

## Re: GPS corrections

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- *From:* Tom Roberts <[tjroberts@xxxxxxxxxx](mailto:tjroberts@xxxxxxxxxx)>
  - *Date:* Thu, 22 Dec 2005 04:35:12 GMT
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Koobee Wublee wrote:

"Dirk Van de moortel"  
<[dirkvandemoortel@xx](mailto:dirkvandemoortel@xx)> wrote in  
message [news:L8cqf.78001\\$1t2.5051463@xx](mailto:news:L8cqf.78001$1t2.5051463@xx)

Look at  
<http://www.eftaylor.com/pub/projecta.pdf>

Taylor's derivation above violates the principle of special relativity.

I have no idea why you think that is relevant. GR itself does not obey that principle -- GR has a far more general principle: general covariance.

[The principle of special relativity says in effect that the laws of physics do not depend upon one's choice of inertial frame; GR has no such dependence on inertial frames, and its principle is that the laws of physics do not depend on any choice of coordinates.]

GR demands only one equation to explain GPS. Neil Ashby realized this. However, he had to perform two fancy metric transformations without any concrete justification.

I have no idea what you are trying to say. "metric transformations" are freely available in GR, and one needs no "justification" for them other than it seems convenient to apply them. This is because general covariance applies, and the underlying laws of physics do not depend on coordinates in any way.

## Re: GPS corrections

The bottom line is that GR has trouble to explain GPS.

Nonsense.

GR's matching result to GPS is taken from the term  $(-U)$  (see below) without any proper consideration to do so.

Sure there is "proper consideration" -- the steps you discuss are part of an approximation to the equations of GR. An approximation that is more than accurate enough in this situation.

$$\sqrt{g_{00}} = \sqrt{1 - 2U} = 1 - U - U^2 / 2 \dots$$

Where

$$** U = G M / c^2 / r$$

To liberally use the term  $(-U)$  to explain the result of GPS is like cutting words out of a newspaper to compose a sentence. It does not prove that GR explains the result of GPS.

The  $(-U)$  is what is backwards compatible with Newtonian physics.

>>[... Rest of handwaving nonsense snipped]

Your writing does not even rise to the level of handwaving. What are you actually trying to say?

Note you are free to apply the equations of GR to the GPS. As, for instance, its designers have done.

Any post-Newtonian theories with Newtonian result as limit should also be able to explain GPS as well. GR is not special.

Sure, in some ways "GR is not special", and there are many other theories of gravitation that explain the GPS as well as GR does. So what?

But GR is indeed "special" in that it is the simplest possible theory that is both coordinate free and accounts for all the relevant experimental observations to date.

[Yes, it's scary to say GR is "the simplest theory"....]

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But indeed, it is its simplicity that permitted Einstein  
(and Hilbert) to discover it.]

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