Re: Simple Sagnac

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2005−08/msg00643.html

- *From*: sal <pragmatist@xxxxxxxxxx>
- *Date*: Sat, 06 Aug 2005 22:12:51 −0400

On Fri, 05 Aug 2005 23:19:16 −0700, bsr3997@xxxxxxxxxxx wrote:

>
> sal wrote:
>> On Thu, 04 Aug 2005 18:57:33 −0700, bsr3997@xxxxxxxxxxx wrote:
>>
>> > sal wrote:
>> >>
>> >> On Wed, 03 Aug 2005 21:59:15 −0700, bsr3997@xxxxxxxxxxx wrote:
>> >>
>> >>
>> >> > sal wrote:
>>

[...]

> Whether you can see it or not the curve is still there. When you
> are pushing a new system of measurement because it is more accurate
> than the old, it seems sort of foolish to say that it is better if
> you don't look too close, or in this case look so close that you
> don't see the big picture.

When you take a derivative that's exactly what you do: look so
closely you don't see the big picture.

When you analyze something by viewing it from a momentarily comoving
reference frame that's exactly what you do.

When you analyze something by using locally flat coordinates you're
generally also looking very closely, so you can see how things behave
locally −− so locally the curvature isn't an issue.

If you think those things are foolish, perhaps you should think about them
a bit more.

....

>> > Two clocks resting at the same point are supposed to show the
>> > same time in SR. A slow transported clock is not supposed to go

>> > out of sync in SR.
>>
>> So? A clock which is carried around the ring is _NOT_ "slow
>> transported" in the local inertial frame of someone who is situated
>> at one point on the ring!
>>
>> Consider: When the clock is situated diametrically across from the
>> "ring−stationary observer" the clock is moving at velocity −V in
>> the observer's MCRF. That's not "slow"! So, it's not slow
>> transport, and there's no surprise that the clock goes out of sync.
>>
>> Just _how_ it goes out of sync is a interesting question which
>> deserves some calculations and graphs of its own. I don't claim to
>> have exhausted the subject −− I have barely scratched the surface.
>
> If the clock is moving with the disk then it has no velocity for
> anyone on the disk.

Look at one point on the rim of the disk, at one particular instant in time. Call it P.

Look at an inertial coordinate system which happens to be moving at the same velocity as point P at that instant in time.

In that coordinate system, at that instant, P is stationary. No other point on the disk is stationary at that instant, in that coordinate system. All other points on the disk are moving in that inertial frame in which P is stationary; they are, therefore, also moving with respect to P.

If you doubt that, then think a bit more about the Coriolis effect.

The _rotating_ coordinates in which the disk is stationary, on the other hand, are not inertial and it doesn't make a lot of sense to talk about relative motion of two objects separated by a substantial distance by comparing their coordinate velocities in that coordinate system.

> Its coordinates are not changing, so it is not moving. If you are
> going to jump frames and say that it is moving at some huge velocity
> due to the rotation of the disk, then there is no slow transport of
> any clock on the earth's surface.

That's more or less correct, but in many cases the deviation is small enough that it doesn't cause a problem. You need to be very cautious with clock sync experiments when standing on a rotating platform.

>> The classical explanation which works requires an assumption of
>> "partial dragging of the aether".

>
> Which again was proposed and varified by experiment before SR
> existed.

Right. Fresnel's theory correctly predicted the Sagnac effect. Its prediction of the result of the Michelson−Morley experiment, however, wasn't exactly spot−on, so I wouldn't push it too hard as a viable alternative to SR, unless you have a box of band−aids ready to fix up the rough spots.

LET with physical length contractions works a bit better, of course.

> Just as a side note, everyone harps on about how relativity is not
> intuitive, but aether theory has a few strange twists too. Who
> would guess that nature could hide the ather frame in LET, but it
> can. Who would guess that even with a cross wind you still hear a
> sound coming straight from a stationary source, not up wind or down
> wind? Who would guess that a moving observer and a stationary
> observer at the same location would not hear a sound come from the
> same direction? Who would guess that moving a clock changes its
> setting, and that moving it back reverses the change. And who would
> guess that you can see the same thing happen when slow transporting
> a clock in SR, if you view it from a moving frame?

What's your point? With regard to mechanics, LET and SR predict the same things using identical math. The difference is LET assumes the existence of an undetectable ether which coexists with the world we know, yet is apart from it.

Einstein supposedly said, in a lecture, something along the lines of, "Gentlemen, keep in mind that we have not proved the ether nonexistent. We have merely proved it to be unnecessary." But that's not an exact quote. In any case, exact, approximate, or apocryphal, I have no objection to the sentiments expressed. If you want to believe in an undetectable ether I shall certainly not attempt to convince you that you are wrong.

−−
Nospam becomes physicsinsights to fix the email

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- ***Follow−Ups***:
  - ♦ ***Re: Simple Sagnac***
    - ◊ *From:* bsr3997@xxxxxxxxxx

- ***References***:

- ***Re: Simple Sagnac***
  - ◊ *From:* Bilge
- ***Re: Simple Sagnac***
  - ◊ *From:* Dirk Van de moortel
- ***Re: Simple Sagnac***
  - ◊ *From:* sal
- ***Re: Simple Sagnac***
  - ◊ *From:* sal
- ***Re: Simple Sagnac***
  - ◊ *From:* Daniel Cook
- ***Re: Simple Sagnac***
  - ◊ *From:* sal
- ***Re: Simple Sagnac***
  - ◊ *From:* bsr3997@xxxxxxxxxxx
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