

Energy Pairs Theory resolves Energy Conservation Issues

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Abstract

The primary aim of this study was to explain some energy conservation issues which seem to be ignored today. These energy conservation issues relate to energy conservation issues in the field of energies embedded in static electric fields and in magnetic fields generated by moving charges which move at a constant velocity. The study uses the *Energy Pair Theory* (EPT) developed in another article (that can be found at: <http://viXra.org/abs/1911.0176>) (Ref. 4), which seems to provide a reasonable explanation to these energy conservation issues.

The article also arrives at the surprising conclusion that *Space* itself might be also some form of *Energy*.

Introduction

In a separate article titled: "Energy Analysis of a Null Electromagnetic Wave" (that can be found at: <http://viXra.org/abs/1911.0176>), (Ref. 4) two one dimensional electromagnetic traveling waves, which collide, then consolidate and unify and continue to travel together in the same direction, was presented and analyzed. In that article, a lab experiment was described, which is able to generate such a Null electromagnetic wave. Analysis of such a wave shows that it is possible to create a Null electromagnetic traveling wave which does not contain any electric and magnetic fields, from two normal electromagnetic waves, which do contain electric and magnetic fields and energy. And thus, a violation of the *Energy Conservation Principle* might *seem* to occur.

In that article the *Energy Pair Theory* (EPT) was presented, which provided a reasonable explanation to that *seemingly* violation of the *Energy Conservation Principle*.

In this article the EPT framework is used to provide explanation to other *seemingly* energy conservation issues which seem to be ignored today. Namely, energy conservation issues related to energy conservation in energies embedded in static electric fields and in magnetic fields generated by moving charges which move at a constant velocity.

In addition to the above, in the separate article mentioned above, a surprising conclusion was presented, namely, that *electric charges* are a form of Energy, analogous to the *mass* being a form of Energy, as derived in the *Special Relativity Theory*.

This article arrives at an additional surprising conclusion that the *Space* entity itself might also be a form of Energy.

The Energy Pairs Theory

The Energy Pair Theory, that was already presented in the above mentioned article titled: "Energy Analysis of a Null Electromagnetic Wave" (that can be found at: <http://viXra.org/abs/1911.0176>), (Ref. 4) is presented also here.

"Energy Pair" is a novel theoretical construct representing a physical state in which energies can be accumulated and stored together, and at the same time disable each other in a way that these energies exist but are untraceable.

To resolve what *seemed* as a violation of the *energy conservation principle* in the creation of a Null electromagnetic traveling wave, and to show that energy conservation in the Null Wave still exists, we introduced the *"Energy Pairs Theory"* and the novel construct of *Energy Pair*. Accordingly, the energies in the Null Wave are not annihilated; they still *exist* together after the unification of the two normal electromagnetic waves which created the Null wave, as *"energy pairs"* that ***disable each other***, such that it only appears that the Null Wave does not have any energy and the energy conservation principle is violated. The Null Wave's embedded energies disable each other and therefore this energy is untraceable.

What is this *"Energy Pair"* and how do the energies accumulated in it disable each other?

Following is a detailed description of ***"The Energy Pairs' Theory"***:

The energy embedded in an electric field generated by a *positive charge*, and the energy embedded in an electric field generated by a *negative charge*, are assigned to one set of "Energy Pairs". The same is applied for the energies embedded in magnetic fields generated by moving charges: The energy embedded in magnetic field generated by *moving positive charge*, and energy embedded in magnetic field generated by *moving negative charge*, are assigned to another set of "Energy Pairs". And, energies belonging to an *Energy Pair* that exist together in the same location in space and have equal intensities can still *exist* together but disable each other, a disabling that *seems* as a violation of the *energy conservation principle*.

In each set of "*Energy Pairs*" the energies of the electromagnetic waves that unified and created the Null Wave, were accumulated and continued to be stored into that *Energy Pair*. The mutual annihilation of the fields or the waves that was seen and measured as a mutual annihilation of energies belonging to these fields, and a violation of the energy conservation principle, can be viewed now as *mutual disabling of the energies* that continue to be stored into each *Energy Pair*.

The idea of "*Energy Pairs*", can be better understood by examining an analogue situation: A rope in a rope pulling game (tug-of-war): Two people pull a rope each holding one edge of the rope and each in a direction exactly opposite to the other; if their pulling force is exactly equal, the rope does not move; this does not mean that the pulling energies that are exerted on the rope annihilate each other or disappear; The energies are accumulated and stored as a potential latent energy in the rope tension. The fact that the rope does not move, does not mean that the energies disappeared; they seem to be undetectable. The same applies when two electric or magnetic fields' forces of exactly the same intensity but *opposite polarity* annihilate each other. The energies of these fields are not annihilated or disappear; they are accumulated and stored into two sets of "*Energy Pairs*", one that was created by the unification of the electric component of the waves, and the other by the unification of the magnetic component of the waves. The energies in each set of these "*Energy Pairs*" disable each other; as a result, the Null Wave cannot be detected.

Energy Pairs Theory might resolve other Energy Conservation Issues

The Energy Pairs Theory can be also used to provide an explanation to a magnetic field potential energy conservation paradox.

This magnetic field potential energy conservation paradox is described as follows:

When a body is charged with electric charges of a certain polarity (such as positive electric charges) and a certain amount of charge, and the body is moved at a specific constant speed in a certain direction, it creates a magnetic field \vec{B} around it whose embedded energy per unit volume u is provided by the following formula:

$$u = |\vec{B}|^2 / (2 \mu_0) \quad (\text{Ref. 2})$$

Where μ_0 is the vacuum magnetic permeability and is equal to:

$4\pi 10^{-7}$ H/m (Henry per meter).

While the magnetic field \vec{B} is described by:

$$\vec{B} = (\mu_0 / (4\pi)) (q(\vec{v} \times \vec{r}) / r^2) \quad (\text{Ref. 1})$$

When a second body is charged with electric charges of the opposite polarity (negative electric charges) but with the same amount of charge, and that body is also moved at the same constant speed in the same direction, it creates a magnetic field in the same space volume, whose magnitude is still expressed by the same formula that describes the magnetic field \vec{B} created by the first body when it was moved, but its direction (or polarity) is inverse to the polarity of the magnetic field \vec{B} that the first body created when it was moved. But, the embedded energy per unit volume of the magnetic field created by that second body is still expressed by the formula presented before for energy per unit volume in a magnetic field. (Ref. 2).

When both bodies are tied to an apparatus that keeps them very close to each other, (but inhibits them from being attracted completely to each other), and both bodies are moved together, at the same speed, in the same direction, no magnetic field is created around

them (or a negligible magnetic field, because the bodies are not exactly at the same point in space).

The reason why in that third case scenario basically no magnetic field was created is well understood.

Magnetic fields obey the superposition rule. Since the first body creates a magnetic field which has the same intensity, but inverse polarity compared to the magnetic field the second body creates, and both magnetic fields occupy the same volume in space, they cancel each other, and basically no magnetic field is created in that volume in space. However, there is still a paradox, concerning the conservation of the energy embedded in these two magnetic fields.

The first body does not "know" that a second, inverse magnetic field is created, and it still creates its own magnetic field. This magnetic field embeds energy per unit volume described by the formula above (Ref. 2). The same is true for the second body. So, the fact that each field cancels the other, contradicts the energy conservation principle, since the energies of both fields also disappear.

A logical explanation to that paradox might be provided by the Energy Pairs Theory presented above, which states that certain energies, such as magnetic fields embedded energies, come in an Energy Pairs form.

And, energies belonging to energy pairs might still *exist* but *disable* each other in certain conditions.

Actually, since the energy density in a magnetic field depends on the magnitude of the magnetic field $B^{->}$ in space at each point, and $B^{->}$ is a vector which can be cancelled by another vector of similar size but opposite direction, it is obvious that the energy density of a magnetic field is not a complete scalar.

Thus, in case of magnetic fields energy, the condition of energy disabling that occurs at each Energy Pair is clear, and it happens when another magnetic field exists at the same space volume, with equal magnitude and opposite direction.

From the above, it is obvious that the Energy Pair for magnetic fields contains the following two energy types: one type is the energy embedded in magnetic fields created by positive charges, the other type is the energy embedded in magnetic fields created by negative charges.

Thus, the mutual annihilation of energies belonging to Energy Pairs can be also viewed not as mutual annihilation but as mutual disabling, assuming that the energies *exist* as Energy Pairs and their mutual disabling is only seen as annihilation.

Similarly, to the explanation of the magnetic field energy conservation paradox, the Energy Pairs Theory provides a similar explanation to a similar electric field energy conservation paradox.

This electric field energy conservation paradox is very similar to the magnetic field energy conservation paradox. Thus, it will be described here more briefly, since its description is very similar to the description of the magnetic field energy conservation paradox.

When a body is charged with electric positive charges it creates an electric field around it whose embedded energy per unit volume u is provided by the following formula: (Ref. 3).

$u_e = \epsilon_0 |\vec{E}|^2 / (2)$. Where \vec{E} is the electric field magnitude in the unit volume, and ϵ_0 is the vacuum permittivity and is equal to: $8.854187817 \dots \times 10^{-12}$ F/m (Farad per meter)

When a second body is charged with same amount of negative charges, it creates an electric field whose polarity is inverse to the polarity of the electric field that the first body created.

But, the embedded energy per unit volume of the electric field created by that second body is still expressed by the formula presented before for energy per unit volume in an electric field. (Ref. 3)

When both bodies are tied to an apparatus that keeps them very close to each other, (but inhibits them from being attracted completely to each other), no electric field is created around them (or a negligible electric field, because the bodies are not exactly at the same point in space).

As before, the paradox is, again, the fact that the energies also disappear, although, each charge is not "aware" of the other charge, and, thus, is supposed to create still its own electric field with its own embedded energy.

Space itself might be a form of Energy

In the separate article mentioned above, titled: "Energy Analysis of a Null Electromagnetic Wave" (that can be found at: <http://viXra.org/abs/1911.0176>), (Ref. 4) the Energy Pairs of the Null electromagnetic wave was assumed to be embedded in the photons that this wave carry.

However, since the Energy Pairs Theory was used above to explain energy conservation issues in static electric fields, and in magnetic fields generated by moving electric charges that move at a constant velocity, the question of where the Energy Pairs reside in these cases might be also asked.

In these cases, it seems that the Energy Pairs reside simply in the space volume where the two opposing fields exist. Then, this space volume actually should be equated with these Energy Pairs, which might mean that Space itself might be a form of Energy.

This might be also supported by the findings of General Relativity Theory that the cause of the Gravitation Force field around a mass is actually the distortion of the space around the mass that creates this Gravitation field. And since Gravitation field is actually a form of Energy, then Space, which causes this Gravitation field to occur by being distorted by the mass, might be a form of Energy.

Aether theory versus the claim that Space itself is a form Energy

Aether theory is a theory that claimed the existence of an elastic mass less medium, or a space-filling substance or field, which fills all the empty volumes in Nature. It was introduced initially as a means to claim that Nature is revolted or should shy away from complete

emptiness (horror vacci), by claiming that emptiness actually contains this aether medium. It was also believed that it was necessary as a transmission medium for the propagation of the electromagnetic or gravitational forces and the electromagnetic waves. (Ref. 5 and Ref. 6). The aether concept became obsolete in 1905 by Einstein's Special Relativity Theory, which stated that the speed of light is a constant value and there is no need for a transmission medium for electromagnetic waves.

Actually, the assumption (or claim) presented above in this article, that Space itself might be a form of Energy, resembles this aether theory, and seems to bring it back.

However, one should discern or distinguish between aether that was introduced as a transmission medium for the propagation of electromagnetic waves, which the Special Relativity Theory shows that such a medium is not required, and aether as a medium which is required, according to the General Relativity Theory.

Albert Einstein himself returned to the aether theory and saw it as a necessary medium that provides physical properties to his Space/Time entity. In his speech in the university of Leiden in May 5th, 1920, he explained the difference between the aether theory before the Michelson-Morley experiment (Ref. 9) and the fact that his General Relativity Theory requires an aether like medium. (Ref. 7 and Ref. 8).

Thus the assumption presented in this article, that Space itself might be a form of Energy, fits with the requirements of the General Relativity Theory, and the claim that Space itself might contain Energy Pairs.

Summary and Conclusions

This study was aimed to analyze and explain some energy conservation issues which seem to be ignored today. These energy conservation issues relate to energy conservation issues in the field of energies embedded in static electric fields and in magnetic fields generated by moving charges which move at a constant velocity.

These energy conservation issues occur when static electric fields generated by opposite polarity charges exist in the same space volume and thus seem to annihilate each other. This creates an energy conservation issue because each charge does not "know" about the existence of the other charge, and thus, still generates its own electric field, which contains energy. Thus, the annihilation of the fields annihilates also the energies embedded in the fields, which might seem as a violation of the Energy Conservation Principle.

A similar energy conservation issue occurs when magnetic fields generated by opposite polarity moving charges exist in the same space volume.

These energy conservation issues are explained by the Energy Pairs Theory whose central idea is that energies can be accumulated and stored together in a state called: "**Energy Pair**" (EP), and at the same time disable each other so that the energies *exist* but can not be detected.

The article also presents the assumption that Space itself might be a form of energy. This might be supported by the findings of General Relativity Theory that the cause of the gravitational force field around a mass is actually the distortion of the space around the mass that creates this gravitation field. And since a gravitational field is actually a form of Energy, then Space, which causes this gravitational field to occur by being distorted by the mass, might be a form of Energy.

And, because the Energy Pairs are stored and accumulated in the space volume where they exit, this might also indicate that this space volume is actually equated with these Energy Pairs, which might also imply that Space itself is a form of Energy.

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