTs for the coordinates (r,t), (r',t') into (5) the well known relativistic Doppler shift equations are obtained. However, microwave measurements have refuted the relativistic transverse Doppler shift [4].

4. Conclusion

It has been shown that the Lorentz Transformations are suffering from at least three severe inconsistencies. Hence, the application of the LTs must yield and have indeed yielded contradictory results.

References

[1] A. Einstein, "Zur Elektrodynamik bewegter Körper", *Annalen der Physik* **4** (17): 891-94 (1905).

[2] H. W. Thim, "Einstein's Light Speed Postulate is illogical ", *Proceedings of NPA* **7**: 581-582 **(**Long Beach 2010).

[3] N. Derksen, St. Gebhard-Str. 19, D-78467 Konstanz, private communication.

[4] H. W. Thim, "Absence of the Relativistic Transverse Doppler Shift at Microwave Frequencies", *IEEE Transactions on Instrumentation and Measurements* **52** (5): 1660-1664 (May 2003).