

## Re: weakness of gravity compared to electricity

**Source:** <http://sci.tech-archive.net/Archive/sci.physics.research/2004-12/0416.html>

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**From:** Igor Khavkine ([igor.kh\\_at\\_gmail.com](mailto:igor.kh_at_gmail.com))

**Date:** 12/04/04

Date: Sat, 4 Dec 2004 21:15:36 +0000 (UTC)

alistair@goforit64.fsnet.co.uk (alistair) wrote in message  
news:<861c1b21.0412021027.302911e4@posting.google.com>...

> Igor Khavkine <[k\\_igor\\_k@lycos.com](mailto:k_igor_k@lycos.com)> wrote in message  
news:<[pan.2004.11.30.20.07.27.943107@lycos.com](mailto:pan.2004.11.30.20.07.27.943107@lycos.com)>...

>> > *This requires that every mass in the universe has a quadrupole moment –*

>> > *see my post on sci.physics.research "complex conjugate of wavefunction"*

>> > *which is detailed below:*

>>

>> [...]

>>

>> *Your hypotheses were well debunked in that original thread. There is no*

>> *need to reproduce that discussion here.*

> *I think the hypothesis was not well debunked in that original thread.*

You assign conceptual meaning to mathematical objects used in the description of a theory, then you proceed to try and derive observable consequences. I think you have this process backwards. This much has already been said, if not in so many words.

> *You merely asked what is an imaginary probability?*

I don't recall ever asking that. And your original post in this thread contained neither the word "probability" nor "imaginary".

> *Since I was saying the wavefunction multiplied by the complex conjugate*

> *of the wavefunction represented two particles being in the same place*

> *at the same time, which I suggested was an imaginary probability squared*

> *i.e a real probability, the real probability, is all an*

> *experimental observation, predicted by a theory using imaginary*

> *probabilities, would care about.*

The word "probability" has a well defined mathematical and conceptual meaning. Prefixing it with the word "complex" creates something which is well defined neither mathematically nor conceptually. The concept you are referring to is well known and goes by the name of "amplitude". It is used extensively in any wave theory including quantum mechanics and classical optics. However, as you yourself

suggest physical meaning is only assigned to probabilities (real numbers) which are the amplitudes "squared".

- > *I could argue that off-shell*
- > *particles are unreasonable but experiment suggests otherwise.*

I would agree with you, off-shell particles are unreasonable. Ironically, my belief exists because of support by experimental data, not in spite of it. What experiment do you think demonstrates the existence of off-shell particles?

- > *And bear in mind that any complex number is something of*
- > *a mystery to anybody because the square root of  $-1$*
- > *is not at all intuitive—it is used in science*
- > *because it is a useful tool which can make predictions that*
- > *can be verified by experiment. I don't like complex numbers*
- > *because they are counter-intuitive, but unfortunately they*
- > *are, somehow, attached to reality.*

You are right complex numbers are a tool. And liking a tool or not has little to do with actually using it. See my comments about complex numbers in the thread you started on their use in physics. If you want to know why complex numbers come up in a particular situation, the answer is simple: it all comes down to factoring polynomials that have no real roots. The challenge is to uncover where these polynomials are hiding.

Igor