ANALYSIS OF STRUCTURED LIQUIDS WITH ELECTROPHOTONIC TECHNIQUE

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Abstract

Basic principles of Electrophotonic – Gas Discharge Visualization (EPI/GDV) technique – method of analysis of stimulated by electromagnetic field glow of liquids are discussed in the paper. Examples of experimental studies of different samples of water, blood reaction to allergens, low concentrations of different salts are presented. High selectivity and sensitivity of the EPI/GDV approach is proven by publications of different authors. EPI/GDV parameters depend on the chemical composition of a liquid, but most interesting is their dependence from structural properties of water and the possibility of data transfer through water. Measured parameters are defined by the emission activity of surface layer of liquid, which depends on surface-active valency. It is clear that this property is defined by the structure of the near-surface clusters, so the EPI/GDV method may serve as one of the informational methods of study the structural-informational properties of liquids. Developed approach allowed to distinguish the changes of electrophotonic parameters of water under the remote influence of the human consciousness – directed human attention.

Introduction

Currently considerable attention is being focused on the study of the structural properties of water and the possibility of data transfer through water. A lot of controversial information we may find concerning memory of water (Johansson, 2009; Montagnier, 2009, 2011). According to the viewpoint that has shaped, the phenomena observed during the experiments are determined by the processes of clusters and clathrates formation, mainly at the atoms of admixtures (Del Giudice, Vitiello, 2006). The task of introducing these notions into the scope of contemporary scientific thinking requires, first of all, a set of probative and reproducible experimental facts. Water is a complex subject of study, and its properties depend on a great number of factors; this requires that several independent techniques should be used in parallel, and that new informative methods for study of water properties should be developed and introduced into practice (Voeikov, Del Giudice, 2009).

The high degree of informativeness of the Dynamic Electrophotonic Imaging (EPI) analysis based on Gas Discharge Visualization (GDV) method (Korotkov, 2002) applied for studying liquid-phase subjects was first demonstrated during the study of the glow of microbiological cultures (Gudakova et al, 1990), blood of healthy people and cancer patients (Korotkov et al, 1998), reaction of blood to allergens (Sviridov et al, 2003), homeopathic remedies of 30C potency (Bell et al, 2003), and very small concentrations of various salts (Korotkov, Korotkin, 2001). The differences between the glow parameters of the NaCl, KCl, $NaNO_3$ and KNO_3, solutions and distilled water were observed until the 2^{-15} dilution; however, the dynamic trends of the 2^{-15} dilution and distilled water still had different directions.

Great interest has been roused by the studies directed at detecting the differences between the glow of natural and synthetic essential oils with identical chemical composition (Korotkov et al, 2004, Vainshelboim et al, 2004). The oils were analyzed in order to detect possible differences between oils that were obtained by means of natural and synthetic processes, between oils of organic and regular origin; between oils obtained in different climatic conditions

and extracted by means of different methods; between oils with different optical activity; between fresh oils and oils that were oxidized by various methods. The combinations of oils under study did not show any statistically significant differences when analyzed by means of the gas chromatography method.

Technique

Study of Electrophotonic parameters of liquids is based on using commercially produced instrument "GDV Camera", which is manufactured by KTI company, St. Petersburg (web. Ref 1,2). This instrument is well-known for analyzing stimulated photon emission from human fingers which is being used for health and well-being diagnostics (Measuring 2002), analysis of athletes (Bundzen et al, 2005), altered states of consciousness (Bundzen et al, 2002. Korotkov et al. 2005), influence of music (Gibson, Williams 2005) and Qigong to people (Rubik, Brooks 2005), as well as geo-active zones (Hacker et al, 2005) and minerals (Vainshelboim et al, 2005).

When the EPI parameters are measured for liquid subjects, a drop of the liquid is suspended at 2-3 mm distance above the glass surface of the optical window of the device, and the glow from the meniscus of the liquid is registered (Fig.1). The volume of liquid is about $5*10^{-3}$ ml. Temperature is kept in the range 22-24 C, the relative humidity is maintained from 42% to 44%. The train of triangular bipolar electrical 10 mcs impulses of amplitude 3 kV at a steep rate of 10^6 V/s and a repetition frequency of 10^3 Hz, is applied to the conductive transparent layer at the back side of the quartz electrode thus generating electromagnetic field (EMF) at the surface of the electrode and around the drop. Under the influence of this field, the drop produces a burst of electron-ion emission and optical radiation light quanta in the visual and ultraviolet light regions of the electromagnetic spectrum. These particles and ions initiate electron-ion avalanches, which give rise to the sliding gas discharge along the dielectric surface (Korotkov, Korotkin 2001). A spatial distribution of discharge channels is registered through a glass electrode by the optical system with a charge coupled device TV camera, and then it is digitized in the computer.

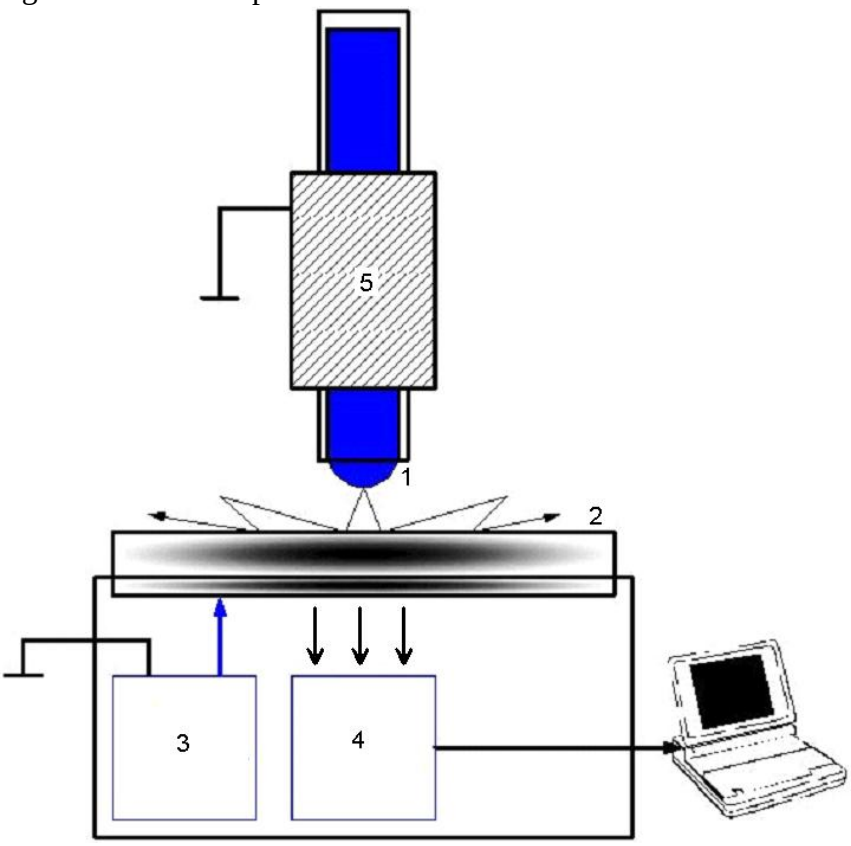
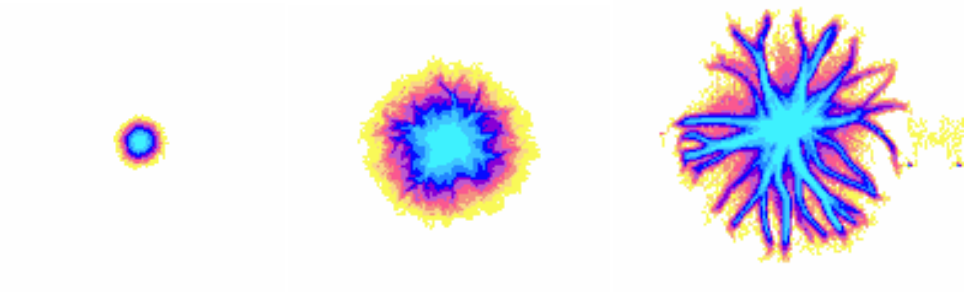


Fig.1. Priniciple of study electrophotonic glow of liquids. 1 – liquid meniscus; 2 – transparent quartz electrode; 3 – impuls generator; 4 – optical system; 5 – metal electrode.

Drops are exposed to EMF from 2 s up to 10 s, and short “films” are recorded in the computer as .avi files. The frame rate (frequency of record) is defined by the optical system and typically range from 30 to 60 frames per second. Avi files then converted in a series of BMP files, and the area (the number of light-struck pixels) and averaged intensity (ranked from 0 for absolute black to 255 for absolute white) parameters for every image is calculated by the software. The time series are averaged on 10 measurements that provide the statistical reliability at the confidence level of 0.95 with the experimental sensitivity of 75%. Examples of EPI glow for different liquids are presented at Fig.2. This method is very sensitive to the condition of water and liquids, but in the process of discharge micro-droplets of water are dispersed to the surface of the electrode thus changing the volume of drop in time. So this method may be used for short – up to 30 s – time series only. Recording 30 frames per second provides about 900 images in 30 s which is quite enough for statistical analysis.



1 2 3

Fig.2. Examples of EPI glow of different samples of water. 1 – distilled water; 2 – tap water; 3 – structured water.

The reproducibility of the method was verified by measuring the time dynamics of the gas discharge around a metal cylinder that was 10 mm in diameter, and was placed at the center of the optical electrode and electrically connected with EPI instrument. 30 subsequent measurements provided statistical reliability at the confidence level of 0.95 with the experimental sensitivity of 95%. Deviation at every point of the time series was less than 3%.

Metal cylinder is used in another method of measuring longtitude time variations of water properties. In this case water is kept in glass vial and standart Pt electrode is inserted in water (Fig.3). Pt electrode is connected with metal cylinder which in this case is disconnected from the EPI instrument. Intensity of gas discharge around metal cylinder depends on the capacitance of the cylinder - Pt electrode chain, which depends on water properties.

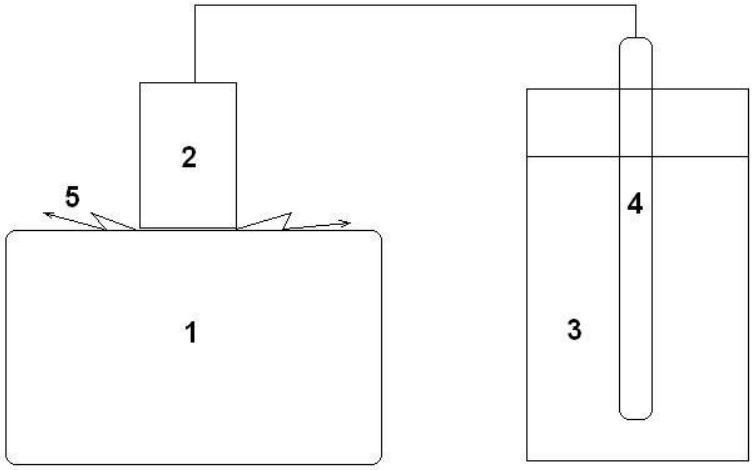


Fig.3. Priniciple of study electrophotonic glow of liquids. 1 – EPI instrument; 2 – metal cylinder; 3 – glass with water; 4 – Pt electrode; 5 – sliding gas discharge.

To define exact dependence from the capacitance metal cylinder was connected to different grounded capacitances. Experimental data and quantative approximation are presented at Fig.4. As you see from the graph signal increases up to approximately C = 100 pF and this line may be described by the eqiatation

$$A = 3717 \cdot \mathrm{Ln}(C) - 2269.3 \qquad \text{at } x \leq 100.$$

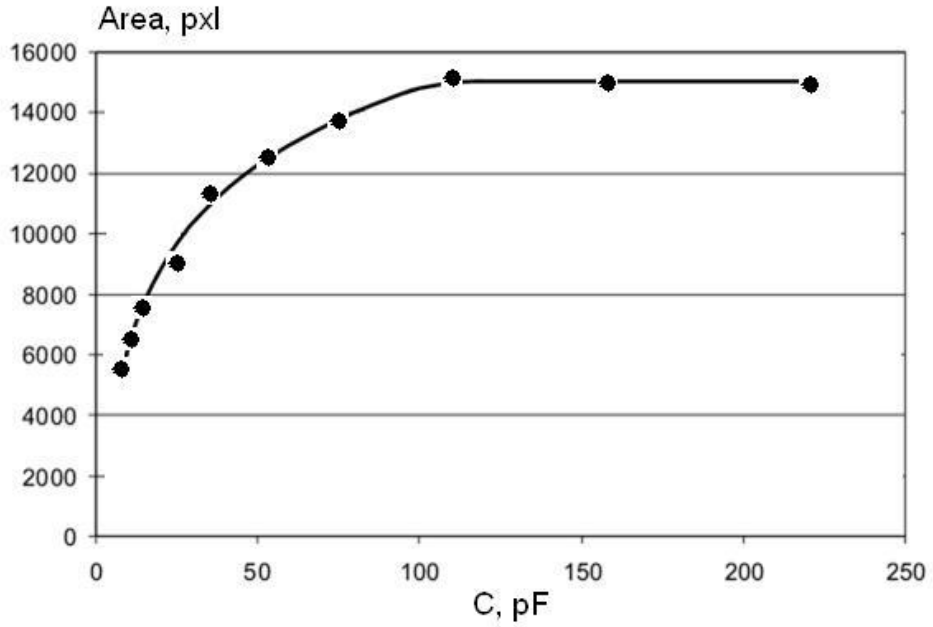
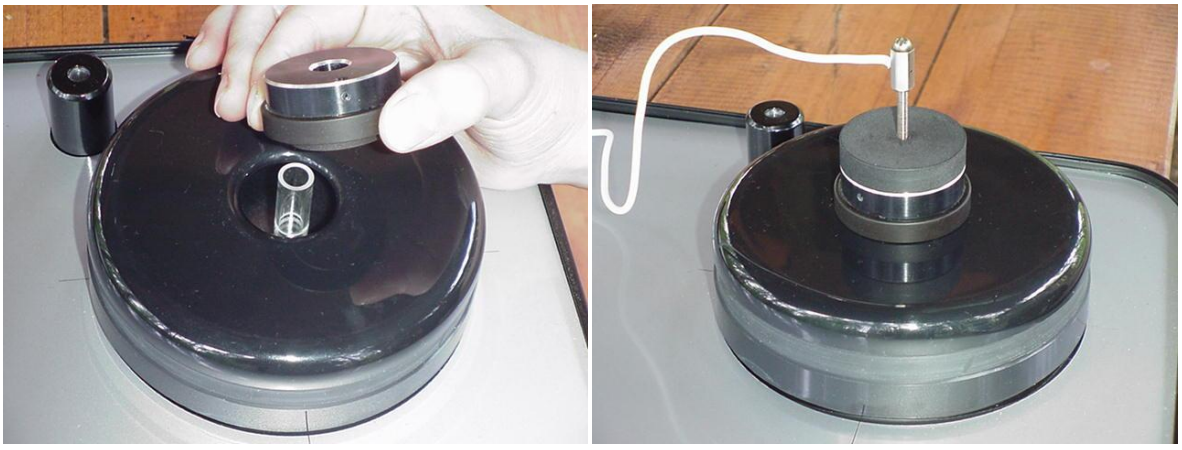


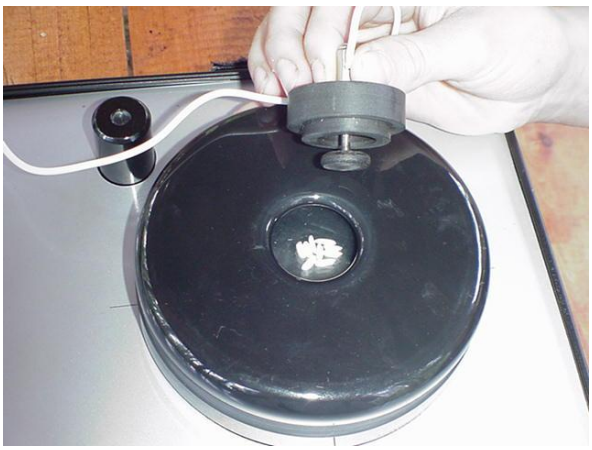
Fig.4. Dependence of the EPI Area of metal cylinder from capacitance.

For water and different liquids capacitance is in the range 25-30 pF and little changes of physical properties of water cause changes of capacitance which is reflected in significant changes of EPI signal. This makes “Pt electrode method” very sensitive to the changes of water properties under the influence of different factors. This method allows to study time changes of water properties for many hours.

Together with mentioned above two methods a set of instruments was developed for study of low-conductive liquids (oils) and different subjects (see fig.5).



A B



C

D

Fig.5. EPI installations for studding different subjects. A,B – low-conductive liquids; C – grains; D – leaf.

Results

Method with suspended drop

Study of water should be done with great precaution: water changes its properties in the process of interaction with air after opening the bottle. This process is well-known in wine industry, but the same "aging" we may see for water. As an example fig.6 demonstrates change of time dynamics of electrophotonic parameters for two water samples just after opening the bottle and 4 hours later.

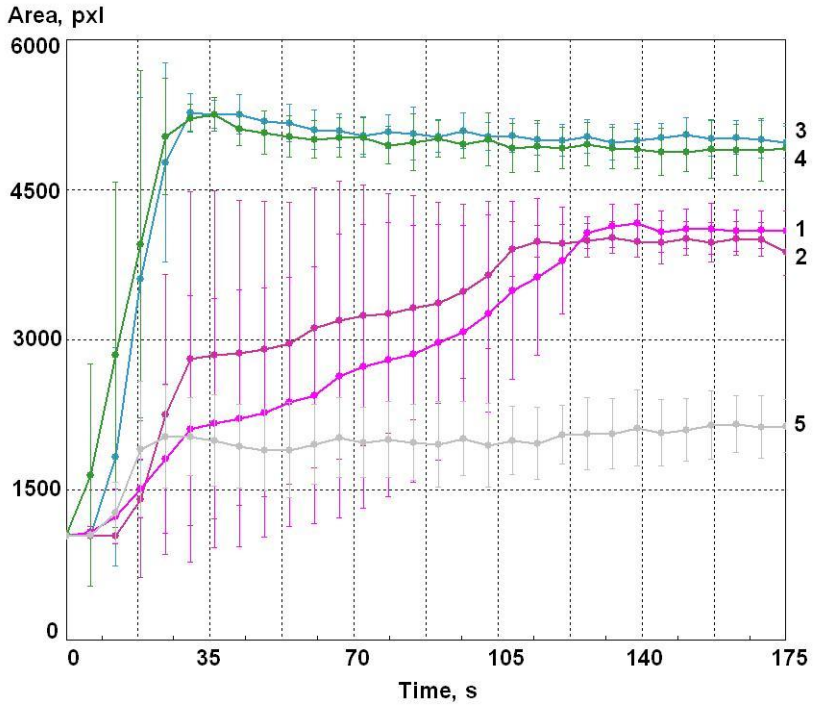


Fig. 6. Time dependence of the EPI glow area of the water drop.
1,2 – Samples of water taken right after the opening the bottle; 3,4 – Samples of water taken 4 hours after the opening the bottle; 5 – Distilled water. Vertical lines represent the level of variation between 10 independent samples of tested water.

The presented data show that right after the opening of the bottle the glow of water is characterized by great variability between the measurements and by considerable increase of the values of parameters, with two distinct phases, but about 2 minutes after the opening the results become stabilized. For the samples of water that were taken 4 hours after, a rise can be observed during the first 30 seconds; after that the parameters remain stable. The amplitude of glow for the distilled water is considerably lower and practically does not change in time.

Monotone increasing of the area at the first seconds of measurement is due to the electro-positive discharge accumulation that takes place at the surface of the glass electrode where the discharge is occurring. As was demonstrated by computer modelling (Korotkov 1985), an electrical field created by positive ions decreased the applied EMF so that the length of the discharge streamers decreased in every subsequent discharge. After some time, when the dynamic equilibrum between the speed of the positive ions accumulation, their neutralization and leakage along the surface was established, and the length of the streamers became quasi-constant.

To study dependence of EPI parameters from the concentration of salts solutions of strong electrolytes (completely dissociated into ions by solvent) such as NaC1, KC1, $NaNO_3$ in distilled water have been used. The studied solutions of strong electrolytes are different in ion radiuses and electroconductivity and have statistically significant differences between EPI parameters for neighboring concentrations of the same solution as well as between similar concentrations of different solutions.

The glow area of drops of the same size is the function of photon emission from their surface. Consequently, activity and flexibility of ions as well as ionization and dissociation degree will contribute to the value of the given parameter. Area and equivalent electroconductivity appear to be connected by the polynomial dependency of the fifth range.

Sensitivity of the Electrophotonic analysis of water allows studying changes of water properties under different influences. As an example fig.7 demonstrate EPI signal from several samples of tap and filtered water under the influence of pulsating magnetic field. In all cases we see big changes of EPI Area of water samples.

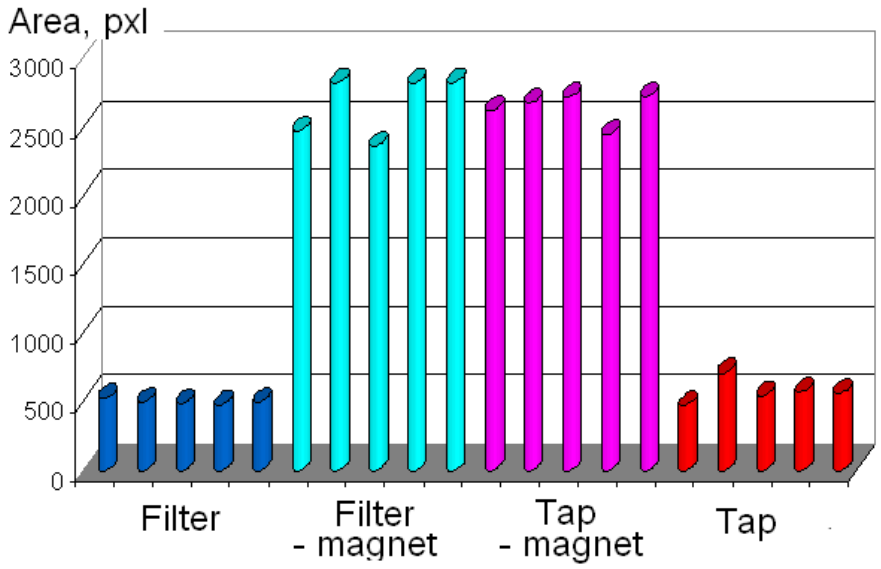


Fig.7. EPI Area for initial and magnetized samples of water.

We have mentioned paper of Bell et al, (2003): “Evaluation of Ultramolecular Doses of Homeopathic Medicines Under Blinded, Controlled Conditions”. It was shown that homeopathic remedies of 30C potency had different response to electromagnetic field compared with solvent.

Similar research was done with Bach Flower essences. They are being prepared by adding several drops of flower essence to the solvent. Fig.8 demonstrates results of the experiment where a different number of drops of chamomile essential oil was added to 100 mL of solvent. As we see from the graph the highest EPI signal we had from solvents with half a drop and two drops. It is interesting that in Dr. Bach recommendations it was written to add two drops.

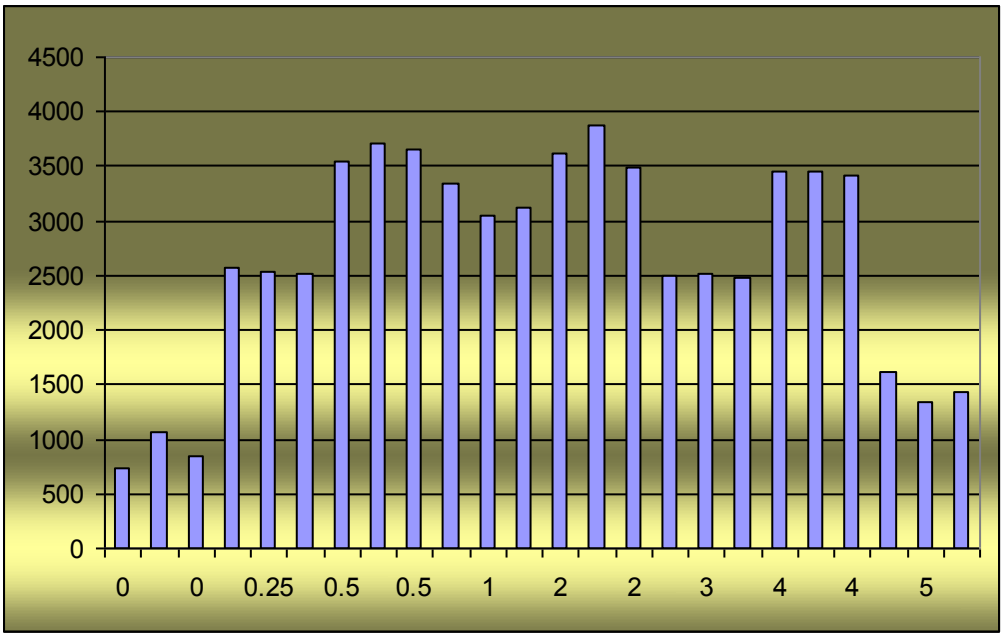


Fig.8. EPI Area of solutions with different number of chamomile essential oil drops (from 0 to 5) added to 100 mL of solvent.

There are a lot of speculations about the influence of pyramidal structures on different processes and in particular, on human condition. We developed a model of pyramid froom paper 30 cm high (~ 1 ft) and placed a glass with 100 mL of tap water under the pyramid for a night. After repeating this experiment several times we found that in some cases EPI image of water being measured in the morning changed their appearance. Fig. 9 demonstrate typical images of initial water and water after a nigh under the pyramid. We need to pay readers attention to the fact that these results were irreproducible, we had them just several times in many experiments and no correlations with environmental conditions or with moon phases were found.

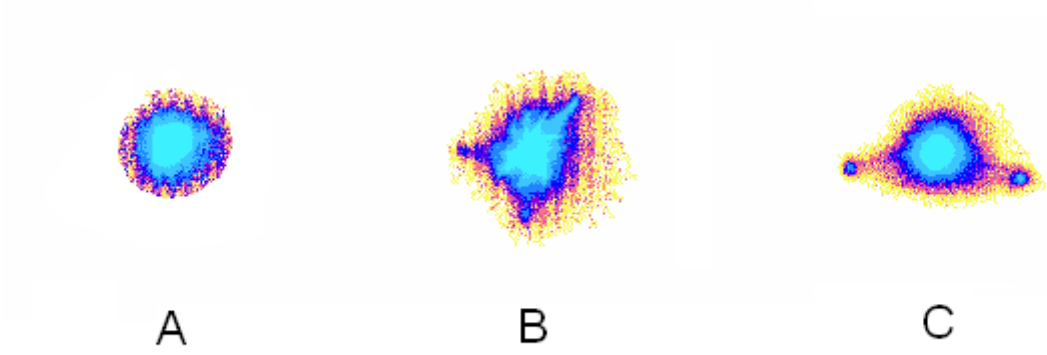


Fig.9. EPI images of water. A – initial tap water; B,C – same water after a night under the pyramid.

In another series of experiments two closed glass vials with distilled water was kept under the model of pyramid from non-transparent glass and in another room in a closed ventilated

cupboard. Pyramid had no bottom so air was able to circulate freely. After a month water from both vials was measured and demonstrated statistically significant difference (fig.10).

Fig.10. Area in pixels of EPI signal from water kept in the room and under the model of pyramid. 8independent tests were done with each type of water.

Later we were able to travel in Mexico where we had numerous experiments with water kept at the top of pyramids for several hours or overnight, and in many cases we had significant difference of EPI parameters from this water compared with control samples. Of course, these results should be accepted as preliminary, and this topic needs much more time and research attention.

There are a lot of discussions about water structurization under the influence of inclusions. Structured water is characterized by ordering water molecules that generally occurs next to hydrophilic interfacial surfaces, where layers of ordered water are found with properties that differ from these of bulk water (Chai et al. 2008). This water has a lot of physical properties different from ordinary bulk water (Wiggins, 2002), in particular that extended water clusters aggregating in an auto stabilizing network can grow to macroscopic proportions (Chaplin 2000, Johansson 2009). This leads to formation of reactive oxygen species (ROS) in water (Voeikov, Del Giudice, 2009) which increases the concentration of free electrons in water and may result in increased signal of stimulated photon emission registered by EPI instrument.

A series of experiments was conducted by measuring EPI images of different waters after immersing gemstones in water, in particular, tourmaline crystals. Typical time dynamics of EPI area are presented at Fig.13. Initial signal of mineral water have some dynamical character, which means response of water to the electrical field, typical for active natural waters. This type of dynamics is quite reproducible and after several second EPI signal reaches quasi-stable level. After tourmaline crystals were immersed in water signal increased and was kept for about an hour (curves 2 and 3 fig.11), after that it came to quasi-stable level, significally higher than initial signal (curves 4 and 5 fig.11). Every curve of Fig.11 were taken with a new sample of water. Control sample of water had no significant difference from sample 1.

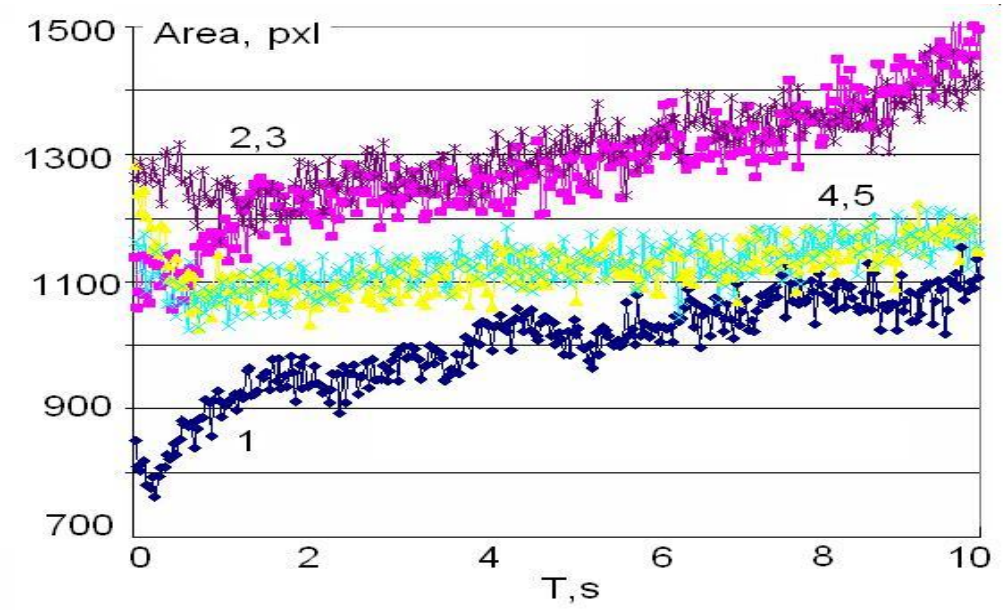


Fig.11. Time dynamics of EPI signal of mineral after tourmaline gemstones were immersed into water. 1 – initial sample; 2,3 – 5 min and 30 min after placing gemstones; 4,5 – 1 hour and 2 hours after immersing gemstones.

As it was mentioned before, different mineral waters have different time response to the electrical field. As an example Fig.12 demonstrate time dynamics for a natural mineral water (curve 1) that is absolutely different from presented at Fig.11. Fig.12 demonstrate example of so named "water memory". Tourmaline crystals were kept in water for 1 hour, then they were taken out, and samples of water were measured for several hours. As you see from the graphs, water had different from initial EPI signal for many hours after crystals were taken from the water.

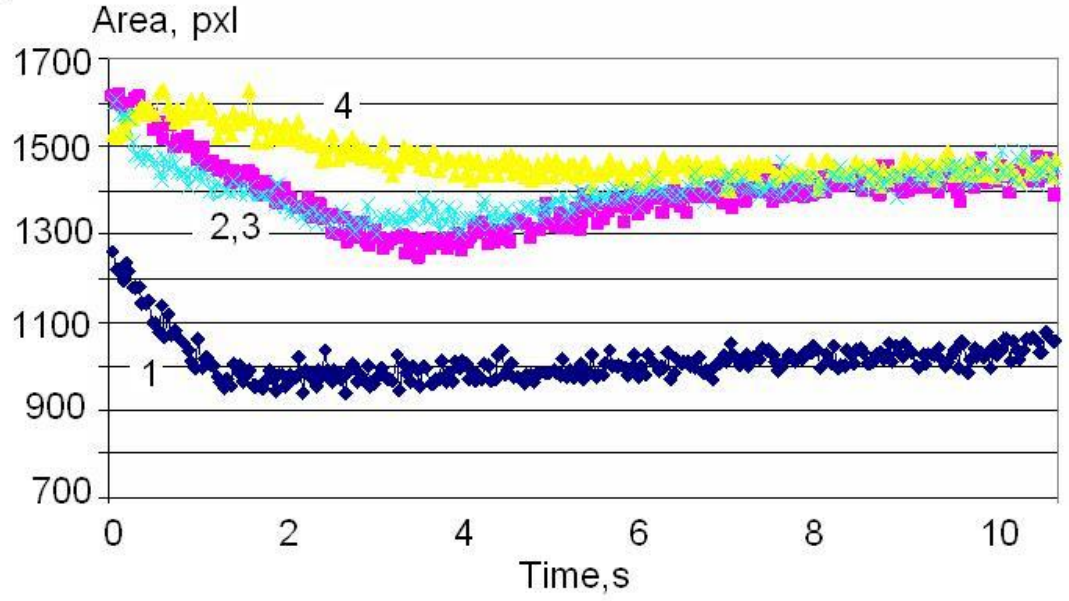


Fig.12. Time dynamics of EPI signal of mineral after tourmaline gemstones were kept in water for 1 hour and taken off. 1 – initial sample; 2,3 – 1 hour and 5 hours after taken off gemstones; 4 – 9 hours after taken off gemstones.

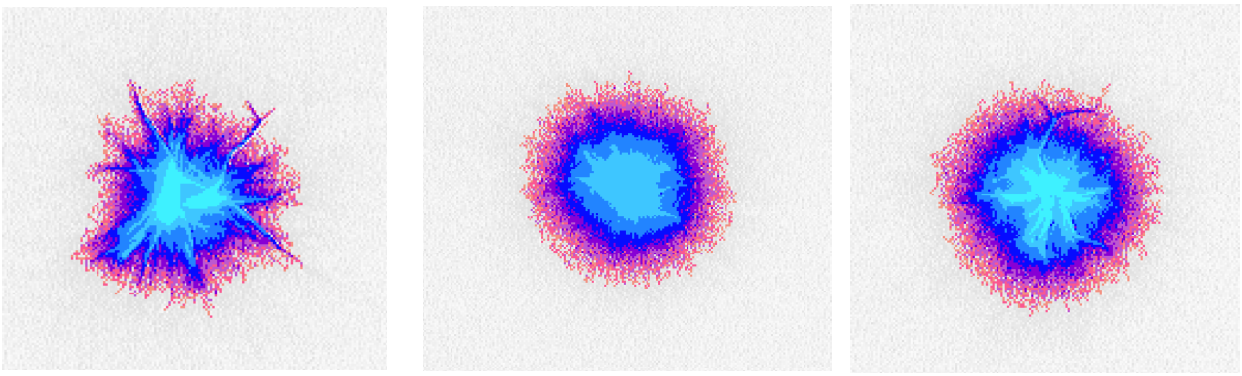
Presented results were repeated many times with different waters and in most cases immersing crystals into water produced significant effect. This confirms ideas of water structurization on crystalline surfaces with increased production of free electrons. The strange

phenomena observed in water coming from springs located in caves could be analyzed just in this context. A very interesting article (Balk, 2009) has reported that at the rock-water interface very interesting oxidative phenomena and also oxidative stresses appear.

Nowadays we may find a lot of offers of different devices for water activation. We are routinely conducting experiments testing these devises with EPI technology. Results of one experiment are presented below. In this experiment three samples of water were investigated:

1. "City water" – water, taken from city water-supply line in St Petersburg;
2. "Filter water" – city water, passed through the filter Aquafor;
3. "Active water" – city water, passed through the filter "Aquafor" and activator "Biobird".

In the EPI experiments statistically significant differences between glow parameters of water samples were observed. Statistical analysis of GDV-grams of water samples had shown that the parameters of glow are corresponded to normal distribution that had allowed applying ANOVA statistical methods for data analysis. The differences in glow pictures were also visible (fig.13).



a) City water b) Filtered water c) Active water

Figure 13. Typical picture of EPI/GDV glow of different water samples.

During the investigation of changes of water glow in time the most significant differences between water samples were observed in the first day of measurements. The largest Area of glow was observed on City water sample. This may be explained by presence of different impurities in city water. After the purification (Filtered water) Area of glow considerably reduced. Pure water from filter then was passed through the Activator. Area of active water glow significantly increased in comparison with pure filtered water. This difference was kept for 4 days of storage (fig.14).

We conducted similar testing for different devices and in many cases (but not all) the influence to water was significant without changing its chemical composition. This may be related only to structurization of water by different fields. We have now conceptual explanation of these effects presented in the Discussion section.

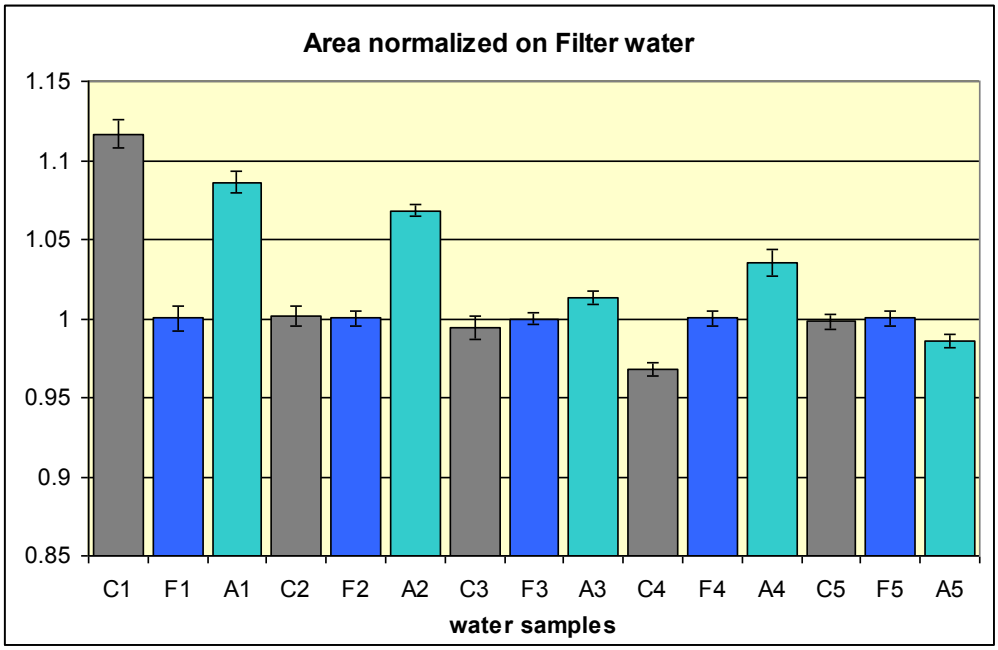


Figure 14. Histogram of average values of glow Area normalized on average Area of Filtered water in 5 day of measurements. C1-C5 – City water taken and measured in different days; F1-F5 – Filtered water taken and measured in different days; A1-A5 – Active water taken and measured in different days.

Consciousness influence to water

Developed approach allowed to distinguish the changes of electrophotonic parameters of water under the remote influence of the human consciousness – directed human attention. Experiments were being performed in many independent sessions from 2001. Numerous experiments demonstrated that mental influence results in statistically significant changes of the EPI parameters of water that remained intact for a long time. These results are not of purely gnoseological importance, but of a real practical value as well, because they prove that the quality of food depends on the mental mood of the person that prepared it. As the saying goes, “poison given by a wise man is better than manna given by an enemy”.

Below we present results of several experiments.

Signal from water drop was measured for an hour in automatic mode, and during this time a person directed attention to the water from some distance trying to change the structure of water. Some people after several attempts were able to do this repeatedly. Typical example of water EPI signal under the mental influence from another room in the same building is presented at Fig.13.

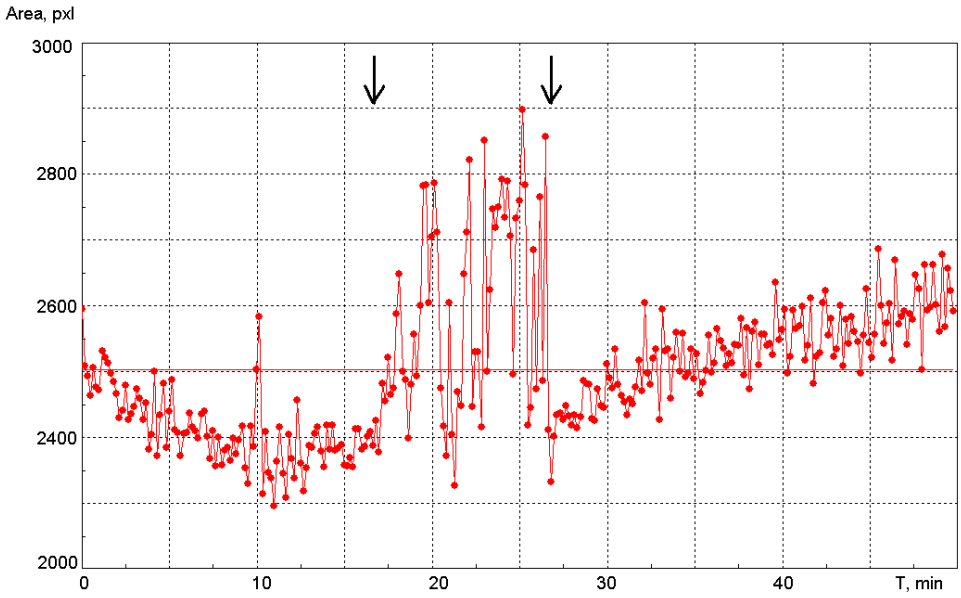


Fig.13. Time dynamics of water signal in intact state and after the remote conscious influence (marked with an arrow).

In another series of experiments in agreed days five plastic 1-liter identical sealed bottles of drinking water were placed at 10 am at the table in the experimental room of Saint Petersburg University. Every bottle was labeled with color strip. Bottles were left intact till 4 pm when measurements of electrophotonic parameters of water samples from every bottle were undertaken.

German healer Christos Drossinakis visiting St. Petersburg has proved his ability to influence water remotely. It was agreed that he would perform remote mental influence to water during eight agreed days to a bottle with particular color strip randomly chosen by him. He performed this influence within four days from Japan and Germany at 12 a.m. for 10 min. Researchers performing measurements were unaware neither of the influence performed no of the target bottle. So the experimental session was organized in accordance with twin blind study design.

Significant changes in electrophotonic parameters of water drops between samples from different bottles were found only in two days. This difference was statistically significant and reproducible in successive measurements. It was days of Drossinakis' influence from Japan. In other six days no significant reproducible difference between samples was found.

Fig. 14 demonstrates dynamical curves of water electrophotonic parameters. In this case curves for samples 4 and 5 have different behavior compared with other samples. For sample 5 subsequent measurements revealed interesting behavior: at the first measurement the curve had a strong variation, while the same sample, measured 10 min after, demonstrated behavior, very similar to the curve of sample 4. This type of curve was repeated in all other subsequent measurements and after the third measurement the curve became quite reproducible.

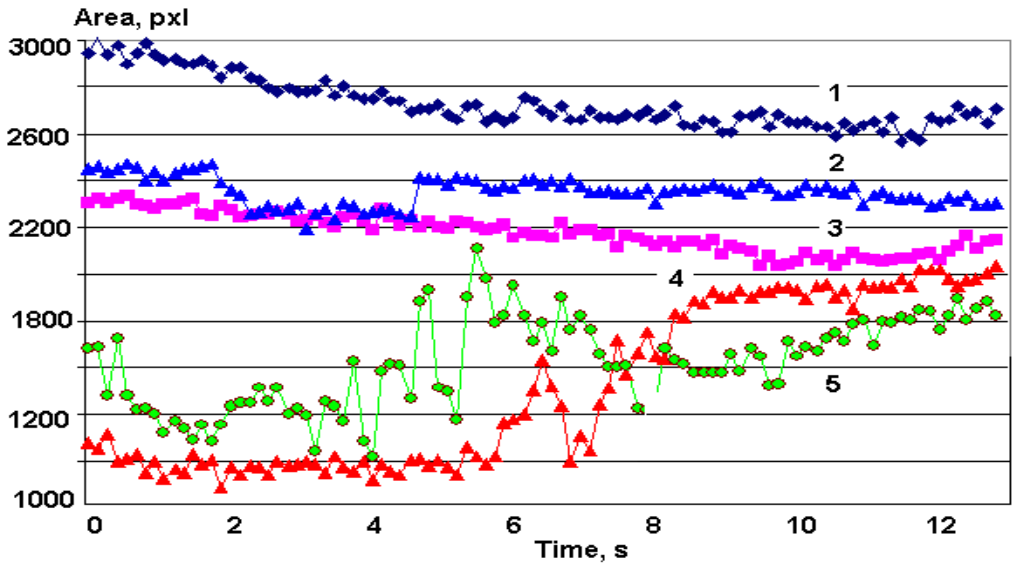


Fig.14. Time Dynamics of the area of GDV glow for water drops from 5 different bottles.

Big series of experiments were conducted together with Lynne Mc Taggart. Using Internet and social networks she was organizing big groups of people in different countries to send their intentions at the particular time to water standing in our laboratory. Time selected was convenient for people in different countries: 5 pm GST, which is 6 pm in Europe, 8 pm in Russia and morning in the USA. Water was measured in dynamic mode (fig.3) every 5 seconds 1 hour before the scheduled time and 1 hour after. Experiment was repeated several times and every time we had statistically significant difference between samples. Example of the results is presented at fig.15.

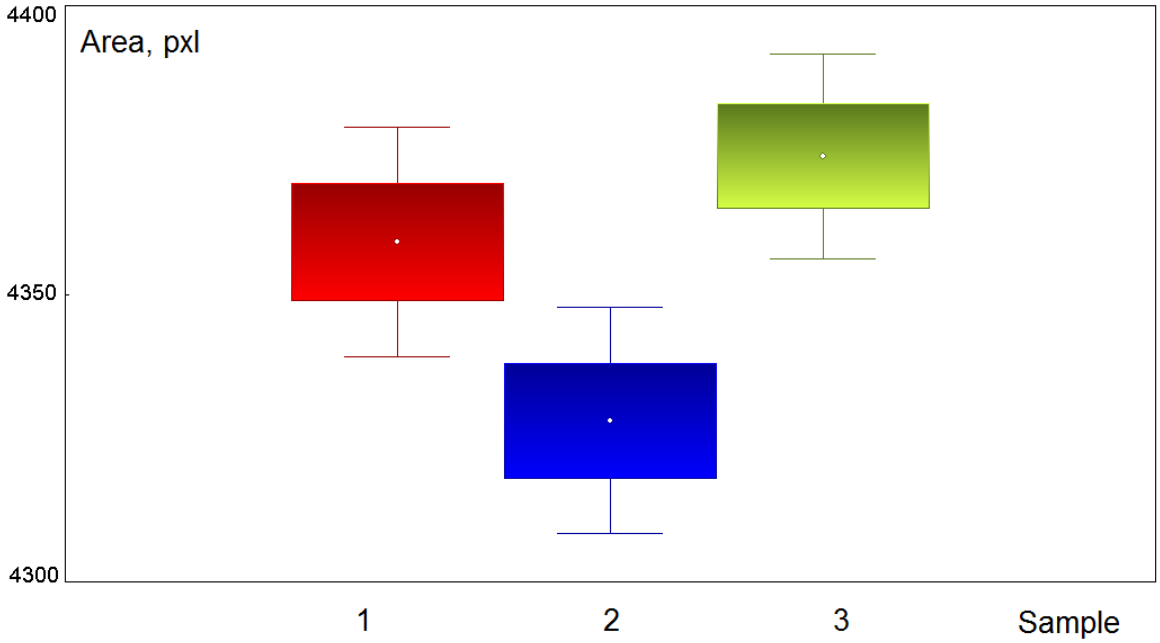


Fig.15. Time Dynamics of the area of GDV glow of water before (1), in the process (2) and after (3) the remote intention influence of a big group of people.

DISCUSSION

Very long ago, water has been recognized to be the matrix of life. In recent times huge amounts of findings have been collected about structured water and its role in the living dynamics. In the 50's Albert Szent-Gyorgyi admitted that biologists were still unable to provide a formally satisfactory definition of the difference between "animate" and "inanimate" objects since "..biology has forgotten water or never thought of it" (Szent-Gyorgyi, 1957). The main proposal of Szent-Gyorgyi was that the organized water existing close to the biological surfaces was able to induce a very long lasting electronic excitation of the different molecular species present thereby, making therefore possible their activation and selective mutual attraction. As a matter of fact, most biochemical reactions are redox reactions, demand a supply of electrons. However, both biomolecules and isolated water molecules are not electron donors, since electrons are tightly bound to parent molecules with binding energies of several eVs.

Quantum Field Theory, developed by the group of Emilio Del Giudice (Del Giudice, 1998, 2006, 2009) has produced a vision of liquid water as a medium, which for a peculiarity of the molecule electron spectrum reveals as an essential tool for long-range communications, being able to change its supramolecular organization according to the interaction with the environment. The electromagnetic fields trapped in the coherence domains and in their coherent arrays produce electromagnetic potentials governing the phase of the whole system, which in turn gives origin to selective attractions among the solute molecules. In this way an array of biochemical reactions (soma) and time-evolving information simultaneously evolve, leading to the appearance of the self-consistency, which opens a new perspective for self-maintaining and stability of the systems under study.

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CONCLUSION

The obtained data show that the electrophotonic method has high selectiveness and sensitivity when used for the study of liquid-phase objects, in particular, various types of water. The obtained information depends on the chemical composition of water, but the determining and the most curious dependency is the dependency on the structural composition of the liquid. The electrophotonic parameters are determined by the emission activity of the surface layer of the liquid, which depends on the presence of surface-active valences. This property is obviously determined by the structure of the near-surface clusters, which means that the electrophotonic method is one of the informative methods for study of structural-informational properties of liquids. Nowadays the EPI method is being used for testing different drinking waters having similar chemical composition for their activity. At the same time several research lines have been developed on studding different liquids, first of all blood.

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