Conversion of Vacuum-Energy into Mechanical Energy under Vacuum Conditions

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Abstract

In order to make vacuum-energy perceptible in the laboratory the author developed a theoretical approach, which he experimentally verified with a special electrostatic rotor that converts vacuum-energy into classical mechanical energy causing a rotation of the rotor. Because all former experiments had been executed under air at room pressure, there was the request on various occasions to implement the experiment into the vacuum in order to prove, that the movement of the rotor was not caused by an artefact due to the recoil of ionized gas molecules. For this purpose the setup was now realized at the absence of air, this means within a vacuum at a pressure sufficient to exclude gas discharge. It is now successfully proven that the experimental verification of conversion of vacuum-energy into mechanical energy is not an artefact caused by ionized gas molecules.

1. Preparation of the setup of two electrostatic rotors appropriate for vacuum

The first successful conversion of vacuum-energy in the laboratory was reported in [1]. The converted engine power was rather small, so that the rotation could only be observed with a bearing of very low friction supporting the rotor. In order to minimize friction a special type of hydrostatic bearing was applied with a rotor swimming on the surface of water. This type of bearing had the advantage to adjust the rotor in the optimal position below the field source by alone, because the forces between the field source and the rotor are attractive.

But this bearing is not suitable for vacuum, because water is not possible inside a vacuum chamber. Thus a further development of the electrostatic rotor had been carried out in order to replace the hydrostatic (water) bearing by a toe-bearing [2]. This bearing is vacuum compatible but it has the disadvantage of a rigidly fixed axis of rotation, which does not allow the self-adjustment mechanism of the rotor relatively to the field source. This would not be a problem as long as the rotor is driven without any metallic chamber, but the conducting walls of a metallic chamber influence the course of the electric flux lines. And it was observed that the rotor can only spin if it is adjusted perfectly with regard to the flux lines (coming from the field source). This means that the rotation inside a metallic chamber essentially needs the self-adjustment mechanism of the rotor, otherwise it would not spin. This problem occurs in the same way inside a metallic chamber filled with air as inside a metallic chamber being evacuated. Thus the toe-bearing creates enormous problems of adjustment if it is used inside a vacuum chamber.

Because of this reason it was necessary to maintain the principle of the hydrostatic bearing of the swimming rotor. This required the use of a vacuum oil with an extremely low vapour pressure. The oil "Ilmvac, LABOVAC-12S" was found to have a vapour pressure of $10^{-8}\,mbar$ and thus it was used for the experiment under vacuum conditions. Not perfectly ideal is the rather large viscosity of this oil (dynamic viscosity at 40°C of $94\,milli\,Poise$ according to manufacturer information), which is more than two orders of magnitude larger than the viscosity of water (dynamic viscosity at 40°C of $0.65\,milli\,Poise$). Thus the swimming rotor on the oil needs remarkably larger force and torque than the swimming rotor on water if it shall rotate. The consequence is, that the voltage to drive the rotor on oil has to be larger than the voltage applied to the rotor on water, and furthermore the rotor on oil goes much slower than the rotor on water. At pre-tests in air two rotors, one with a diameter of $51\,mm$ and the other one with a diameter of $58\,mm$ have been tested. The voltage necessary to achieve rotation with the rotor on oil was minimum about $8\ldots12\,kV$ in comparison to a voltage of about $1.5\ldots2\,kV$ at which the rotation of the rotor on water begins. And the angular velocity of the rotor on oil was only about one turn per 2 … 3 hours in comparison with an angular velocity of several turns per second of the rotor on water. The angular velocity of about 2 … 3 hours per one turn will be brought back to our mind in section 2 when the rotor in the vacuum is investigated.

The rotor blades have been electrically connected with each other and grounded with a copper wire of a diameter of about $60\,\mu m$. The example of the $58\,mm$ -rotor mentioned above can be seen in Fig.1.

Two types of driving forces might occur:

(a.) Attractive Coulomb-forces in connection with the conversion of vacuum-energy and
(b.) Recoil forces of ionized gas molecules,

whereas the force of (b.) is only possible at the tests with air, but the force of (a.) should occur in the tests with air as well as in the experiment inside the vacuum. Perhaps, in the case that the force of (b.) would not exist, the rotor should have the same angular velocity in air as in the vacuum (as long as the electric potential is the same). But it would not be a principle problem if the rotor spins inside the vacuum with a smaller angular velocity than in air.

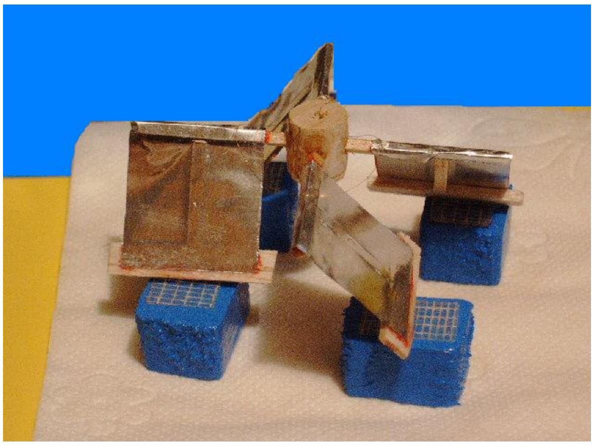

Fig. 1:
Photo of the $58mm$ - electrostatic rotor for the conversion of vacuum-energy. It consists of four rotor blades made of aluminium-foil fixed on balsa-wood with glue. The floating bodies have been covered with blue lacquer in order to avoid permeation of the oil into the balsa wood. The aluminium rotor blades are connected with a copper wire, which is fixed at the axis of rotation in the centre of the rotor and from there it goes down to the ground plate of the metallic chamber so that the rotor blades can be grounded via the chamber.

2. The experiment under the conditions of vacuum

Both rotors (the $51mm$ one as well as $58mm$ one) have been inserted into the vacuum. In Fig. 2 the $51mm$ -rotor can be seen inside a vacuum chamber of $100mm$ diameter. The field source with a diameter of $63mm$ at its bottom end (which is aligned towards the rotor) is made of aluminium. It can be seen in Fig. 3.

Fig. 2:
Electrostatic rotor in the unclosed vacuum chamber, swimming on vacuum oil. The floating body sealed with blue lacquer consists of one piece of balsa wood in this example, so that the copper wire for the electrical grounding is conducted through the middle of the floating body down to the ground of the vacuum chamber.

Fig. 3:
The field source produced of aluminium is mounted at the top flange of the vacuum chamber from where it is supplied with a high-voltage duct. The voltage applied to the field source can be arranged from $0 \ldots 30kV$.

The procedure of the experiment, at which finally the rotor rotated inside the vacuum was the following:
After the rotor was inserted into the vacuum chamber, the top flange with the field source was closed, bringing the field source into position. Then high voltage was applied (in the range of $10 \ldots 20 kV$) to test the rotation in air. At this phase of the experiment two forces driving the rotor were imaginable, the attractive Coulomb-force as well as force from the recoil of ionized gas particles. The electrostatic Coulomb-force does not produce an electric current, but forces from the recoil of ions does. At the begin of the pumping process an electric current could be measured, especially when the pressure passed the range at which according to Paschen's law ionization is to be expected rather much [3,4]. At a distance of about $19 \ldots 20 mm$ between the upper edges of the rotor blades and the field source, the Paschen-minimum of the breakthrough voltage (with $p \cdot d = 7.5 \cdot 10^{-6}\ m \cdot atm$, where $p =$ pressure and $d =$ distance of the capacitor plates) occurs at a pressure of about $p \approx 0.4 mbar$. This means, that the gas has its maximal conductivity (and ionization) in this order of magnitude of the pressure.
The high voltage supply was operating with a current limiting (for instance at $50 \mu A$), so that the voltage decreased down to $0.6 kV$ at pressure in the range of several $10 mbar$ down to few $mbar$. At this time violet streamers could be seen optically. With further decreasing pressure only few single gas discharges occurred, which were visible (as soon as the room was beclouded) by looking into the window flange of the vacuum recipient and which were recognized as short-time peaks in the measurement of the electric current. When the pressure comes down to about $10^{-3} mbar$ gas discharges did not occur any further (because the voltage was limited in an appropriate way). Finally the pressure was brought down to $6 \cdot 10^{-5} mbar$ with the rotor of Fig. 2 and to $1 \cdot 10^{-4} mbar$ with the rotor of Fig. 3, which is sufficient to exclude gas discharges optically as well as by current measurement. A check of the reliability of the detection of gas discharges was done by enhancing the voltage. Beyond a critical voltage (approximately $17 kV$ at the $58 mm$ -rotor) gas discharge began, visible clearly and easily under optical control as well as with current measurement.

Under full air pressure, the rotation was observed as usual (described above), but during the time of the electrical breakthrough and ionization, no rotation could be observed any further (the voltage was too low). Even though gas ionization occurred at this pressure very much, it did not drive the rotor. It should be mentioned that the floating bodies degassed vehemently at the beginning of the pumping procedure, so that lots of bubbles have been produced in the vacuum oil. (There have been especially many bubbles at the $58 mm$ -rotor, when the blue floating bodies have been replaced by a Styrofoam disc as floating body, because Styrofoam is not a material compatible with vacuum because of its outgassing. This material was only used in order to maximize the buoyant force of the floating body in order to minimize the friction between the floating body and the tough oil.) When degassing decreased during time, the production of bubbles decreased, coinciding with low pressure.
Nevertheless the voltage was not switched off completely during the time of gas discharge in order to maintain the self-centering mechanism of the rotor within the flux lines of the electrical field of the field source. This was necessary to avoid an adhesion of the floating bodies at the walls of the vacuum chamber due to the oil.

When the pressure decreased down to values at which gas ionization did not occur any further, the ionization current disappeared to a value smaller than the current measurable with the present amperemeter ($1 \mu A$ per each $10 kV$ high voltage), so that the voltage came back to its high value (for instance to $16 kV$ with regard to the limit of $17 kV$ mentioned above, from which a certain distance was kept).

Together with the voltage the rotation of the electrostatic rotor recurred. For example the $58 mm$ -rotor, with a voltage of $16 kV$ and a distance of about $19 \ldots 20 mm$ between the upper edges of the rotor blades and the field source produced a angular velocity of one turn per 2 … 3 hours. Please recognize these values from the pre-tests in air. But please also remember, that voltage was smaller during the pre-tests in air. This demonstrates that both forces (a.) and (b.) mentioned in section 1 occur as long as the air is present, namely the Coulomb-force in connection with conversion of vacuum-energy as well as the force from the recoil of gas ions. When the last-mentioned force was omitted due to the removal of the gas molecules, the Coulomb-force could be enhanced by enhancing the voltage (and the field strength of the electrostatic field) enough that the rotation was still observed.

This is the central proof that the conversion of vacuum-energy into classical mechanical energy with the electrostatic rotor introduced by the author really works, with no gas discharge in the presence of the rotor.

3. Future prospects

The next step has to be an optimization of the energy balance. According to the theory of the conversion of vacuum-energy, the rotor does not take up any classical electrical energy, but it produces mechanical energy, which it gets and converts from vacuum-energy. Inevitable for a real existing device are isolation losses and the losses with the measuring equipment for the measurement of the high-voltage and the electric current. Aim of the optimization of the energy balance is a minimization of the practical energy and power losses far enough, that the produced mechanical power will be larger than the consumed electrical losses due to the real existing measurement. This would be the implementation of the principle of the conversion of vacuum-energy to the technical purpose of an inexhaustible energy-source without any environmental pollution at all.

In order to plan this type of further development, the sensitivity of the measuring equipment can be planned as following: A further evidence for the attractive Coulomb-force was observed by an elevation of the rotor as soon as the high voltage was switched on. This elevation directly followed the switch of the high voltage supply. Switching on the voltage lifted the rotor of Fig. 2 by about $h = 2 \ldots 3\,mm$, switching off this voltage immediately caused the rotor sinking down back to the height before the elevation began. This was observed in air in the same way as in the vacuum. With a weight of the rotor of $m = 2.02\,grams$, the potential energy of one elevation is about $W = 40 \ldots 60\,\mu Joule$. When the process of elevation takes about $\Delta t = 1 \ldots 2\,\text{sec.}$, the power is not less than $P = W / \Delta t \geq 40\,\mu Joule / 2\,\text{sec.} = 20\,\mu Watt$ (plus the power against the viscosity of the oil). This lower estimation allows an estimation of the current measurement: $I = P/U = 20 \cdot 10^{-6} W / 20 \cdot 10^{3} V = 10^{-9} Ampere$. If this current shall be measured at least with an accuracy of 1%, the sensitivity of the amperemeter has to be at $10^{-11} Ampere$.

Cooperation:

The experiments in the vacuum have been planned, prepared and carried out together by

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