

## How vacuum energy and electric systems are related to each other

Matter and space-time (quantum vacuum) are phenomena, which have a close relationship. Since matter tells space-time how to curve and space-time tells matter how to move, it is obvious that so called material things are rather a condition of space-time instead of phenomena, which are disconnected from each other. In modern physics not only a so called force field in space is considered as a function of the quantum-vacuum, but also the composition of an atom merely consists of quantum fluctuations. Mass is not an isolated “thing” but a quality of space-time itself.

If space-time determines how an atom will move, then space-time must contain a form of energy.

A known method to extract energy from seemingly empty space-time is the Casimir effect. The Casimir experiment consists of two smooth plates which are positioned close to each other. Just before they touch, an attracting force emerges. The force occurs due to a difference of the quantum-vacuum energy densities between and around the plates.

In the absence of atoms and fields the geometry of space-time is nearly perfectly symmetrical. If there are two plates in space-time, the plates will break the symmetry in a small way. The broken symmetry will integrate a part of the energy from the quantum-vacuum into our observable reality. This is what we perceive as the so-called vacuum energy!

“As we have seen the uncertainty principle of the quantum theory shows, that fields even within empty space-time are exposed to permanent ongoing quantum fluctuations and possess an unlimited energy density. So we have to subtract an unlimited value to receive a limited energy density. This is what we see in our universe”.

*(Mathematician und Physicist Prof. Stephen Hawking, The Universe in a Nutshell, German version)*

If a physical quantity can be measured, then it is called an observable. The vacuum energy is a non-observable. So the vacuum energy exists only in a virtual or potential form. This potential represents a preliminary stage of an observable or usable energy. The quantum-vacuum is pure potential. The potential can be transformed into observable energy. Asymmetry means that something virtual is being converted into something observable, i.e. potential into real energy.

„Since non observables imply symmetry, any discovery of asymmetry must imply some observable“

*(Physicist Prof. T. D. Lee, Nobel Prize in Phys. 1957. Symmetries, Asymmetries and the World of Particles)*

One possibility to extract substantial amounts of energy from the quantum-vacuum is to break the symmetry by active means. Such a forced asymmetry is e.g. constituted by an electric field.

“The asymmetry between opposite signs of electric charge is sometimes called particle - antiparticle asymmetry”.

*(Physicist Prof. T. D. Lee, Nobel Prize in Physics 1957. Particle Physics and Introduction to Field Theory, Harwood New York, 1981)*

“The existence of the positive charge, in some sense, distorts, or creates a ‘condition’ in space, so that when we put the negative charge in, it feels a force. This potentiality for producing a force is called an electric field”

*(Physicist Prof. Feynman, Nobel Prize in Physics 1965, Addison-Wesley, Reading, MA, 1964, Vol. 1, p. 2-4)*

The electromagnetic interaction is transmitted by virtual photons. Virtual photons permanently emerge and disappear in the quantum-vacuum.

„The exchanged Photon which has carried and caused the classic electromagnetic force is in reality a virtual photon.“

*(Physicist Prof. Lisa Randall, Harvard University, - Warped Passages. Unraveling the Mysteries of the Universe’s Hidden Dimensions- Nov. 2006, German version)*

An electric field is a with light velocity propagating polarization of locally appearing virtual photons. Some of the virtual photons decay into virtual particle pairs with opposite electric charge. By polarization we mean the orientation of the charged virtual particle pairs.

“The meaning of quantum fluctuations is that even empty space-time is filled with virtual particle pairs. These virtual particle pairs emerge from space-time, then the two charges move a little bit from each other and then again come together. After that they annihilate each other. One partner of the virtual particle pair has positive energy the other partner has negative energy”

*(Mathematician und Physicist Prof. Stephen Hawking, The Universe in a Nutshell, German version)*

An electric field is a phenomenon of the quantum-vacuum. So the energy within the quantum-vacuum plays a fundamental role within every electric system. This fact is normally not obvious because the electric input energy, which is e.g. used to drive an ideal electric motor, is usually equal to the mechanical output energy. Thus it appears as if the electric energy is being directly converted into mechanical energy. That which enters at the entrance comes out at the exit.

But this is not the case!

The electric input energy is initially “lost” into the quantum-vacuum in an observable sense. It now exists in a potential form. This potential spreads with light speed into space.

Subsequently, with the help of this potential observable (mechanical) energy is integrated from the local quantum-vacuum at the output. The reason why (in the case of an ideal system) the observable input and observable output energy are equal is provided by something what the author has called “The self-symmetrizing mechanism in electromagnetic systems”. The self-symmetrizing mechanism enforces the conservation of the observable energies involved. The author is convinced that the self-symmetrizing mechanism also exists in other interactions.

The first law of thermodynamics (conservation of energy) now receives a new meaning. The energy in the quantum-vacuum must be considered. Therefore electromagnetic systems are energetically open systems. They only appear like energetically closed systems because their energetic exchange with the quantum-vacuum is energy-symmetric. If we want to realize an asymmetric electromagnetic system with a coefficient of performance of higher than 100 %, then the self-symmetrizing mechanism has to be bypassed.

A static electric charge implies the presence of a dynamic energy flow which is related to the vacuum energy. Due to this fact electric systems extract usable energy from the quantum vacuum.

[http://www.cheniere.org/techpapers/Fact\\_Sheets/Fact%20Sheet%20-%20Source%20Charge%20Problem10.doc](http://www.cheniere.org/techpapers/Fact_Sheets/Fact%20Sheet%20-%20Source%20Charge%20Problem10.doc)

The Casimir effect. It detects the presence of the vacuum energy by a measurable force between parallel plates.

*Phys. Rev. A 78, 062111 (2008)*

To extract usable energy by the Casimir effect it is necessary to add special conditions, see e.g. the “Tunable Casimir Effect“:

E. Davis et al., “Review of Experimental Concepts for Studying the Quantum Vacuum Field” (Space Technology & Applications Int. Forum 2006, 3rd Symposium on New Frontiers & Future Concepts, Albuquerque), p. 8 and 19 – 25:

[http://www.earthtech.org/reports/Davis\\_STAIF\\_Rev.Exper.Quant.Vac.Field.pdf](http://www.earthtech.org/reports/Davis_STAIF_Rev.Exper.Quant.Vac.Field.pdf)

Dr. Harold Puthoff has pointed out that it is possible to extract energy and heat from the vacuum.

*Phys. Rev. E, 48, 1562 (1993):* [http://prola.aps.org/abstract/PRE/v48/i2/p1562\\_1](http://prola.aps.org/abstract/PRE/v48/i2/p1562_1)

*Phys. Rev. A 40, 4857 (1989):* [http://prola.aps.org/abstract/PRA/v40/i9/p4857\\_1](http://prola.aps.org/abstract/PRA/v40/i9/p4857_1)

The Hughes Laboratory has pointed out that it is possible to extract electrical energy from the vacuum by cohesion of charged foliated conductors.

*Phys. Rev. B, 30(4), 1700, (1984):* [http://prola.aps.org/abstract/PRB/v30/i4/p1700\\_1](http://prola.aps.org/abstract/PRB/v30/i4/p1700_1)

Prof. Dr. C. W. Turtur’s direct conversion of vacuum energy into mechanical energy.

[http://philica.com/display\\_article.php?article\\_id=155](http://philica.com/display_article.php?article_id=155)

Concerning new energy technologies the former NASA astronaut and physicist Prof. Brian O’Leary has pointed out to the significance of the extraction of usable energy from the quantum vacuum. See his open letters to Al Gore and Barack Obama.

<http://www.newenergymovement.org/olearygore.php>

<http://www.brianoleary.info/>

Marcus Reid, November 2009