Ball Lightning

The Great Hopes and the Great Fears

I. General

The phenomenon of ball lightning still remains one of the greatest mysteries in the field of the plasma science and electromagnetism. Despite enormous contemporary advancements into the micro-world – the structure of elementary particles, nuclei, atoms, and the origin, evolution, and structure of the universe, the natural phenomenon of ball lightning, which literally appears right in front of our eyes during a storm or in electrical appliance in our houses, still remains baffling.

But why this interesting phenomenon failed to attract the serious attention of physicists? First, because nobody expects to realize any great benefit for humankind from understanding the nature of ball lightning. A common belief is that the energy of ball lightning is negligible and comes from an external source. Second, to reproduce a natural phenomenon under controlled conditions requires a clear understanding of what, exactly, the natural phenomenon is. So far, modern scientists are not clear about the nature of ball lightning. Observations, not experimentation, remain the only source of information; and these observations are based on statistical analyses of reported sightings of ball lightning by members of the general public. Yet to discover the nature of the ball lightning will require active experiments and new ideas. Here are some excerpts from a report presented on First International Symposium on Ball Lightning in Waseda University in Tokyo (1989):

- Ball lightning "is a phenomenon of qualitatively new character, similar to radioactivity discovered at the end of the previous century, that might prove to be a new, precious source of energy in the future."
- The most widely held opinion is that ball lightning is " a new and unfamiliar form of stable plasma or ionized gas."
- If scientific study of the phenomenon increases, as most participants hoped, "the results might prove quite surprising and will determine an unexpected turn in the future energy production."
- Such a realm of study would be "new, unprecedented, fantastic."

I heartily agree. My own study of ball lightning promises "fantastic" new applications of this little-understood natural phenomenon. At the end of second millennium I finally harnessed "quantum free energy". After a seemingly endless series of experiments, I reached the happy moment when the two-dimensional quantum macro-object (ball lightning) finally yielded its secret, rewarding me for my long years of love

for this concept and fidelity in seeking out its mystery. I understood its unusual quantum nature and how to excite it to produce a generous response in form of abundant free quantum energy.

Ball lightning researchers (in fact they are "ball lightning observers") were attracted mostly by the unusual energy production during the short life of natural ball lightning. Exactly what kind of energy are we talking about? In most cases, it is energy beyond human ability to reproduce with machines or current technology. Below are few cases of natural ball lightning described in "Problems of Ball Lightning" by Russian professor Boris Smirnov (Moscow, 1988):

- In one case, a fire ball of the size of a soccer ball rebounded along the surface of a street, leaving behind gouges one and half meters in diameter.
- In the city of Habarovsk, Russia, a sphere of ball lightning fell into a reservoir containing approximately 7,000 liters of water. In ten seconds the water started to boil. It boiled for approximately ten seconds. Then the sphere of ball lightning exploded. The yield of this ball lightning was the equivalent of two tons of TNT.
- A sphere of ball lightning the size of a tennis ball fell into the sleeping bag of some mountaineers, killing one and severely burning the others, in some cases tearing their flesh open to the bone.
- Numerous cases report that ball lightning has melted or evaporated several grams of metal.
- In one case, a sphere of ball lightning passed through glass 5 mm thick, leaving a pinpoint and cleanly edged opening that could have been made by a laser ray, showing extremely concentrated power.

Many similar incidents have been reported.

Sometimes large ball lightning can cause very severe destruction. Four thousand years ago, a city called Mohenjo Daro in present-day Pakistan was swept from the face of the earth. A ball shining with a blinding light exploded over the city, emitting such high energy that even the stones in the city were melted, a fact established by archaeological research. Perhaps also relevant are reports of the "burning" chariots of the ancient Greeks and Romans, the "fiery chariot" of the Old Testament prophet Elijah, the luminous "round baskets" of the American Indians, the "heavenly phantom-ships" with burning lanterns of the Japanese, and the biblical destruction of Sodom and Gomorrah by fire from heaven.

II. Tunguska meteorite

The most impressive observation of ball lightning made in contemporary times is the so-called "Tunguska meteorite" For this reason I devote to this unusual natural phenomenon special chapter. The "Tunguska meteorite" occurred in the basin of the Podkamenna River in Tunguska region (Russia) in 1908. According to witnesses, an

enormous bright ball, 400 meters in diameter, appeared in the air. The devastation was so intense that scientists have also hypothesized that it was an anti-matter body which had penetrated the earth's atmosphere, a nuclear explosion, or an enormous comet. I believe rather that it was an extremely large ball lightning sphere for the following reasons:

- First, a nuclear explosion, even assuming that such a device could have been created on earth in 1908 or sent to earth from an extraterrestrial source, can be ruled out. Isotope studies of the soil composition, inert gases, and minerals in the Tunguska region and fireball site show no elevation in the number of neutrons which would normally accompany a nuclear explosion.
- Second, no metallic traces or typical debris from meteorite were found.
- Third, a comet can also be ruled out. The heat generated when a comet entered the atmosphere should have disintegrated most of it; the melting and vaporization of the ice in the comet's head would have produced an enormous cloud of gases and vapor. Although there were significant atmospheric anomalies between 30 June and 2 July 1908, no such cloud was observed.
- Fourth, the usual reason for rejecting ball lightning as the cause of devastation is that the weather was sunny. There were no rainstorms. Although it is true that rainstorms favor the occurrence of ball lightning, it can materialize at any time given conditions necessary for complete ionization of gases in certain volume.
  And in fact, such conditions were present at Tunguska region. In 1908 the eleven-year cycle of sunspot activity coincided with the century cycle; oscillations in sunspot activity increased rapidly, reaching critical values toward the end of June 1908. This activity was accompanied by fluctuations in sunspot activity, increased brightness in the sun's corona, radio emissions in the visible band (a factor which increases the probability of air ionization), an increased number of solar flares, and the appearance of great sun spots. In general such increased sun activity manifests itself in the earth's atmosphere by intensified geomagnetic activity, the presence of abnormal optic events such as an unusual distribution of silvery clouds, bright dawns, disturbance in the atmospheric polarization, and brightly lit night skies, which started about 25 June, reached climaxes on the date of the catastrophe, and slowly passed away over next few days. These phenomena indicate that there were very favorable conditions facilitating the ionization of a large volume of gas.
- Fifth, there are many uncertainties about the trajectory of the Tunguska phenomenon. It seems that the fireball's motion included some deviations from a straight-line "fall" (or ballistic line) that would have been impossible for meteorites, comets, and other natural bodies. Ball lightning, however, can maneuver in both horizontal and vertical plans; its motion is governed by earth's gravitational field and by the electromagnetic fields in the atmosphere. Certain disturbances in the magnetic fields on earth were registered in Irkutsk (city in Siberia) following the explosion, thus supporting my hypothesis.
- Sixth, ball lightning is a spherical capacitor, carrying heavy electromagnetic loads which affect the neighboring magnetic fields. Studies of soils in the surrounding area have determined their remagnetizations. Such a phenomenon is certainly possible, given the powerful electromagnetic impulse which usually accompanies

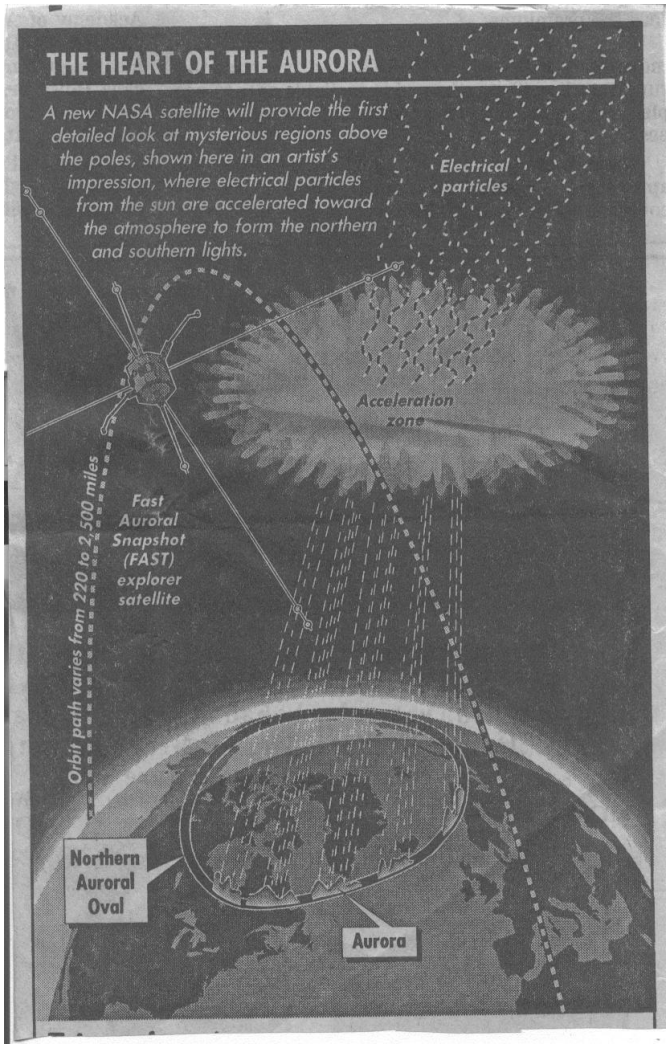
an explosion of the ball lightning sphere. Ball lightning can explode because of the leakage of electrical charges from the sphere and the resulting disintegration of its structureless nuclear component. On another hand, ball lightning could be excited by some electrical current which occurred at the moment just before explosion. We, human beings on planet earth, had incredible chance that "Tunguska meteorite" was excited not much. The explosion of the Tunguska ball lightning yielded powerful currents of charged particles moving irregularly. These charged particles created strong electromagnetic fields, which demagnetized soils in the region.

- Seventh, large ball lightning typically disintegrates into smaller spheres, which further disintegrate into still smaller spheres, until finally they explode. Fires broke out simultaneously at widely scattered areas of the forest and witnesses reported hearing many explosions. Both facts suggest that the ball lightning sphere followed the typical pattern of disintegration into smaller spheres before exploding.
- Eight, the presence of mutated trees and ants along the fireball trajectory is also consistent with the hypothesis of ball lightning. Proponents of the comet theory point out that ultraviolet radiation would penetrate the atmosphere because of a rupture through the ozone layer caused by the comet and its movement through the atmosphere or, secondarily, because of the explosion wave created by the comet's impact. Obviously, if the rupture in the ozone layer was caused by the explosion, then it could as easily have been caused by the explosion of the ball lightning as by the explosion of the comet. My research shows that ball lightning radiates all the time ultraviolet radiation. It is significant to note in this case that the pattern of mutated trees and ants covered the whole of the fireball trajectory which support my hypothesis and contradicts with the hypothesis of comet.
  Furthermore, dendrologists claim that the new forest (with high percentage of mutated trees) at the explosion's epicenter sprang from seeds that had been preserved deep in the soil. Yet ultraviolet radiation has low penetration capacity. How could deep-buried seeds mutate at such a depth? More convincingly, the ball lightning was excited by some electrical current and produced a lot of X-rays (or even gama-radiation) which have much higher penetration capacity than ultraviolet rays.
- Ninth, various hypothesis have suggested different types of explosions (thermal, apple-like, rheological); but none of these hypothesis are sufficient to explain the enormous energy generated during the Tunguska explosion. The accounts suggest an accumulation of enormous energy for very short period of time on the surface of the Tunguska phenomenon. As a result of this accumulation of energy, a monstrous explosion occurred. Indeed, this explosion closely resembles the profile of slightly excited large ball lightning.

The Tunguska Meteorite was an explosion which equaled in power to about 2000 Hiroshima atomic bombs.

III. Polar Auroras – natural quantum free energy accelerators

Most visible near the arctic and antarctic circles, and also called “aurora borealis” in the north and “aurora australis” in the south, this unusual natural phenomenon is due to the effect of quantum acceleration of the charged electrical particles coming from the sun. Because of unshielded sun’s radiation and low air pressure in the higher layers of the earth’s atmosphere, giant ball lightning can be created in this zone. Passing through the ball lightning’s electron shell, the sun’s electrically charged particles can be accelerated significantly. These showers of “free” accelerated particles ionize the air in the lower layers of the atmosphere creating curtains and streamers of violet, red and green lights writhing and scampering across the night sky. See the photocopy below.



IV. Neutron Stars – Giant Cosmic Ball Lightning

Neutron stars typically have masses of around 1-2 solar masses and diameters of approximately 10 km. Thus, they have enormous densities that are similar to those encountered in the nucleus of atom. In fact, in certain way, neutron starts are similar to giant cosmic atomic nuclei the size of a city. In this state of their substance neutron stars represent giant cosmic ball lightning.

Although most neutron stars have been discovered as radio pulsars, the vast majority of the energy emitted by neutron stars is in very high energy photons (X-rays and Gamma-rays). Typically only about 1/100,000 of their radiated energy is in form of radio waves.

Neutron stars are believed to form in supernovae such as the one that formed the Crab Nebula. The stars that eventually become neutron stars are thought to start out with about 15-30 times the mass of our sun. The basic idea is that when the central part of the star fuses its way to iron, it can't go any farther because at low pressures iron 56 has the highest binding energy per nucleon of any element, so fusion or fission of iron 56 requires an energy input. Thus, the iron core just accumulates until it gets to about 1.4 solar masses (the "Chandrasekhar mass"), at which point the electron degeneracy pressure that had been supporting it against gravity gives up the ghost and collapses inward. This theory is highly speculative one. The fact that we see a neutron star in the center of the "Supernovae" explosion doesn't mean that neutron stars are residues of explosion of dead giant stars. Neutron star is there because the giant explosion happens as a result of some extremely powerful excitement of this giant cosmic ball lightning. Neutron star's explosion equals in power to the total photon radiation of whole galaxy.

Gamma-ray bursts have been known for more than 25 years, but there are still a lot of uncertainties about their origins. The total energy of some gamma-ray bursts is equal to the total energy radiated by our sun during all time of its existence. Now it is believed that the neutron stars are those giant cosmic gamma-ray guns.

V. What is Ball Lightning

Here I would like to clarify the nature of ball lightning, a quantum macro-object (QMO) from which free energy may be extracted. Since publishing Final Quantum Revelation (*FQR*) in 1994, my understandings about this energy field have considerably evolved. In 1995 I elaborated a correct theoretical model of ball lightning, but experimentally providing the model required more than four years.

To reach an unquestionable success in the practical harnessing of any new source of energy, the researcher must completely understand the nature of this source. Combining the correct theoretical model with corresponding experimental evidence brought me success in harnessing quantum energy.

The problem of free energy production is about two decades old. It first arose in connection with the development of the "physical vacuum" theory. The main stimulus for the scientific investigation of this problem (largely theoretical and mathematical) was the problem of making nuclear energy safe.

Harnessing quantum energy for practical use will fundamentally transform the world. Cheap, safe, limitless, and easily accessible energy will elevate living standards to the point where inequalities between rich and poor will disappear. Money will lose its power to dictate human relations. Because of my faith in this vision, I have sacrificed the best years of my life, devoting them to this exhausting and ungrateful scientific research.

V.1. Quantum Boundaries of the World.

In this section, I will explain the theory of the quantum macro-object (ball lightning). See Figure V-1.

Within the area limited by the quantum boundaries, the substance is definite and predictable. Within this zone, all of the known laws of physics, including the law of gravity and law of conservation of energy, are strictly observed. Material objects are three-dimensional.

Outside of this zone, however, the physical face of the world changes drastically. The known laws of physics are replaced by the action of quantum boundaries, and three-dimensional material objects become two-dimensional quantum units. The law of energy conservation is violated beyond this zone.

Contemporary science does not acknowledge - or even suspect - the existence of two-dimensional quantum objects. This fact is a result of lack of knowledge about the existence of quantum boundaries of the world.

If gas (air, for example) is forced to ionize very quickly and completely enough so that the energy absorbed by the atomic nuclei is low, the complex of ionized atomic nuclei that results could lie outside the zone of definite existence of the substance. See Figure V-2.

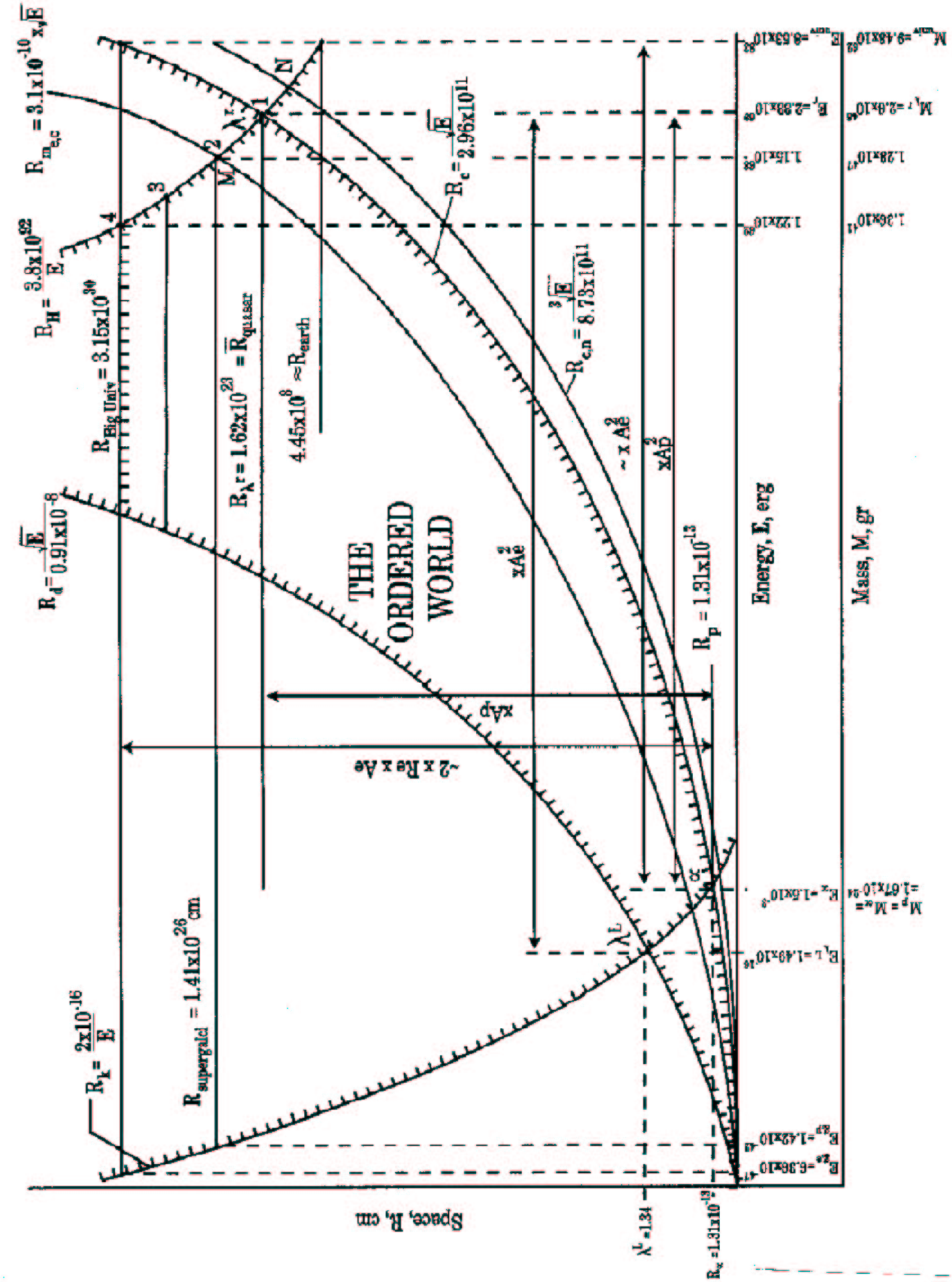


Fig. V-1.

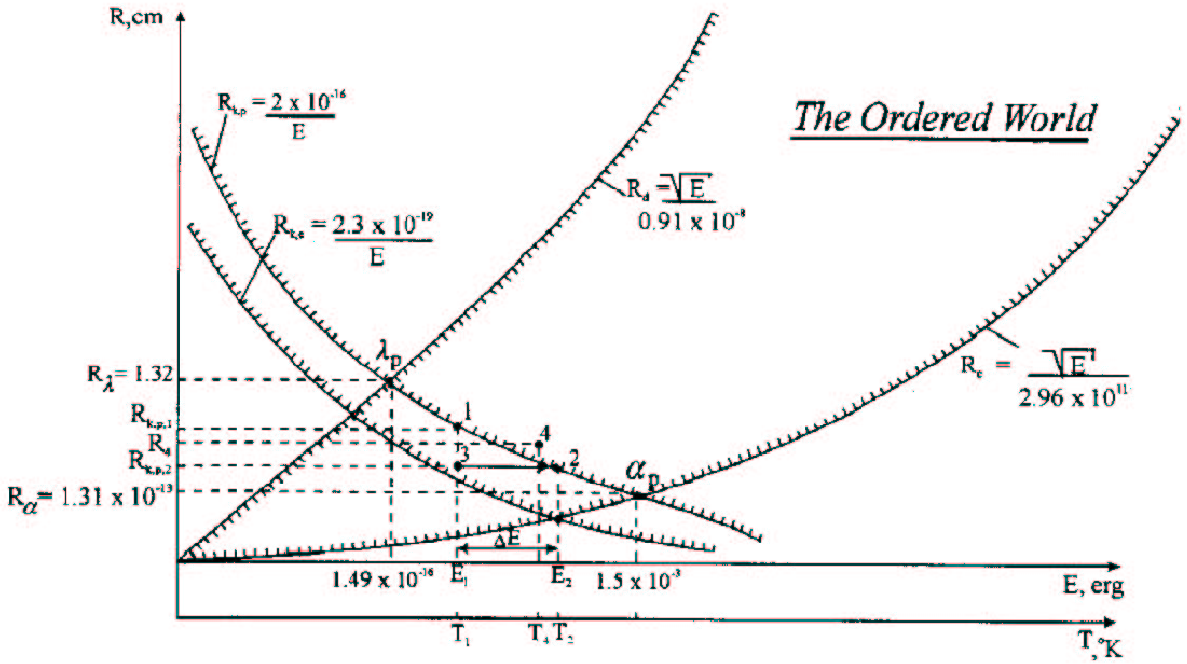


Fig. V-2.

The protonic (nucleonic) gas component can become a structureless (quantum) unit quite easily, but achieving such a state is very hard for the electronic component. This stable nuclear macro-formation is the quantum macro object. It can be observed in a rare but naturally occurring phenomenon called ball lightning.

Experiments carried out by many researchers have established with certainty that the ordinary electron-nuclear plasma which occurs in the zone limited by quantum boundaries does not generate stable plasma formations. However, my experiments conducted in the zone outside those boundaries prove the possibility of creation of stable-state formations.

The quantum nuclear component has no definite internal structure. Its individual atomic nuclei are undifferentiated. The electronic component of the plasma, however, after such accelerated ionization is transformed into regular electronic plasma composed of individual free electrons.

As discussed in the previous my publications, a quantum material object can be ONLY a closed two-dimensional formation.

The protonic (nucleon) quantum material object is “open to the outside” - Figure V-3.

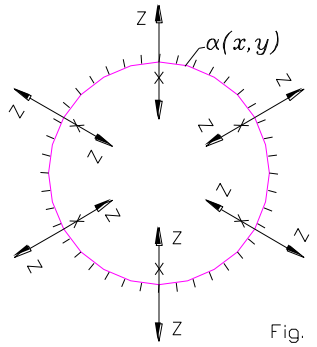


Fig. V-3.

It has a sharp boundary, or line of demarcation (surface "α"), which separates this exotic two-dimensional object from its surrounding background of space (electronic continuum). The volume closed by the quantum surface "α" has nothing to do with the quantum material object. It is amazing to observe this sharp material boundary. In my first experiments on ball lightning, I observed and investigated the quantum behavior of this strange object. See Figure V-4.

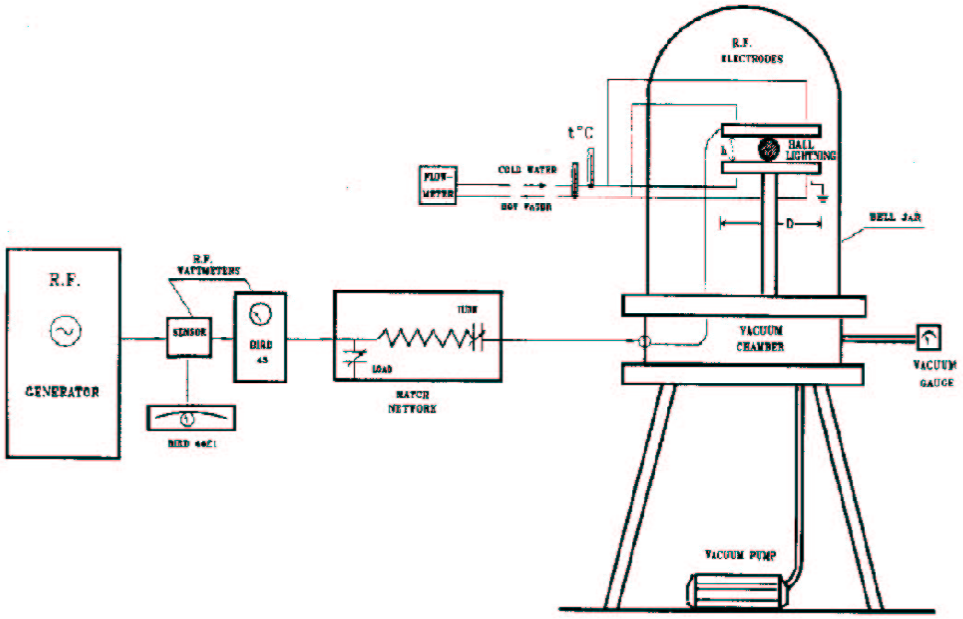


Fig. V-4.

During these experiments, I changed the distance between the electrodes (1 and 2) and I could contact (touch) the ball lightning (6) with a metal stick (5). The greater the distance between electrodes, the greater and more diffuse the ball lightning is. In this experiment, the metal stick could not pass the boundary of the ball lightning and penetrate within it. I later realized that this phenomenon was a function of the fact that, in fact, there was no "interior" to the ball lightning. The only effect was some deformations

of the shape of the ball lightning. If the distance between the electrodes is smaller or if the input power level is higher, then the ball lightning becomes denser and behaves like a solid metal ball, incapable of being deformed.

During these experiments of manipulations (deformations) on ball lightning, I discovered that the volume of the surface did not change (F_α = const), even though the volume enclosed by this surface could vary from 0 (like a popped balloon) to a maximum spherical shape. The ball lightning nucleus is "closed" to the inside. Therefore no solid or fluid object can penetrate quantum surface "α."

In this way we can understand why air currents (wind) can easily transport ball lightning. The gas molecules located in the volume enclosed by the quantum surface "α" can, however, escape from the ball lightning without hindrance in the form of macro-packets. It is probably also true that macro-packets of electromagnetic radiation can be reflected by the quantum surface of ball lightning. Radio waves, whose wavelengths (λ) are of the same range of spatial dimensions as ball lightning, are especially sensitive during contact with this macro quantum body. When ball lightning passes near a radio-receiver, it causes a crackle of static electricity.

The quantum macro-nucleus of ball lightning is a positively charged two-dimensional unit. An electron shelf (cloud) surrounds this giant nucleus. Ball lightning is thus a Giant Macro Atom! See Figure V-5.

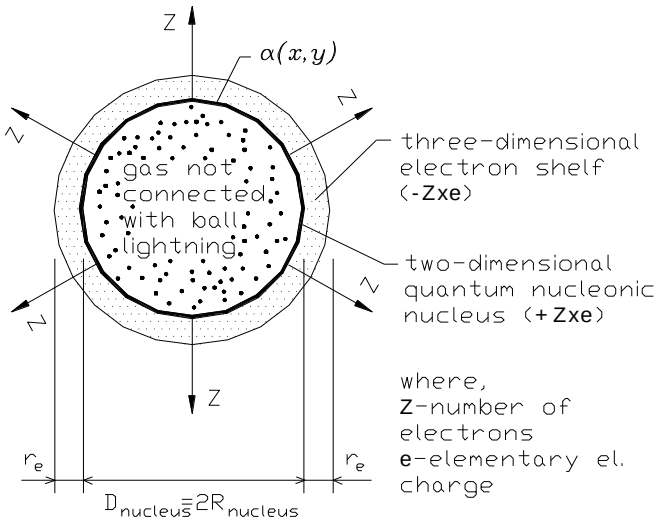


Fig. V-5.

During experimental observations on ball lightning, the macro-nucleus and electron shell are quite visible and differentiated from each another. In my experiments, conducted with a quartz container and ordinary air, the ball lightning nucleus appeared as a sharp shining spherical boundary between the orange-colored electronic shell and the volume of gas enclosed by this quantum boundary. Increasing the input power to a certain level can cause the ball lightning to become totally transparent, easy to see through. In this state, ball lightning generates a great deal of heat, but no shining plasma formations are visible within its volume. This experiment is an excellent visual illustration of the two-dimensional structure of the ball lightning nucleus.

If the ball lightning nucleus is illuminated from the exterior with a dense light beam, the quantum nucleus reflects part of this light.

The ball lightning nucleus is also impermeable to electrical current. A weak high voltage current (I used U ≈15,000 volts, I ≈ 0.01 amps) creates an arc discharge that enfolds the ball lightning nucleus. See Figure V-6.

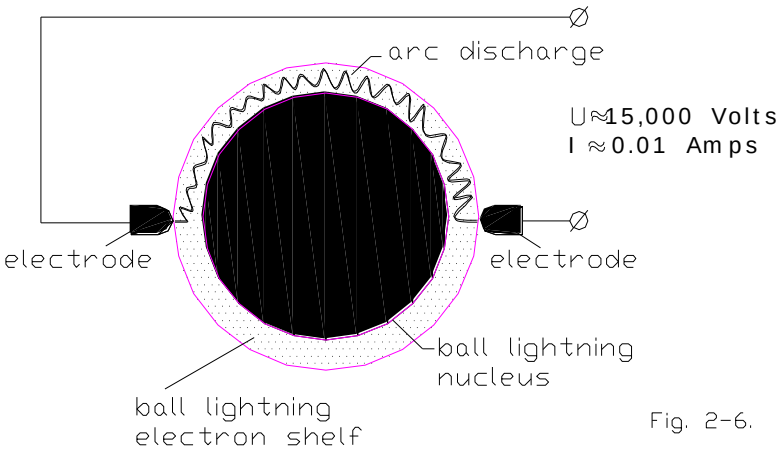


Fig. V-6.

Instead of passing through the ball lightning by the shortest way – a straight line between the two electrodes - the current "prefers" to slide over the surface of the ball lightning nucleus.

After many years working on ball lightning and related experiments, I have indisputable proofs that ball lightning represents a "Giant Macro Atom" composed of a two-dimensional quantum nucleonic nucleus and a three-dimensional electronic shelf (cloud).

The discovery of such a material object opens the gates of science to a hitherto unknown world with very stimulating features and possibilities. This discovery changes the field of physics in fundamental ways. Only the discovery of the laws of the classical mechanics by Isaac Newton can be compared in importance with the discovery of the laws of the General Quantum Mechanics.

V.4.2.Theoretical Estimations of the ball lightning electrical field

In this section, I will provide approximate calculations of the electrical features of the quantum macro- object (ball lightning). Because I have not been educated physicist, it is possible that some of these theoretical estimations are not sufficiently precise; but this possibility does not alter the fundamental conclusion. The quantum macro- object (ball lightning) possesses unusual electrical features and enormous energy possibilities.

V.4.2.1. Electron. (Figure V-7.)

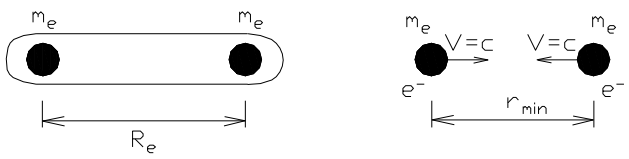


Fig. V-7.

$$E_k = E_p; \quad m_e \times c^2 = \frac{e^2}{r_{\min}} \quad \Rightarrow \quad r_{\min} = \frac{e^2}{m_e \times c^2} = R_e = ... = 2.82 \times 10^{-13}\ cm$$

V.4.2.2. Ball lightning (Figure V-8.)

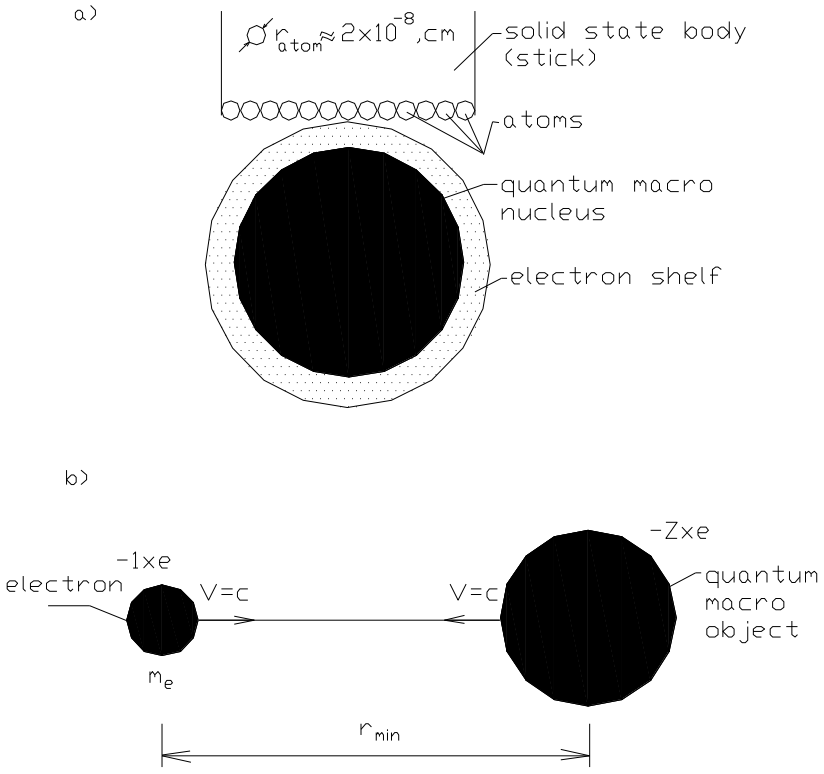


Fig. V-8.

$$E_k = E_p; \quad m_e \times c^2 = \frac{Z \times e^2}{r_{\min}} \quad \Rightarrow \quad r_{\min} = Z \times \frac{e^2}{m_e \times c^2} = Z \times R_e$$

$$\text{If} \quad Z \approx 10^{12} \quad \textit{then} \quad r_{\min} = 10^{12} \times 3 \times 10^{-13} \approx 3\, mm$$

This value of r_{min} is a provable estimation of the thickness of the electron shelf, substantiated by my observations in my experiments. See Figure V-9.

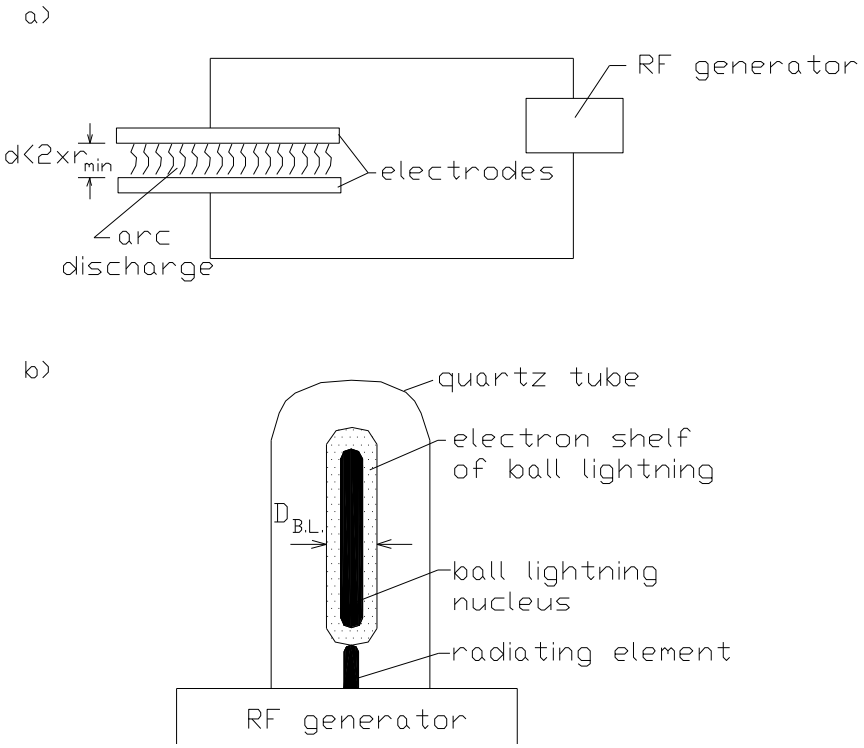


Fig. V-9.

Experiments show that ball lightning will not form if the distance between electrodes is less than the double value of r_{min} (Figure V-10,a.) The same observation is valid for the experiment illustrated in Figure V-10,b.

a) ordinary plasma

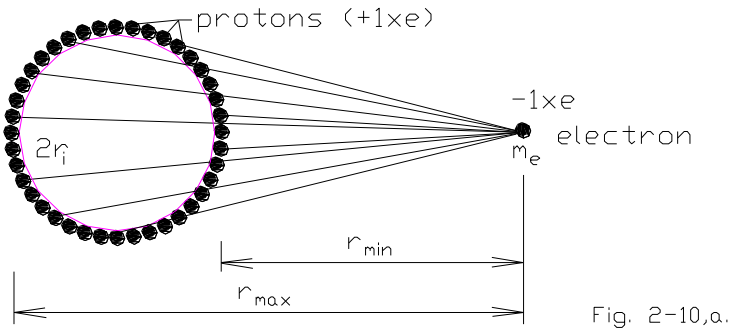


Fig. V-10,a

If $Z = 10^{12}$, $r_{\min} < r_1 < ... < r_{\max}$

$$F_{culon} = \sum_{i=1}^{10^{12}} \frac{e^2}{r_i^2}$$

Note: relatively weak electrostatic field.

b) quantum macro object

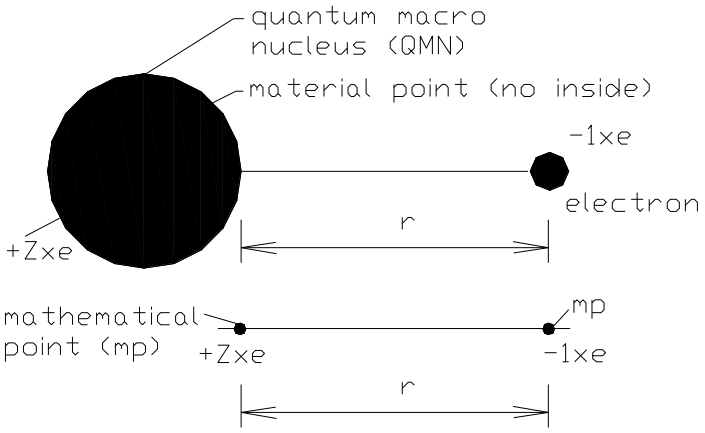


Fig. V-10,b.

Where,

r – the shortest distance

$$F_{cul} = \frac{Z \times e^2}{r}$$

The quantum macro-object is a two-dimensional materiel point, with no subparts and no internal structure. The only distance between the two points represented by the electron and the quantum macro-object is r. If r is small, F_{cul} becomes very big. In the case of quantum macro-object, the electrostatic field can become very strong. See Figure V-11.

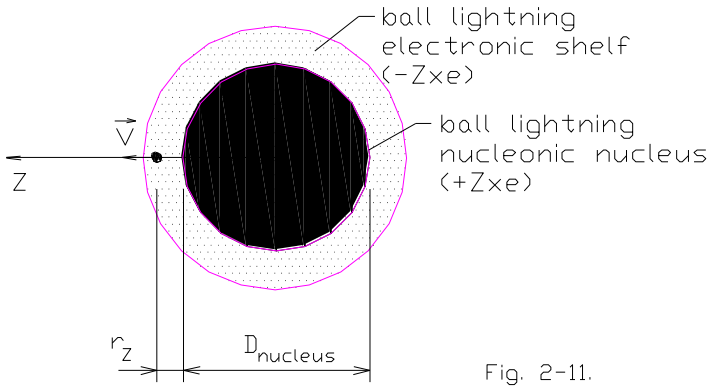


Fig. V-11.

$$E_k = E_p; \qquad \frac{m_e \times V^2}{2} = \frac{Z \times e^2}{r_Z}$$

$$If \quad Z = 10^{12} \quad and \quad r_Z \approx 10^{-8}\ cm \quad \Rightarrow$$

$$\Rightarrow \quad E_p = \frac{10^{12} \times \left(4.8 \times 10^{-10}\right)^2}{10^{-8}} = 22\ ergs = 13.5 \times 10^{12}\ eV = 13{,}500\ GeV$$

Note: the most powerful electron accelerator in the world (CERN – Geneva) will generate in year 2006 only 7,000 GeV.

Outside the electronic shell, this powerful electric field is screened by the negative electric charge of the shell.

Some observations and experiments, discussed below, prove the existence of a strong electrostatic field around the ball lightning nucleus.

a) experiment - Figure V-12.

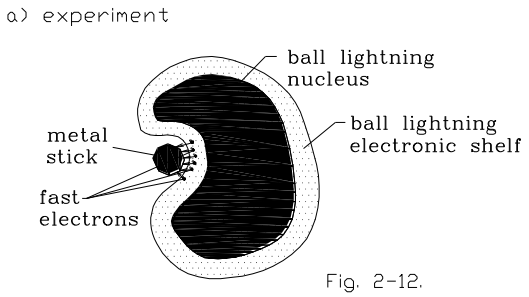


Fig. V-12.

Note: The fast electrons (characterized by very high energy) can destroy the metallic stick very quickly.

b) Observations under natural conditions - Figure V-13.

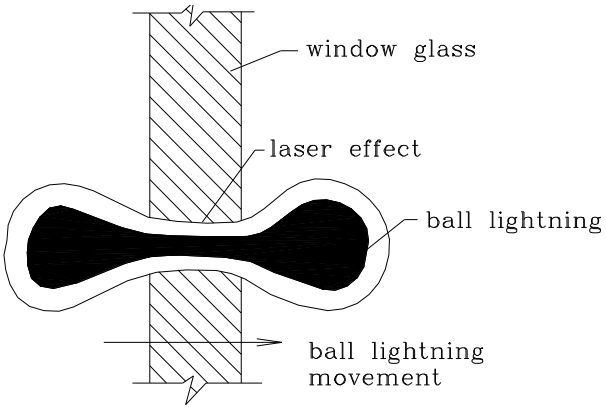


Fig. V-13.

Note: Ball lightning can cut a hole in glass without melting it.

c) Ball lightning can cause injury or death in humans in the same way that a very strong electric field can.

d) Ball lightning exerts a very strong electrical influence on electrical networks that are located nearby.

e) My experiment - Figure V-14.

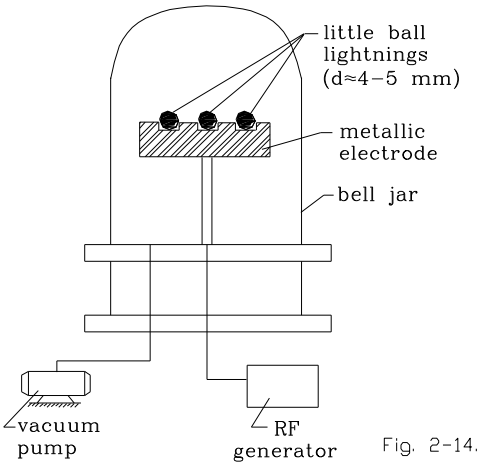


Fig. V-14.

Note: A tiny ball lightning can destroy the electrode in few seconds. It makes large holes in the electrodes but does not melt it. Only very high- energy electrons can produce such an effect.

VI. The history of ball lightning investigation

Ball lightning is a very unusual natural phenomenon, which differs too much from the known physical phenomena including regular linear lightning. Ball lightning emits visible light like heated body, and the same time it doesn't emit heat. Ball lightning doesn't "feel" earth's gravity force, its motion looks "not motivated", electro-magnetic fields have impact on its behavior. Ball lightning differs significantly from the air in which it exists: it doesn't occupy the volume, which is encompassed by its surface; it doesn't mix with air. Ball lightning surface is very clearly outlined- this surface is preserved intact during all time of ball lightning existence (sometimes several minutes). The motion of ball lightning (sometimes very fast) doesn't destroy this surface no matter how big distance it pass. Ball lightning preserves its brightness unchanged during its life. If ball lightning is composed by some electrically charged particles, then in absence of energy coming from outside ball lightning must exhaust its energy (as a result of recombination) in very short time. After disconnecting of the electrical current, the linear lightning channel cools down and disappears in few milliseconds. Ball lightning is transparent for the visible light. Ball lightning almost doesn't emit heat, but in the contact with dense substance it can cause very significant burning. Ball lightning can damage surrounding objects, or even kill humans and animals, like the effect of very strong electrical discharge. Beside visible light, ball lightning can radiate also ultraviolet light (proven fact) and possibly X-rays. Only very hot plasma formations can radiate such radiation. However, the observations show that ball lightning represents "shining cold body". If ball lightning surface is heated more than 1,000 ° *C*, than ball lightning must be

surrounded by dense hallo of water vapor – such hallo is not observed. And many more strange "inconveniences."

The reports of eyewitnesses are the main resource of knowledge about the nature of ball lightning. Below I will analyze some top-table experiments aiming to create an artificial ball lightning or something similar to it.

When I was actively working on the theoretical an experimental research on ball lightning, I came across the results of the experiments of Russian Professor Peter Kapitsa (Nobel Prize laureate). In 1950 while conducting his experiments with high-frequency powerful generator (λ = 20 cm) Kapitsa observed an extremely bright light in the form of a cord within a quartz container full of helium under pressure. He observed the luminous cord with its clearly defined shape for only about ten seconds; then the quartz container melted at some places. In 1958, Kapitsa started anew his experiments with the "free-floating plasma cord," as he called it, by applying different gases, wattages, and pressures. His intuition told him that the observed phenomenon had something in common with ball lightning; but being a strong proponent of the law of energy conservation, he did not deduce that the energy of the luminous cord might be generated by itself alone. He believed that the cord was supplied with energy by the high-frequency generator using electromagnetic waves as a guide. By studying plasma conductivity and by active and passive spectrum diagnosis, he reached a reliable conclusion, i.e. the electrons in the cord's central part possessed temperatures of millions of degrees or more. Thus, at the cord's boundary and at distance of several millimeters beyond the cord's surface proper was an incredible jump in the temperature – an increase of more than a million degrees.

At the same time, the simple plasma could not be shown to have such temperature. Furthermore, if such superheated electrons could diffuse freely into the surrounding gas medium, they would drain off hundreds of kW. But Kapitsa could not observe such a power drain and, in fact, did not think one was possible, given the law of energy conservation. Thus, he concluded that what happens to the plasma enclosed by the luminous cord was similar to what happens when the plasma is forced into a vessel with a dielectric walls, where a double electric layer is induced from which the hot electrons are reflected with no essential energy losses. Although Kapitsa's observations were correct, his conclusion was incorrect.

Analysis of high-temperature plasma in different kinds of magnetic traps show that the conductivity and convection of electrons occur at the expense of particle diffusion. Conductivity and convection are, in fact, the main channels of energy loss from the plasma electron component, provided that losses incurred by the heating of ions and their emissions are not counted. The bigger the T_{plasma} is, the higher are the losses. Thus Kapitsa's explanation of an electrons confined in the hot plasma cord fails to answer to every criticism. Naturally the hot electron component of the plasma cord would realize losses along the electron channel as a synchrotron, linear, or harassed emission. The energy losses would be recovered as a free gift from the violation of law of energy conservation.

The discovery of that phenomenon by Kapitsa remained unnoticed for long period of time. Except for his four articles, the literature contains no other records of experiments in the field. After his death in 1984, apparently no one continued his experiments. However, even these preliminary papers are important. After registering

such high “thermonuclear” temperatures in the electron component, Kapitsa decided in 1970 to attempt a directed thermonuclear synthesis (DTS). Hi did not succeed in his attempts, but the reason is understandable. The nuclear component of the deuterium-tritium mixture, when it is in form of quantum macro-object (ball lightning –giant maco-atom), is structureless. The separate atomic micro-nuclei are, in principle, indistinguishable from one another. Any interaction between them – more specifically, a nuclear synthesis – is impossible.

Yet Kapitsa’s contribution is enormously important, for he isolated experimentally a quantum macro-object (ball lightning) and studied its unusual electron component. In my opinion, his achievement was that of a great discoverer-practitioner whose discoveries provide the basis for further theory construction by others.

Few decades later, Kapitsa’s idea of thermonuclear fusion in artificially created ball lightning was revived mostly in the USA. I read at least two issued patents on this problem. Here I would like to note the work of Paul M. Koloc (USA) – *The plasmac solution – the answer for the space power and propulsion.* All these works are based on the Kapitsa’s wrong idea about possibility of thermonuclear fusion in ball lightning (or plasmac).

VII. Ball lightning – Source of Free Quantum Energy

In this section I will present an estimation of the ball lightning energy based on the concepts of the contemporary quantum mechanics. On Figure VII.1 is shown the theoretical model of ball lightning.

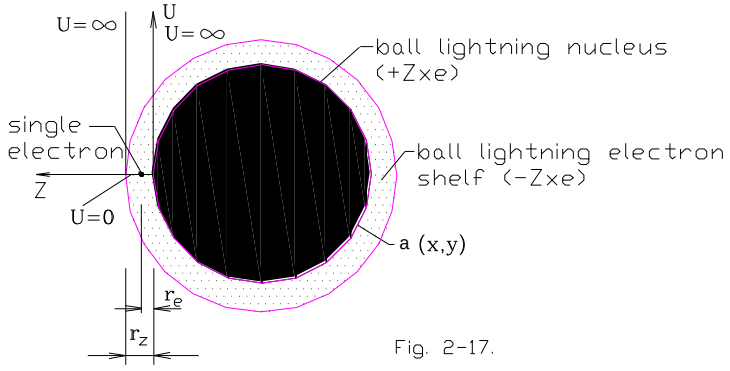


Fig. VII-1.

Shrodinger equation: $$-\frac{\tilde{h}^2}{2m}\times\Delta^2\times\Psi+u\times\Psi=i\times\tilde{h}\times\frac{\partial\Psi}{\partial t};$$

$$u=0,\quad r_e\le r_Z\le 0;\quad Z-starts\ \ from\ \alpha\ (x,y)$$

$$\frac{d^2\Psi}{dr_Z^2}+\frac{2\times m_e}{\tilde{h}^2}\times(E-U)\times\Psi=0;$$

$$\Psi(0)=\Psi(r_e)=0;\qquad \frac{d^2\Psi}{dr_Z^2}+\frac{2\times m_e}{\tilde{h}^2}\times E\times\Psi=0,\qquad if\ \ r_e\le r_Z\le 0$$

$$\omega^2=\frac{2\times m_e}{\tilde{h}^2}\times E;\quad \Psi''+\omega^2\times\Psi=0;$$

$$\Psi(r_Z)=a\times\sin(\omega\times r_Z+\alpha);\qquad \Psi(0)=a\times\sin\alpha=0;\qquad \alpha=0;$$

$$\Psi(r_Z)=a\times\sin(\omega\times r_Z)=0;\qquad \omega\times r_Z=\pm n\times\pi,\quad n=1,2,3,...$$

$$E_n=\frac{\pi^2\times\tilde{h}^2}{2\times m_e\times r_Z^2}\times n^2,\quad n=1,2,...,\frac{Z}{137},...$$

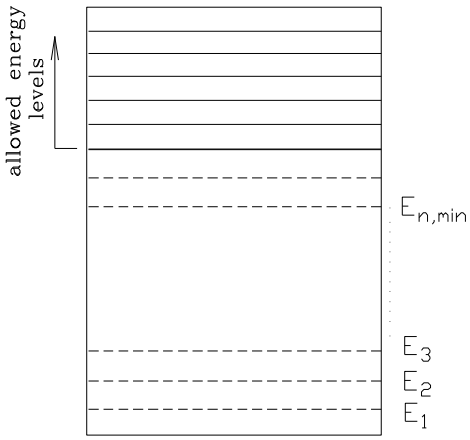
Only discrete values of energy!

$$If,\quad r_Z=r_e=0.3\,cm;\quad n\approx 10^{10}$$

$$E_n=E_{n,\min}=\frac{3.14^2\times(1.05\times10^{-27})^2}{2\times0.91\times10^{-27}}\times\frac{(10^{10})^2}{0.3^2}=0.66\times10^{-5}\ erg$$

$$E_{n,\min}=4.1\times10^6\ eV=4.1\,MeV-the\ same\ range$$

Nuclear range!



The number of electrons which can occupy the "n" energy level is:

$$\sum_{l=0}^{n-1}(2l+1)=n^2\ !$$

l,n – main quantum numbers

Where does this enormous energy come from? The correct answer is: From nowhere. This energy is a quantum gift of nature, which violates the law of energy conservation in this particular case. Such enormous energy is not available in the close environment at the moment of the birth of ball lightning.

Lets us analyze the quantum energy spectrum of a moderately dense ball lightning created in hydrogen gas. See Figure VII-2.

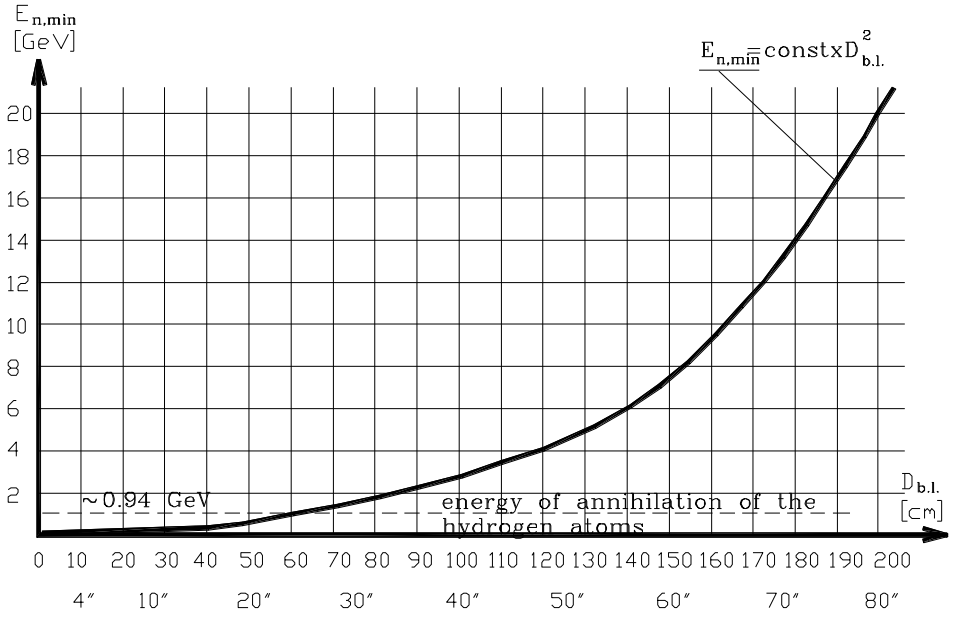


Fig. VII-2.

If we postulate that about 10^{21} atoms/cm^3 are involved in the formation of the ball lightning, then we can calculate:

$$Z = 10^{21}\ quantum\,electrons\,/\,cm^3\,; \quad E_{n,\min} = \frac{\pi^2 \times \mathrm{h}^2}{2 \times m_e \times r_e^2} \times n^2\,;$$

$$n = \frac{Z}{137} = \frac{10^{21}}{1.37 \times 10^2} \approx 10^{19}\,/\,cm^3 \quad \Rightarrow$$

$$\Rightarrow \quad E_{n,\min} = \frac{3.14^2 \times (1.05 \times 10^{-27})^2}{2 \times 0.91 \times 10^{-27} \times r_e^2} \times 10^{19} \approx \frac{6 \times 10^{-8}}{r_e^2}\ erg\,/\,cm^3\,;$$

$$r_e \le \frac{D_{b.l.}^{1/2}}{5} \quad (1)$$

Where,

$D_{b.l.}$ – ball lightning diameter

Note: The correlation (1) is based on observations made during my experiments.

$$E_{n,\min} \approx \frac{6\times10^{-8}}{\left(\frac{D_{b.l.}^{1/2}}{5}\right)^2} \times \frac{\pi \times D_{b.l.}^3}{\underset{=V_{b.l.}}{6}} \approx 0.8\times10^{-6} \times D_{b.l.}^2$$

According to the "principle of economy" ball lightning electrons must occupy the lowest energy levels: $E_{n,\min} \rightarrow ... \rightarrow E_{n,\max}$. If the quantum electron somehow radiates energy, then this energy can be only its full quantum energy, because quantum energy cannot be divided in smaller parts. After this energy radiation, the quantum energy of the electron is restored (from nowhere) instantaneously.

$$\lambda_{\min} = \frac{h\times c}{E_{n,\max}}; \quad \lambda_{\max} = \frac{h\times c}{E_{n,\min}};$$

The energy spectrum of the radiating photons is discontinuous. See Fig. VII-3.

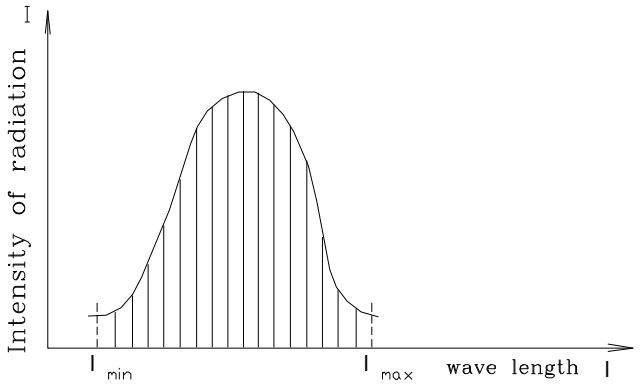


Fig. VII-3.

The critical practical question is: HOW SHOULD WE USE QUANTUM ENERGY? After about fourteen years of hard work on ball lightning I have found a way to extract, harness, and channel this colossal quantum energy.

Free energy from ball lightning is produced as a result of violation of Law of Energy Conservation in some particular quantum conditions.

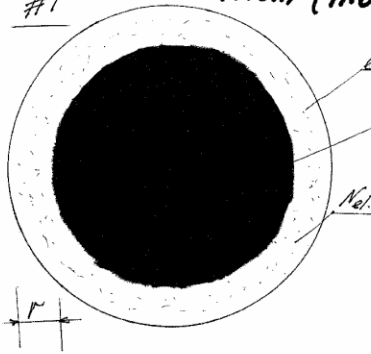
We know that every natural law in manifests stability of some relations between material bodies affected by this law. All natural laws have limits of their application – out of these limits these laws are not valid. In parallel with natural laws in the universe there

exist some world quantum constants, quantum objects and their quantum values of the parameters, fundamental principles of behavior of the different forms of Reality, fundamental symmetries, and quantum principles. This complex of quantum items and principles represents the *Constitution of the World.* As we know, the natural laws could be violated or surrounded in some special conditions. Constitution, however, is something, which is absolutely untouchable – not one of its items can be violated in any possible conditions. As we know from my previous publications, there are no principle obstacles for violation of the Law of Energy Conservation in special quantum conditions. Energy, out of connection with some concrete material carrier, has no individual "face" (amount of space-time characteristics). Only general potential property of the *energy* is its ability to activate (energize) material objects. If in some special conditions there exist some quantum obstacles, which are in conflict with the requirements of the Law of Energy Conservation, then *Mother Nature* can sacrifice this major physical law.

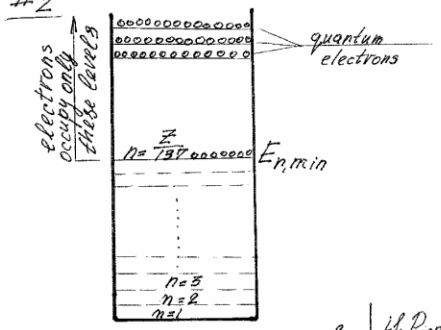
If an electrical current is applied to the ball lightning (two electrodes touching the surface of the ball lightning electron shell), then the path of this current cannot go directly through the ball lightning quantum nucleus (the shortest distance between two electrodes). The ball lightning nucleus is impenetrable not only for macro-material objects, but also for an electrical current. In this case the only possible path of the applied electrical current is around the ball lightning nucleus in the zone of the ball lightning electron shell. Been a material carriers of the electrical current, the rotating (in circle around the ball lightning nucleus) electrons must radiate photons – the so-called "synchrotron radiation." Because of the action of the fundamental Principle of Economy, first in the game (electrical current) are involved the "free electrons" (electrons not connected with ball lightning), which are located in the zone of the ball lightning electron shell. Mother Nature is trying to minimize the effect of the violation of the Law of Energy Conservation. Because the energy of the "free electrons" is relatively low (depends on the applied voltage), we don't see any significant flow of synchrotron radiation for small "excitement" currents. If higher electrical current is applied, then some of low energy level "quantum electrons (electrons connected with ball lightning) start to be involved in the game ("free electrons" are not enough in amount to carry the whole electrical current) – ball lightning starts to shine very intensively. If increase the "excitement current" (more Amps), the quantum free energy synchrotron radiation becomes more and more intense. Quantum electrons can radiate only they whole quantum energy they have, not just portion of this energy. Potential energy of quantum electrons is negative, but the kinetic energy of the quantum free energy photons is always positive. For strong electrical current of excitement, in the "quantum free energy" game can be involved quantum electrons from the inner electron layers which have extremely high energy. These electrons can radiate X-rays, Gamma-rays, and much more. This is in brief the explanation of the "quantum Free Energy Radiation." See Figure VII-4.

METHOD OF GENERATING QUANTUM ENERGY

#1 Giant Atom (model)



#2



$E_{el} \geq E_{n,min} = 3.18 \times 10^{-31} \times \frac{Z^2}{r^2}$

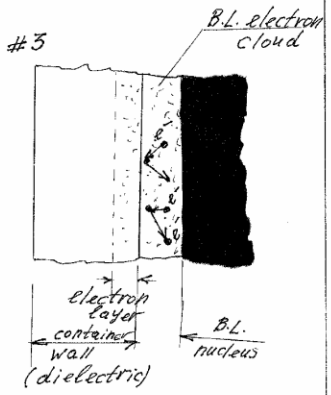
if $Z = 10^{12}$, $r \simeq 0.3$ cm,

$E_{n,min} \simeq 2$ MeV !!!

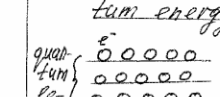
if $P_{input} \simeq 20$ KW

$E_{n,min} \simeq 20$ MeV!

#3



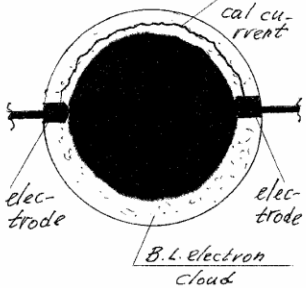
#4 How to use this huge quantum energy?

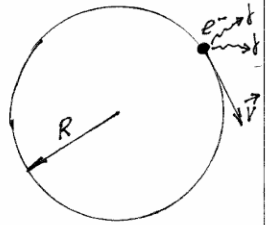


Note: On quatum energy levels the electrons do not radiate energy!!!

Not excited Ball lightning doesn't radiate energy!

#5 excitment of the ball lightning





every single electron "e-" in the B.L. electron cloud has two faces (two states):

#1: quantum electron with energy $E_n \geq 2$ MeV

#2: electrical current carrier

Note: electrons are moving only on circular orbits (as a electrical current carriers). The zone of the B.L. nucleus is forbiden for them. Electrons can't move on straight lines!

On circular orbits electrons radiate it's quantum energy!

Betatron radiation (?).

$E_{rad} = K \times \frac{E_n}{R}$

Due to the very high energy of the quantum energy the electrodes are destroyed very fast.

Better is to use pulse electromagnets (electrodeless method):

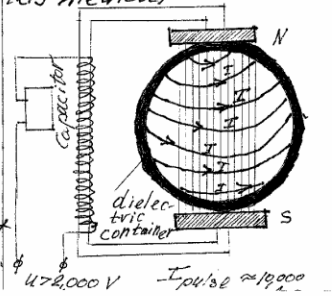


Fig. IV-18.

The quantum macro-object is new, unlimited, safe, and very cheap source of energy. I invite the reader to calculate the colossal amount of energy that the quantum electrons from the electron shell in a large and dense ball lightning would posses. The answer is that this quantum free energy has no limit. Quantum free energy accelerators could accelerate the electrons to energy comparable with the energy of the very energetic cosmic rays ($E \approx 10^{12}$ eV, and more).

Such energy levels are unthinkable for conventional electron accelerators. Future quantum electron (and photon) accelerators are small in size, very cheap, and unlimited in the energy they can produce.

Is it possible to use ball lightning as a laser gun? Perhaps, but this concept currently lacks experimental data. See Figure VII-5.

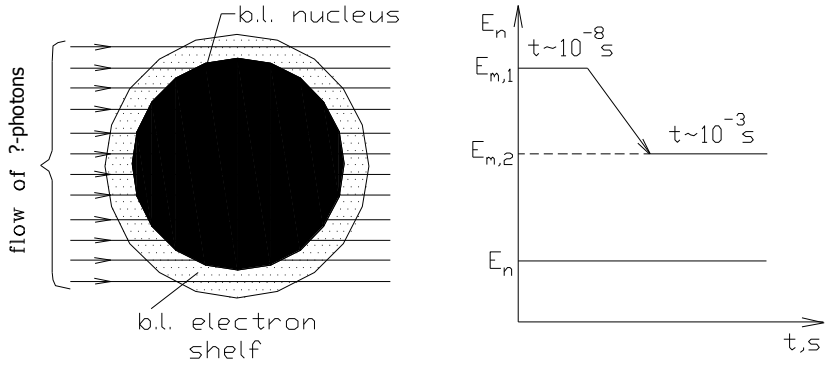


Fig. VII-5.

$E_n \rightarrow E_{m,1}$, pumping of energy in ball lightning
$E_{m,2}$ – metastable state, $t \approx 10^{-3}$
$E_{m,2} \rightarrow E_n$, shot of γ -photons

This quantum device can be called: Quaser (Quaser = Quantum Amplification by Stimulated Emission of Radiation).

Quantum energy could be used also as a very bright source of high-energy photons for conventional lasers, for biological and chemical research, for nano-technologies in semiconductor industry, etc.

The quantum macro-object is an unusual material object. The quantum surface of this two-dimensional material body has no differentiated points or areas. In other words, touching one spot of the quantum surface means touching the whole surface, as my experiments prove. The quantum macro -nucleus of ball lightning is a closed two-dimensional material formation, which can be deformed in the third spatial dimension Z without changing the volume of its surface (F_α = const).

It is impossible to create ball lightning that is confined between two closed surfaces like ordinary plasma. See Figure V-6.

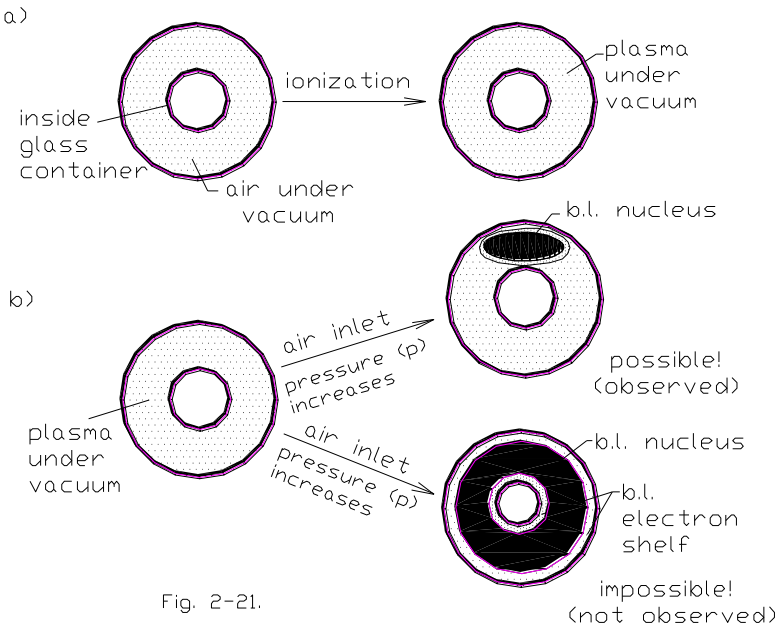


Fig. VII-6.

The quantum surface "α" of ball lightning is a boundary between the World and the Anti-world. The World is built up of matter. The Anti-world is built up of anti-matter. See Figure VII-7.

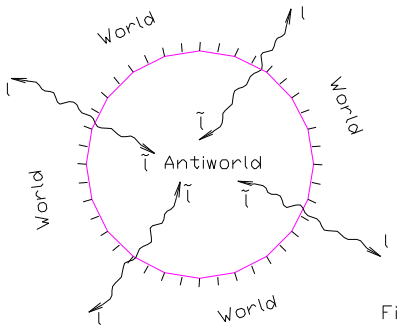


Fig. VII-7.

Every material object during its existence describes a line: l (matter), $\tilde{l}$ (anti-matter). See Figure VII-8.

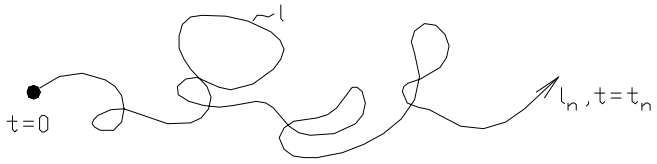


Fig. VII-8.

The quantum surface "α" is like a mirror in which every particle can see its anti-particle counterpart. See Figure VII-9.

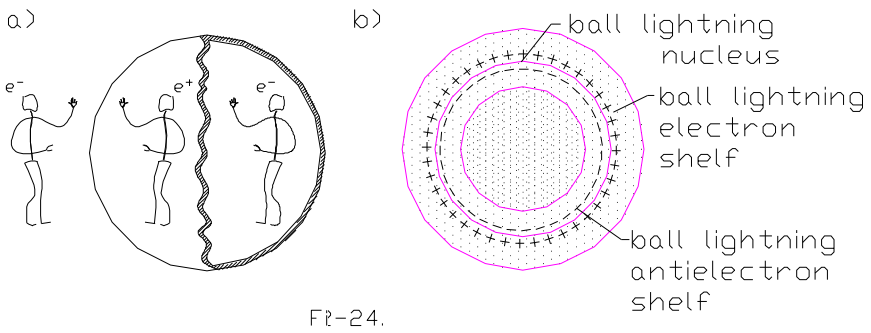


Fig. VII-9.

Anti-electrons (positrons) from the anti-electron shelf are real. The volume *V* enclosed by quantum surface "α" contains gas particles, which are not associated – and hence no exchange of energy - with ball lightning. The anti-electrons are not located on the ball lightning quantum surface. They exist only in the anti-world that is "seen" in the quantum mirror "α." Of course, they are not in contact with gas particles from the volume *V*. And so on. The anti-world "seen" in quantum mirror "α" (the surface of the ball lightning nucleus) is not a virtual anti-reality but it is a real and actual anti-reality.

The discovery of the quantum macro-object will have an enormous impact, not only on science, but also on technology. Here are some, among other, practical applications of the quantum macro-object:

- Providing unlimited, safe, and cheap energy
- Making practical very powerful elementary particles accelerators
- Providing direct rocket propulsion (photon rockets)
- Enabling the production of very powerful weapons for mass destruction (photonic bombs).

VIII. Ball Lightning – theoretical model

Ball lightning represents a giant macro-atom. Being an atom, ball lightning must build its structure in observing all rules valid for the ordinary micro-atom plus other rules, which are typical only for macro-quantum systems. I spent a lot of time and effort on the elaboration of a correct model of ball lightning, but I am still not satisfied with the models, which I have at hand now. It is really very hard work to arrange about 10^{20} electrons (middle size ball lightning) in a workable combination following all known (by myself at the present moment) rules of quantum coexistence of such a large number of electrons and nucleons.

In my experiments I create ball lightning in closed quartz chamber. Ball lightning touches the walls of the quartz chamber with its electron shell. See Figure VIII-1.

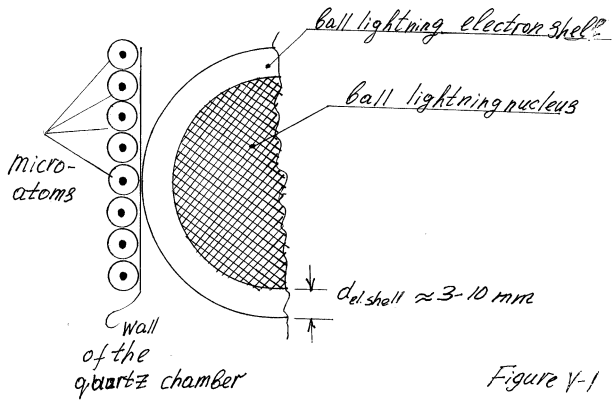


Fig. VIII-1.

For input microwave power 2-3 KW and diameter of the quartz chamber about 4" (~ 10 cm), the visible thickness of the ball lightning electron shell varies between 3 and 10 mm. For the same input power (2-3 KW) it was possible to create ball lightings of different sizes (1" → to 6") depending on the diameter of the quartz chamber. Smaller ball lightings are much brighter and have less thickness of the electron shell. Hence, for the same value of *z* (number of the electrons) the thickness of the electron shell can vary between 3 and 10 mm (in my experiments).

Having in mind this preliminary experimental information and following all rules of construction of atoms, let's try to create some possible (real) model of the ball lightning electron shell. Obviously the most important rule in this construction is Pauli's Exclusion Principle. On Figure VIII-2 is presented a graphic model of the ball lightning electron shell.

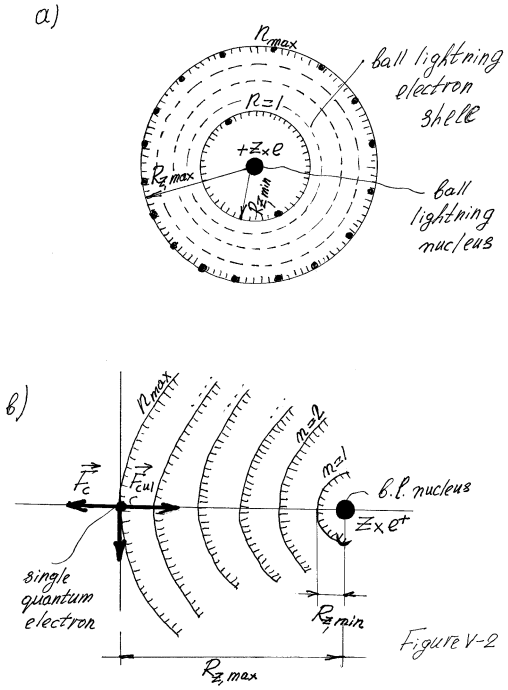


Fig.VIII-2.

In the balance of forces acting on a single electron, the electromagnetic influence of other electrons (belonging to the electron shell) can be neglected for this influence is in comparison too weak with the electromagnetic influence of the ball lightning nucleus.

On another hand, we must take in consideration the "screening" effect of all inner individual electron shells. A very important task is to determine the limits of the total ball lightning's electron shell. Ball lightning's total electron shell is like an onion's shell, which is composed by multi-concentric peels surrounding the central dense kern. The individual quantum peels (electron shells) in ball lightning, however, have no thickness.

Apparently the electrons belonging to the outer quantum electron shell are "optic" electrons (E_{ion} ~10 eV) for they emit "light" photons. In the environment of existing of ball lightning (high temperature) thermal quantum electrons cannot be detained by the ball lightning's nucleus.

$$N_{el,i}=2 \text{ x } n_i^2, \quad i=1,2,3,\ldots$$

Where,

$N_{el,i}$ – max number of quantum electrons on the quantum level n_i.

$$Z = \sum_{i=1}^{n_{\max}} N_{el,i}$$

Where,

Z – total number of the quantum electrons.

$$n_{\max}^2 \; \langle \; \frac{Z}{2} \; \langle \; n_{\max}^3 \text{, obvious disparity.}$$

$$\frac{Z}{2} \approx n_{\max}^{2\ 1/2}; \quad n_{\max} \approx \left(\frac{Z}{2}\right)^{5/2}$$

$$\text{For } Z=2 \text{ x } 10^{18}, \quad n_{\max} = \left(\frac{2\times 10^{18}}{2}\right)^{2/5} \approx 10^7$$

Every main quantum level "n" is composed by "l" sub-levels. See Figure VIII-3.

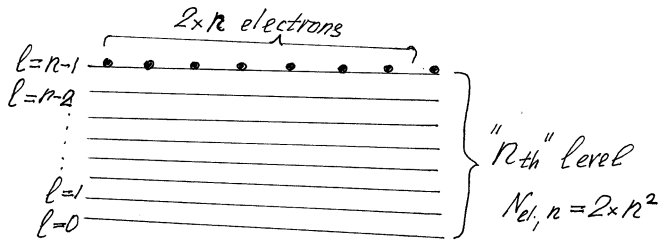


Fig. VIII-3.

Presumably on the outer sub-quantum level "*l = n-1*" are located *2* x *n* electrons. In the considered case here ($Z = 10^{18}$) the number of the electrons belonging to the external (outer) quantum sub-level is equal to: $N_{n_{\max},l_{\max}} = 2 \times n_{\max} = 2 \times 10^7$ electrons. However, because of the "screening" effect, the resulting positive electrical charge acting on this sub-level is: $e_{b.l.nucleus} = 2 \times n_{\max} = 2 \times 10^7 \times e^+$.

Hence,

$$\left|\vec{F}_c\right| = \left|\vec{F}_{cul}\right| \quad \rightarrow \quad \frac{m_e \times V^2}{R_{z,\max}} = \frac{2 \times n_{\max} \times e^2}{R_{z,\max}^2} \quad \Rightarrow \quad R_{z.\max} = \frac{2 \times n_{\max} \times e^2}{m_e \times V^2}$$

$$E_{kin,e} = \frac{m_e \times V^2}{2} \quad \rightarrow \quad V^2 = \frac{2 \times E_{kin,e}}{m_e}; \qquad E_{kin,e} \approx 10\ eV = 1.6 \times 10^{-11},\ erg \quad \Rightarrow$$

$$V^2 = \frac{2 \times (1.6 \times 10^{-11})}{0.91 \times 10^{-27}} = 2.2 \times 10^{16} \quad \rightarrow \quad V = 1.48 \times 10^8\ cm/s$$

Hence,

$$R_{z,\max} = \frac{2 \times 10^7 \times (4.8 \times 10^{-10})^2}{0.91 \times 10^{-27} \times 2.2 \times 10^{16}} = 2.3\ mm$$

The above-calculated value of $R_{z,max}$ is a real estimation for the thickness of the total electron shell for well "packed" ball lightning.

Let's estimate now the limit of the inner (first quantum level, $n = 1$) quantum electron shell. The two inner quantum electrons are under the fierce electro-magnetic influence of the "non-screened" ball lightning nucleus. ($e_{nucleus} = Z$ x e^+). Unlike the first (closest to the nucleus) electrons in micro-atoms, the first electrons in the ball lightning atom have an enormous acceleration. If we replace the electrical charge "*e*" by reciprocal gravity mass "M_e" we have:

$$a_{e,1} = \frac{G \times Z \times M_e}{R_{Z,\min}^2},$$

$$M_e = \frac{e}{\sqrt{G}} = 1.86 \times 10^{-6},\ g$$

Where,

$a_{e,1}$ - the acceleration of the electrons belonging to the first quantum electron level.

$$a_{e,1} \le a_{\max},$$

Where,

a_{max} – maximum quantum energy.

$$a_{\max} = \frac{c^2}{R_e} = \frac{(3\times10^{10})^2}{2.82\times10^{-13}} \approx 3\times10^{33},\ cm/\sec$$

Hence,

$$a_{e,1} = \frac{G\times Z\times M_e}{R_{Z,\min}^2} \le a_{\max} = 3\times10^{33}$$

$$R_{Z,\min}^2 \ge \frac{G\times Z\times M_e}{a_{\max}} \quad \rightarrow$$

$$\rightarrow \quad R_{Z,\min} \ge \sqrt{\frac{G\times Z\times M_e}{a_{\max}}} = \sqrt{\frac{6.67\times10^{-8}\times10^{18}\times1.86\times10^{-6}}{3\times10^{33}}} = \sqrt{4.14\times10^{-29}} = 0.64\times10^{-14},\ cm$$

$$R_{Z,\min} \ge 0.64\times10^{-14},\ cm$$

The minimum quantum spatial dimension in the universe is: R_e = 2.82 x 10^{-13} cm.
Hence, $R_{Z,min} \ge R_e$ = 2.82 x 10^{-13} cm!

The kinetic energy of the "first" electrons is equal to:

$$E_{e,1} = \frac{1}{2}\times\frac{Z\times e^2}{R_e} = \frac{1}{2}\times\frac{10^{18}\times(4.8\times10^{-10})^2}{2.82\times10^{-13}} = 0.41\times10^{11},\ erg = 2.54\times10^{22},\ eV$$

Tremendous energy comparable only with the energy of the most energetic cosmic rays!

It is also possible, however, that other quantum limitations are "pushing" $R_{Z,min}$ to higher values. For example,

$$R_{Z,\min} \ge \lambda\!\!\!^{-}_e = \frac{\hbar_p}{m_e\times c} = 3.86\times10^{-11},\ cm$$

$$E_{e,1} = \frac{1}{2}\times\frac{Z\times e^2}{\lambda\!\!\!^{-}_e} = \frac{1}{2}\times\frac{10^{18}\times(4.8\times10^{-10})^2}{3.86\times10^{-11}} = 0.3\times10^{10},\ erg = 1.9\times10^{21},\ eV$$

Huge energy!

For the considered here case ($Z = 10^{18}$) we have:

$$0.23 \text{ cm} \le R_{Z,1} \le 3.86 \text{ x } 10^{-11} \text{ cm}, \quad n = 10^7$$

How big can the space intervals separating two neighboring quantum levels be? What rules must we follow to determinate these space intervals between two neighboring quantum levels?

$$3.86 \text{ x } 10^{-11} \text{ x } n = 3.86 \text{ x } 10^{-11} \text{ x } 10^7 \approx 4 \text{ x } 10^{-4}, \text{ cm} \ll 0.23, \text{ cm}$$

Or,

$$\frac{0.23\,cm}{n} = \frac{0.23}{10^7} = 2.3\times10^{-8},\, cm \rangle\rangle\, 3.86\times10^{-11},\, cm$$

For $R_{Z,min}$=2.3 x 10^{-8}, cm, we have:

$$E_{e,1} = \frac{Z\times e^2}{R_{e,\min}} = \frac{1}{2}\times\frac{10^{18}\times(4.8\times10^{-10})^2}{2.82\times10^{-8}} = 0.4\times10^7,\, erg \approx 2.5\times10^{18},\, eV$$

This energy is the minimum possible energy for the first electron shell.

The most stable state of the Giant Atom – Ball Lightning is the case when electrons occupy the lowest allowed energy levels. In this state "first electrons" (closest to the atomic nucleus) are "relativistic" electrons. See Figure VIII-4.

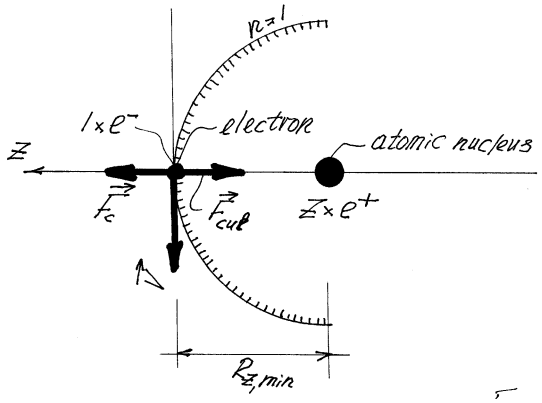


Fig. VIII-4.

$$\vec{F}_c - \vec{F}_{cul} = 0; \qquad \frac{m_{e,0}\times V^2}{\sqrt{1-V^2/c^2}}\times\frac{1}{R_{Z,\min}} = \frac{Z\times e^2}{R_{Z,\min}^2}$$

$$\frac{m_{e,0}\times V^2}{\sqrt{1-V^2/c^2}}=\frac{Z\times e^2}{R_{Z,\min}};$$

$$c^2-V^2=u;\quad V\approx c;$$

$$\frac{m_{e,0}\times V^2\times c}{u}=\frac{Z\times e^2}{R_{Z,\min}};\qquad \frac{m_{e,0}\times c^3}{u}=\frac{Z\times e^2}{R_{Z,\min}}\qquad\Rightarrow\qquad R_{Z,\min}=\frac{Z\times e^2}{m_{e,0}\times c^3}\times u$$

For the considered case ($Z = 10^{18}$) we have:

$$R_{Z,\min}=\frac{10^{18}\times(4.8\times10^{-10})^2}{0.91\times10^{-27}\times(3\times10^{10})^3}\times u=0.94\times10^{-5}\times u$$

$$u \geq V_{min} = 1.47 \text{ x } 10^{-11}, \text{ cm/sec}$$

Where,

V_{min} – minimum quantum velocity in the universe.

For $u = V_{min}$, we have:

$$\min (R_{Z,min}) = 0.94 \text{ x } 10^{-5} \text{ x } 1.47 \text{ x } 10^{-11} = 1.38 \text{ x } 10^{-16}, \text{ cm.}$$

"$R_{Z,min}$" must be bigger than $\lambda\!\!\!^{-}_{e} = 3.86\times10^{-11}$, cm.

$$u\,(R_{Z,\min}=\lambda\!\!\!^{-}_{e})=\frac{3.86\times10^{-11}}{0.94\times10^{-5}}\approx4\times10^{-6},\ cm/\sec\rangle V_{\min}=1.47\times10^{-11},\ cm/\sec$$

So, ball lightning (in the considered case) starts to build its electron shell structure from $R_{Z,min} = \lambda\!\!\!^{-}_{e}$!

The gravity mass of the "first" electron is equal to:

$$m_{e,1}=\frac{m_{e,0}}{\sqrt{1-V^2/c^2}}=\frac{m_{e,0}\times c}{u}=\frac{0.91\times10^{-27}\times3\times10^{10}}{4\times10^{-6}}=0.68\times10^{-11},\ g$$

Too big mass!

The gravity mass of the atomic nucleus is equal to:

$$M_{nucleus} \approx 1.7 \text{ x } 10^{-24} \text{ x } 10^{18} \approx 2 \text{ x } 10^{-6}, \text{ g}$$

The value of the potential energy for the "first" electron is equal to:

$$E_{p,1} = \frac{Z \times e^2}{R_{Z,\min}} = \frac{10^{18} \times (4.8 \times 10^{-10})^2}{3.86 \times 10^{-11}} = 0.6 \times 10^{10}, \; erg \; !!!$$

Tremendous energy!

Location of the "first" electrons is governed also by the lower quantum boundaries $R_{k,e}$ and $R_{c,e}$. See Figure VIII-5.

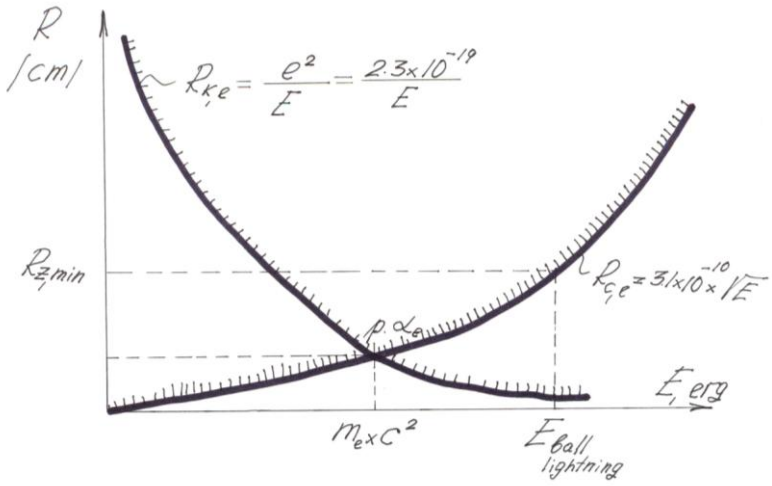


Fig. VIII-5.

Stability of the first quantum electrons is determined by the balance of two forces. See Figure VIII-6.

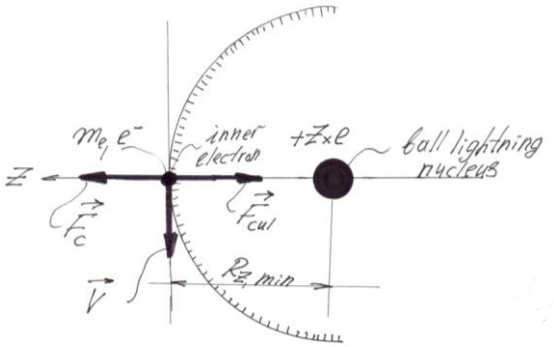


Fig. VIII-6.

Stability

$$\left|\vec{F}_c\right| = \left|\vec{F}_{cul}\right| \quad \rightarrow \quad \frac{m_e \times V^2}{R_{Z,\min}} = \frac{Z \times e^2}{R_{Z.\min}^2};$$

$$R_{Z,\min} \geq \frac{Z \times e^2}{m_e \times V^2}; \qquad V \approx c; \qquad R_{Z,\min} \geq \frac{Z \times e^2}{m_e \times c^2} = Z \times R_e \,!$$

On another hand:

$$R_{Z,\min} \geq R_{c,e} = 3.1 \times 10^{-10} \times E^{1/2};$$

$$E = \frac{Z \times e^2}{R_{Z,mun}};$$

$$R_{Z,\min} \geq 3.1 \times 10^{-10} \times \sqrt{\frac{Z \times e^2}{R_{Z,\min}}};$$

$$R_{Z,\min}^{3/2} \geq 3.1 \times 10^{-10} \times 4.8 \times 10^{-10} \times \sqrt{Z} = 1488 \times 10^{-20} \times Z^{1/2};$$

$$R_{Z,\min}^3 = 221.4 \times 10^{-40} \times Z = 22.14 \times 10^{-39} \times Z;$$

$$R_{Z,\min} \geq 2.82 \times 10^{-13} \times Z^{1/3} = R_e \times Z^{1/3};$$

Energy

$$E_{\max} \leq \frac{Z \times e^2}{R_{Z,\max}} = \frac{Z \times e^2}{R_e \times Z^{1/3}} = Z^{2/3} \times \frac{e^2}{R_e} = Z^{2/3} \times \frac{(4.8 \times 10^{-10})^2}{2.82 \times 10^{-13}} = Z^{2/3} \times 0.81 \times 10^{-6}, erg;$$

For $Z = 10^{21}; \quad (10^{21})^{2/3} = 10^{14}; \quad E_{\max} = 10^{14} \times 10^{-6} \approx 10^8, erg \approx 10^{20}, eV$!

It is also possible that other quantum limitations are involved in the composition of the ball lightning's electron shell. Now we don't know yet that.

IX. Calculations and Technology

I've been working on the problem of Quantum Free Energy – from artificially created ball lightning – for about 18 years. During this long period of time I created hundreds of experimental set-ups of different frequency and power of the microwave field. I investigated in parallel both physical and energy features of ball lightning. In this chapter I will not present results of these numerous experiments: no tables, no graphs, no plots. Results of experiments could be manipulated – as many free-energy researchers are doing – so, some skeptical readers of such publications are very suspicious about the reality of presented facts. Instead, I will present here some "free tips" about some Quantum energy experimental set-ups and useful instructions how to build industrial QE generators.

IX.1. Experimental QE set-up.

On Figure IX-1 is shown a simple QE set-up for investigating physical and energy features of ball lightning – source of Quantum free energy. This set-up is approachable for every self-funded free-energy researcher. The approximate cost of such set-up is $5,000.00.

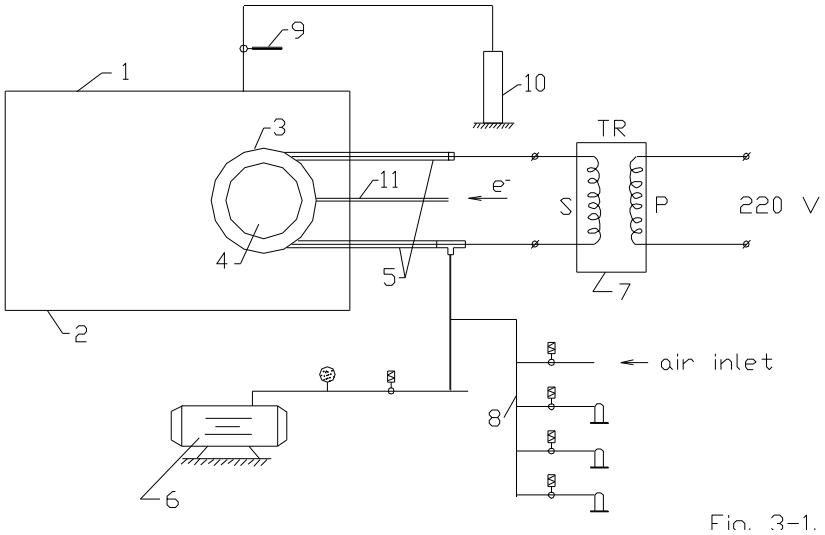


Fig. IX-1.

Legend:

1 – industrial microwave oven "Amana",
input microwave power P_{in} ~ 2200 W
2 – microwave cavity
3 – spherical quartz container, ~ 4" Dia.
4 – ball lightning
5 – tungsten electrodes, ~ 2 mm Dia.
6 – small rotary vacuum pump
7 – transformer (secondary U > 1000 V)
8 – gas inlet (H_2, O_2, He, N, CO_2,…)
9 – electronic thermometer (DT ~ 0.01 ºC)
10 – air-water calorimeter
11 – electron gun

The technology of one (out of many) QE experiment is as follow:

- in the quartz container 3 create a vacuum

. run the microwave power – in the quartz container appears regular plasma.

. gradually, and slowly, raise the gas pressure in the quartz container – for some higher pressure (smaller than atmospheric pressure) ball lightning starts to appear. More gas pressure, brighter becomes ball lightning. The maximum pressure is 1 atm.

. run the electron gun (source of additional electrons) – ball lightning becomes very bright.

. run the current of excitement (U ~ 1,500 Volts, I ~ 10 Amps) – ball lightning becomes extremely bright (it shining like 12 KW light bulb).

Because of very low, practically zero, electrical resistance of ball lightning, the voltage of the secondary current (measured by special voltmeter) drops to about 100 Volts. The real input power of the current of excitement is about 400 Watts. All calorimetric measurements are performed with "air-water" precise calorimeter, including the input power of the current of excitement. All energy results are compared with the "Zero" experiment (regular plasma). If we "excite" regular plasma – created with the same input microwave power and the same power of excitement – we don't observe any free QE radiation. The QE effect is very obvious (detectible) in this kind of experiment. Quantum energy radiation – for this very low level of input microwave power and current of excitement – is in form of: light photons (very bright source – like 12 KW light bulb), UV- photons, and some small amount of X-rays photons.

IX.2. Some instructions for producing very powerful QE effect.

IX.2.1. Input microwave power.

As discussed in Chapter VII, the output QE power and the energy of QE photons is highly depended on the value of the input microwave power going for creation of the ball lightning (see Figure VII-2). For small input powers (in the experiment described above – 2200 Watts) QE effect is small. How must we calculate the coefficient of energy efficiency in this case? See Figure IX-2.

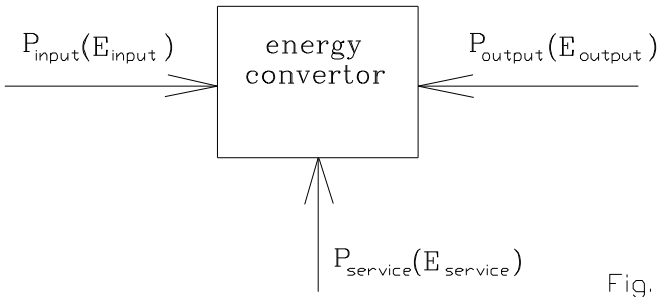


Fig. Fig. IX-2.

Note: in the calculations we can use either power, either energy, as a main characteristic.

P_{input} (E_{input}) – power of the primary source of energy (wood, coal, oil, nuclear fuel, solar energy, energy of falling water, wind energy, etc.).

$P_{service}$ ($E_{service}$) – power/energy needed for maintaining the process of converting of the primary energy to the secondary energy (electricity, for example); this energy includes: energy for transportation, energy for treatment of the fuel, energy for the running of the energy converter, etc.

P_{output} (E_{output}) – output useful power (or energy), usually electricity or heat.

$$K_{effect} = \frac{P_{output}}{P_{input} + P_{service}} \times 100, \%$$

In all known cases of the conversion of one kind of energy to another, the value of the coefficient of efficiency is smaller than 100 %.

For QE this coefficient is:

$$K_{effect} = \frac{P_{output}}{0 + P_{service}} \times 100, \%$$

The input power (or energy) is zero – there is no primary source of energy!

For the experiment described in Figure IV-31 the value of this coefficient is:

$$K_{effect} = \frac{P_{output}}{0 + (P_{service} + P_{excitment})} \times 100 = \frac{2800}{2200 + 400} \times 100 = 108\ \%$$

Over unity! Small, but very reliable free energy effect!

Where,

$P_{output} \approx$ 2,800 Watts (heat + QE radiation)

$P_{microwave}$ = 2,200 Watts

$P_{excitment}$ = 400 Watts

The value of the "regular" coefficient of efficiency is:

$$K_{\substack{effect \\ reg.}} = \frac{P_{QE}}{P_{input}} \times 100 = \frac{200}{0} \times 100 = \infty\ !$$

The output QE power increases in exponential proportion by contrast with the input microwave power (a service power). For input powers bigger than 100 KW, the output QE power can be hundreds of times bigger than the service microwave power!!! Only high QE generators are economically efficient!!!

IX.2.2. Pressure of the working gas

For information: in the experiment described above, ball lightning can be created in air, O_2, CO_2, N_2; the best results are obtained in O_2 and air – media. Ball lightning does not appear in H_2, He, water vapor.

Quantum free energy is produced only in the ball lightning electron cloud (shell). See Figure IX-3.

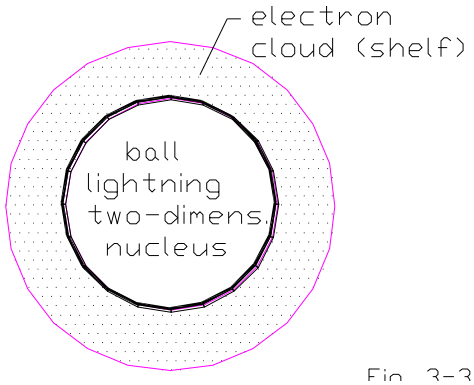


Fig. IX-3.

The ball lightning electron cloud (shelf) is "populated" by the following particles:

- air particles – molecules
- regular plasma-particles: non-quantum electrons, ions, atomic nuclei
- quantum electrons (with very high energy)

In the zone of ball lightning electron shell, quantum electrons are continuously transferring free quantum energy to all particles located in this zone. More are the non-quantum particles in this zone of transfer – more is the amount of transferred free quantum energy. Obviously the pressure of the working gas (air, for example) plays a crucial role for the efficiency of the QE process. For equal input microwave power, we can expect hundreds of times more QE output power in very condensed gas-media by contrast with gas under atmospheric pressure.

IX.2.3. Additional electrons.

Another crucial factor for the efficiency of the QE process is the density of non-quantum electrons in the zone of the ball lightning electron shelf. Quantum electrons and non-quantum electrons are, in fact, the same kind of elementary particle – electrons. In a big and compact assembly of equal elementary particles-electrons in this case – the separate particles lose their individuality. It is impossible to attach to every single electron a tag of identity. In the ball lightning electron shelf quantum and non-quantum electrons are indistinguishable. What is distinguishable is only their relative proportion: 10% quantum electrons and 90% non-quantum electrons, for example.

Quantum electrons are transferring free quantum energy to non-quantum electrons via "non-contact way" – by induction, without direct mutual collisions. Hence,

introducing of additional electrons (with an electron gun) into ball lightning electron shelf will considerably improve the coefficient of efficiency of the QE process – many, many times. My experiments prove this possibility.

IX,2.4. Ball lightning – an inexhaustible reservoir of free electrical energy.

Ball lightning, a quantum macro-object, represents a QE spherical electrical capacitor. See Figure IX-4.

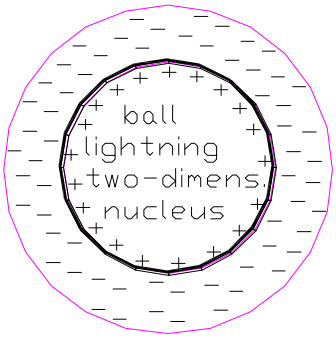


Fig. IX-4.

As known from electrodynamics, every charged electrical capacitor is a source of electrical energy – a kind of electrical battery. The “only” difference between a regular capacitor and quantum capacitor is that the first one possess a limited supply of electrical energy, whereas the quantum capacitor possess an unlimited (inexhaustible) supply of quantum electrical energy. Therefore, ball lightning can be used as an inexhaustible source of quantum electricity.

IX.3. Another practical applications.

Beside QE production, ball lightning can be used as an extremely bright source of X-rays.

The construction of very bright sources of X-rays has been one of the great – and infrequently told – success stories of science and technology over the past few decades. The price of the conventional facilities for producing such a bright X-rays varies between $100 million and $1 billion per site. Nine of those facilities (in the whole world) are now operating, and another one is to be operating in the near future. The diameter of the storage ring (the main element of the electron accelerator) varies (depending on the electron energy) between several hundreds meters to few kilometers.

The short wavelengths and extreme brightness of the X-rays beams are allowing researchers to investigate objects and phenomena that because of their size and other characteristics would have been difficult if not impossible to study as recently as ten years ago.

Many of these experiments have potentially significant technological implications, others promise to elucidate long-standing scientific enigmas. Among them are:

. investigation of the microbiological processes in the human body and developing on this basis of new methods of cure and drugs.

. study technologies to reduce the size of transistors in future integrated circuit.

Bright X-rays beams may considerably aid the electronics industry. The core business of this industry, which generates hundreds of billion dollars in revenue every year, is the manufacturing of integrated circuits ("chips"). The heart of the fabrication process is based on a cycle of photolithographic steps, in which ultraviolet light (or X-rays if available) is used to project the image of a stencil –like mask onto the photosensitive coating on a silicon wafer. The wavelength of the light used in the exposure determines the minimum feature size that can be projected and therefore the density of transistors on the silicon wafer. The use of very small wavelengths can make a revolution in electron industry. These technologies are called "nano-technologies". Unfortunately the costs and the dimensions of conventional sources of such a bright X-rays beams (electron accelerators) are insurmountable obstacles for such an electronic revolution.

The QE generators of medium size (about 200 KW input microwave power) will have a moderate price (about half of million dollars), small dimensions (approximately 6'x5'x4'), and can generate much brighter X-rays beams.

. bright X-rays beams are also furthering our understanding of how atoms and molecules interact (bond) with a surface – and how their electronic structure changes as a result of that interaction. This insight is important in the study of corrosion and also of catalysis, in which two chemical agents are induced to react by the presence of a third. Both phenomena are of enormous practical significance.

. bright X-rays beams are also illuminating long-standing scientific mysteries, including the nano-second-by-nanosecond behavior of biologically important molecules, such as proteins. Biology researchers and the drug industry are putting an ever-increasing demand on very bright X-rays sources.

Quantum energy achievements will lead to demand for a yet more advanced generation of very bright light sources. Quantum energy generators will yield many orders of magnitude brighter than those from today's electron accelerators. More important, Quantum energy generators will deepen our understanding of increasingly complex systems, extending the set of phenomena illuminated by this extraordinary quantum light.

The price of the most powerful contemporary elementary particles accelerators varies in the range of 1 to 5 billion dollars. Their size is the size of city – 1-8 miles in circumference. The maximum energy of the electrons is about 1,00 GeV.

There is no conventional method of producing extremely energetic photons. Quantum energy generators can produce a very bright beams of photons (and electrons) with a monstrous energy – 30-100 thousands GeV. The collision between two opposite beams can give a birth to new, undiscovered to date, elementary particles. The size of

such a Quantum energy collider will be the size of a small room; price – about half of a million dollars.

IX.4. Calculations

The outer energy source must ionize the gas (air) very quickly in order to avoid formation of regular plasma. Such energy sources could be:

. powerful electron beam
. high frequency electromagnetic field (MHz, GHz)
. short impulse powerful electrical discharge
. powerful lasers

In order to limit the undesirable heating of plasma, we must reduce the time of ionization of the gas particles. Very good for this purpose are the short impulse outer energy sources- high frequency energy sources, for example. My own experiments on ball lightning prove this claim. Further calculations are based on "high frequency" energy sources.

$$t = \frac{1}{f}, \text{ sec} \qquad (1)$$

Where,

t- time-interval of the outer energy impulse, sec.;
f- frequency of the impulse, sec^{-1} (Hz)

We can calculate the time of heating the following way:

$$e_i \times q \times t \le n \times c_p \times \Delta T \qquad (2)$$

Where,

e - energy of ionization for one nucleus (ion); $e_i \approx 10^2$, eV/ion.
q – ionization power of the outer energy source, ions/ cm^3.sec.
t – time-interval of the impulse, sec.
n – gas density, cm^{-3}; $n = 2.7 \times 10^{19}$, cm^{-3} (air, 1 atm.)
$c_p = \frac{7}{2} \times k_B$;
k_B - Boltzmann's constant; $k_B = 1.38 \times 10^{-23}$, J/ ° K

ΔT - admissible change (rise) of the gas (plasma) temperature; $\Delta T \le 10^3, °K$, because for higher temperature the walls of the quartz container can melt;

Further calculations are based on real or projected experiments.

Note: Significant differences between calculations and real situation can occur for $n > 10^{14}$, cm^{-3}; however, as we will see below, our cases are in the zone of the "ideal" plasma – $n < 10^{14}$, cm^{-3}.

In a stationary regime the speed of formation of ions must be balanced by the speed of recombination:

$$\frac{dn}{dt} = q - \alpha \times n^2 \qquad (3)$$

Where,

q – ionization power of the outer energy source, ions/cm^3.sec.

α - coefficient of recombination, $\alpha \approx 10^{-6}$, cm^3/sec;

For $\frac{dn}{dt} = 0$ (stationary regime) we have:

$$q = \alpha \times n^2 \qquad (4)$$

If the plasma density at the end of the outer energy impulse is n_0, then the time-interval of recombination must be equal to:

$$t_{\sec} = \frac{1}{n_0 \times \alpha} = \frac{1}{10^{14} \times 10^{-6}} = 10^{-8}, \text{ sec};$$

Note: $n_0 = 10^{14}$ is a real density!

$$f \geq \frac{1}{t_{rec}} = \frac{1}{10^{-8}} = 10^8, Hz = 100\ MHz!$$

The above value of the frequency represents the lowest admissible level of frequency for the outer energy source. In my first experiments on ball lightning I used 26 MHz RF generator. In these conditions the artificially created ball lightning was stable only for pressures lower than 1 atm.

Since I switched to micro-wave frequencies (f = 2.48 GHz) the problems of stability disappeared.

Formula (2) gives us another way for estimation of the time-interval of the outer energy impulse.

$$n \times c_p \times \Delta T = 10^{14} \times 4.83 \times 10^{-23} \times 10^3 \approx 5 \times 10^{-6}, J/cm^3 \approx 3 \times 10^{13}, eV/cm^3;$$

$$q = \alpha \times n^2 = 10^{-6} \times (10^{14})^2 = 10^{22}, ions/cm^3.\text{sec};$$

$$l_i \times q \times t = 10^2 \times 10^{22} \times t = 10^{24} \times t, eV;$$

$$t = \frac{3\times10^{13}}{10^{24}} = 3\times10^{-11}, \text{ sec};$$

$$f = \frac{1}{t} = \frac{1}{3\times10^{-11}} = 0.33\times10^{11}, \; Hz = 33\, GHz\,!$$

The above calculated value of "*f*" assures low temperature (small energy losses) of the plasma and stable conditions of existence of the artificially created ball lightning.

In my experiments conducted on QFE generators *Angelina-III*, *Angelina-IV*, and *Angelina-V*, the artificial ball lightning was created in quartz container (inside diameter about 10 cm) with 2.2 KW (*Angelina-III* and *Angelina-V*) and 3.2 KW (*Angelina-IV*) input micro-wave power. See Photo Section.

On Figure IX-5 is shown the energy spectrum of quantum electrons in ball lightning (giant macro-atom).

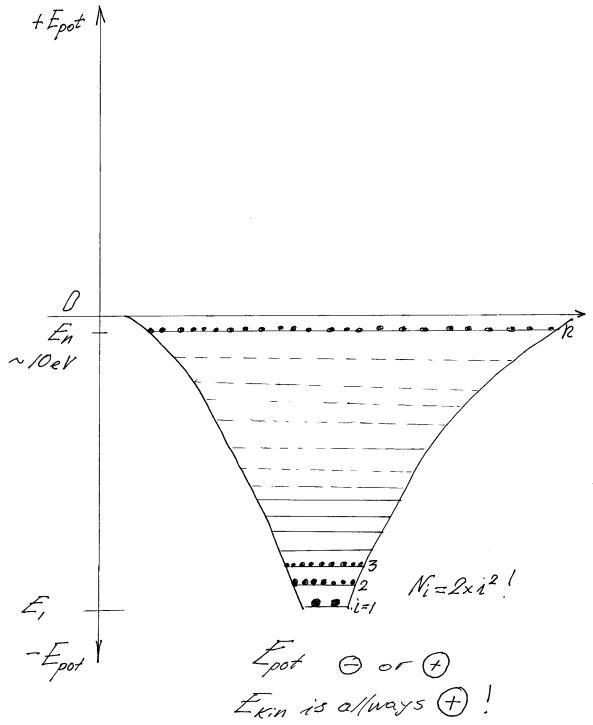


Fig. IX-5.

$$V_{b.l.} = \frac{4}{3}\times\pi\times R^3 = 0.52\times D^3 = 0.52\times10^3, \; cm^3;$$

The power of the outer ionization source must be equal to:

$$Q = q \times V_{b.l.} = 0.52 \times 10^3 \times q, \; ions / \sec;$$

Or,

$$P = Q \times e_i, \; eV / \sec$$

$$P = 0.52 \times 10^3 \times 10^2 \times q = 0.52 \times 10^5 = 0.52 \times 10^{-5} \times (\alpha \times n^2) =$$
$$= 0.52 \times 10^5 \times 10^{-6} \times n^2 = 0.52 \times 10^{-1} \times n^2, \; eV / \sec$$

1 J/sec = 1 Watt; 1 J = 6.24 x 10^{18}, eV

P = 0.08 x 10^{-19} x n^2, Watt

In our case, P = 2.2 KW, we have:

2.2 x 10^3 = 0.8 x 10^{-20} x n^2;

$$n^2 = \frac{2.2 \times 10^3}{0.8 \times 10^{-20}} = 2.75 \times 10^{23} = 0.275 \times 10^{24} \qquad \rightarrow \qquad n = 0.52 \times 10^{12} \approx 10^{12}, \; cm^{-3}$$

As we know from the above calculations, it is possible to create more dense ball lightning ($n \approx 10^{14}$, cm^{-3}) using higher input micro-wave power, or using smaller quartz container.

$$\overline{R} \approx n^{-1/3} = (10^{12})^{-1/3} = 10^{-4}, \; cm$$

Where,

$\overline{R}$ - average distance between two neighbor nuclei;

$$R_{k,p} = \frac{2 \times 10^{-16}}{E}$$

Where,

$R_{k,p}$ - quantum boundary of the "proton matter" substance;

$$10^{-4} = \frac{2 \times 10^{-16}}{E_{k,p}} \qquad \rightarrow \qquad E_{k,p} = \frac{2 \times 10^{-16}}{10^{-4}} = 2 \times 10^{-12}, \; erg$$

$$T = \frac{2 \times 10^{-12}}{2.07 \times 10^{-16}} \approx 10^4, \; ^\circ K$$

The above calculated temperature represents the maximum admissible plasma temperature for "successful" transition of plasma into state of two-dimensional quantum macro-object – ball lightning. As we see, our technological conditions assure good conditions for such transition.

Let estimate now the free energy production possibilities of an excited ball lightning (for our particular case) - Figure IX-6.

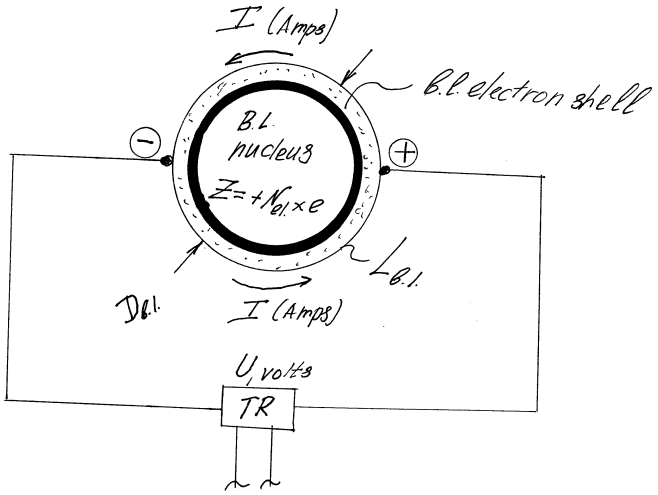


Fig. IX-6.

$$n \approx 10^{12}, \text{ cm}^{-3};$$

$$N_{electron} \approx V_{b.l.} \text{ x } n = 0.52 \text{ x } 10^{3} \text{ x } 10^{12} \approx 10^{15}, \text{ electrons;}$$

$$Z = N_{electrons}$$

For well "packed" ball lightning we have:

$$E_{\substack{inner \\ electrons}} \leq \frac{Z^{2/3} \times e^2}{R_e}$$

Where,

Z – number of the elementary electrical charges, $Z = 10^{15}$;
e – elementary electrical charge, $e = 4.8 \text{ x } 10^{-10}$, CGS;
R_e - "classical" radius of the electron, $R_e = 2.82 \text{ x } 10^{-13}$, cm;

$$E_{\substack{inner \\ electrons}} \leq \frac{(10^{15})^{2/3} \times (4.8 \times 10^{-10})^2}{2.82 \times 10^{-13}} = 0.81 \times 10^{4}, \; erg / electron$$

$$E_{\substack{inner \\ electrons}} \leq 5 \times 10^{15}, \; eV \; !!!$$

Tremendous energy!!! This enormous quantum energy is a "hidden" energy; without outer excitement quantum electrons don't give out this free energy. As mentioned before, if outer electrical current is applied to the ball lightning electron shell, then part of quantum electrons can become active (carriers of the current). Because of the action of the fundamental Principle of Economy, first free electrons (not connected with ball lightning) are involved as a carriers of the electrical current. If we rise the current (more electrical charges are involved), then we can expect that part of quantum electrons will be involved as carriers of these extra electrical charges. In our particular case I_{imput} = 4 Amps. See Figure IX-7.

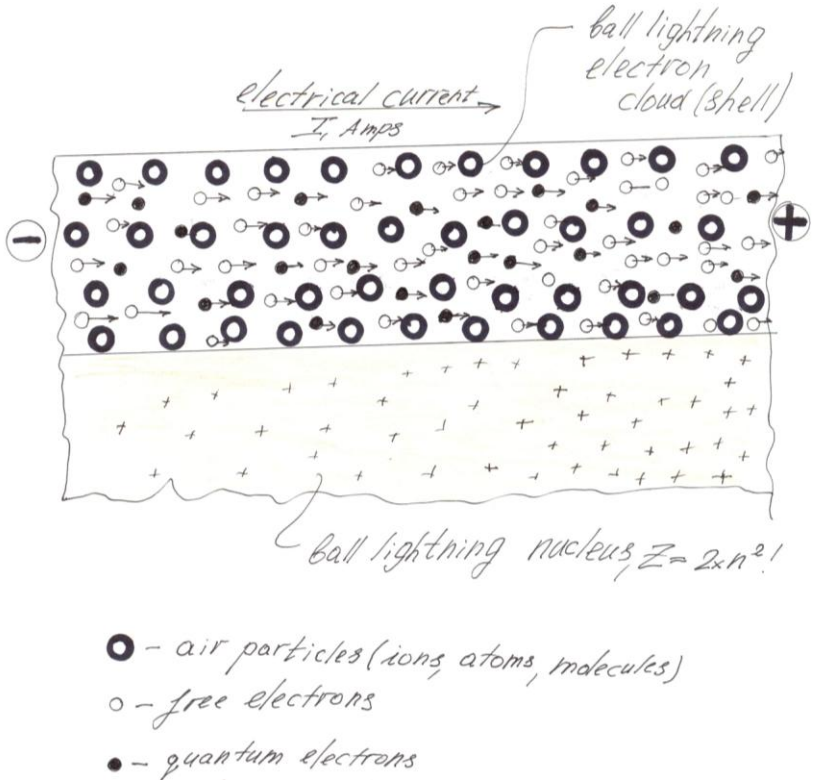


Fig. IX-7.

$$I = \frac{Q}{t},\ Amps; \qquad E - energy,\ I;$$

$$U = \frac{E}{Q},\ Volts; \qquad Q - el.\,ch\arg e,\ C$$

In the limit case (maximum possible pressure of the gas) all available outer energy is used to maintain ball lightning only – there is no free plasma around ball lightning. We admit (for this limit case) that all electrons in the zone of the ball lightning electron shell are "quantum electrons," i.e. they belong to the ball lightning electron shell. For the considered particular case we have:

$$D_{b.l.} = 10\ cm; \quad L_{b.l.} = \pi \times D_{b.l.} = 3.14 \times 10 = 31.4,\ cm;$$

Available electrical charge in the zone of the ball lightning electron shell is equal to:

$$Q = \frac{N_{el}}{6.25 \times 10^{18}} = \frac{10^{15}}{6.25 \times 10^{18}} \approx 1.5 \times 10^{-3},\ c$$

As we know already, electrons can move only around the ball lightning nucleus.

Let start to calculations from the limit case ($V_{el} = c$, speed of light).

$$t_{el,\min} = \frac{L_{b.l.}}{c} = \frac{31.4}{3 \times 10^{10}} = 1.05 \times 10^{-9},\ \text{sec};$$

$$I_{\max} = \frac{Q}{t_{el,\min}} = \frac{1.5 \times 10^{-3}}{1.05 \times 10^{-9}} \approx 10^{6},\ Amps\ !$$

$$E_{el} = \frac{m_e \times V_e^2}{2}$$

Where,

E_{el} - kinetic energy of single electron, erg;

For simplicity we will consider the case when the relativistic effect caused by the speed of quantum electrons is still small – the value of $\vec{V}_e$ is a little bit smaller than the value of speed of light.

$$E_{el} = \frac{m_e \times V_e^2}{2} \approx \frac{m_e \times c^2}{2} = \frac{0.911 \times 10^{-27} \times (3 \times 10^{10})^2}{2} = 4.1 \times 10^{-7},\ erg = 4.1 \times 10^{-14},\ J;$$

$$E_{total} = N_{el} \times \varepsilon_{el} = 10^{15} \times 4.1 \times 10^{-14} \approx 40,\ J;$$

$$U = \frac{E_{total}}{t} = \frac{40}{1.05 \times 10^{-9}} \approx 2 \times 10^{10},\ volts\ !\ \text{Too much!}$$

In fact, there exist some electrical resistance in the electron shell.

$$R = \frac{U}{I},\ \Omega; \qquad \rightarrow \qquad U = R \times I$$

Total input “excitement” power is equal to:

$$P_{exc.} = U \times I = R \times I^2$$

When an electrical current flows through the ball lightning electron shell, the quantum electrons (carriers of the current) move in the media of air particles. Occasionally quantum electrons collide with these particles and transfer to them quantum free energy. More dense is the media (higher pressure), bigger is this "free transfer" of energy.

As mentioned before, there exist two main channels of quantum energy production. First channel is due to the effect of "free quantum energy" synchrotron radiation.

The second channel is "direct production of free electrical energy" – see Figure IX-8.

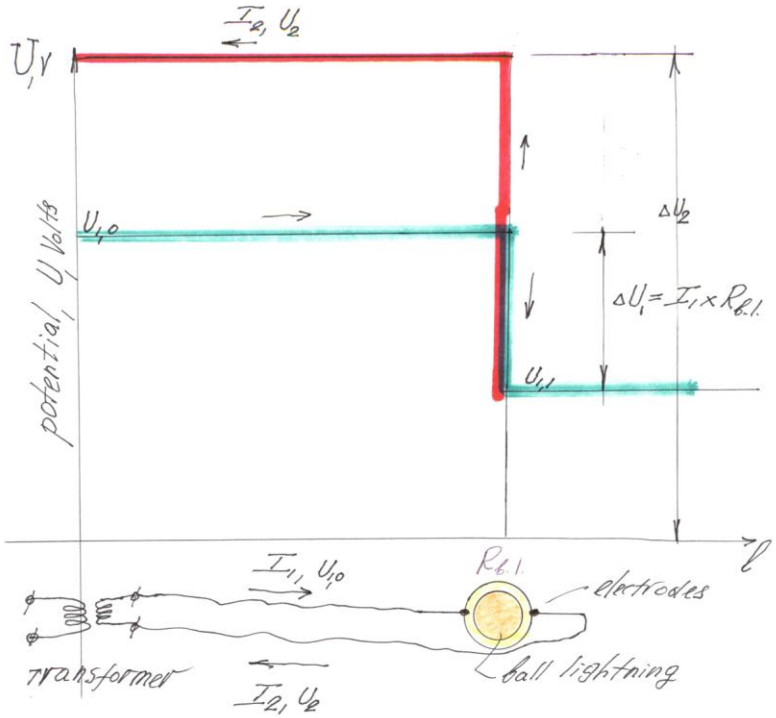


Fig. IX-8.

I_1 – forward el. current; $\Delta U_1 = \dfrac{I_1}{R_{b.l.}}$

I_2 – backward el. current;

ΔU_2 - millions of volts!!

Let consider the second channel. Ball lightning quantum electrons are "excited" by the outer electrical current I_1 (forward current). Because of the electrical resistance $R_{b.l.}$, there is a drop of the electrical potential ΔU_1. Ball lightning quantum electrons,

however, don't lose any energy in the accidental collisions with the air-particles or because of indirect transfer of quantum free energy to the electrical charged particles (ions, electrons) in the zone of the ball lightning electron shell. The energy of quantum electrons is several orders of magnitude higher than the energy of "free electrons-carriers of electrical current.

$$U_2 = \frac{E_{q.el.}}{t} \rangle\rangle\rangle U_1 = \frac{E_{\substack{free \\ electrons}}}{t}$$

Because of this huge "quantum free energy" potential, a backward electrical current is generated. I observed this phenomenon many times. Every time when I tried to excite scientifically my ball lightning, every time my electrical system and the transformer in our neighborhood were destroyed. My little excited ball lightning was able to produce very strong electrical current (millions volts). We must harness this "free electrical monster" for practical use. See Figure IX-9.

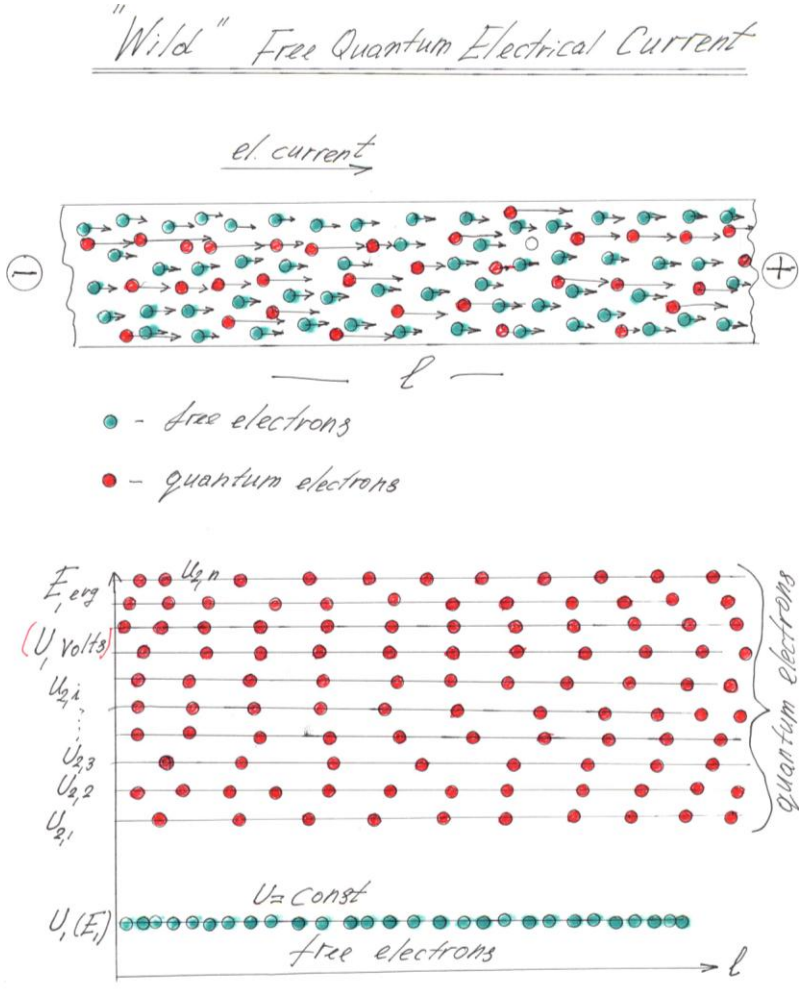


Fig. IX-9.

X. Quantum Photonic Bomb

Any new discovered and harnessed kind of energy in the history of human civilization is much more powerful than the previous ones – that's the logic of evolution of our civilization. Chemical energy (stored in wood, coal, oil, etc.) is much more powerful than mechanical energy of the falling water or wind, nuclear energy is hundred thousands of times more powerful than chemical energy; quantum free energy can be millions or billions of times more powerful than nuclear energy. On the basis of all new discovered kind of energy the human society created a new kind of weapon. Nuclear bombs are the latest achievement in the field of weaponry. During the Cold War era this kind of weapon of mass destruction created relative stability in the world and balance between the world powers (NATO and Soviet block). Now only one country is pretending to be lone super power and ruler of the world. Politicians, however, must understand that the role of nuclear weapon as a stabilizing factor in the world is over. Russia (with its 20,000 nuclear war-heads and U.S.A. (with its 12,000 nuclear war-heads) will be no longer the only strategic superpowers in the world. How can you prevent China to build Quantum Photonic Bombs which are millions of times more destructive than nuclear bombs? How can you prevent other countries as well to build such a weapon of mass destruction? Nuclear programs are very expensive and hard to be hidden from the eye of the world intelligences. QFE weapon programs are very cheap, they can be performed in "garage" conditions, this kind of work does not need super qualified specialists, etc. How can you prevent terrorists to build and use such a weapon on your own territory? Especially vulnerable to such a terrorist attacks are countries like Israel and U.S.A (guess why?). Is it possible to avoid the creation of such a monstrous weapon? I don't think so – the contemporary world is so divided and so far away from perfection. Until the power of money will be the supreme ruler of this world, this perfection is impossible. I understand the realities in our sinful world. My strong opinion on this issue is: to avoid future destruction of our civilization and full extermination of the life on our planet, we must talk about the monstrous destructive power of QFE weapon, to push governments to prevent the building of such a weapon, to eliminate the political causes of using of such a weapon. Israel must give up its ambitions to expend its territory on Palestinian land, Palestine must stop to terrorize innocent Israelis and give up the idea of return of Palestinian refugees, U.S.A. must give up its ambitions to rule the world and to spread its false democracy around the globe, Muslims must democratizes their societies, dictators must step down, etc.

The number of ways in which modern civilization could be brought to crashing down seems to increase by the day. Here are shown the top 10 doomsday scenarios of possible destruction of our civilization.

. Ecological Meltdown: many parts of the world face imminent water crisis, water wars may break out in the future; soil loss and desertification; pollution; habitat destruction; population pressure; etc.;

. Third World War - worsening worldwide poverty and social injustice, and an increasing gap between the haves and have-nots, may lead to mass migration, and will

increase global instability. With weapon of mass destruction scattered around the world, an apocalyptic showdown could happen;

. Climate Changes – global warming, for example;

. Giant Asteroid/Comet Strike;

. Massive Volcanic Eruption;

. Mega-Tsunami;

. Thinning Ozone;

. Cosmological Catastrophe;

. Pole Reversal;

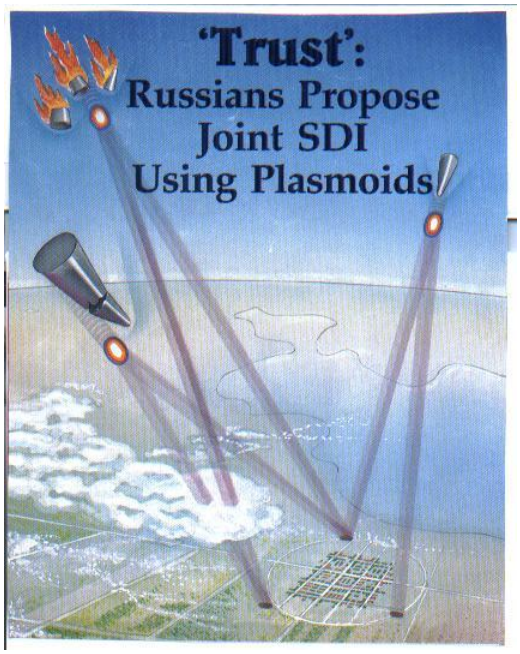
. **The Frankenstein Effect**: as scientific and technological advances outstrip social control, the chances of mankind being undone by its own inventions increases; there is a risk of physicists setting off new source of very powerful energy they can't control, as scientists continue to investigate the fundamental forces of the universe – QFE could be this energy source;

I am willing to work just "for food" (for U.S. government only) in the creation of the first QFE generator for peaceful application and small power Quantum Photonic Bomb. I am ready for practical application of QFE right now – I have all knowledge, experience, technical skill and wish to bring this work to successful end. I need approximately $3 million, about ten good specialists, and about 1 ½ years to build first in the world industrial QFE prototype (about 800 KW output power) and first small power (more than conventional nuclear bomb) Quantum Photonic Bomb. The "QFE Manhattan project" will be much cheaper and much more efficient (QFE bombs are millions of times more destructive than nuclear ones) than the "Nuclear Manhattan project."

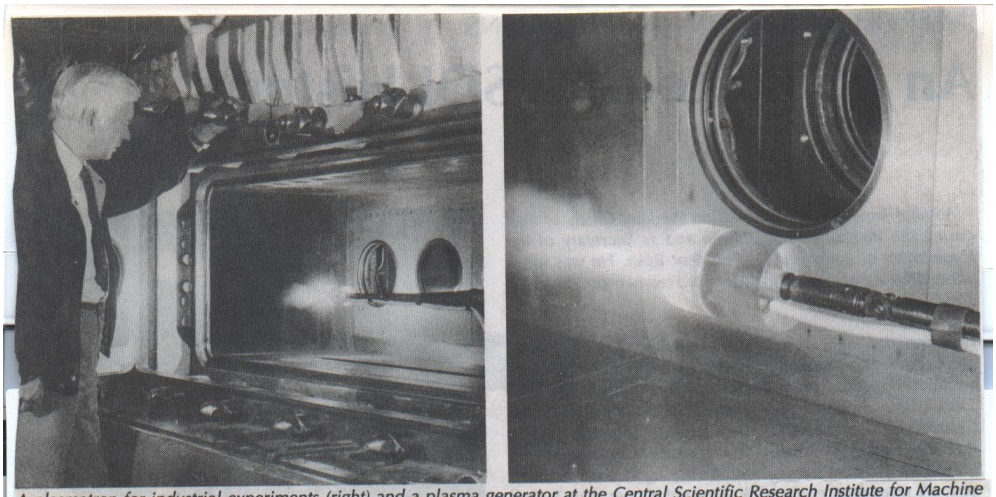
Due to security concerns, I will present in this report only short review of possible military applications of Quantum Free Energy.

X.1. Review of the Russian micro-wave military program

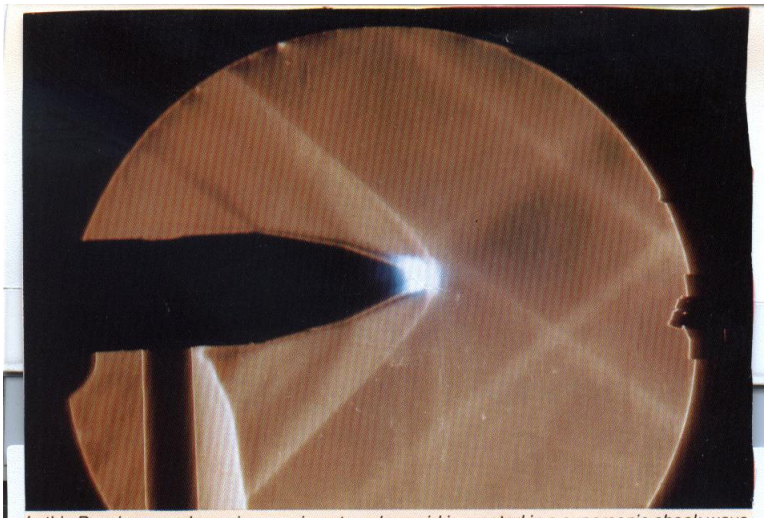
In 1993 Russian leading newspaper *Izvestia* (controlled by the highest levels of the Russian government) published very interesting article about Russian work on creating of plasma weapon. According to the Russian scientist quoted by *Izvestia,* plasma weapons would be devastatingly effective against missiles, warheads, and aircraft moving through the atmosphere. In *Izvestia'*s version of the system, focused beams of electromagnetic energy from ground-based micro-wave generators create an ionized structure known as a "plasmoid" in front of the target, throwing it off course and causing it to be destroyed by enormous aerodynamic forces. See photos below.



The new Russian plasma weapons are made possible by advances in radar systems for location and aiming using super-high-powered, super-high-frequency equipment. At left is the general director and chief designer of the Thorium Scientific Production Association, Dr. I.G. Artyukh. At right is Dr. V. Ye. Myasnikov, chief engineer of the Gyro-instrument Developers Directorate. They are standing next to a 1-megawatt, millimeter-range gyro-instrument at a Russian testing station. Thorium SPA has achieved unique results on enlarging the band of amplified frequencies in multibeam klystrons, simultaneous with record efficiencies.



A plasmatron for industrial experiments (right) and a plasma generator at the Central Scientific Research Institute for Machine Building. In the foreground is Dr. Artur Krasilnikov, chief designer at the institute.



In this Russian aerodynamic experiment, a plasmoid is created in a supersonic shock wave at the Scientific Research Institute for Aviation Systems, directed by Academician Yevgeni Fedosov.

Reaction of the western specialists was negative, voices began to be heard dismissing it as an "April Fool's joke." Unfortunately this was not just a joke, this was an omen of future serious work on creation of new generation of weapon of super mass destruction – Quantum Photonic Bomb!!! Russians are very close to create such monstrous weapon – they just need knowledge about secrets of "excitement" of this artificially created ball lightning.

Russian project aims to generate a "plasmoid" at any selected location in the atmosphere, by means of beams of electromagnetic radiation: high-power microwaves, laser beams, or a combination thereof. The proposed project would involve an application of this technology for a ground-based terminal defense system; that is, a system designed to destroy warheads in the last phase of their trajectory. Russians claim to have already working very powerful pulse microwave generators – gyrotrons and other devices generating microwave pulses of up to **1 billion watts!!!** Subsequently, Lawrence Livermore National Laboratory initiated a series of laboratory tests of the effects of ultra-high power microwave pulses on military targets.

In the region where two (or more) microwave beams are crossed, the focused microwave energy ionizes the air, causing a formation of "plasmoid" (in fact - artificial ball lightning). The "plasmoid" creates a massive disturbance of the air flow around the target object, causing it to divert from its path and to break up under the influence of huge aerodynamic and mechanical forces.

From the mid-1970's Russian laboratories have taken the world lead in development of technology for generation of high-power microwave pulses. The famous gyrotron, created by Russian scientists, is a type of microwave tube (a cyclotron resonance maser), in which an electron gun or accelerator directs an electron beam into resonance microwave cavity. A homogeneous magnetic field, perpendicular to the forward direction of the beam, turns the electrons in circular orbits. The combination of this rotation and the forward velocity results in helical motion, which then transforms the homogeneous magnetic field into an electromagnetic field oscillating at the frequency of the electron's rotation. The oscillating field bunches the electrons at intervals equal to its wavelength, Doppler shifted by the relativistic factor of the electron's velocity. These

bunches emit radiation at the corresponding upshifted frequency at harmonics that depend on the chosen resonance of the microwave cavity.

Russians developed high peak power gyrotrons that at some frequencies operate efficiently at peak powers three orders of magnitude greater than in the West!!! The high peak power generators have no application to the area of interest in the West (heating of magnetically confined plasmas).

In addition to gyrotrons, Russian laboratories produced many other important technologies in the domain of pulsed microwave generators, high-current electron beam generators, etc. The above cited two devices are necessary elements in the construction of QPB!!!

However there are some unanswered questions about Russian system of beam defense. How the plasmoid is created at so distant location from the emitting antennae? Ordinarily, extremely high electric fields and large energies would be required to create any significant ionization of the air. The plasmoid is created *in situ* in the stratosphere, by focused electromagnetic radiation. One possibility would be to generate a small "seed" plasma with powerful laser pulse, and then pump additional energy into the plasma with microwave beam tuned to the appropriate plasma frequencies. The "pumped" plasmoid would form at the region of intersection of the laser and microwave beams. Another question – *How is the microwave energy focused onto a sufficiently small region?* If very large energies are required for ionization, then won't much of the microwave energy dissipate near the antenna array and in the intervening layers of atmosphere? Russians claim that their beam weapon can destroy targets up to altitudes of 50 kilometers. To be able to focus a substantial portion of the microwave energy from a ground-based source into region of at most a few meters' diameter at that sort of range, the emitter arrays would have to be extremely large; at least, that is the conclusion if we use a linear optics approximation. If the focusing problem is solved anyway, still remains the problem of dissipation of energy in heating and ionization of the air between the emitting array and the target area. And other unanswered questions.

Whatever Russian system of beam weapon is real, the Russian experience in this field represents a very important basis for creating Quantum Photonic Bomb. I think that Russians are about one year away from creating first QPB with power at least hundred of thousands times more powerful that conventional nuclear bomb!!! How about Chineese???

X.2. Calculations, technology, and constructions

In this section I would like to present a very short description of this diabolic Weapon of Super Mass Destruction.

X.2.1. Carriers of QPB

The following carriers can be used to transport QPB to the target:

- Satellites;

- Missiles;
- Airplanes;
- Ships;
- Trains;
- trucks;

See Figures X-1,2,3,4,5.

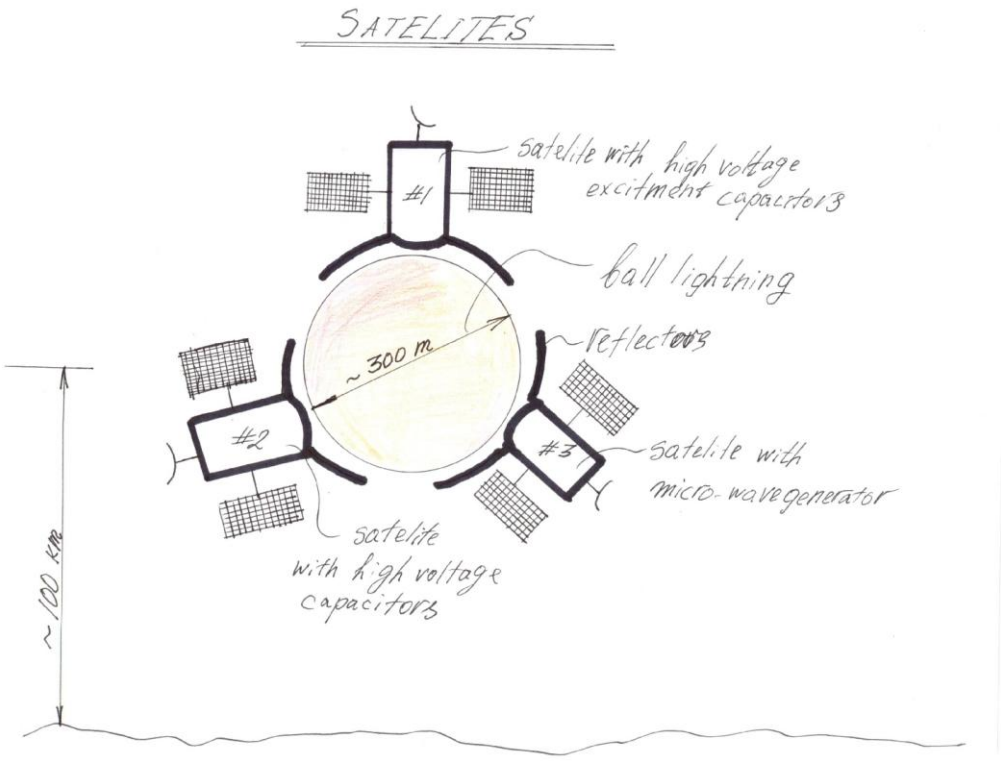


Fig. X-1.

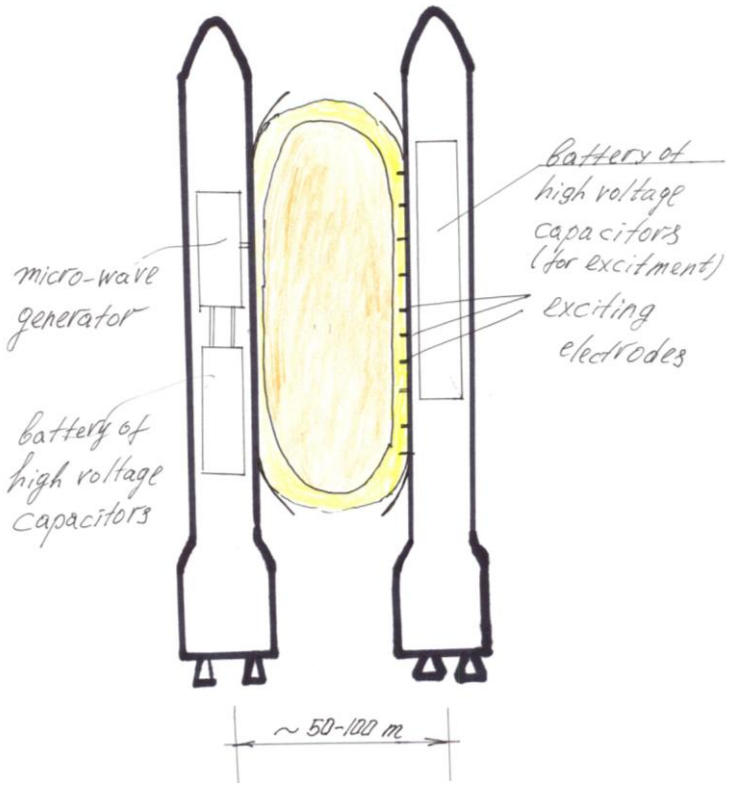

micro-wave generator
battery of high voltage capacitors
battery of high voltage capacitors (for excitment)
exciting electrodes
~ 50-100 m

Fig. X-2.

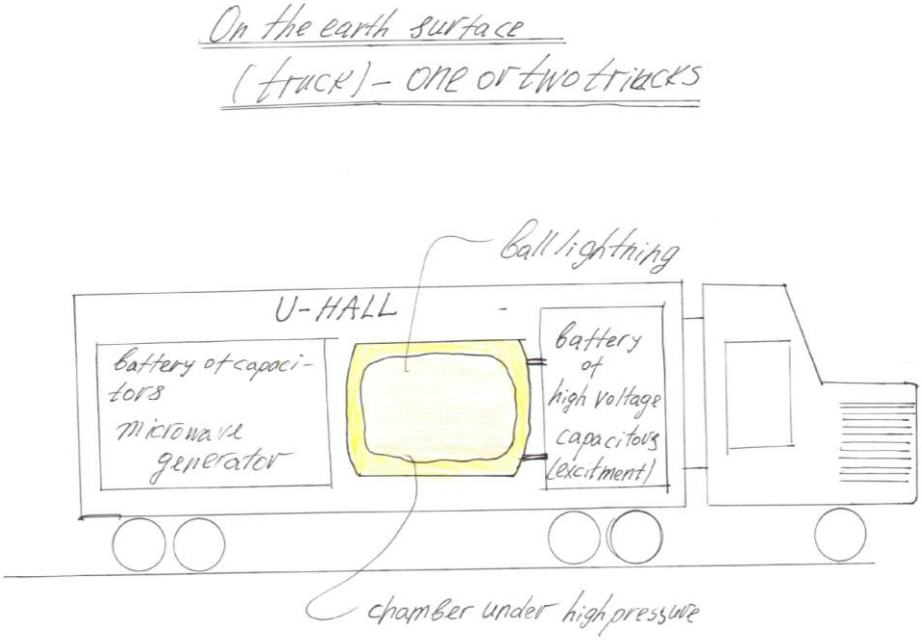

On the earth surface
(truck) - one or two trucks
ball lightning
U-HALL
battery of capaci-tors
microwave generator
battery of high voltage capacitors (excitment)
chamber under high pressure

Fig. X-3.

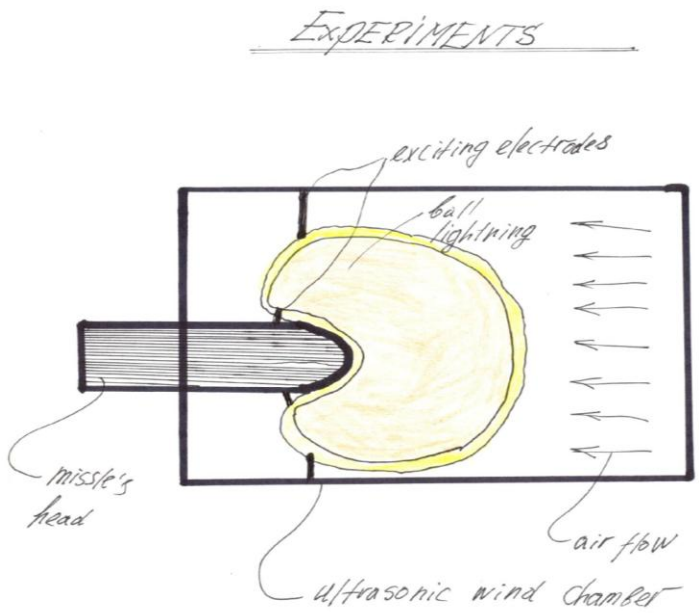


Fig. IV-42.

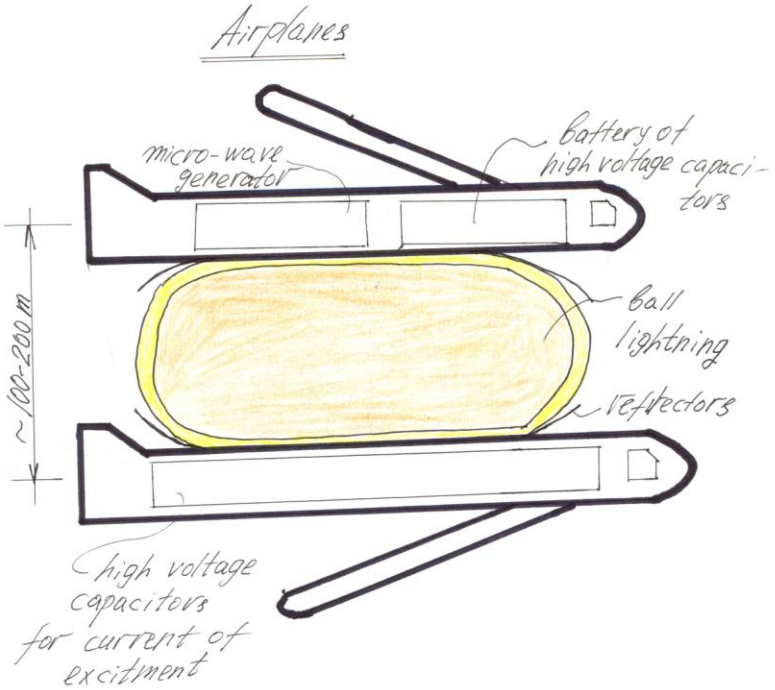


Fig. X-4.

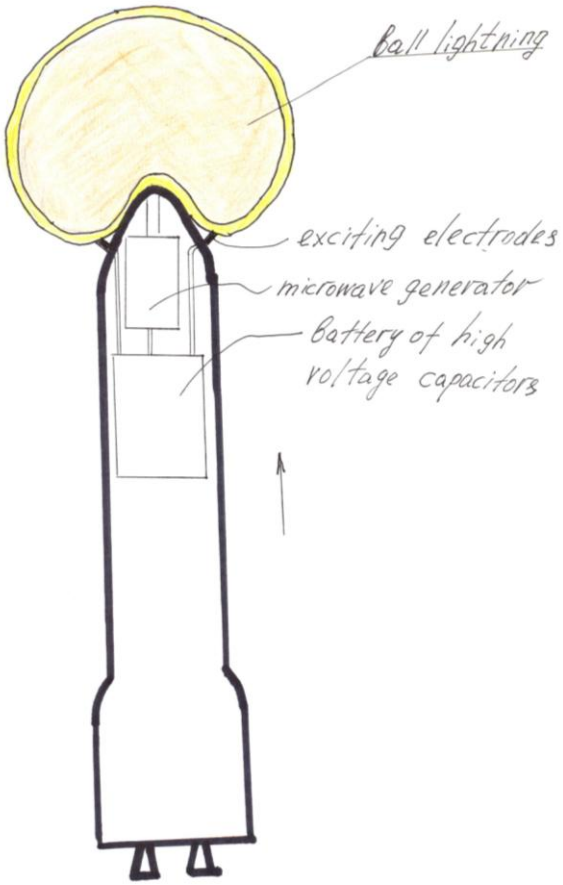


Fig. X-5.

Quantum Photonic Bomb ("QPB") can be build and detonated also "on place" – in warehouse, for example.

"Open Air" QPB (on satellites, airplanes, missiles) are bigger and easier to operate (there is no need in "vacuum-pressure" chamber). Here the main problem is stability of the carrier. Probably this problem is not so serious having in mind that the time of the whole operation is about one minute.

The technology of creating and operating of "closed volume" ball lightning has some advantages:

- smaller dimensions, d ~1-5 meters;
- very high density – n ~10^{16} – 10^{22}, quantum electrons/cm^3;
- much higher average energy rate of quantum electrons;
- stable conditions of existing of ball lightning;
- possibility of using of local sources of electrical energy (in warehouse).

X.2.2. Technology of QPB explosion

On Figure X- 6 is shown an example of possible scheme of QPB.

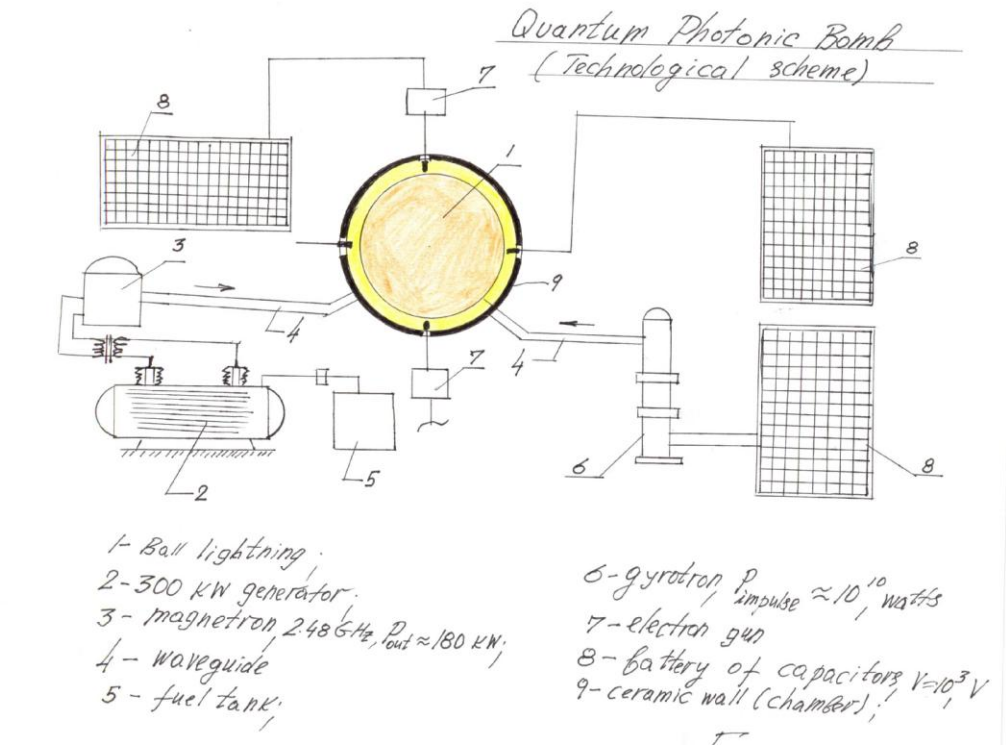


Fig. X-6.

Ball lightning is created in a closed container (with high temperature resisting walls – ceramic or quartz), which is located in bigger chamber (microwave cavity). The process of creating and explosion of QPB includes the following steps:

. creating vacuum in the container "9"; $p \approx$ - (80-100) kPa; time – about 30 sec.;

. creating lower power ball lightning seed (P_{input} ~ 200-300 KW input microwave power); time – about 2-3 sec.;

. rise of the gas pressure – $P_{max} \approx$ 20-30 atm.; time – about 15 sec.;

. applying of high power microwave impulse (from the gyrotron "6"); time – 2-3 sec.;

. excitement – applying of high voltage electrical current ($U \sim 10^4$, Volts) from the capacitor battery "8" and simultaneously an "ectron beam" shock (from the electron gun "7"); $I \sim 10^6$ -10^7, Amps;

. explosion;

See Figure X-7.

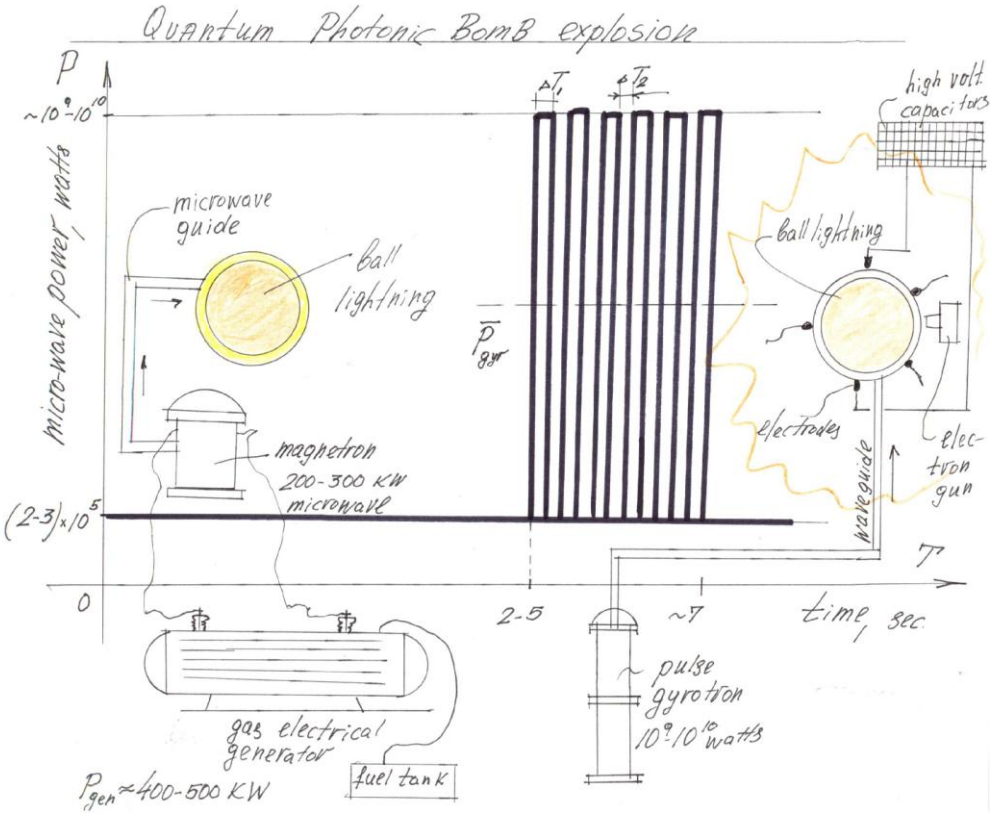


Fig. X-7.

X.2.3. Calculations

If we want to create ball lightning with some desirable superficial mass density (the same as the density in the considered above experiment, for example), then we have:

$$\frac{P_1}{P_2} = \frac{D_1^2}{D_2^2}$$

Were,

P_1 = 300 KW;

P_2 = 2.2 KW; $D_1 \approx 10$ cm;

$$D_1 = D_2 \times \sqrt{\frac{P_1}{P_2}} = 10 \times \sqrt{\frac{300}{2.2}} \approx 117\ cm;$$

$$D_{\substack{ball \\ lightning}} = 117\ cm; \qquad V_{\substack{ball \\ lightning}} = 0.52 \times D_{b.l.}^3 = 0.83 \times 10^6, cm^3;$$

$$Q = q \times V_{b.l.};$$

Where,

Q – power of the outer ionization energy source, *ions/sec*.

$$Q = 0.83\times10^{6},\ ions/\sec.$$

Or,

$$P = Q\times e_i = 0.83\times10^{6}\times10^{2}\times q = 0.83\times10^{8}\times q,\ eV/\sec$$

$$P = 0.83\times10^{8}\times(\alpha\times n)^{2} = 0.83\times10^{8}\times10^{-6}\times n^{2} = 0.83\times10^{2}\times n^{2},\ eV/\sec$$

1 *J/sec* = 1 *Watt*; 1 *J* = 6.24 x 10^{18}, *eV*;

$$P = 0.13\times10^{-16}\times n^{2},\ Watts;$$

I our case, P = 300 *KW* = 3 x 10^{5} *Watts*;

3 x 10^{5} = 0.13 x 10^{-16} x n^{2}

$$n^{2} = \frac{3\times10^{5}}{0.13\times10^{-16}} = 2.3\times10^{22} \qquad \rightarrow \qquad n = 1.52\times10^{11},\ cm^{-3};$$

$$\overline{R} \approx n^{-1/3} = \frac{1}{(1.52\times10^{11})^{1/3}} \approx 2\times10^{-4},\ cm;$$

$$R_{k,p} = \frac{2\times10^{-16}}{E} \qquad \rightarrow \qquad E = \frac{2\times10^{-16}}{2\times10^{-4}} = 10^{-12},\ erg;$$

$$T = \frac{10^{-12}}{2.07\times10^{-16}} \approx 0.5\times10^{4} = 500,\ ^{\circ}K$$

Very low limit temperature! So, there are no technological obstacles for "successful" transition of plasma into state of ball lightning.

The total number of quantum electrons is equal to:

$$N_{\substack{quantum\\electrons}} = V_{b.l.}\times n = 0.83\times10^{6}\times1.52\times10^{11} = 1.26\times10^{17},\ electrons;$$

$$Z = N_{q.e.}$$

$$R_{Z,\min} \geq Z^{2/3}\times R_e = (1.26\times10^{17})^{2/3}\times2.82\times10^{-13} \approx 0.15,\ cm;$$

The parameters values of ball lightning at the moment of applying of the high power microwave impulse are equal to:

$$P_{inpulse} = 10^9 - 10^{10}, Watts;$$

$$10^{10} = 0.13\times10^{-16}\times n^2 \qquad \rightarrow \qquad n = \sqrt{\frac{10^{10}}{0.13\times10^{-16}}} \approx 3\times10^{13}, cm^{-3};$$

$$N_{\substack{quantum\\electrons}} = V_{b.l.}\times n = 0.83\times10^6\times3\times10^{13} = 2.5\times10^{19}, electrons;$$

$$R_{Z,\min} \geq Z^{2/3}\times R_e = (2.5\times10^{19})^{2/3}\times2.82\times10^{-13} \approx 1, cm;$$

$$E_{\substack{inner\\electron}} \leq \frac{Z^{2/3}\times e^2}{R_e} = \frac{(2.5\times10^{19})^{2/3}\times(4.8\times10^{-10})^2}{2.82\times10^{-13}} = 1.5\times10^7, erg/electron \approx$$

$$\approx 10^{19}, eV/electron;$$

The average energy of quantum electrons is approximately equal to:

$$\overline{E}_{q.el.} \approx \sqrt{E_{\substack{outer\\electrons}}\times E_{\substack{inner\\electrons}}} = \sqrt{10^2\times10^{19}} = 3.3\times10^{10}, eV/electron =$$

$$= 33\,GeV = 0.53\times10^{-1}, erg/electron$$

$$E_{total,b.l.} = N_{electrons}\times\overline{E}_{q.el.} = 2.5\times10^{19}\times0.53\times10^{-1} = 1.3\times10^{18}, erg = 1.3\times10^{11}, J$$

This energy is the energy from just one "free energy" quantum radiation impulse. In fact, the total energy of explosion is much bigger:

$$E_{total,b.l.} = K\times1.3\times10^{11}, J; \qquad K = ...10,...1000,....?$$ Scary!!!

The destructive power of QPB is due mostly to the effect of tremendous mechanical explosion of the space.

$$\overline{T}_{\substack{quantum\\electrons}} \approx \frac{\overline{E}_{q.el.}}{2.07\times10^{-16}} = \frac{0.53\times10^{-1}}{2.07\times10^{-16}} \approx 2.6\times10^{14}, {}^\circ K;$$

$$\frac{P_{QPB}}{P_{\substack{nuclear\\bomb}}} \approx \frac{T_{QPB}}{T_{\substack{nuclear\\bomb}}};$$

Where,

P – pressure created at the moment of explosion, atm;

$$E_{\substack{nuclear \\ bomb}} \approx 2\times10^{6}, eV \approx 0.3\times10^{-51}, erg / particle;$$

$$T_{\substack{nuclear \\ bomb}} \approx \frac{0.3\times10^{-5}}{2.07\times10^{-16}} = 1.5\times10^{10}, {}^{\circ}K;$$

$$\frac{P_{QPB}}{P_{\substack{nuclear \\ bomb}}} = \frac{2.6\times10^{14}}{1.5\times10^{10}} \approx 2\times10^{4} = 20{,}000\ times \quad !!!$$

The mechanical destructive power of QPB is 20,000 times (in this case) bigger than the mechanical power of conventional nuclear bomb!

Beside energy calculations, we must calculate also the parameter values of all elements of the QPB:

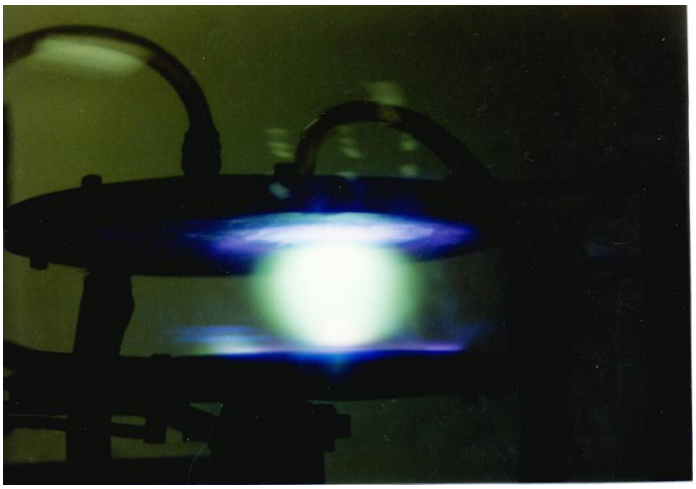
- kind and number of high voltage capacitors; their total volume ant total weight;
- dimensions of "microwave cavity";
- parameter values and power of the electron gun;
- parameter values of the gyrotron (or another source of high power microwave impulse);
- etc.;

I stop here.

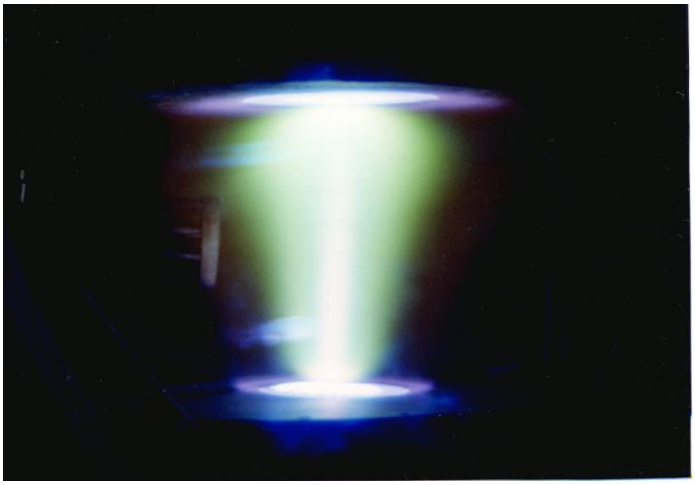
XI. Photo Gallery

1990-1992
Sunnyvale, CA

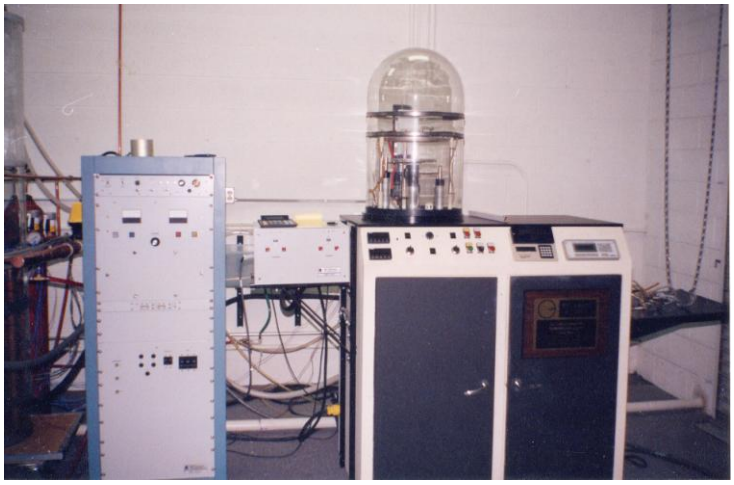
1990-1992
Sunnyvale, CA



Ball Lightning
1990-1992
Sunnyvale, CA



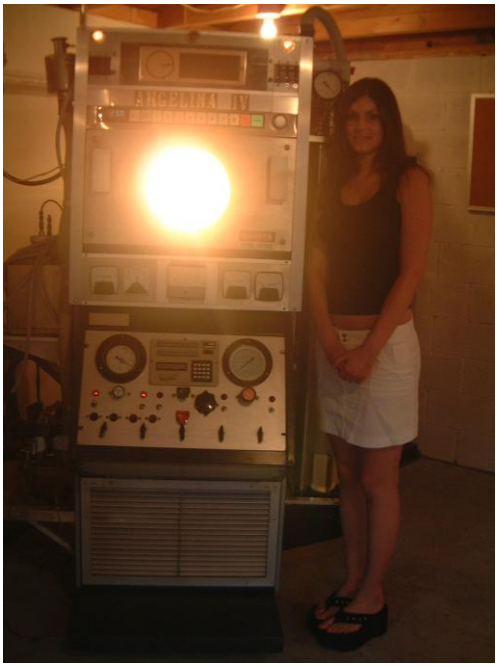
Ball Lightning
1990-1992
Sunnyvale, CA



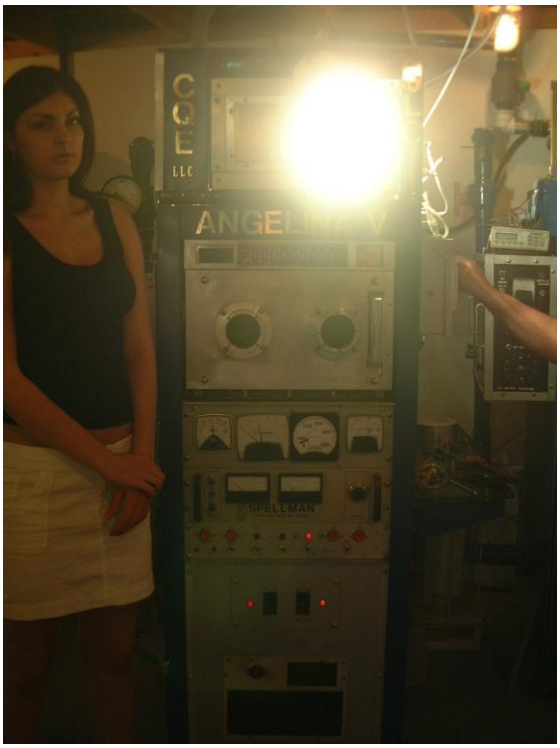
“Angelina-I”
1994
West Jordan, UT

“Angelina-II”
1998
West Jordan, UT

“Angelina-III”
1999
West Jordan, UT



“Angelina-IV”
2000
West Jordan, UT



“Angelina-V”
2001
West Jordan, UT