

# Re: GPS CLOCK PARADOX

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*Source:* <http://sci.tech-archive.net/Archive/sci.physics.relativity/2008-01/msg02519.html>

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- *From:* The Ghost In The Machine <ewill@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>
  - *Date:* Wed, 30 Jan 2008 20:41:24 -0800
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In sci.physics.relativity, Randy Poe  
<poespam-trap@xxxxxxxx>  
wrote  
on Wed, 30 Jan 2008 10:42:33 -0800 (PST)  
<bbd2c968-10a2-4310-8cb5-9edac2e950cd@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>:

On Jan 30, 11:27 am, "Ockham" <m...@xxxxxxxxxxxxxxxxxxxx> wrote:

"The Ghost In The Machine" <ew...@xxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote in  
message [news:12d675-gfp.ln1@xxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:12d675-gfp.ln1@xxxxxxxxxxxxxxxxxxxxxxxxxxxx)  
| In sci.physics.relativity, Jeckyl  
| <no...@xxxxxxxxxxxx>  
| wrote  
| on Wed, 30 Jan 2008 21:28:28 +1100  
| <13q0kaft9d71...@xxxxxxxxxxxxxxxxxxxx>:  
| > "Ockham" <m...@xxxxxxxxxxxxxxxxxxxx> wrote in message  
| > [news:SAXnj.14454\\$3m6.7071@xxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:SAXnj.14454$3m6.7071@xxxxxxxxxxxxxxxxxxxxxxxxxxxx)  
| >>  
| >> "snapdragon31" <snapdrago...@xxxxxxxxxx> wrote in message  
|  
>>>[news:dc482e20-b4df-43ff-a84e-70909a0b93b2@xxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:dc482e20-b4df-43ff-a84e-70909a0b93b2@xxxxxxxxxxxxxxxxxxxxxxxxxxxx)  
| >>> On Jan 29, 8:54 pm, Randy Poe <poespam-t...@xxxxxxxxxx> wrote:  
| >>>> On Jan 29, 8:14 pm, HW@....(Dr. Henri Wilson) wrote:  
| >>>>>  
| >>>>> According to relativists, GPS clocks GAIN 38us per day on the  
ground  
| >>>>> clock.  
| >>>>> That is due to two components, 45us for gravity and -7us for  
relative  
| >>>>> speed.  
| >>>>  
| >>>>> Accordingly, an observer (OO) in GPS orbit would see the GC  
LOSING  
52us  
| >>>>> per  
| >>>>> day.  
| >>>>  
| >>>>> After one year, the OO would calculate that the OC was about 19ms  
ahead

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| >>> > of the  
| >>> > GC.  
| >>> > However, the GO would calculate that his GC was only 13ms behind.  
| >>>  
| >>> > What happens when the clocks are reunited?  
| >>> > Who is right?  
| >>>  
| >>> Two people drive different routes from city A to  
| >>> city B. When they are reunited, one odometer reads  
| >>> 220 km and the other reads 230 km. Which one is  
| >>> right?  
| >>>  
| >>> – Randy  
| >>  
| >> | According to relativity, both odometer readings are wrong. They do  
| >> | not represent the true distance of the routes travelled because of  
the  
| >> | length contraction effect.  
| >> | According to Newton's law, both odometer readings are right.  
| >>  
| >> | The GPS clock paradox is a variation of the twin paradox, so no valid  
| >> | solution.  
| >>  
| >> The paradox resides in the third postulate.  
| >  
| > Androcles .. we've told you .. there is no third postulate  
|  
| Yes there is; it's not usually expressed as a postulate, but  
| it is a simple one:  
|  
| – If a TWLS be conducted between a source and a moving mirror,  
| then the time taken (as observed by the source) of the  
| light beam from source to mirror and back to source is  
| exactly twice that of the time taken from source to  
| mirror. In other words,  $t_{AB} = t_{BA}$ .

Not true, the reflected beam will be doppler shifted.

Yes, both wavelength and frequency experience a doppler shift.

Only in SR (though both have been observed). In Newtonian math the frequency changes as per the Doppler, but the wavelength is unaltered.

That's how doppler radar works.

Since  $c_1 = \lambda_1 * f_{outbound}$  and  $c_2 = \lambda_2 * f_{inbound}$

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it follows that  $c1 < c2$ .

How does that follow without a statement about how both lambda and f shift?

As it turns out, if  $\lambda_2 = p \cdot \lambda_1$ , then  $f_{inbound} = f_{outbound}/p$ . As a result,  
 $\lambda_2 * f_{inbound} = (\lambda_1 * p) * (f_{outbound}/p)$   
 $= \lambda_1 * f_{outbound}$ .

– Randy

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#191, ewill3@xxxxxxxxxxxxxx  
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