A Stronger form of The 2nd Law
A Short Essay

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Abstract

Theoretical analysis into the energetics of a novel putative electromagnetic field propulsion device by the author, found that it was able to impart momenergy to the ground state of the electromagnetic field; some rest-energy of the craft was converted to kinetic energy of the craft. Electrical analysis showed that the propulsor was always a net electrical load – if the device accelerated from one frame, then deaccelerated to the original frame, both processes would consume electrical work. The aim of this paper is to look further into this sinking of high-grade electrical energy into the field ground state and to show that an even more pernicious form of 2nd Law of Thermodynamics exists.

Keywords: 2nd Law, Thermodynamics, Quantum mechanics, Zero-point

1. Introduction

The author[1-3] is one of many people[4, 5] who think that the 2nd Law, as it applies to matter, is compromised. Indeed, Sheehan has constructed a device (although working at elevated temperatures) that demonstrates a clear 2nd Law violator with labile chemical bonds (similar to the 1st order phase transition sorting in the appendix[3]). Perhaps, clear to this research community, is that an isolated system can re-sort itself from equilibrium by what Sheehan calls a "Maxwell Zombie" (as opposed to demons) processes; these are akin to sorting on an information theoretic level. Thinking that the matter was settled (obviously for a closed system and not open), it came as a surprise to the author in his researches on electromagnetic propulsion[6, 7], that another insidious form of energy degradation exists involving the zero-point of a field and the *harmonic oscillators themselves* being put into motion.

Research in the fringe energy community on zero-point energy usually looks at ways it might be "cohered" or rectified, for it is well established that although it has zero expectation, its variance is non-zero[8, 9]. The author makes no attempt here to either refute or agree with this objective, save to say that, isotropy and Lorentz invariance makes the task extremely difficult. Our different take is to consider it as a potential *sink of energy* rather than a source.

2. Moving the whole field

How to begin our claim that the zero-point could be a sink of energy? Let us consider a rather idealised atom of a single electron and proton with linear potentials[†], such that it forms an harmonic oscillator. It consists of leptons, electrons and quarks, with the latter bound to form the proton. Undoubtedly the rest-energy of these constituents, their potential and kinetic energies contribute to the mass of the system (we can define a classical conceptual zero of energy of the system at zero separation in this model with linear potentials). The energy levels of the system would be related to the quantum number thus: $E = \left(n + \frac{1}{2} \right) \hbar \nu$. We can compare this with the rest masses of an electron 0.511MeV and a proton at some 1836 times heavier than this. Inescapably when this hydrogen-like atom is set in wholesale motion, part of the kinetic energy must be ascribed to the zero-point in motion. All is mass-energy; all can be set in motion.

Looking further, each fundamental lepton of the hydrogen atom is an excitation of the fundamental lepton fields – a Fourier sum of modes of the field describing a somewhat localised wavepacket that represents the particle. Whether to say that all the fields describing the atom are moving or that it is a "blip" on the number line moving down it (like sending a wave down a rope tied at one end) is moot, both viewpoints are relativistically correct.

This the basis of our claim in the putative electromagnetic propulsion system based on the static (zero-frequency) Poynting flow[6]. After the fields have been setup and we tend to the steady-state, the momentum of the photon modes describing the E and B fields of the device is

[†]This avoids the infinite electrostatic energy argument and to just where we'd place our zero of energy. We are interested in absolute energies and not differences in this discussion.

transferred to the zero-point of those modes, as it must for momentum conservation (please consult [6] to see why a unidirectional circulation of energy results and why the zero-point term must be include in the photon's momentum) – the field is set in motion if the craft moves the other way. One may counter that the craft too "is made of fields" but there is no contradiction to say, by linear superposition, that part of the field goes one way whilst the other goes another; it is all one field.

3. Thermalisation and Conclusion

Returning to the hydrogen-like atom (which is just a foil for our field argument, sans rest mass), imagine now that it is part of an ensemble a cloud of gas or a liquid, each harmonic oscillator describing the atom is coupled to others by short and long range forces. These forces from exchange of real photons as excited atoms lower in energy by emission or virtual photons by dipole (or higher) fields, the so-called Van der Waal/London Forces. The process of mixing is inherently random but the upshot is the Equipartition of Energy: if we shoot a molecule of gas into a greater body of gas, its energy and momentum will randomise amongst the ensemble.

If we now strip our hydrogen gas argument foil of mass and concentrate on the zero-point (which we have already agreed translates in space as the atom translates), it is not then to a great a step to see that the zero-point modes of the field would be set in motion by the putative propulsion device and then would exchange the kinetic energy and momentum of their movement with others in the ensemble, leading to thermalisation too.

However and this is our point, the thermalisation of the kinetic energy of fields, from the translation of the harmonic oscillators, is a more insidious form of 2nd Law: with matter, Maxwell Zombie[5] processes can sort away from thermal equilibrium but the isotropy and Lorentz invariance of the zero-point of fields makes it hard to do the same.

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