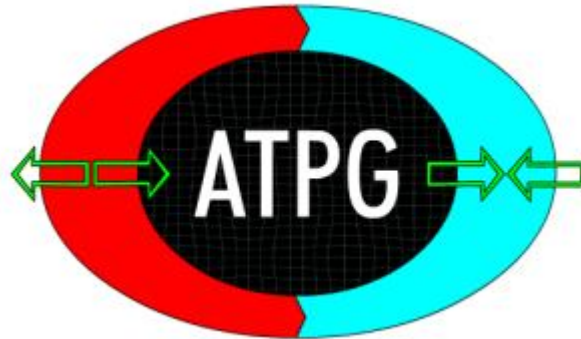


Advanced Theroetical Proplusion Group

The offical newsletter of the Alcubierre Warp Drive Disccusion Fourm

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Group Motto: *"Ex Somnium Ad Astra"*

Contents

What is the ATPG?	2
Spacetime	
On the Warp Drive Horizon 'Problem'	3
Wormholes, loopholes in spacetime	4
Energy	
The Casimir Effect and Free Energy Nonsense . . .	5

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Editorial

There is one car commercial that states in the world of automobiles there are drivers and there are passengers...drivers wanted. Its fine to sit back and to look at the scenerie but often when we really need to get somewhere we need drivers, this group are the drivers for future technologies. As the editor I would like to welcome you to the first newsletter of the Advanced Theoretical Propulsion Group (ATPG), remember that this is only the first issue and that the group still has many bugs to work out, please enjoy.

-eh

What is the ATPG?

Many of you may be curious as to what is the ATPG, in short it is a more formal origination of the Yahoo Club Forum Alcubierre Warp Drive. The scientific discussion of the warp drive was made possible by the 1994 publication of Miguel Alcubierre in the journal *Classical and Quantum Gravity*, The Warp Drive, Hyper Fast Travel in General Relativity [1], which in essence is a form of spacetime-propulsion. Of course in order to understand such a propulsion scheme requires a background in theoretical physics, and it is from these two concepts which the group name earns its name. The group logo can also aid one in order understand the mission of the group, the logo is simply a graphical depiction of the Alcubierre warp drive. The green arrows within the group logo represent the local properties of the stress-energy tensor required by the warp drive spacetime. While the red and blue regions represent doppler shifts due to the gravitanal dipspacement of the warp shells.

Although the Alcubierre Warp Drive is theoretically possible it is far from complete, and some would argue physically impractical, this group is dedicated to eliminating these impractical issues. And perhaps ultimately this group may provide the blue prints for some futuristic propulsion system in order to achieve one of mans greatest dreams, reaching the stars, at least this is the goal the group.

The group is open ended and accepts newcomers of varying background from mathematicians to the curious layman. We use the scientific method to seek out ways of allowing for possible constructions that may lead to interstellar travel within fractions of a human life time. It is however up the mathematicians and physicists of the group to attempt to answer questions prompted by other group members of what we can and can not achieve with our current understanding of science. We are not a group of technical engineers looking to build rockets for space travel, we are simply looking for inspiration for that next great technological leap paving the way for ships of the stars.

Reference

- [1] Alcubierre M. *Class. Quant. Grav.* **11** 1994

On the Warp Drive Horizon ‘Problem’

The horizon problem can be generalized by a coordinate transformation of a body moving through the x coordinate through an apparent coordinate transformation $c'dx/dct$, known as remote light speed. The coordinate transformation is given in its most basic form from the following equation

$$c' = \{-g_{01}[g_{02}^2 - g_{00}g_{11}]^{1/2}\}c/g_{11} \quad (1)$$

where $c < v_x > c'$. To imagine the horizon problem create a photon far in front and far behind the ship. The speed is c , which is less than the ship's speed. Create a photon near the ship. It will have speed c' , which is greater than the ship's speed. Between the far photons positions and the ship's position, there are points (for the one dimensional case), where the speed of the photons equal the ship's speed. For a constant speed for the ship, these photons behind the ship will never arrive at the ship, nor will the ship overtake these photons in front of the ship. For the three dimensional case, this would define the horizon, we now consider a modified Alcubierre Spacetime

$$ds^2 = A^2 dct^2 - (dxvf/cdct)^2 - dy^2 dz^2 \quad (2)$$

where there is always matter extending beyond the horizon, for warp speeds.

A possible method of ‘control?’

Define a matter region, starting from inside the horizon and extending beyond it, whose behavior is preprogrammed before flight based on the flight plan. It controls the behavior of A starting from a large value and bringing it back down to 1. The region outside of the event horizon appears tachyonic in that this matter region moves with the ship at speeds greater than c even though it's outside the event horizon where the local speed of light is less than the speed of the ship. The ship is not causally connect to the region in the front outside of the event horizon, but with this arrangement of matter, if some emergency should occur and the ship needs to drop to sublight speed, it is causally connect to the region which is responsible for the ship speed anyway. The matter region outside the event horizon would tear away and fly off into space according to its preprogrammed behavior as though nothing had happened, but the ship can be stopped without any such difficulty.

Wormholes, loopholes in spacetime

A popular movie and television series produced by MGM has captivated public interest in the phenomena of wormholes, short cuts in spacetime, to well somewhere else. While technically permissible through the laws of general relativity wormholes have serious. Much like the warp drives wormholes are seriously limited by an exotic energy requirement, in the case of a worm hole the exotic matter is used to keep the “throat open.” Without the introduction of this exotic matter wormholes are prone to collapse as any material body attempts to enter the throat.



Figure 1: The Stargate “SG-1,” hollywood’s artificial wormhole.

However, one of the big misconceptions of wormholes comes from Hollywood the believe that a human being could survive a trip trough a wormhole 2 meters in diameter. The reality of the situation is that if a wormhole were the size of the earth only potato chip sized bodies could survive the tidal forces of the wormhole. However, the application of wormholes are quite interesting in the use of interstellar travel, and will undoubtedly provide for some interesting discursion in the future.

The Casimir Effect and Free Energy Nonsense

The Casimir Force is a mysterious property of space which can unleash untold amounts of energy, hell free energy even. Well the reality couldn't be further from the truth, its quantum effect is really quite weak and quite honestly unimpressive, but someone thought hey you could get energy from this, and the myth building began. But none the less the Casimir Effect is very well, and possibility could be used as a potential energy source so lets discuss the Casimir force. Electrical energy can be "gained" through the Casimir force by building up a potential on a static charge lets discuss this

It is also often stated that the Casimir force is an attractive force, this need not always be true, but in order to extract energy from the vacuum this also becomes a requirement. In order to see how I arrived at this conclusion I will discuss some applications in quantum theory which gives rise to the Casimir Force, which is essentially a weak approximation of the Van der Waals Force.

The Van der Waals Force stems from the Schrödinger wave equation:

$$i\hbar \frac{\partial \psi}{\partial t} = \frac{\hbar^2}{2m} \frac{\partial^2 \psi}{\partial x^2} \quad (3)$$

this is derived by quantizing a classical energy field, so that $E = h\nu$ gives:

$$E/h\nu = 1 \quad (4)$$

$$h/h\nu = -h \rightarrow i\hbar \quad (5)$$

$$E/\nu = h^2 \quad (6)$$

So that $E/\nu/t = E\nu/t \rightarrow Em/c^2 = 2m$ (classical approximation), which in quantum terms roughly translates to $\hbar^2/2m$.

In terms of the Schrödinger wave equation *psi* represents a probability wave, and the last term of the left hand side represents how probability waves interact. With this we can say that two atoms can interact via probability waves, although they must be sufficiently close, now we can discuss the Van der Waals Force.

One begins with two neighboring atoms which are neutrally charged, such that they do not repel one another (or attract), we make the assumption that there is no net charge acting on them. However since electrons orbit asymmetrically around the nucleus there will be at some small sampling time

negative and positive systems acting on the system. Thus some electrons at distance r and some energy u , will begin to exchange energy through the Schrodinger wave equation with a probability wave of order:

$$\psi = \frac{1}{\sqrt{2}}[u(r)u(r) \pm u(r)u(r)] \quad (7)$$

the force on two electric charges is given with M , and strength dictated by a volume a^3 , when interacting with two waves the energy is represented by:

$$U = \frac{Mr}{a^3}e^2(r_2\nabla)(r_1R/R^3) \quad (8)$$

which can be reduced to

$$v = \pm 2e^2|z_{1,0}|^2/ha^3 \quad (9)$$

If the two charges are in phase this translates to a macroscopic "Casimir Effect," however, if the charges are out of phase the charges will repulse, and there will be NO attractive force. When discussing phase of this degenerate system they can be controlled by incident radiation (or the electromagnetic field), i.e. the conceptual ZPF.

However if the incident radiation field corresponds to $rad > (\lambda/2)2\pi$, one can generalize the radiation interaction on the system to receive the Casimir force:

$$F/A = df/da = (\pi/480)(hc/a^4) \quad (10)$$

To calculate the energy per area one has

$$U/A = (\pi/1440)(hc/a^3) \quad (11)$$

which shares some properties of the Van der Waals Force, but as can be easily seen is only a very weak approximation of it. From this it can be seen that the Casimir Force could be repulsive but it is not worth mentioning, and DEFINITION WISE this repulsive action does not correspond the Casimir Force.