Can We Make A Casimir-Cavity ZPE Thruster ?

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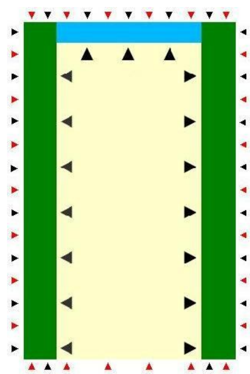
I am not trying to prove anything with this paper, so please do not ask if these things are actually true, just ask if they are plausible-enough to justify the proposed experiment. Sometimes it is astonishingly difficult to reflect carefully-enough on something we already know: For example, the force that is acting upward on the ceiling of any pressurized box is unopposed by an equal and opposite force if the floor of the pressurized box is missing. There must therefore be a net force acting on the ceiling. (See the illustration below.)

The cited peer-reviewed articles have proposed making cavities that experience the "Positive" or "Repulsive" Casimir Effect. In terms of the widely accepted, historical Radiation-Pressure Interpretation of the Casimir Force, this translates into cavities that have a Quantum-Flux Radiation-Pressure Equilibrium-Point that is higher than the ambient Quantum-Flux Radiation-Pressure Equilibrium-Point, that exists outside the cavity. I am not even insisting that these peer-reviewed Positive-Pressure hypotheses are correct, but am merely pointing out the unavoidable consequences IF Quantum-Flux Pressurized-Cavities are really possible!

Large Arrows represent hypothetically Stronger Radiation-Pressure, *inside* the cavity. **Small Arrows** represent the much weaker Radiation-Pressure, out-side of the cavity.

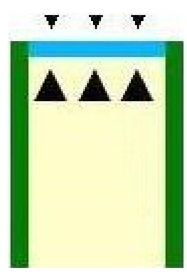
Black Arrows represent those wave-lengths that are small enough to form inside the cavity. The small wave-lengths ***also*** occur outside the cavity where the pressure is very small, so those Black Arrows are small.



Red Arrow *wave*-lengths are too ***large*** to fit inside the cavity. **Red** Arrows are always ***weak,*** therefore, their arrows are **small;** none-theless, the These weak wavelenths are so large that they push across the cavity opening as though it was solid.

All Arrows pushing on the cavity ***sides*** come in pairs that are equal and oppo-site. The Red Arrows that act down-ward on the Cavity Roof are counteracted by Red Arrows pushing up across the opening.

If everything else really cancels, then we are left with three Large Arrows that are pushing up on the (blue) Ceiling of the cavity that are only partly counter-acted by the three Small Black arrows that push down on the Cavity Roof. This hypothetical net force is repre-sented by the large Green Arrow.



The Electromagnetic Quantum-Flux is unlike **Thermal**-Flux. Adjacent regions of differing ***temperature*** will result in heat flow, but this is ***not*** the case with the Radiation-Pressure of the Quan-tum-Flux; therefore, the higher radia-tion pressure outside the cavity between two Casimir's Two Plates does not leak into the low flux-pres-sure cavity between the two plates; neither will the high-pressure inside one of the pressurized cavities leak away. There is no transfer between the regions with different Flux-Pressures because it is not thermal energy or a gas. The higher radiation-pressure, inside the cavity, is merely the modified equilibrium condition of the space inside the cavity and the lower pressure, outside the cavity, is simply the natural equilibrium-condition of the Ambient Quantum-Flux, outside the Cavity. Diffraction gratings prove that photons have wave-widths that are equal to their wave*lengths;* therefore, the separation distances of the walls, and the materials that they are made of will govern the equilibrium conditions for all photons inside the cavity, even those that are striking the ***ceilings*** of the cavities.

A macroscopic array of nanoscopic cavities can be constructed quite easily with ***existing*** nanotechnology. A large portion of its one side will be comprised of the cavity-ceilings. Since the sides of these cavities do not move they ***can*** be as close as 10 nm. This might yield net pressures as much as ***six million times stronger*** than previous experiments using separation distances that are closer to 500 nm.

2 Pages of Journal Quotes

1) Casimir Zero-Point Radiation Pressure; Phys. Rev. Lett. 95, Issue 8, 080404 (2005) Yoseph Imry; Department of Condensed-Matter Physics, The Weizmann Institute of Science, Rehovot 76100, Israel

We analyze some consequences of the Casimir-type zero-point radiation pressure. These include macroscopic “vacuum” forces on a metallic layer in between a dielectric medium and an inert one. Ways to control the sign of these forces, based on dielectric properties of the media, are thus suggested. Finally, the large positive Casimir pressure, due to surface plasmons on thin metallic layers, is evaluated and discussed.

2) **Engine cycle of an optically controlled vacuum energy transducer;** Phys. Rev. B 60, 14740–14755; F. Pinto, Jet Propulsion Laboratory, M/S 301-150, California Institute of Technology, Pasadena, California 91109-8099

An idealized system composed of two parallel, semiconducting boundaries separated by an empty gap of variable width is considered. A gedanken experiment is discussed to show that, in general, the total work done by the Casimir force along a closed path that includes appropriate transformations does not vanish. It is shown that, in the limit of an engine cycle bringing the two boundaries to a relatively small distance, positive net exchange of energy associated with the Casimir force field could quite possibly be achieved.

Viable technological implementations of this idealized system are analyzed in some quantitative detail, in particular, in the case of doped and undoped c-Si boundaries. For the purpose of direct experimentation, measurements with both macroscopic and micro-electromechanical devices are suggested. A full theoretical and experimental study of systems of this kind on every scale will greatly contribute to a much deeper understanding of the nature of the Casimir force and associated concepts, including the possible manipulation of semiconducting nanostructures and the noninvasive optical characterization of semiconducting samples. In the event of no other alternative explanations, one should conclude that major technological advances in the area of endless, by-product free-energy production could be achieved.

3) **Repulsive Casimir force as a result of vacuum radiation pressure;** American Journal of Physics -- May 1997 -- Volume 65, Issue 5, pp. 381-384

We study the Casimir force between a perfectly conducting and an infinitely permeable plate with the radiation pressure approach, used by earlier authors for the case of two perfectly conducting plates. This method illustrates in a very simple context how a repulsive force arises as a consequence of the redistribution of the vacuum-field modes corresponding to specific boundary conditions.

4) **Repulsive Casimir Forces;** PhysRevLett.89.033001; O. Kenneth, I. Klich†, A. Mann, and M. Revzen; Department of Physics, Technion-Israel Institute of Technology, Haifa 32000 Israel; kenneth@physics.technion.ac.il; klich@tx.technion.ac.il

repulsive Casimir forces may be found in a large range of parameters, and we suggest that the effect may be realized in known materials. The phenomenon of repulsive Casimir forces may be of importance both for experimental study and for nanomachinery applications. . . repulsive Casimir forces may be found in a large range of parameters, and we suggest that the effect may be realized in known materials. The phenomenon of repulsive Casimir forces may be of importance both for experimental study and for nanomachinery applications.

5) **z-Function Method for Repulsive Casimir Forces;** Brazilian Journal of Physics, vol. 29, no. 2, June, 1999 371; M.V. Cougo-Pinto, C. Farinay, A. Tenorio; Instituto de Fisica, Universidade Federal do Rio de Janeiro. pp. 371-374; marcus@if.ufrj.br; farina@if.ufrj.br

We compute the Casimir pressure between an unusual pair of parallel plates, namely, a perfectly conducting plate and an infinitely permeable one with the generalized -function method. The result for this problem, which has been rarely discussed in the literature, is a repulsive Casimir force.

6) **Repulsive Casimir forces produced in rectangular cavities: possible measurements and applications.** GUSSO, A. and SCHMIDT, A. G. M. ; Braz. J. Phys. [online]. 2006, vol.36, n.1b, pp. 168-176.

We perform a theoretical analysis of a setup intended to measure the repulsive(outward) Casimir forces predicted to exist inside of perfectly conducting rectangular cavities. We consider the roles of the conductivity of the real metals, of the temperature and surface roughness. The possible use of this repulsive force to reduce friction and wear in micro and nanoelectromechanical systems (MEMS and NEMS) is also considered.

7) Electromagnetic field correlators, Maxwell stress tensor, and the Casimir effect for parallel walls. SANTOS, F. C.; PASSOS SOBRINHO, J. J. and TORT, A. C.. Braz. J. Phys. [online]. 2005, vol.35, n.3a, pp. 657-666.

We evaluate the quantum electromagnetic field correlators associated with the electromagnetic vacuum distorted by the presence of two plane parallel conducting walls and in the presence of a conducting wall parallel to a perfectly magnetically permeable one. Regularization is performed through the generalized zeta function technique. Results are applied to **re-derive the attractive and repulsive Casimir effect through Maxwell stress tensor.** Surface divergences are shown to cancel out when stresses on both sides of the material surface are taken into account.

8) Repulsive Casimir force in chiral metamaterials. Phys Rev Lett. 2009 Sep 4;103(10):103602. Epub 2009 Sep 4. Zhao R, Zhou J, Koschny T, Economou EN, Soukoulis CM. ; Ames Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA.

quantum electromagnetic field correlators associated with the electromagnetic vacuum distorted by the presence of two plane parallel conducting walls and in the presence of a conducting wall parallel to a perfectly magnetically permeable one. Regularization is performed through the generalized zeta function technique. **Results are applied to re-derive the attractive and repulsive Casimir effect through Maxwell stress tensor.** We demonstrate theoretically that one can obtain repulsive Casimir forces and stable nanolevitations by using chiral metamaterials. By extending the Lifshitz theory to treat chiral metamaterials, we find that a repulsive force and a minimum of the interaction energy possibly exist for strong chirality, under realistic frequency dependencies and correct limiting values (for zero and infinite frequencies) of the permittivity, permeability, and chiral coefficients.

9) Comparison of Chiral Metamaterial Designs for Repulsive Casimir Force; arXiv.org > cond-mat > arXiv:0911.2019 Authors: R. Zhao, Th. Koschny, E. N. Economou, C. M. Soukoulis; Rongkuo Zhao: rkzhao@iastate.edu

In our previous work [Phys. Rev. Lett. 103, 103602 (2009)], we found that repulsive Casimir forces could be realized by using chiral metamaterials if the chirality is strong enough. In this work, we check four different chiral metamaterial designs (i.e., Twisted-Rosettes, Twisted-Crosswires, Four-U-SRRs, and Conjugate-Swastikas) and find that the designs of Four-U-SRRs and Conjugate-Swastikas are the most promising candidates to realize **repulsive Casimir force** because of their large chirality and the ***small ratio of structure length scale to resonance wavelength.***

10) Tunable Casimir repulsion with three dimensional topological insulators; arXiv:1002.3481; Alberto Cortijo and Adolfo G. Grushin; aggrushin@icmm.csic.es

switching between repulsive and attractive Casimir forces by means of external tunable parameters could be realized with two topological insulator plates. We find two regimes where a repulsive (attractive) force is found at small (large) distances between the plates, canceling out at a certain critical distance between the plates where the net force is zero. Furthermore, we suggest that switching between repulsive and attractive regimes could be also controlled

11) The Casimir Force for a Perfectly Conducting Rectangular Parallelepiped at Finite Temperature; J Phys Soc Jpn; VOL.71;NO.7;PAGE.1655-1662(2002)

Quantized electromagnetic field inside a rectangular parallelepiped surrounded by perfectly conducting parallel walls is studied. The Casimir energy and the Casimir force at finite temperature are calculated by the mode summation method, and it is found that the sign of the Casimir force depend on both the shape of a cavity and the temperature. The temperature at which the Casimir force change from the attractive force to the repulsive force is shown as a function of the separation of walls.