Re: What's up with gravity wave detection?

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From: Bilge (*dubious_at_radioactivex.lebesque−al.net*)
Date: 09/02/04

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Date: Thu, 02 Sep 2004 03:11:56 −0000
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Eric Flesch:
>On Tue, 31 Aug 2004 01:47:02 −0000,
>dubious@radioactivex.lebesque−al.net (Bilge) wrote:
>> You didn't address the fact that light is a four vector, which for
>>whatever reason, you seemed to think was an essential feature.
>
>T'was you who used that term to describe light, not me,

I only mentioned because you said:

``Bosons classically manifest routinely and so their gravitational
vectors can be described."

And my response contained my best attempt to make sense out of that
sentence.

>and in any
>event the four vector relates to spacetime transforms which is not my
>point which is regards to the nature and behavior of the individual
>photon.

Huh? The ``nature" of the photon _is_ how it ``relates to spacetime
transforms". What else could it possible be?

>> Eric Flesch:
>> >(two books on QG) are speculative works.
>>
>> In what way do you find them speculative? In view of the fact that
>>you specifically referred to qed, which is a quantum field theory,
>>try to be specific.
>
>I was specific, but you snipped that part.

You were _not_ specific and in fact, did not give a single example
from those texts which fit your assertion that those texts were spec−
ulative. While there exists speculation within those texts, I want
to know which parts you think are speculative with respect to what

is being discussed here, not the parts which might be regarded as
obviously speculative.

>My whole reply was:
>"These are speculative works. What has quantum gravity ever predicted
>which has been observationally confirmed? (which is the topic of this
>thread)"

So what? That doesn't tell me what you found speculative about either
of the texts I referenced. My guess is that you've never seen either text
and your comment was made without any basis in actual knowledge or fact.
Have you ever studied (or even seen) either text I referenced? If not,
what is the basis for your comments?

>To that I will add that they present progress−thus−far on an
>experimentally unverified hypothesis. Specifically, the "graviton"
>does not exist and so will never be found.

Once you tell me why that is relevant to doing quantum field
theory in curved spacetime, you can prove that statement. I said
nothing about quantum gravity, so gravitons are irrelevant.

>I do however think that gravitational waves should be detectable,
>but they have no particle analog.

That really isn't relevant to anything here.

[...]
>propagate in addition to the usual three. OK, is that specific enough
>for you? (and off−topic to my original point, altho perhaps more
>on−topic to the thread title)

No, it addressed nothing regarding what I asked, which with regard
to the texts I referenced was, to tell me what you found to speculative
in those references.

>> >A pity fhen that photons don't travel in continuous paths, shown by
>> >the delayed−choice experiment.
>>
>> That is not what that experiment shows and in any case, what does that
>>experiment have to do with anything?
>
>It shows that GR stress−tensors do not model photon behavior and so
>cannot be used, as they so often are, to claim that the in−flight
>photon exerts gravity.

Please write down the appropriate T^uv and show explicitly what
problem you think that causes.

>>You mentioned qed, so obviously you
>>must think special relativity is ok. How does formulating qed in curved

>>spacetime differ in any way from formulating it curved spacetime with
>>a specific value for the curvature, nanely zero, in any way that matters
>>to your argument?
>
>It makes no difference, I suppose. You're obviously very learned and
>skillful, Bilge (you could have picked a nicer nick), but physical
>models are just descriptions. Think of the reality of being a photon.
>You are emitted from place A. You are absorbed at place B. And what
>is your experience in between?

I suggest the entire exercise is a no sequiter. ``Experience'' suggests collecting information about the ``journey'' between two events. However, the distance between the events in question is zero and it's inconsistent to treat a photon as if it could store information about experienes, since the photon is massless.

>You are travelling at the speed of light, you know. What is the time
>dilation involved?

Time dilation from the perspective of a photon (loosely speaking), is a meaningless concept. Time dilation refers to frame dependent observations of other moving frames and a photon has no frame of reference.

>Did you not have time to view the passing scenery? No time to exchange
>gravitons?

First, I suggest you anthropomorphizing the photon in a way which is not appropriate. Second, it's meaningless to think of particle exchange in terms of something which ``takes time''. You might possibly say something about time involved for a diagram depicting timelike exchange, but not all diagrams are timelike and in any case, only the covariant sum of a set of diagrans represents an observable.

>This is the point, the in−flight photon has *no time* to interact with
>spacetime whilst on its journey.

Things don't ``interact'' with spacetime. Spacetime defines the distance between events in a given coordinate system. Light propagates along null rays, so the distance between events is zero. In minkowski space, that distance is defined by, $ds^2 = -dt^2 + dx^2 + dy^2 + dz^2$. Around a mass, in schwarzchild coordinates, for example, (for $r > R_{mass}$), the distance is given by, $ds^2 = -(1-k)\, dt^2 + dr^2/(1-k) + (r\, d\Omega)^2$, $k = 2m/r$. In either case, light propagates along null rays so that events connected by light rays are the ones with $ds^2 = 0$. What is the big deal here?

>There is no classical existence
>whilst travelling at c. No continuous travel, no precise vector. The
>photon can only depart and arrive. Its experience is that of stepping
>across, analogous to conduction between bodies in contact. And the
>wave description of its flight is the mapping of that vectorless

>conduction into our 4D spacetime manifold. Model that, "Bilge".

p^u e_u = 0. p^u is the photon four−momentum and e_u is the polarization
(i.e., the photon). Ok, so what?

>> All you've quoted is an ancient and irrelevant thought experiment
>> about quantum mechanics. Stop jumping from topic to topic.
>
>I was replying to Carlip's "demonstration" that light is attracted to
>mass, showing that gravitational equivalence to time flow accounts for
>it. Never mind, then.

But that doesn't have anything to do with the experiment you mentioned or quantum mechanics, in general. The issue here really has little to do with light, per se. It has to do with the path light takes in spacetime _and_ what that path looks like from the perspective of some observer. Steve Carlip gave you a rather straightforward way to picture why light was ``attracted" by a mass. Perhaps you would have been happier with a less physical, but more rigorous, mathematical description?

>> No one, least of all me, is disputing quantum mechanics. I'm disputing
>>your understanding of quantum theory and general relativity, not to mention
>>qed.
>
>I'm not a professor of QM as you appear to be. Your knowledge is
>greater than mine. That doesn't prohibit that I might have a correct
>thought which you did not yourself arrive at.

No, it doesn't prohibit that, but in this case, you're mixing apples and oranges and concluding the result ought to be grapes. Having a good idea is one thing. But to have one, you first have to clarify the concepts involved. Gravitational bending of light is nothing more than light doing what it always does: following a null geodesic in spacetime. There is no reason that spacetime should have any particular curvature, a priori, so zero is not special except in the sense that you would have justify why it should be zero, a priori.

>Think about it. There are problems with current theory, such as the
>inability to unify QM and gravity.

That is not really true. For example, I can use quantum mechanics to calculate the probability of a level transition in hydrogen in the same way I use quantum mechanics for anything else. There is no real issue regarding quantum mechanics and gravity. The problem is a quantum theory _of_ gravity, so unless you have a good idea of how to create one and your point is that it's being ignored, I don't see your point. You seem to have an aversion to quantum gravity, which makes your objections even more puzzling.

>Is it not sensible to investigate changes in the model,

Which model?

>consistent with observation, which might bring that unification
>closer? Any simplication is bound to be favorable. My idea on light
>is a simplification.

So far, the current theories _are_ consistent with observation. Not only are they consistent, but general relativity and the standard model are the most well−tested theories in the history of science. There is simply no experiment or known natural phenomena which isn't explained by one of those two theories. Since you seem to object to quantum gravity in general, I really don't see that to which you are objecting. Quantum gravity is essentially just finding a way to combine gravity and the standard model. Since you seem to find that idea objectionable, I would think you would be perfectly happy with the two separate theories which work in any case anyone has ever been able to test them.

>> >I expect (ignoring neutrinos) that the box will weigh less the more
>> >"in−flight" radiation there is inside the contained box, so W(1)=W(3)
>> >and W(2) is less. Do tell me about any such experiment which has been
>> >done −− citation please.
>>
>> In other words, what you are saying is that energy, momentum and
>>angular momentum are not conserved.
>
>It depends on what frame you use.

No, it doesn't. Conservation laws are not frame dependent. Conservation laws are a consequence of frame independence.

>The key is what the null geodesic represents. It is, in fact, the
>straightest of lines.

Actually, a null geodesic is one for which the interval, ds^2, is null.

>When spacetime is bent by a mass, you (presuming your thought is similar
>to others' in your profession) seem to think that there is a "straighter"
>line than that, by which the curvedness of the geodesic can be described.

No, a null geodesic is a null geodesic. Flat spacetime is nothing but curved spacetime in which the value of the curvature takes on a particular value, namely zero.

>But what is spacetime curvature all about, other than a redefinition
>of straightness in local places?

Curvature is not a ``redefinition of straightness''.

>We can view the curvature from a distance, but even our lines of sight
>follow those geodesics.

Huh?

>If we take the gravitational contours to represent true straight
>lines, then angular momentum is still conserved. But this would lead
>to some interesting results, it is true. Using advanced technology,
>we could build this device:
>
>Say we can construct a pinhead−sized black hole using electrical
>current (so it evaporates when the current is shut off).

OK, if I take ``pinhead'' to mean on the order of a mil or two
in radius, then we're talking about the moon.