Re: Simple Sagnac

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2005−08/msg01250.html

- *From*: "bsr3997@xxxxxxxxxxx" <bsr3997@xxxxxxxxxxx>

- *Date*: 14 Aug 2005 20:15:28 −0700

sal wrote:
> 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.
> >
> > ...

I am not saying those things are foolish, I am saying that you are
missapplying them in this aplication. The Sagnac experiment extends
beyound one instant at one point. The further you go from the single
time and place for which you have taken the derivative the further your
aproximation deviates from reality. A curve is not a straight line.
At any given instant you may be headed in the same direction as some
straight line, but that doesn't mean you are going in a straight line.
If you think what I am saying is foolish, try not straightening the
steering wheel when your car reaches the end of a curve.

> >> > 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.

As much as you wish it to be so, if point p is on the disk it is not
inertial. The reality is that if you were to stand on a rotating disk,
you could look at any point on the disk and see that it appears
stationary. You would not have to adjust where you were looking in any
way to keep the point from changing position in your field of view.
The point is stationary in your rotating frame of reference.

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

You're trying to claim that observers on a rotating disk will see the same thing as an inertial observer, and you use the Coriolis effect to support your claim. Ohhh k :)

> 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.

Which is why you don't use SR for rotating systems.

> > 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.

We are talking about a specific experiment here, and it appears that no amount of caution will eliminate the Sagnac effect.

>
> >> 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.

I never said Fresnel's theory explained everything. It was just one part of the puzzle.

> 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.

LET and SR use the same math, but they were derived differently. It may be possible to extend LET to cover rotating systems. It would be much more complicated than just taking some derivative though. See if you can correctly predict how sound would travel through a rotating system using air flowing at a constant velocity in relation to the center of rotation. That could be checked in a real world experiment.

The examples above were to show that aether theory results were not as intuitive as many seem to think. The sound examples can be explained after the result is known, and some thought is given to how that result could come about. But it is not what most would predict before the results are known.

> 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

.

- ***Follow−Ups***:
  - ♦ ***Re: Simple Sagnac***
    - ◊ *From:* Androcles

- ***References***:
  - ♦ ***Re: Simple Sagnac***
    - ◊ *From:* Bilge
  - ♦ ***Re: Simple Sagnac***
    - ◊ *From:* Dirk Van de moortel
  - ♦ ***Re: Simple Sagnac***
    - ◊ *From:* sal
  - ♦ ***Re: Simple Sagnac***

- Prev by Date: ***Re: Space/Time/Energy characteristics 0***
- Next by Date: ***Re: Simple Sagnac***
- Previous by thread: ***Re: Simple Sagnac***
- Next by thread: ***Re: Simple Sagnac***
- Index(es):
  - ♦ ***Date***
  - ♦ ***Thread***