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Research of Interaction of Background Geo-Magnetic Radiation with Architectural Forms

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Abstract: The article investigates the influence of architectural forms on local changes of background electromagnetic field (EMF) of the Earth, the results of assessment of background EMF of mock-ups of main architectural forms (cube, parallelepiped, pyramid, prism) are given, patterns of distribution of background EMF in 3D forms used in architectural organization of living environment have been found out. For the first time indicator of geo-magnetic anomalies IGA-1 was used to study the issue of regular changes of background EMF of the Earth depending on the specially oriented in space architectural form: such changes can influence ecological climate of city spaces and architectural complexes and internal space of a house.

Key words: Non-normative risk factors · Eniology · Architectural form effect · Ecology of a house · The Earth's background EMF

INTRODUCTION

One of the most important ways to make the living environment more healthy is choosing of ecologically safe territories, arrangement of buildings and facilities with due regard to geo-activity of the places of their location; choosing of architectural forms which make living space more healthy [1, 2, 3]. Arrangement and 3D structure of architectural facilities is closely connected with human health because constant presence of a man in space with negative ecological characteristics causes pathological changes in his organism, decreases his immunological potential which can lead in separate cases to disease and death [4, 5, 6]. Thus, E. Hartman has discovered that cancer is connected with the place where a person dwells [7, 8].

When identifying marginal (maximum allowed) dose and norms for risk factors in architecture and construction some scientists discovered that weak (which are much lower than known thresholds of harmful impact on human organism) and even very weak (which in theory can never influence the human organism) levels of factors influence human organism conditions and his psychology greatly [9, 10, 11, 1, 12, 13]. The scientists know both positive and negative influence of electro-magnetic radiation of low and very low rate of natural and artificial origin on human

organism. This is connected, as a rule, with great changes of gradients of constant and variable components of Earth's EMF induction [14, 15].

Analysis of traditional technologies of design demonstrates that in folk house-building and professional architecture the influence of geo-magnetic radiation in the place of construction was always taken into consideration on experiential or thinking level while performing design works. It was connected with health of people (deathtraps, geo-pathogen zones, healthy territories, Vastu, Feng-Shui etc.) [16, 17, 18, 19, 2, 20, 21, 22]. But today no scientific studies have been performed which explain the interaction of background geo-magnetic radiation with architectural forms and their influence on ecological characteristics of surrounding living space of a man.

In these conditions investigation of specific character of geo-magnetic impact on basic architectural forms used for creation of living environment is up-to-date. This will allow to identify the ways to increase ecological characteristics of architectural solutions, will found empirical base for development of new technologies of architectural design of living facilities.

During summer and autumn of 2013 academic laboratory INRFAC (SFU) in cooperation with SRRO of IAEIS performed outdoor experiments to identify the

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influence of different architectural forms on local changes in the structure background EMF taking into consideration static and dynamic factors [23, 11].

Methods: Interaction of background geo-magnetic radiation with architectural forms was investigated by measurement of voltage of EMF on earth's surface in the point of location of architectural forms orientated in a special way, without the forms and with them. Besides that the parameters of background EMF which was passing through top and side facets (surfaces) of the models were recorded. In order to identify the structure of distribution of radiation on separate surfaces, the models were oriented by compass in the direction from North to South.

Models of architectural forms were the mock-ups of main architectural forms which are used in erection of living facilities: cube, parallelepiped, four-facet pyramid, six-facet prism, cylinder and 3 forms of 3-facet prism (imitating the form of inverted-V roof with slope angle of 60°, 45°, 15° (Figure 1).

Empty mock-ups made from foam board with thickness of 0,5 cm. Relative sizes of models were compatible with each other, the height was 45-50 cm.

Measurements were done outdoors in different days and different time with the aid of the geo-physical anomalies indicator IGA-1. This device (Figure 2) is highly sensitive selective gauge of EMF. The range of measurements is between 5-10 KHz. Sensitivity of the device is from 1 to hundreds of pV. Outgoing parameter of the device is integral of phase shift (deviation) on the analyzed frequency. Values of background EMF' changes were displayed on digital scale in relative conditional units.

IGA-1 is designed in Ufa state aviation-technical university (Russian Federation). The author of the device and its designer is Yu. Kravchenko [24].

Measurements were done since 9.07.2013 to 03.10.2013 every 3 hours from 12 00 to 24 00 both indoors and outdoors and on earth's surface and on the level of 3rd floor (+16 m) and 8th floor (+30 m). Total number of measurements was 840. In order to register the facts of influence of models of architectural forms on background EMF in the place of measurement a reference measurement was done in the point of model's location without it and after its installation just above the model. Further measurements were performed with every model separately on every side facet (surface). Antenna of the device was directed perpendicularly to the surface and

registered the voltage of changed (because of the model influence) background EMF at the distance of 30-40 cm from the mock-up. In all cases the values changed which proved the influence of the form on the indications of the device.

Main Part: While measuring background EMF of architectural forms' models we observed general trends in changes of radiation rate of facets of the forms and specific particularities of dynamics of such changes on separate figures. Obtained results prove the hypothesis about influence of the models of architectural forms on the structure of background EMF in the point of their location on earth's surface. Significant influence of cosmic factors was recorded on this structure, namely, location of the Sun and the Moon in the sky in regard to the point of location of the model. Critical points of their location in the sky were the times of rising, zenith and setting. In all cases specific reactions of model facets on the location of the Sun and the Moon which were manifested in changes of rate of background EMF radiated by them were also recorded.

On two diagrams which are demonstrated above for comparison you can see the distribution of radiation strength of background EMF of the forms' surfaces depending on location of the Sun and the Moon in the sky and, first of all, near the time of their culminations.

In cases when zeniths and settings of the Sun and the Moon are within short time interval, about 30 minutes, rate of radiation of models' surfaces occurs synchronically and in one direction and separate surfaces can be more active – it means that rate of their radiation is increasing or decreasing in regard to other surfaces. If time intervals between separate culminations of the Sun and the Moon exceed 30 minutes, phenomenon of de-synchronization of the structure is observed: for some surfaces rate of radiation rises and falls synchronically, for others - in counter-phase.

While comparing diagrams with orientation of the parallelepiped with its big or small facet to the north you can see that with orientation of the small facet synchronization of the sides signals is observed, with orientation of the big facet we observe clear increase in activity of south and west surfaces and east side “works” in counter-phase. It is necessary to point out that maximum and minimum values of the rate of background EMF are reached at culmination points of the Sun and the Moon.

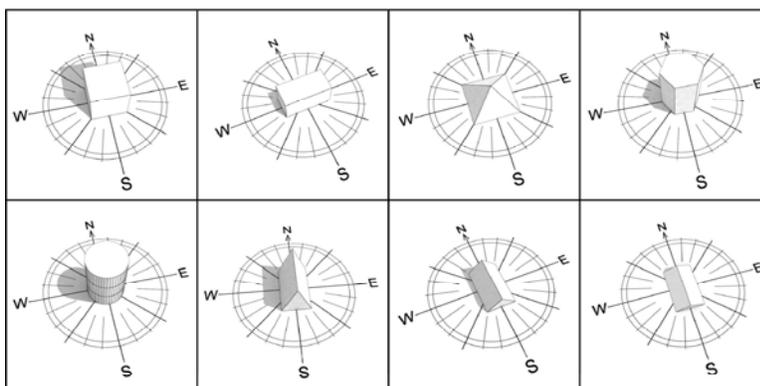
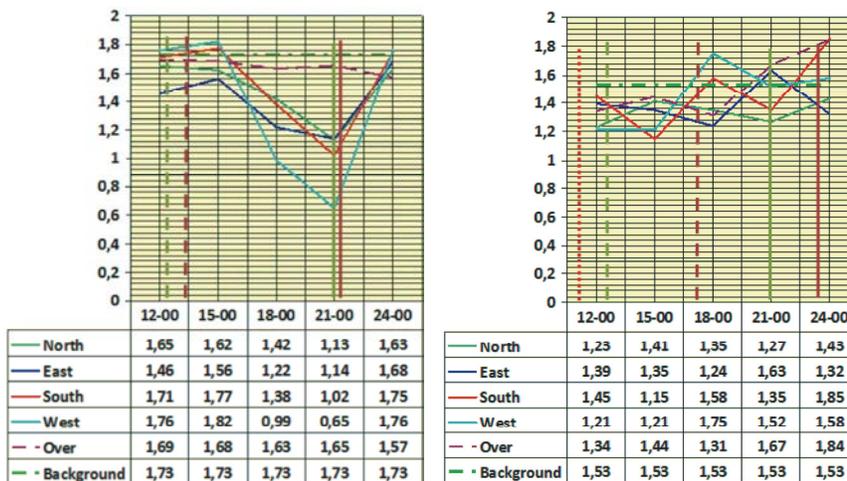


Fig. 1: Models of architectural forms



Fig. 2: IGA-1



Model: Cube: Cube's facet is oriented to the north. Experiment's date: 09.07.2013. Voltage of EMF without object (natural background) 1,73 c.u.

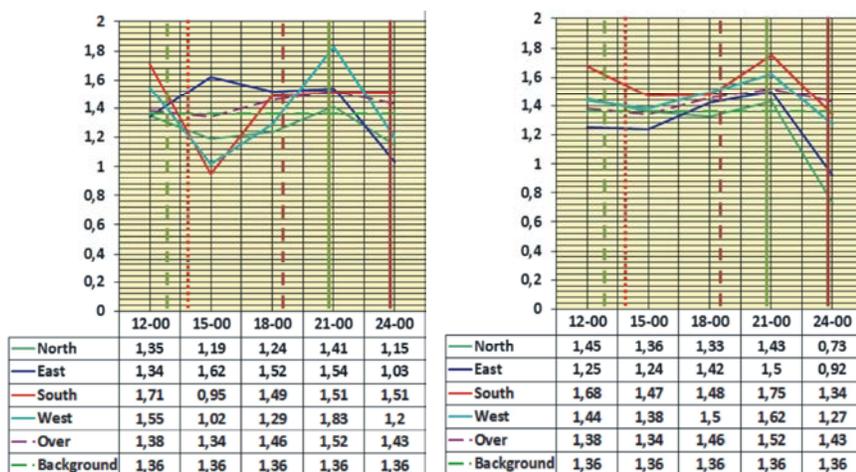
Sun rising 05:36. Sunset 21:18. In zenith 13:22

Moon rising 06:47. Moonset 21:33. In zenith 14:10

Fig. 3: Structure of background EMF of cube form depending on location of the Sun and the Moon

The diagrams show that in all cases a trend to synchronicity is observed, but on the roofs with the slope angle of the side facet of 15° the structure of the surfaces'

radiation rate distribution differs greatly from the roofs with slope angles of 45° and 60°. In regard to the roofs with angles 45° and 60° we observe synchronization of the

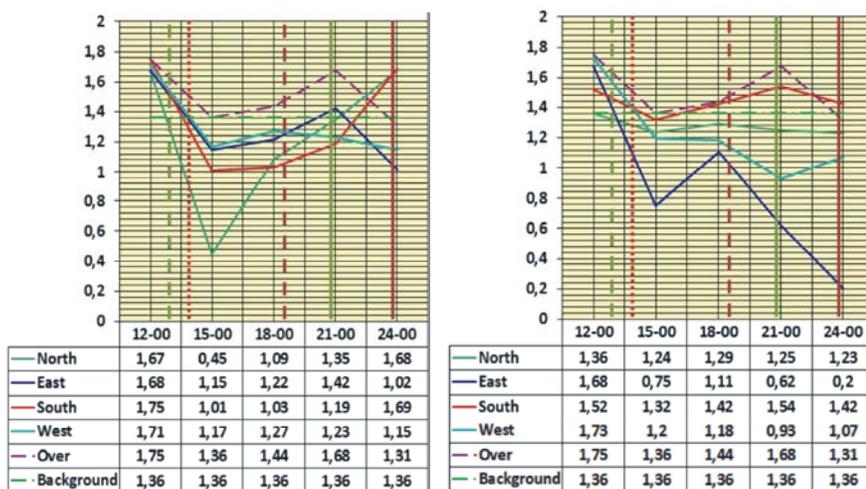


Model: Parallelepiped: Big facet is oriented to the north. Experiment's date: 16.07.2013. Voltage of EMF without object (natural background) 1,36 c.u.

Sun rising 05:42. Sunset 21:14. In zenith 13:28

Moon rising 14:17. Moonset 00:13. In zenith 19:15

Fig. 4: Structure of background EMF of parallelepiped. On the left: big facet is oriented to the north. On the right: small facet is oriented to the north



Model: Three-Facet Prism: (inverted-V roof). Objects of investigation: prisms with side facet's slope angles 15°, 45°, 60°. Experiment's date: 16.07.2013. Voltage of EMF without object (natural background) 1,36 c.u.

Sun rising 05:42. Sunset 21:14. In zenith 13:28

Moon rising 14:17. Moonset 00:13. In zenith 19:15

Fig. 5: Structure of background EMF of three-facet prism with side slope angle of 15°. On the left: butt-end is oriented to the north. On the right: side facet is oriented to the north

surfaces' radiation structure with orientation "butt-end to the north" and de-synchronization when the slope is oriented to the north. Similar changes were observed in other days with significant differences in location of the Sun and the Moon in the sky.

For this model of architectural forms is characterized by a trend to synchronization of the radiation signal by the facets oriented to all four directions (south, north, west and east). In the same time, activity of the facets near the culmination points is clearly manifested.

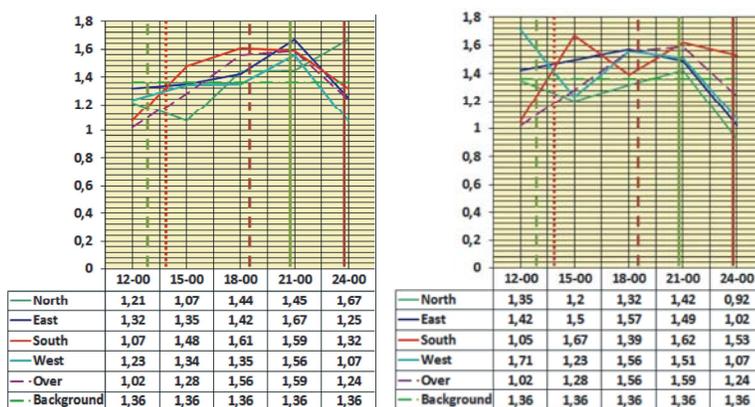


Fig. 6: Structure of background EMF of three-facet prism with side slope angle of 45°. On the left: butt-end is oriented to the north. On the right: side facet is oriented to the north

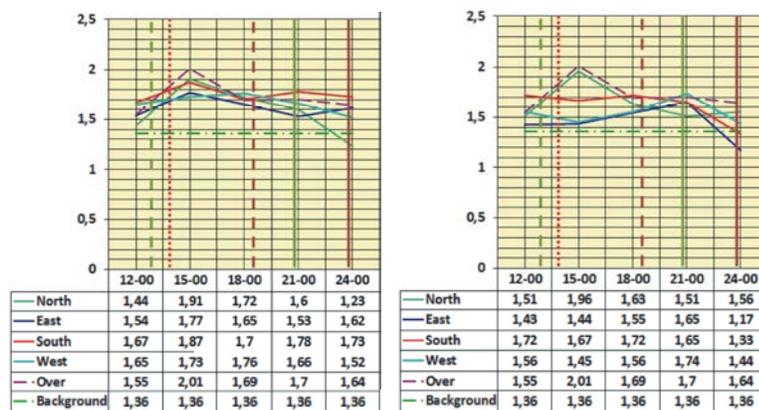
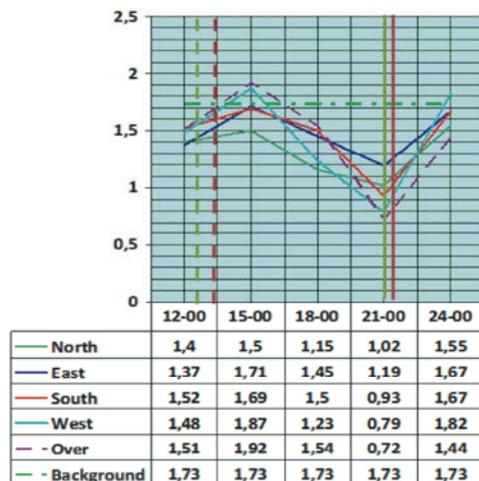


Fig. 7: Structure of background EMF of three-facet prism with side slope angle of 60°. On the left: butt-end is oriented to the north. On the right: side facet is oriented to the north

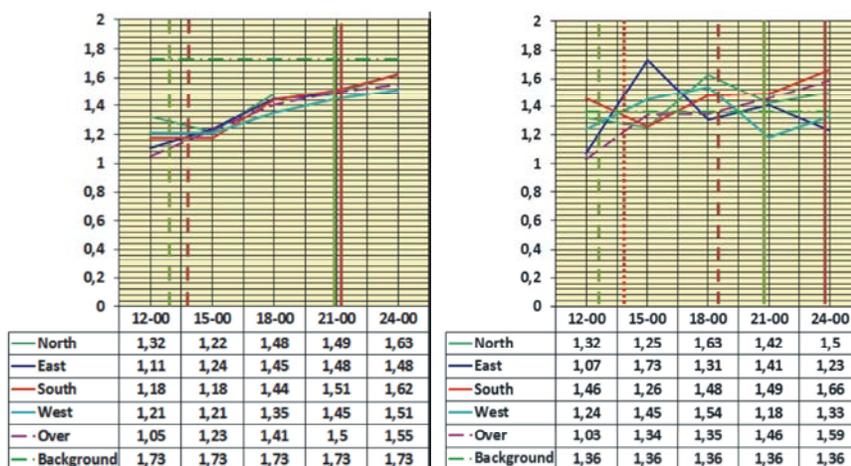


Model: Pyramid: (one of the facets is oriented to the north) Experiment's date: 09.07.2013. Voltage of EMF without object (natural background) 1,73 c.u.

Sun rising 05:36. Sunset 21:18. In zenith 13:22

Moon rising 6:47. Moonset 21:33. In zenith 14:10

Fig. 8: Structure of background EMF of pyramid



Model: Cylinder: On the left: Experiment's date: 09.07.2013. Voltage of EMF without object (natural background) 1,73 c.u. Sun rising 05:36. Sunset 21:18. In zenith 13:22
Moon rising 6:47. Moonset 21:33. In zenith 14:10
On the right: Experiment's date: 16.07.2013. Voltage of EMF without object (natural background) 1,36 c.u. Sun rising 05:42. Sunset 21:14. In zenith 13:28
Moon rising 14:17. Moonset 00:33. In zenith 19:15

Fig. 9: Structure of background EMF of cylinder

While considering diagrams of the model of cylinder form dense synchronization of the structure of surface radiations in all directions when culmination points' times (zenith and setting of the Sun and the Moon) differs not more than for 30 minutes. When the difference is more than 30 minutes significant de-synchronization in all directions is observed.

Measurements demonstrated little increase in electro-magnetic values during a day. For example, by the end of the day (21:00-00:00) as a rule maximum values of electro-magnetic activity of forms were registered. Besides that it was found that in days with unstable Earth's geo-magnetic field the values of electro-magnetic activity were of higher amplitude than in days with flat geo-magnetic activity.

Conclusion: This study established some underlying patterns of formation of electro-magnetic background created by basic architectural forms (pyramid, prism, cylinder) on the base of measurement by the device which registered geo-magnetic anomalies (IGA-1). Besides that the influence of the models on external environment was investigated because the changes in background EMF from external side of models were registered.

For the first time on empirical level the issue of patterns of changing background EMF of the Earth depending on architectural forms specifically oriented in

space was studied. These changes can break ecological climate of city spaces and architectural complexes and internal space of a house.

Diagrams demonstrate that changes of background EMF are of distinct periodical character. Besides that these changes are connected with location of the Sun and the Moon in the sky in regard to the Earth. The time of their rising, setting and zenith is of utter significance. And influence of the Sun on changes in background EMF depends on the angle of its slope to Earth's surface in the point of measurements, season, temperature, level of lighting intensity (atmospheric conditions).

Influence of the Moon on changes of background EMF of the Earth in a given point depends on its location in regard to the Earth. Especially strong this influence is when the Moon is near to its zenith at the moment of measurements and in the points close to location of the Sun in the sky when the Sun and the Moon are located in the sky at points with close coordinates. In the same time in the end the device registers dynamical change of background EMF which can be explained by overlapping of dynamic cosmogenic factor on static geo-genic factor.

Architectural forms while changing background geo-magnetic radiation of the Earth influence ecological values of surrounding living space of a man. Because of the fact that background EMF of the Earth influences greatly man's health [11, 4, 25, 26] we can suggest that

changes in background EMF of the Earth under the influence of architectural forms models produce specific effect on this health characteristic. First of all, influence is produced on neuro-system, exchange processes in the cells and on functioning of separate organs. Practical value of the results of the project is in the possibility to reason new approaches to architectural design of houses and practical means and methods of formation of ecological, health-improving living environment.

CONCLUSIONS

Architectural forms located in specific place and oriented in the direction from the south to the north starts to change a number of physical characteristics of environment, in particular, background EMF of the Earth. With the aid of special device IGA-1 which uses the integral of phases shift we investigated voltage of background EMF of the model of 3D-shape. It was discovered that architectural forms in some way influence the energy outgoing from the Earth - either amplifying or reducing it.

By experiments which were performed in different times in summer and autumn it was found that the models of different architectural forms change intensity (rate) of background EMF of the Earth in a given point. With different positions of the antenna of the device depending on the facets of the models and with different orientation of them the changes of background EMF take place in different way. Thus, model of architectural forms does not possess constant and always intrinsic attribute to radiate energy. An architectural form changes background EMF depending on the place, time and orientation. This means that ability of 3- form to change background EMF is determined by location of the Earth on its cosmic way.

The results of the study allowed to conclude:

- Background EMF is changing when passing through the models of architectural forms differently orientated in regard to magnet pole.
- Changes of background EMF happens on all facets of architectural models.
- 3D-form influences changes of background EMF during a day depending on location of the Sun and the Moon in the sky. Activity of forms' influence is connected with motion of the Sun and the Moon.
- Changes of background EMF, apart from cosmogenic factors, are determined by the influence of geo-genic factors, namely: under-surface geological structure of soils (granites, basalts, aluminum sulfates, sandstone, water and oil layers etc.).

- The orientation of the form (S-N) influences the way and strength of interaction of the form with background EMF. This is a condition of energy activity of architectural forms.
- Change of values of electro-magnetic activity of the mock-ups of geometric forms depends on the following factors: hours of the day, location of the object (its location in space, coordinates, height above the earth's surface); index of solar and geo-magnetic activity during a day; phase of Moon.

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