



Subtle Energy Interaction as Pure Physics

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ABSTRACT

This research paper shows subtle energy known as chi or vital energy to be an existing kind of physical interaction that can be used in healing. Subtle energy is proven in this paper to have pure physical existence that interacts through Nikola Tesla coil and electromagnetic interaction principles. The findings of this paper reveal that the human body is composed of LCR electronic circuits suggesting that the induction source in the human cell is from the Alpha helices nano structure proteins. Human bodies can resonate with its surrounding environment being animate or inanimate based on the findings of the paper. The results show that electromagnetic waves can be transmitted and received, while energy can be transmitted then induced in human bodies or inanimate objects in the form of high frequency electrostatic currents. LCR properties can also have effects on the human health as explained in this paper.

Keywords: Subtle Energy, LCR, resonance, Alpha helices proteins, Health, Environment interaction, Nikola Tesla.

INTRODUCTION

Throughout the history of mankind, people have been fascinated by what we call today paranormal phenomena that sacred figures in various religions, cultures, and myths, have been practicing through different kinds of rituals.

Modern science however believes in experimental work and empirical measurements, causing people not to believe in anything but what you can test with scientific empirical measurement tools and devices. That's why scientists and researchers tried to understand these types of phenomena caused by this type of energy called subtle energy, life force energy, or called Chi energy by Chinese traditional arts' practitioners such as Tai chi, Feng Shui, Chinese Meridian energy healing, acupuncture, etc...

Scientists as Sir Isaac Newton(1643-1727) believed in the aether like many astronomers who believed that the fabric of space is made from this medium [1]. While Franz Anton Mesmer(1734-1815) introduced the term Animal magnetism [2]. Many people believed that through this medium -aether and animal magnetism – people can interact emotionally and mentally. However, the aether was then totally rejected by scientists after experimentations [3]. The research shows that interactions can happen without us being aware of any and they can be physically detected without the existence of the aether.

The research findings are based on electrical properties of materials. That's why experiments were based at the begining on skin resistivity since it has to do with human mental stress and it was used in lie and emotional stress detection [4]. Stress detection, heart rate, brain waves, and even muscle state are all used in different medical research purposes. This kind of research was used and still used as therapy known as Biofeedback which is used to decrease and treat mental stress, psychological problems, and for human wellness [5]. Energy healing and Medicine meet under Biofeedback therapy since breath patterns used in meditation in different energy arts such as Yoga release stress and make humans at ease.

Many healers believe that all kinds of healing are not due to anxiety relief but because of subtle energies or Chi energy. Chi energy was never detected scientifically, however scientists tried to understand why Chinese healing such as acupuncture would work for patients; till it was discovered and confirmed that the meridian points on a human being have lower skin resistances measured in ohms having a relation to capacitance [6]. However, this didn't explain how this phenomenon has any effect on our health, and didn't show what Chi or life force are.

This research is built upon their research to understand subtle energy as pure physical electric interaction since some geometrical shapes and vital living things create high voltage discharges

upon handling them on a kirlian camera [7]. Some researchers also showed that Kirlian photography can show health hazards [8].

Many Energy practitioners and paranormal people use scientific terms trying to explain different forms of practices they perform by electric force, magnetism, electromagnetic interaction, etc... without any evidence or empirical scientific experimentation that proves and explains how healing or any kind of paranormal activity takes place. However, some researchers tried to understand subtle energy as an interaction that takes place through our human subtle aura and they investigated our Bioelectromagnetic properties and they said that our human electromagnetic aura is affected by the subtle aura [9]. The research bridges the gap between kirlian photography and Bioelectromagnetism since Scientific experiments showed that geometrical shapes and proportions have effects on biological life [10].

This paper shows what subtle energy is and what type of physics energies it is and to achieve this, the research paper built upon skin resistance as a solid Biological and Physics phenomenon and studied the human body as a complicated electric and electronic circuit because Living cells have capacitance properties that can be calculated through a mathematical model that even shows how action potentials take place in living cells [11].

This research shows that the human body is not just an RC circuit but it is a more complicated and advanced LCR circuit built from inductors, capacitors, and resistors. Hence, a human body has Nikola Tesla Coil properties.

In the methods section it is explained how the research discovered this, showing a step by step experimentation method. While In the discussion section the impact and the interpretation of the discovery is explained that proves that subtle energies or chi are electrostatic currents having high frequencies that create electric fields, magnetic fields, and electromagnetic fields that interact as pure physics bound by equations while on the biological level they can affect human cells.

MATERIALS

Various devices were used to measure different electric properties as shown below;

MT-1820 (multi-meter)

An MT-1820 multi-meter from Pro'sKit company was used in the experiments for measuring AC voltage at finger tips, DC voltage of water and the resistance of water. The device accuracy at measuring resistance at the range of 6 K Ω to 6 M Ω is $\pm(0.8\%+4d)$. As for the accuracy at measuring DC voltage at the range of 6 V to 600 V is $\pm(0.5\%+4d)$. The device accuracy at measuring AC voltage at the range of 6 V to 600 V is $\pm(0.8\%+10d)$.

LCR55A (LCR meter)

AN LCR55A meter from AMPROBE company was used in the experiments to measure the Inductance, capacitance and resistance in the LCR experiments at the midway between both frontal bosses area known as the third eye chakra. The accuracy of measuring resistance from the range 2 k Ω to 2 M Ω is $\pm (0.5 \% \text{ rdg} + 1 \text{ dgt})$, while the accuracy at the 20 M Ω is $\pm (2.0 \% \text{ rdg} + 2 \text{ dgts})$. As for Inductance; the accuracy at the range 2 mH to 200 H is $\pm (5.0 \% \text{ rdg} + 20 \text{ dgts})$. The capacitance accuracy at the range 200 pF to 200 nF is $\pm (1.0 \% \text{ rdg} + 1 \text{ dgt})$. Readings over range show OL. on the screen.

FC-2500A (frequency counter)

An FC-2500A frequency counter from LUTRON ELECTRONIC company was used in the experiments to measure the frequency of the electromagnetic waves in the energy accumulation experiment to show if there was any change in the electromagnetic frequencies during the experiment. The device was used at the 10 MHz range which is sensitive at frequencies from 10 Hz to 10 MHz. The frequency accuracy is $\pm (4 \text{ PPM} + 1 \text{ d}) - 23 \pm 5$, after calibration. The device was set to high sensitivity, SLOW mode which has a resolution 1 Hz and a sampling time 1.25 sec.

70% Ethyl Alcohol

Areas being tested were cleaned using a cotton having 70% Ethyl Alcohol to make sure there is no sweat or dirt on skin.

YULE Gel (ultrasound and conductivity gel)

A medical ultrasound gel was used to enhance device measurements. This Gel does not irritate skin, non greasy, hydrosoluble. It also does not injure transducer, spreads out easily, and uniformly. This Gel can be removed easily using disposable towels.

Experiments Lab Specifications

Experiments were done in a controlled environment to decrease electromagnetic radiation and electrostatic noise. The room footprint is 1.5 m x 2.2 m with a height 2.2m Fig. 1. This room has no window openings to reduce direct sun light, However it has a wind-chimney to let in indirect light and a little breeze of air to provide a meditation environment. No AC electricity wires were allowed in the room to prevent uncontrolled electromagnetic interaction from taking place during experiments. That's why this room is naturally air-conditioned with the wind-chimney having it directed towards the wind direction and having a grill opening in the door to let the air flow out-in. This would prevent people being tested from sweating which can cause troubles in measurements. The walls of the room are wooden boards while the external side of the walls is lined with aluminum foil sheets. The wind-chimney and the grill openings are designed to have welded wire mesh. The Aluminum foil sheets lining of the room and the welded wire mesh at the openings block electromagnetic waves at the range of radio waves and microwaves from entering the room. This provides better accurate measurements.

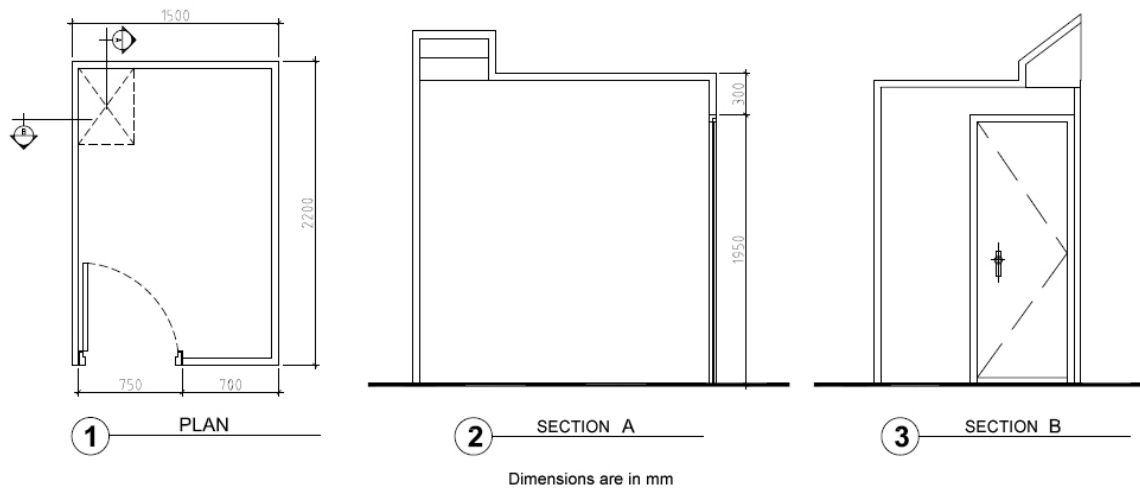


Fig. 1: Experiments Lab Design

METHODS

First experiment

Objective To prove that our body has LCR properties represented in Induction, capacitance, and resistance skin properties that can be tuned.

Procedure The third eye chakra was chosen as an easy access point in the human body which is located at the midway between both frontal bosses. 10 subjects cleaned their face with a piece of cotton having 70% Ethyl alcohol. A Gel was then added to the third eye chakra to help accurate device measurements. The third eye chakra was measured with the probes of the LCR meter as absolute values. Induction, capacitance, and resistance were measured each in 10 seconds. After recording the device readings the subjects did clock wise rotation massage for their third eye chakra for a one minute. The same point was measured with the LCR meter again to measure the induction, capacitance, and resistance to check if there was any change, each measurement reading was recorded after 10 seconds each. The subjects then did an anti-clock wise massage for their third eye chakra in an anti-clockwise direction for one minute and the same point was measured again with the LCR meter to measure the induction, capacitance, and resistance if there was any change each in 10 seconds.

Second Experiment

Objective To prove that human bodies can interact and resonate with the surrounding environment and accumulate subtle energy. This experiment is also to prove that subtle energy is an electromagnetic interaction force that can take several forms such as electrostatic currents or electromagnetic waves.

Procedure The subjects cleaned their middle one third of the palmar surface of the middle finger in both right and left hands with cotton having 70% ethyl alcohol. They also added medical Gel at the same area. Subjects were grounded to a zero volt source so that they get cleansed out of charges. The MT-1820 multimeter recorded absolute readings of AC Voltage after cleansing at both areas in both right and left hands. Subjects made each hand take the form of a tube and they inserted the antenna of the FC-2500A frequency counter without touching their skin. Frequencies were recorded for each hand of each subject. Each subject started to meditate for 5 minutes and same measurements were taken after the five minutes meditation at the same points the same way.

Third Experiment

Objective To prove that human bodies can interact and do physical change in other things through resonating electromagnetic force.

Procedure Water was chosen to be the sample that subjects interacted with through palm healing. Water was chosen since it's an inanimate non living thing, yet human bodies and living things have water composition. The MT-1820 multimeter recorded initial absolute DC Voltage and Resistance of drinking water that was kept in a glass of water before any water healing. Subjects meditated for 5 minutes then they did palm healing for the water having both of their palms around the glass of water without touching it for 2 minutes. The multimeter then recorded Absolute DC Voltage and Resistance after each healing session. Each healing session was performed on a new water glass.

RESULTS

In the following statistical results, null hypothesis statistical technique in the t-stat statistical method (t-test: two- sample assuming equal variances) is used. Results of significance from 0 to 0.5 mean no significant change while from 0.5 to 1 mean significant change.

First Experiment

Table 1 shows Induction, capacitance, and resistance measurements before massage, while Table 2 and Table 3 show LCR measurements after clockwise and anticlockwise massage. knowing that L stands for induction, C for capacitance, and R for resistance. OL measurements mean measurements were over the device measuring range which is 200 H in this case.

Table 1: LCR Measurements Before any Massage

	1	2	3	4	5	6	7	8	9	10
L (H)	9.5	28	18.5	36	OL.	38	18	14	19	36.1
C (nF)	7.5	2.6	3	1.7	0.5	1.4	4.9	1.1	1.9	3.3
R (K ohm)	70.4	400	1100	900	900	1050	89	700	700	900

Table 2: LCR Measurements after Clockwise Massage

	1	2	3	4	5	6	7	8	9	10
L (H)	36	18	31	OL.	OL.	36	18	39	200	23
C (nF)	1.1	1.8	0.6	1.1	0.6	0.9	1.4	1.4	2.3	3.5
R (K ohm)	50	700	1000	1800	3000	800	600	790	690	260

Table 3: LCR Measurements After Anticlockwise Massage

	1	2	3	4	5	6	7	8	9	10
L (H)	40	56	26	33	OL.	38.8	OL.	22	OL.	24.4
C (nF)	1.9	1.5	0.6	1.8	0.8	2.1	1	1.3	1.3	2.1
R (K ohm)	600	140	1900	2900	2500	800	500	490	160	240

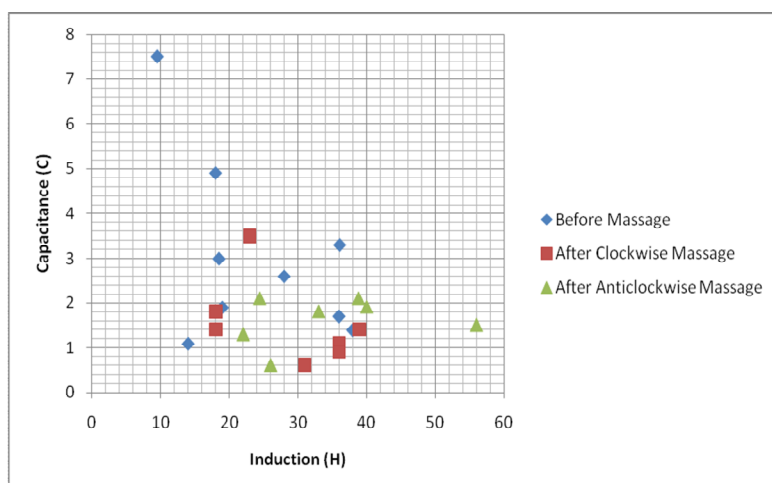


Fig. 2: Induction to Capacitance Before and After Massage

Statistics showed that capacitance values decrease on clockwise massage with significance 0.918559 while in case of anticlockwise capacitance decrease with significance 0.937616968. As for induction values, statistics showed it to be increasing in case of clockwise massage with significance 0.757474 and showed that in the case of anticlockwise massage induction value increase with significance 0.809065349. Fig. 2 shows induction to capacitance change. Resistance was shown to increase in both cases with significance 0.66.

Second Experiment

Table 4, and table 5 show AC voltage and electromagnetic frequency at both the right and left hands before and after meditation.

Table 4: AC Voltage and Frequency at Right and Left Hands Before Meditation

1	2	3	4	5	6	7	8	9	10			
0.003	0.00	0.001	0.00	0.005	0.001	0.001	0.003	0.023	0.00	AC	Voltage	Right
180	-	196	-	207	171	-	192	-	170	-	170	-
190		192		185	195		175		190		195	
0.004	0.00	0.003	0.01	0.003	0.015	0.001	0.001	0.014	0.01	AC	Voltage	Left
170	-	195	196	202	195	170	-	140	-	192	192	-
190					195		175		195		220	

Table 5: AC Voltage and Frequency at Right and Left Hands After Meditation

1	2	3	4	5	6	7	8	9	10				
0.03	0.02	0.001	0.013	0.0029	0.027	0.011	0.024	0.0	0.1	AC Voltage (V)		Right	
5	8							5	7			Hand	
170	189	140	-	140	-	197	194	181	-	170	-	214	222
		195		193				192		180			
0.03	0.01	0.016	0.02	0.011	0.025	0.03	0.001	0.0	0.3	AC Voltage (V)		Left	
5	5							4				Hand	
17	200	140	-	179	-	170	-	170	-	160	-	205	211
		195		197		190		180		180			

Statistics showed AC voltage measured at the right hand to increase after meditation with significance 0.938461298. Statistics also showed an increase in the AC voltage values measured at the left hand after meditation with significance 0.828449229. AC voltage change can be noticed in Fig. 3 at the right and left hands. As for electromagnetic frequencies; statistics showed that after meditation frequencies decreased in the right hand with significance 0.685757679 and the left hand decreased with significance 0.714349549.

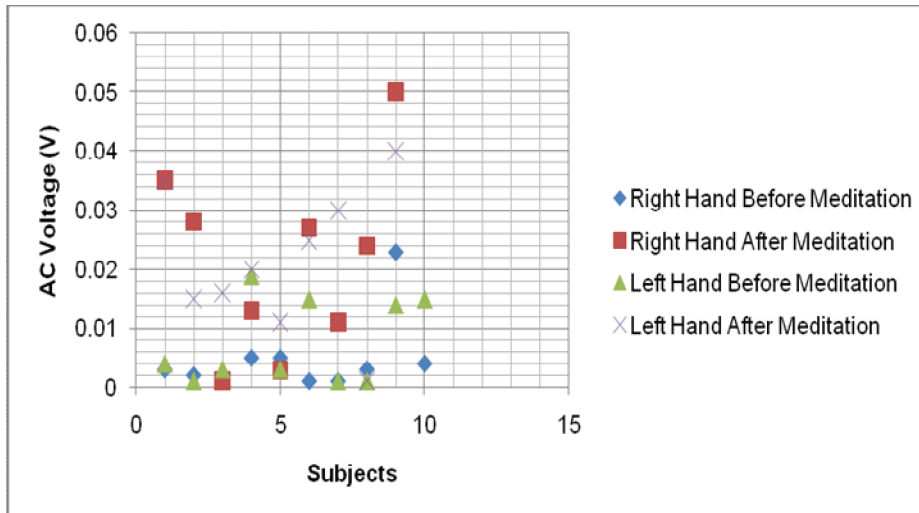


Fig. 3: AC Voltage at Right and Left Hands Before and After Meditation

Third Experiment

Table 6 and Table 7 show DC voltage and resistance of water measured before and after water healing.

Table 6: Water DC Voltage and Resistance before Water Healing

1	2	3	4	5	6	7	8	9	10	
0.03	0.05	0.033	0.027	0.035	0.044	0.021	0.015	0.005	0.012	DC Voltage (V)
130	130	213	127	55	218	275	198	202	223	Resistance (K Ohm)

Table 7: Water DC Voltage and Resistance after Water Healing

1	2	3	4	5	6	7	8	9	10	
0.07	0.07	0.06	0.05	0.042	0.072	0.046	0.03	0.024	0.04	DC Voltage (V)
230	200	287	185	186	252	403	277	276	227	Resistance (K Ohm)

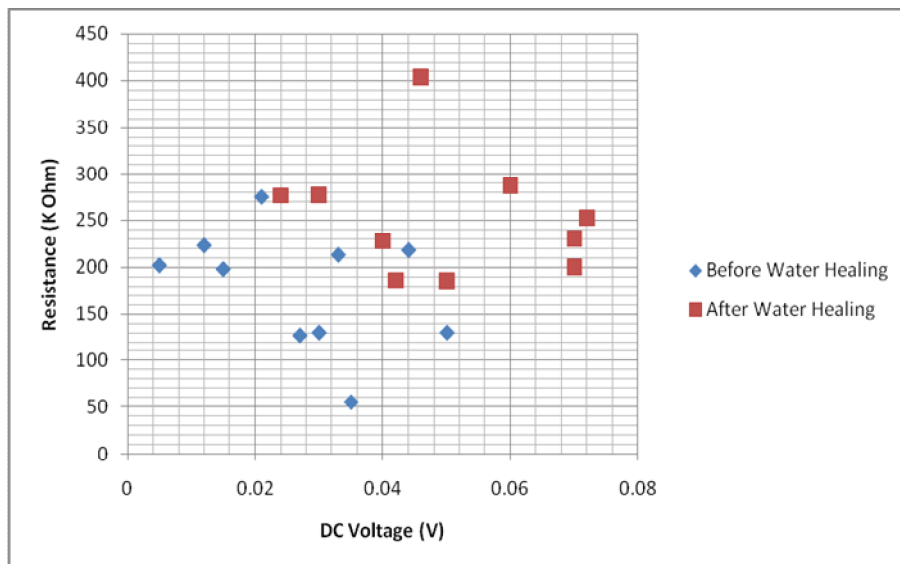


Fig. 4: Water DC Voltage to Water Resistance before and after Water Healing

Statistics showed that water DC voltage increase after water healing with significance 0.99599971. Water resistance also increases after water healing with significance 0.981795379. Fig. 4 shows change in water DC voltage and resistance after water healing.

DISCUSSION

Previous experiments and statistics show that subtle energy interactions are based on pure physics that can be explained based on the principles of electricity and electromagnetism.

According to the results of the first experiment, Table 1 shows LCR measurements of the third eye chakra before any clockwise or anticlockwise massage, which proves that our human skin has LCR properties. Yet as mentioned before in the methods section, the third eye chakra was chosen as an easy access area in the human face.

According to the statistical significances mentioned in the results section of the first experiment; both clockwise and anticlockwise massage showed an increase in the induction value and a decrease in the capacitance value. Yet the significance of the anticlockwise massage is stronger. This means that the LCR circuit can be fine tuned. It tunes static electricity through resonance at high frequency being induced from electromagnetic waves or other electrostatic sources.

High resistance of the human skin acts as a good conductor of static electricity as it allows high frequency static electricity which can be explained by the physics phenomenon known as *skin effect* [12].

An LC circuit is a circuit that creates resonant frequency based on this law $f = \frac{1}{2\pi\sqrt{LC}}$ knowing

that f is the resonant frequency, L is the inductance value, while C is the capacitance value [13].

Through creating a resonating electrostatic frequency based on the LC resonance between two separate circuits, the circuit having the power supply induces in the other circuit through electromagnetic waves depending on the power of the primary circuit. This is the main concept of Nikola Tesla coils which is also the concept of transferring electricity through wireless communication as in what is now known as WiTricity or wireless electricity which is all based on tuning a resonance based on induction and capacitance in two separate circuits [14].

Therefore when our body is not charged it can be charged if exposed to electrostatic fields from any kind of source that can be a healer or a geometrical shape having resonant LC frequency (in resonance) or through intentional healing meditation. Our body can also charge other people or objects based on electrostatic interaction. Our bodies have the capability also to transmit electromagnetic waves from different LC points in our body and can receive electromagnetic waves from the same LC points based on the LC resonance knowing that receiving electromagnetic waves means inducing electrostatic currents. This is what the second and third experiments showed from the statistical significance results. Since subjects were able to increase their AC voltage and change their electromagnetic frequencies on both the right and left hands through meditative healing sessions in the second experiment. While in the third experiment subjects were able to increase water DC voltage and resistance.

Therefore our bodies can interact with other people, animals, plants, geometrical shapes, architectural spaces, light, and the sun, the moon, the stars, TV, phones, computers, electricity lines, antennas and everything if in resonance with our own body's LC circuits.

The reason for our human skin capacitance is caused due to the *Lipid Bi Layer* [15] which is the material that forms cell membranes in living things Fig. 5 and this property helps in the action potential process as calculated by Goldman Equation [16]. As for the induction skin property, the research suggests that the induction is due to the cell membrane channels form, that's because the ion channels passing through the cell membranes that cause the action potentials and other purposes take Alpha Helices ribbon structures at the Nano scale [17] Fig. 5.

It is believed that the channel pumps work through the Na-K ATPase pump [18]. The researcher also suggests that the potential gradient at the channels can be caused due to the voltage induced in alpha helices coils or at least can be affected by the induced voltage.

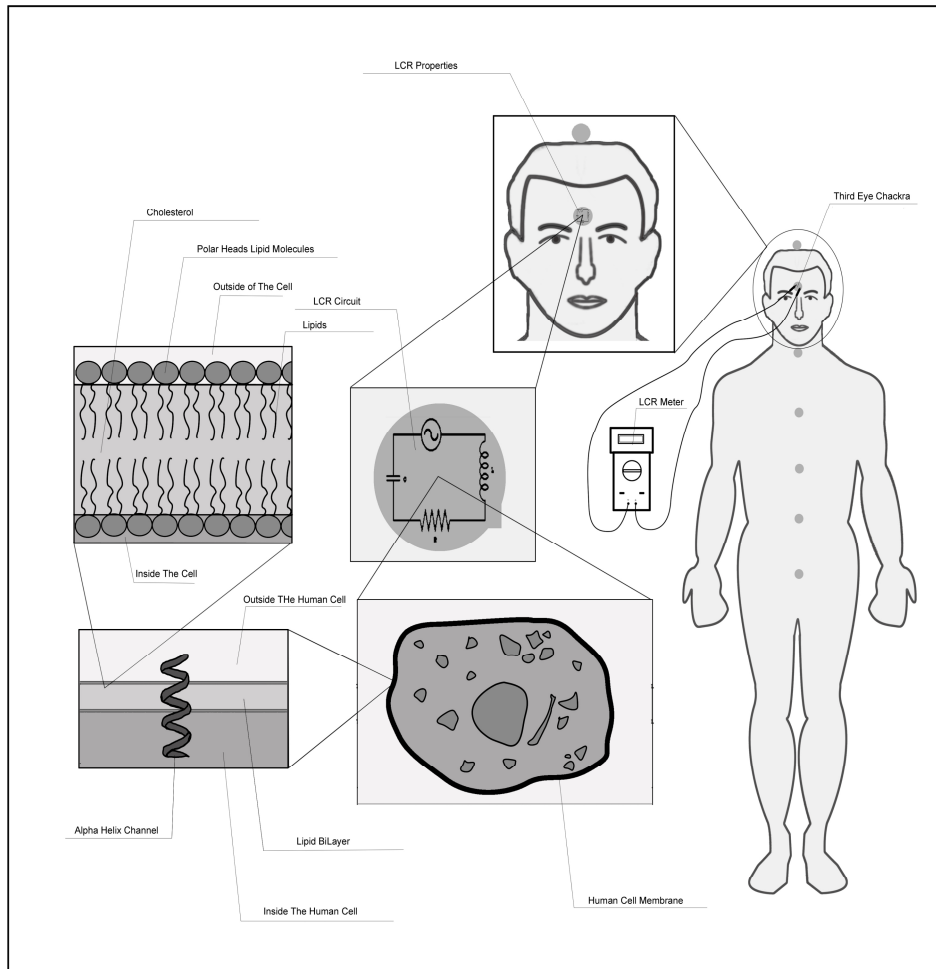


Fig.5 : Human Skin LCR Properties

EXPECTATIONS

Based on the findings of this research, the researcher expects that healing using subtle energies accumulated on palms or resonating with geometry or any kind of energy that generates an induced electrostatic field on human skin would have positive or negative effect on the human health based on its voltage value and frequency. This can happen since voltage at skin would have an effect on the ion channels and any channel that is based on potential gradient or deals with ions even through osmosis, because the induced voltage can change the value of the voltage source at the channel gate which may change the firing voltage rate. It can also cause **Positive feedbacks** [19].

Induced voltage in the cell may also cause Electroporation to take place which can let bodies such as viruses into cells or help other bodies enter the cell through the cell membrane itself and not through channels [20]. Induced currents that can reach nerves through capacitance can also increase the rate of signal transmission that may be balanced to heal from diseases or may cause diseases if not balanced through decreased or increased impedance or nerve resistance.

CONCLUSION

Subtle energy is one of the fundamental forces of nature that is electromagnetic force which can take different forms and interact through different ways that are all known in physics and can be predicted through mathematical physics calculations based on LCR circuit properties. It can interact with living and non living things through LCR properties either in living cells or due to geometrical shape's electrical properties.

RECOMMENDATIONS

The researcher recommends on behalf of this research that other researchers and scientists would continue researching further steps towards more experiments based on the findings of this research in different fields of science as Physics, Engineering, Biology, Medicine, Astronomy, Arts and all kinds of human knowledge.

As for Physicians:

- 1- It is recommended to create research groups studying the effects mentioned in the paper to find suitable healing ways and methods using electromagnetic and electrostatic interaction.
- 2- It is recommended to study paranormal and parapsychology through the new understanding of subtle energy and the new concept of subtle energy resonance.
- 3- It is recommended to create new wellness devices for people.
- 4- It is recommended to study the effects of modern technology to help retuning them to be in the sake of human health.

As for Physicists and Engineers:

- 1- It is recommended to study humans as part of nature and to study how physics interacts with life.
- 2- It is recommended that physicists and engineers create simulation software that simulates our environment in terms of architecture and geometry to show their effects on the electromagnetic interactions while having humans as part of the simulation based on LCR resonance.
- 3- It is recommended that BioGeometry instructors, researchers, and practitioners start to study BioGeometry principles through the findings of this research and find which frequencies and voltages act as the balancing BioGeometry energy known as BG3 or BioGeometry three components energy.

As for Artists:

- 1- It is recommended to study the effect of music, colors, proportions, and different art principles through the new understanding of subtle energy interaction.
- 2- It is recommended to study ancient art and philosophy trying to understand their effect on our health and being.
- 3- It is recommended to try explaining ancient myths and legends to unlock ancient technology

GLOSSARY

- 1- **skin effect**, in electricity, the tendency of alternating high-frequency currents to crowd toward the surface of a conducting material. This phenomenon restricts the current to a small part of the total cross-sectional area and so has the effect of increasing the resistance of the conductor. Because of the skin effect, induction heating can be localized at the surface and the heated area controlled by a suitable choice of the inductor coil (*see* induction heating). The skin effect becomes more pronounced as the frequency is increased.
- 2- **Lipids**. Lipids are several types of substances that are grouped together because of their common property of being soluble in fat solvents. Especially important lipids are *phospholipids* and *cholesterol*, which together constitute only about 2 per cent of the total cell mass. The significance of phospholipids and cholesterol is that they are mainly insoluble in water and, therefore, are used to form the cell membrane and intracellular membrane barriers that separate the different cell compartments.
- 3- **feedback 1** any feature of a system, e.g. of a metabolic pathway or of an electronic circuit, whereby information about the output of the system is used to influence the input to that system. Such feedback may increase the input to the system – **positive feedback** - or reduce the input to the system – **negative feedback**. A cyclic system of

components participating in feedback forms a **feedback loop**, and the system is known as a **closed-loop system**. *Compare open-loop system*. 2 that part of the output of an electronic, mechanical, or other system that is returned to the input, so modifying its characteristics.

REFERENCES

1. Isaac Newton, Opticks, 4th Edition, William Innys, (1730).
2. Alan Gauld, (1995). A History of Hypnotism, Illustrated Edition, Cambridge University Press.
3. Albert A. Michelson, Edward W. Morley, LIX. (1887). On a method of making the wave-length of sodium light the actual and practical standard of length, Philosophical Magazine Series 5, Vol.24, Iss. 151.
4. Gupta HL, Singh SH, Selvamurthy W, Rai UC, (1995). Effect of Sahaja yoga practice on stress management in patients of epilepsy, *Indian Journal of Physiology and Pharmacology*, 39(2):111-116].
5. G Mandler, JM Mandler, ET Uviller, (1958). Autonomic feedback: The perception of autonomic activity, *The Journal of Abnormal and Social Psychology*, Vol 56(3), May, 367-373. doi:10.1037/h0048083
6. Agatha P. Colbert, Adrian Larsen, Steve Chamberlin, Carrie Decker, Heather C. Schiffke, William L. Gregory, Tran Thong, (2009). A Multichannel System for Continuous Measurements of Skin Resistance and Capacitance at Acupuncture Points, *Journal of Acupuncture and Meridian Studies*, Volume 2, Issue 4, Pages 259-268, ISSN 2005-2901, 10.1016/S2005-2901(09)60066-2.
7. J.G. Gadsby,(1993). Kirlian photography diagnosis — a recent study, *Complementary Therapies in Medicine*, Volume 1, Issue 4, Pages 179-184, ISSN 0965-2299, 10.1016/0965-2299(93)90027-B.
8. Hoosain Ebrahim and Robin Williams, (1982). Kirlian photography—an appraisal, *Journal of Visual Communication in Medicine* 5:3, 84-91.
9. Dinca, Florea, Gal, (2006). Personal Filters for Live-line Workers to Mitigate the Biologic Impact of the Low Frequency Magnetic Field, *Transmission & Distribution Construction, Operation and Live-Line Maintenance*, 2006. ESMO 2006. IEEE 11th International Conference.
10. Karim Ibrahim, (1993), *Vital Geometrical Shape* 23, Egypt, 18905, 11/1/1993, 21/12/1993.
11. Hodgkin, Rushton, (1946). The Electrical Constants of a Crustacean Nerve Fibre, *Proceedings of the Royal Society of London. Series B, Biological Sciences*, Volume 133, Issue 873.;44-479.
12. source: <http://www.britannica.com/EBchecked/topic/547639/skin-effect>
13. John W. Jewett, Raymond A. Serway, (2008). *Physics For Scientists And Engineers With Modern Physics*, 7th Edition, Thomson Brooks/Cole.
14. Aristeidis Karalis, Andre B. Kurs, Robert Moffatt, John D. Joannopoulos, Peter H. Fisher, Marin Soljacic, (2010), *Wireless energy transfer*, USA, 7825543, 26/3/2008, 2/11/2010.
15. Arthur C. Guyton, John E. Hall, (2006). *Text Book of Medical Physiology*, 11th Edition., ELSEVIER SAUNDERS.
16. Arthur C. Guyton, John E. Hall, (2006). *Text Book of Medical Physiology*, 11th Edition., ELSEVIER SAUNDERS.
17. A. D. Smith, S. P. Datta, G. Howard Smith, P. N. Campbell, R. Bentley, H. A. McKenzie, D. A. Bender, A. J. Carozzi, T. W. Goodwin, J. H. Parish, S. C. Stanford, (2000). *OXFORD DICTIONARY OF BIOCHEMISTRY AND MOLECULAR BIOLOGY*, Oxford University PRESS, Revised edition , pp. 540
18. Arthur C. Guyton, John E. Hall, (2006). *Text Book of Medical Physiology*, 11th Edition., ELSEVIER SAUNDERS.
19. A. D. Smith, S. P. Datta, G. Howard Smith, P. N. Campbell, R. Bentley, H. A. McKenzie, D. A. Bender, A. J. Carozzi, T. W. Goodwin, J. H. Parish, S. C. Stanford, (2000). *OXFORD DICTIONARY OF BIOCHEMISTRY AND MOLECULAR BIOLOGY*, Oxford University PRESS, Revised edition, pp. 228
20. E Neumann, M Schaefer-Ridder, Y Wang, P H Hofschneider, (1982). Gene transfer into mouse lyoma cells by electroporation in high electric fields, *THE EMBO JOURNAL*, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC553119/>