

# Re: why lorentz transformation?

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*Source:* <http://sci.tech-archive.net/Archive/sci.physics.relativity/2005-09/msg00337.html>

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- *From:* [D.McAnally@i'm\\_a\\_gnu.uq.net.au](mailto:D.McAnally@i'm_a_gnu.uq.net.au) (David McAnally)
  - *Date:* Sun, 4 Sep 2005 18:32:42 +0000 (UTC)
- 

"Sue..." <suzysewnshow@xxxxxxxxxxxx> writes:

>David McAnally wrote:

>> "Sue..." <suzysewnshow@xxxxxxxxxxxx> writes:

>>

>> >David McAnally wrote:

>> >> "Sue..." <suzysewnshow@xxxxxxxxxxxx> writes:

>> >>

>> >> >francisco wrote:

>> >> >> galileo's principle of relativity states that the laws of mechanics should

>> >> >> be the same for all inertial observers. and indeed, newtonian mechanics is

>> >> >> unchanged under galilean transformations. the problem is that maxwellian

>> >> >> electrodynamics is not the same in every inertial frame under that

>> >> >> transformation. so what to do? find a set of transformations under which

>> >> >> both mechanics and electrodynamics are the same for all inertial frames.

>> >> >> this leads to the lorentz transformation.

>> >>

>> >> >Since Maxwell's equations don't predict radiation either

>> >>

>> >> As the sofrat points out, Maxwell's Equations do predict the existence of

>> >> electromagnetic radiation. What line of reasoning could possibly have led

>> >> you to believe that they don't? Seeing that you have made this

>> >> demonstrably false claim about Maxwell's Equations, how could anybody

>> >> trust your word on anything else?

>>

>> >Science is not the business of knowing who to trust.

>> >The line of reasoning is in the two well considered

>> >papers offered

>>

>> At no point in either of those papers was there any statement to the

>> effect that Maxwell's Equations do not predict the existence of radiation.

>> The first of the papers that you listed was connected to gauges for the

>> electromagnetic potential, and the fact that the physical properties of

>> the electromagnetic field are not affected by the choice of gauge.

>>

>> >and you have offered nothing

>> >\*demonstrable\*.

>>

>> I shouldn't need to demonstrate the fact that Maxwell's Equations predict

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>> the existence of radiation. The fact is very well documented, and has  
>> been known since the nineteenth century. If, in the twenty-first century,  
>> this fact, which has been known for well over 100 years, escapes you, then  
>> that says more about your incompetence than it says about Maxwell's  
>> Equations.  
>>  
>> I will give a small part of the derivation, although, with your level of  
>> competence, I have no doubt that it will be a waste of time to explain it  
>> to you.  
>>  
>> In vacuo, and in the absence of sources, Maxwell's Equations reduce to  
>>  
>>  $\frac{\partial E_x}{\partial x} + \frac{\partial E_y}{\partial y} + \frac{\partial E_z}{\partial z} = 0,$   
>>  
>>  $\frac{\partial B_z}{\partial y} - \frac{\partial B_y}{\partial z} = (1/c^2) \frac{\partial E_x}{\partial t},$   
>>  
>>  $\frac{\partial B_x}{\partial z} - \frac{\partial B_z}{\partial x} = (1/c^2) \frac{\partial E_y}{\partial t},$   
>>  
>>  $\frac{\partial B_y}{\partial x} - \frac{\partial B_x}{\partial y} = (1/c^2) \frac{\partial E_z}{\partial t},$   
>>  
>>  $\frac{\partial B_x}{\partial x} + \frac{\partial B_y}{\partial y} + \frac{\partial B_z}{\partial z} = 0,$   
>>  
>>  $\frac{\partial E_z}{\partial y} - \frac{\partial E_y}{\partial z} = - \frac{\partial B_x}{\partial t},$   
>>  
>>  $\frac{\partial E_x}{\partial z} - \frac{\partial E_z}{\partial x} = - \frac{\partial B_y}{\partial t},$   
>>  
>>  $\frac{\partial E_y}{\partial x} - \frac{\partial E_x}{\partial y} = - \frac{\partial B_z}{\partial t},$   
>>  
>> where  $E_x$  is the x-component of the electric field,  $B_x$  is the x-component  
>> of the magnetic field, etc,  $c$  is a constant with the dimensions of speed  
>> (with known value  $299\,792\,458\text{ m s}^{-1}$ ), and for any field  $f$ ,  $\frac{\partial f}{\partial x}$   
>> denotes the derivative of  $f$  with respect to  $x$ , etc.  
>>  
>> Upon differentiation of the first equation above with respect to  $x$ , the  
>> second with respect to  $y$ , the seventh with respect to  $z$ , and the eighth  
>> with respect to  $y$ , we get  
>>  
>>  $\frac{\partial^2 E_x}{\partial x^2} + \frac{\partial^2 E_y}{\partial x \partial y} + \frac{\partial^2 E_z}{\partial x \partial z} = 0,$   
>>  
>>  $\frac{\partial^2 B_z}{\partial t \partial y} - \frac{\partial^2 B_y}{\partial t \partial z} = (1/c^2) \frac{\partial^2 E_x}{\partial t^2},$   
>>  
>>  $\frac{\partial^2 E_x}{\partial z^2} - \frac{\partial^2 E_z}{\partial z \partial x} = - \frac{\partial^2 B_y}{\partial z \partial t},$   
>>  
>>  $\frac{\partial^2 E_y}{\partial y \partial x} - \frac{\partial^2 E_x}{\partial y^2} = - \frac{\partial^2 B_z}{\partial y \partial t}.$   
>>  
>> By an appropriate linear combination of these four statements, it follows  
>> that  
>>  
>>  $\frac{\partial^2 E_x}{\partial x^2} + \frac{\partial^2 E_x}{\partial y^2} + \frac{\partial^2 E_x}{\partial z^2} = (1/c^2) \frac{\partial^2 E_x}{\partial t^2}.$   
>>  
>> This is just the statement that  $E_x$  satisfies the wave equation.

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## Re: why lorentz transformation?

>> Similarly,  $E_y, E_z, B_x, B_y$  and  $B_z$  satisfy the wave equation. This  
>> immediately implies the existence of electromagnetic radiation which  
>> moves at a speed of  $c$ .  
>>  
>> Alternatively, in vacuo and in the absence of sources,  
>>  
>>  $\text{div } \mathbf{E} = 0$ ,  
>>  
>>  $\text{curl } \mathbf{B} = (1/c^2) \partial \mathbf{E} / \partial t$ ,  
>>  
>>  $\text{div } \mathbf{B} = 0$ ,  
>>  
>>  $\text{curl } \mathbf{E} = - \partial \mathbf{B} / \partial t$ .  
>>  
>> It follows that  
>>  
>>  $\text{curl curl } \mathbf{B} = (1/c^2) \partial (\text{curl } \mathbf{E}) / \partial t = - (1/c^2) \partial^2 \mathbf{B} / \partial t^2$ ,  
>>  
>> and  
>>  
>>  $\text{curl curl } \mathbf{B} = \text{grad div } \mathbf{B} - \text{del}^2 \mathbf{B} = - \text{del}^2 \mathbf{B}$ ,  
>>  
>> where  $\text{del}^2$  is the Laplacian operator, i.e.  
>>  
>>  $\text{del}^2 f = \partial^2 f / \partial x^2 + \partial^2 f / \partial y^2 + \partial^2 f / \partial z^2$ .  
>>  
>> It follows that  $\text{del}^2 \mathbf{B} = (1/c^2) \partial^2 \mathbf{B} / \partial t^2$ . Similarly,  
>>  $\text{del}^2 \mathbf{E} = (1/c^2) \partial^2 \mathbf{E} / \partial t^2$ . So both  $\mathbf{E}$  and  $\mathbf{B}$  satisfy the  
>> wave equation, and so the existence of electromagnetic  
>> radiation automatically follows from these considerations.  
>>  
>> -----

>I don't see any  $1/r^2$  term in your work.

That is about a SOLUTION of the equations. Can't you even tell the difference between equations and their solutions, or is this distinction too hard for your minuscule intellect?

Look up the Lienard–Weichert potential sometime, and also the electromagnetic field associated with it. The Lienard–Weichert potential obeys the Lorenz gauge condition. The Coulomb formula for the electric field of a stationary charge is derivable from the Lienard–Weichert potential, and the Lienard–Weichert potential is derivable from Maxwell's Equations. The radiation from an accelerating charge (in which the strength of the electromagnetic field drops as  $1/r$ ) is also derivable from the Lienard–Weichert potential.

>Try again:

><http://arxiv.org/abs/physics/0204034>

## Re: why lorentz transformation?

That paper is completely irrelevant to any point that you think that you are making. That paper is about different potentials corresponding to solutions of Maxwell's Equations, and about the different gauges. The paper also notes the fact that all physical quantities are independent of the gauge, a fact which is well-known. The idiotic thing here is that you have already been told this fact. Perhaps you were too obtuse to understand what you were being told at the time.

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- **Follow-Ups:**

- ◆ **Re: why lorentz transformation?**

- ◇ From: Sue...

- ◆ **Re: why lorentz transformation?**

- ◇ From: Androcles

- **References:**

- ◆ **why lorentz transformation?**

- ◇ From: francisco

- ◆ **Re: why lorentz transformation?**

- ◇ From: Sue...

- ◆ **Re: why lorentz transformation?**

- ◇ From: David McAnally

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- Prev by Date: **Re: twin patadox question**

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