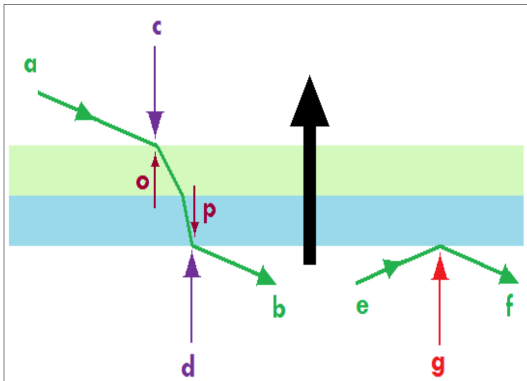
Zero- Point Energy Diode

Former Director of NASA's Breakthrough Physics Propulsion Program, Marc Millis, summarizing certain aspects of that program, concluded that the electromagnetic radiation pressure of the Quantum Vacuum might someday be used *as a practical source of fuel-less energy and massless propulsion; Millis stated that we might someday develop a practical Quantum Optical Diode that will provide energy and massless propulsion,* **lifting or rapidly accelerating many tonnes of Mass.**[1] A *Light Diode* consists of a material that is ***relatively*** more transparent to the light that approaches it from one side, but **relatively** reflective to equally strong light that is approaching the other side. Visible light diodes like this already exist. This paper establishes the strong likelihood of adapting existing material science, VUV, X-Ray Optics, and nano-layering techniques to create a Quantum-Flux Optical Diode, (Q-FOD,) that can interact with some significant part of this particularly dense range of Quantum Vacuum wavelengths.

Just as we already use the ***free radiant energy of the Sun,*** **Z-PED is a way for *anyone*** to also use the more-abundant ***free radiant-energy*** of the Quantum Vacuum at anytime, at any place, as much as they want, and as often as they want, without paying any money to anyone, ever!!!

A light diode enables us to do a *seemingly* impossible thing, to derive a **net** force from its random encounters with these light particles of the Quantum Vacuum. This truly ***seems*** as ludicrous,as trying to harness the thermal motions of air particles; this is because, just as air particles shower all objects uniformly from all sides, so also is Z-PED showered with equal numbers of equally intense light particles, on every side, from every direction and because light particles, like air particles, impart forces as they bounce off of an object. However, ***unlike*** the situation with air particles, equal numbers of light particles do ***not*** have to **bounce** off all sides of a light diode, since some of them can pass through the diode instead of reflecting off of it. Light that is passing through the diode exerts mere trivial forces.[1] Light Particles bounce off of-, or pass through- various transparent materials differently. Different materials change the direction of the light that enters them by different amounts. These properties, that are unique to light, give us us unexpected new possibilities that do not pertain to the thermal motions of air pressure.

For many years, we have been unwittingly doing this exact same thing with visible light. Glare bounces off of our faces and approaches the back side of our eyeglasses at a shallow**-**, therefore highly reflective**-** angle; it *would* reflect back into our eyes, however, the coating on the backside of glare-proof lenses bends this shallow-angle light so that it then passes through the back of the lens at a steeper**-**, ***less***-reflective**-** angle. Therefore, if equal and opposite fluxes of light approach both sides of a piece of glass, *from* **all** *directions,* comparatively less light will reflect from the coated side than from the non-coated side; this will produce a net thrust, since light that is passing through the material exerts far less *net* force on the material than the light that reflects from its surfaces.



Picture 1

In Picture 1, all of the forces, that are exerted by light that passes *all of the way* through the device from top to bottom, counteract each other: Green Arrow a represents light that is approaching the top surface of a highly transparent material from a very shallow angle. Purple arrows, c & d, indicate that the light that passes through the material exerts equal and opposite vertical forces when they enter and leave[2] the device; both of these facts have been experimentally demonstrated by independent experimenters.

Green arrow e represents light that approaches the bottom of the device from the same very shallow angle as before; but this time, the light *must* reflect from the bottom surface because the blue material is highly reflective AND because the light is approaching the blue material from a very shallow angle AND because there is no coating that could alter the angle of the incoming light.

Even though the downward-bound light was originally approaching the blue material from the same shallow angle as the upward bound light, it *cannot* reflect as much as the bottom surface because the green material bends this light, which causes the light to into the top surface of the blue material at a steeper, less-reflective angle.

Brown arrows o & p represent the forces that are exerted on the device by the bending of the light. We truly *know* that these light-bending forces are equal and opposite since the light is bent back to the original angle by the time it has passed all of the way through both materials.

The green material also bends the light to a steeper, non-reflective angle. Because of its now-steeper, non-reflective angle, the light can now enter and pass through the top of the blue material without *being reflected.* Red arrow g indicates that the light pushes upward on the bottom of the blue surface as it reflects. Therefore, we have a net propulsive force.

Visible light is far too weak to exert practical forces on anything; however, there is a strong likelihood that we can adapt already-existing, soft X-ray and VUV optical technologies to manipulate these same wavelengths of the denser, far-more powerful wavelengths of the light of the Quantum Vacuum in exactly the same way.

The attached budget contains bids for consulting fees for experts in all of the various fields who will primarily work together to design and test various prototypes and secondarily, as funds permit, to determine the feasibility of various alternative approaches. It also contains estimates for the cost of building different kinds of prototypes.

1 In Astronautics and Aeronautics, Volume 227;University of Texas at Arlington, Progress Frontiers of Propulsion Science, Edited by Marc G. Millis and Eric W. Davis; pages 155-156.

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3 Radiation pressure from the vacuum: Physical interpretation of the Casimir force; Physical Review A; Volume 38, NUMBER 3; I AUGUST 1, 1988; PW. Milonni, Theoretical Division,* M.E. Goggin, *Los Alamos National Laboratory, Los Alamos, New Mexico; R.J. Cook, Rank J. Seiler, Research Laboratory, United States Air Force Academy, Colorado Springs, Colorado 80840.