Re: Simple Sagnac

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- *From*: sal <pragmatist@xxxxxxxxxx>
- *Date*: Fri, 29 Jul 2005 10:31:24 −0400

On Fri, 29 Jul 2005 08:25:11 +0000, Dirk Van de moortel wrote:

>
> "Bilge" <dubious@xxxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote in message
> news:slrndeisl0.7ma.dubious@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
>> sal:
>>
>> >Again, "classical" doesn't seem to be defined here. As far as I
>> >can tell he's saying length contraction doesn't play a role, and
>> >you don't need wicked fast velocities. One thing he certainly is
>> >_not_ saying is that a fiber optic ring gyro can be analyzed
>> >using "classical" (non−relativistic) physics.
>>
>> Why not? If the ring rotates with an angular velocity, w, then
>> the light in the direction of rotation has to travel a distance:
>>
>> s = 2\pi r + wrt_1
>>
>> Where t is the time required for the light to reach the point on
>> the ring that it started, since the ring rotated by a distance wrt
>> in that time. Similarly, in the opposite direction, the distance
>> traveled is s = 2\pi r − wrt_2. The speed of light in the ring is v
>> = c/n, so it travels a distance s = vt_1 in the direction of
>> rotation and s = vt_2 in the opposite direction. then,
>>
>> vt_1 = ct_1/n = 2\pi r + wrt_1 => t_1 = 2\pi r/[(c/n) − wr]
>>
>> vt_2 = ct_2/n = 2\pi r − wrt_2 => t_2 = 2\pi r/[(c/n) + wr]
>>
>>
>> t_2 − t_1 = 2 n\pi r [(1/(c − nwr)) − (1/(c + nwr))]
>>
>>
>> = 2pi r [2nwr/(c^2 − (nwr)^2)]
>>
>> = 4\pi r^2 [(n^2 w)/(c^2 − (nwr)^2]
>>
>> >Again, I'd be more impressed with the quotes if you explain how
>> >you can use anything other than k+v and k−v for the velocities in

>> >the "classical" case, if you don't happen to have a perfect
>> >vacuum on tap in which to run the experiment.
>>
>> The index of refraction for air at STP for 590 nm is about,
>> 1.00029. Rearranging the above gives:
>>
>>
>> $t_2 - t_1 = 4\pi w r^2/[(c/n)^2 - (wr)^2]$
>>
>> for $n = 1.00029$. $1/n^2 =$