Modifications of Polarizable Vacuum Theory For Deep Space Transport at High Speed

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Abstract

The Polarizable Vacuum theory of Harold Puthoff and others is evaluated with relativistic calculations to show that it can only be valid when velocity is low or zero.

A modification to PV theory is proposed based on work by Niels Bohr in 1949 to extend the theory for high speed deep space transport vehicles. Planck's constant is allowed to vary slowly with stress energy in the vacuum.

The modification is used to predict that polarization of the vacuum can arise from high speed of prolonged acceleration, resulting in localized negative curvature. A weakness of PV theory is removed that previously required a leap of faith for field effect generators of the future.

Evaluation of Velocity in the Theory of Polarizable Vacuum

Polarizable Vacuum theory has offered an alternative to geometric theories of space time curvature, with some acceptance in the scientific community as a step in the right direction, but not a final theory or replacement for General Relativity. With only one adjustable parameter K to describe the vacuum response to stress energy, PV theory is the simplest of the large scale cosmologies, and the only one to express relativity in terms of local variables that are measurable. As such the PV theory is an attempt to move space science forward with predictions that can be tested experimentally.

A publication by H. E. Puthoff [1] and S. R. Little in 2010 gave a description of PV as it relates to deep space transport, showing that a field effect propulsion

generator must be very powerful, requiring technology that is far advanced beyond the present capability of space science on Earth.[2]
In principle ($K < 1$) could arise from a powerful field generator, but as Puthoff pointed out in the referenced article, the power requirements are far beyond the capacity of existing equipment.

In this present work the question will be asked about how PV theory is altered locally by a fast moving deep space transport vehicle. More specifically an attempt will be made to extended PV sufficiently to show the polarization parameter ($K < 1$) arising from a velocity term, for example the speed of a deep space transport vehicle under prolonged acceleration. The accumulated kinetic energy of a starship will be proposed as a substitute for the field effect generator, both of which must interact with the local vacuum.

First the Puthoff system of PV will be evaluated to add a velocity term. Conventional equations of relativistic energy and momentum are used at high velocity, causing the Puthoff energy function to be modified. In this context relative velocity is compared to the frame in which it is measured. Velocity can also be related to red shifted or blue shifted background microwaves in space, making zero velocity measurable at 2.7 degrees Kelvin in every direction.

Instead of $\{E^2 = E_o^2 / K\}$ where $\{m/mo = K^{(3/2)}\}$

Relativity requires $\{E^2/E_o^2 = (mc^2)^2 + (pc)^2\}$ and $\{ (pc) = E(v/c)\}$

High speed PV gives $E^2 = (E_o^2 / K)(1+ v^2/c^2)$

Where ($K = c_o/c$) and c_o is standard light speed in nearly flat space.

So far this doesn't show how ($K < 1$) arises from v/c. To do so requires integration of the fundamental equation for energy and momentum.

$dE = v\, dp$

Or in relativistic terms $\{ (pc) = E(v/c) \}$

$dE^2 = c^2\, dp^2$

Planck's equation $\{ E = h f \}$ is used with the Puthoff preference for constant h, but using variable f as frequency.

$E/E_o = f / f_o$

From the reference file table 2, $\{ (f/f_o)^2 = c/c_o \}$

$(E_o^2/c_o^2)d(c/c_o) = (c/c_o)^2 \, dp^2$

$p^2 = E_o^2(1 - (c_o/c)) / c_o^2$

$E^2(v/c)^2 = E_o^2((c/c_o)^2 - (c/c_o))$

$(v/c)^2 = K(1/K^2 - 1/K) = 1/K - 1$ And $\{K > 0\}$

$K = 1/(1 + (v/c)^2)$

All that is remaining is to relate v and c in the Puthoff system of Polarizable Vacuum using the relativistic equations.

$c/c_o = 1 + (v/c)^2$

Again the energy and momentum equation is used in the Puthoff system.

$E^2 = (E_o^2 / K)(1+ v^2/c^2) \}$
$c/c_o = (1+ v^2/c^2)/K$

$v = o$
$c = c_o$
$K= 1$

This demonstrates that when ($c/c_o = 1/K$) in the Puthoff system of PV, an invariant Planck's constant applies only when velocities are small. Then a negative curvature ($K < 1$) does not occur from high velocity in PV although it might occur from futuristic field generators or other methods.

So far this work has used the standard equations of relativity to show an invariant Planck's constant h is only valid for small velocities in the Puthoff system of PV. However Planck constant is a property of space and should vary when energy density changes.

Modification of PV Theory for High Speed Vehicles

To advance the theory on vacuum polarization Planck's constant is allowed to vary slowly with stress energy. This will produce results that disagree with Puthoff on energy and mass, but agree with Puthoff on other terms such as light speed, frequency, time, and length.

The key revision to PV theory is taken from a published speech of 1949 by Niels Bohr(3) about Einstein and Heisenberg. $\{ \Delta t \sim 1/\Delta f \}$

$\Delta E/\Delta f \leq \hbar$ or $\{ dE/df = \hbar \}$ in the limit, representing the least possible variation of Planck's constant for high velocity in the PV modification(4).

Again $\{ E = h f \}$

$E/E_o = (f/f_o)^{(1/2\pi)}$

$E^2/E_o^2 = (c/c_o)^{(1/2\pi)}$

$E^2/E_o^2 = (1/K)^{(1/2\pi)}$

$(\hbar/\hbar_o) = (f/f_o)^{(1/2\pi-1)}$

$(\hbar/\hbar_o)^2 = (c/c_o)^{(1/2\pi-1)}$ variable Planck's constant

$(\hbar/\hbar_o)^2 = (1/K)^{(1/2\pi-1)}$

$(E_o^2/c_o^2)d(E^2/E_o^2)/ (E^2/E_o^2)^{4\pi} = dp^2$

$p^2 = (1/(4\pi-1))(1 - (E^2/E_o^2)^{(1-4\pi)})(E_o^2/c_o^2)$ momentum

$(mc^2)^2 = E^2 - (pc)^2$ giving m

$(v/c)^2(E^2/E_o^2) = (pc)^2 /E_o^2$

giving v which does not exceed c although v can exceed c_o.

This exercise demonstrates that when Planck's constant is allowed to vary, the prolonged acceleration of a deep space transport vehicle may be sufficient to polarize the vacuum and cause ($K < 1$) to occur naturally with acceleration.

K goes from 1.0000 to 0.2529 while v goes from zero to c.

There is a predicted limit beyond which ordinary space cannot be stressed which occurs when the kinetic energy density approaches the Planck energy. At the limit ($c = c_w$).

$(4\pi)^{(4\pi/(4\pi-1))} = (c_w^2/c_o^2) = 15.6402917334001$

This is the predicted limit when ($v = c$) suggesting a worm hole is opened by the extreme interaction of the starship with the vacuum.

$(c_w/c_o) = 3.95478087046553$

In this system the deep space transport vehicle takes 359 days of acceleration equivalent to standard Earth gravity to reach this energy level.

Summary of Methods

In summary the ordinary equations of energy momentum are used.
$E^2/E_o^2 = (mc^2)^2 + (pc)^2$
$(pc) = E(v/c)$
$dE = v\,dp$

From relativity and metric solutions light speed is related to frequency.
$c/c_o = f^2/f_o^2$

From quantum mechanics Planck's law is used.
$E = h\,f$

Heisenberg uncertainty is used for interchange of energy with the vacuum.
$(\Delta E)(\Delta t) \leq \hbar$

Finally a new interpretation is given to a speech of Niels Bohr.
$\Delta t \sim 1/\Delta f$
$dE/df = \hbar$

Conclusions

In conclusion there is prediction for a polarization of vacuum space arising from velocity of a deep space transport vehicle under prolonged acceleration. Required power is a reasonable extension of existing technology.

The conclusion depends on local variation of Planck's constant under extreme bending of space.

Acknowledgements

Thanks are given to Harold Puthoff for private correspondence and all of the published work on polarizable vacuum. He has not commented on this proposed modification of PV with variable Planck's constant.

Reference Notes

1) {puthoff@earthtech.org}

2) http://arxiv.org/ftp/arxiv/papers/1012/1012.5264.pdf

3) The reference to Niels Bohr is found in the 2010 Dover reprint ATOMIC PHYSICS AND HUMAN KNOWLEDGE, first published in 1961 by Science Editions in New York, shortly before Bohr died. The speech of 1949 was first published in 1949 in Contribution to ALBERT EINSTEIN: PHILOSOPHER SCIENTIST, Library of Living Philosophers, volume 7, starting on page 199. The quoted reference was to page 44 of the Dover edition for a relation of time interval to frequency interval.

4) Interpretation of the limit { $dE/df = \hbar$ } was not endorsed by Bohr, Einstein, Heisenberg, or Planck. It makes a reasonable extension of existing science, in a situation where a function something like this is needed to modify PV theory. It is used for the first time in this article.