Re: [OT] Speed of light as speed limit (was Re: DECW$CLOCK design flaw

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From: Ken Fairfield (*my.full.name_at_intel.com*)
Date: 02/17/05

Date: Wed, 16 Feb 2005 17:08:12 −0800

Dave Froble wrote:
> briggs@encompasserve.org wrote:
>
>> We can pulse the fields at just the right rhythm so that the
>> particle is always on the downward slope as it passes each acceleration
>> point. Again, there is no relativistic speed limit on our ability
>> to pulse these fields. We can do it at 10 times the speed of light
>> if we like. But if we do, the particle won't keep up.
>>
>> John Briggs
>
>
> You're still pushing from the perspective of the pusher, not the particle.
>
> I know of no research done from the perspective of the particle, mainly
> because we do not have the capability of being on a particle at
> lightspeed relative to an outside observer. The real question, which at
> this time we cannot answer, is what's possible relative to the particle
> that's at or near lightspeed relative to an outside observer.
>
> It's been many years since I was into such, so be kind.

Gads, I guess I'll have to step in here being an elementary particle physicist by training...

We have a lot of examples of particles "traveling at light speed" and the effects of special relativity on them. If you'll allow me to switch the perspective just slightly, from "speed" to time, time dilation happens every day...to cosmic "rays".

To points of fact: when cosmic rays (usually energetic protons) hit molecules in the upper atmosphere, a shower of secondary particles is produced, most of which are pions (a simple up−quark/down−quark pairing). These have a fairly short lifetime and decay quickly to muons (and neutrinos). All of the charged particle remnants of cosmic rays that

we detect a sea level are muons.

Now muons are moderately stable: they decay to an electron and two neutrinos with a mean lifetime of 2.6 microseconds. Now do the math: at the velocity of light, how far do you go in 2.6 microseconds? Ans: 3x10^8 m/s x 2.6x10^−6s = 780 m . That's a lot less than the 20km to 30km where these particle are formed. Therefore, that fact that muons are detected at sea level AT ALL proves time dilation is at work. That is, from the point of view of the muon itself, very much less than 2.6 microseconds has elapsed from when it was formed to when it arrives at the surface of the earth.

The same effect allows the measurement of non−zero decay path lengths of exotic particles produced in accelerator experiments (google for SLAC BABAR and/or PEP II).

Oh, and most of the remarks about "pushing" particles is flat wrong as well. What John referred to above (I think) is the fact the the phase velocity of waves can exceed the speed of light (but don't worry, only the group velocity carries information, so Einstein is still happy). In a particle accelerator, the electromagnetic fields inside of RF cavities are phased to match the velocity of the particles being accelerated (for electrons and positrons, that essentially c), so the particles "feel" a constant acceleration, even though their "speed" as measured in the rest frame of the accelerator is fixed (once you're above about 1 GeV energy).

−Ken

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I don't speak for Intel, Intel doesn't speak for me...
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