Experimental Approach Towards Long-Range Interactions from 1.6 to 13798 km Distances in Bio-Hybrid Systems

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ABSTRACT

This work describes performed experiments on device-device and operator-device interactions at distances of >1 km, >100 km and >10000 km. Experimental setup involves several types of receiving sensors and transmitting optical generators as well as a group of human operators. We analyzed the structure of setup, establishing a connection between receiver and emitter, and multiple effects appeared. The experiments suggest a common character of operator- and device- interactions that point to possible 'neuro-quantum mechanisms' underling both systems. This approach replicates and extends early experiments from 80x and 90x, and can be considered as a novel unconventional communication system.

Key Words: long-range interactions, quantum phenomena in macroscopic systems, non-local effects, communication system, bio-hybrid systems

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1 Introduction

Recently, a number of publications suggest a possible existence of quantum phenomena in macroscopic systems (Vedral, 2008; Lee *et al.,* 2011; Vedral, 2011). In particular, a large interest is attracted to non-local effects with long-range interactions in spatially distributed systems. There are known empirical biological studies with human and animal twins (Perov, 1984), plants and seeds (Maslobrod, 2012, 2011), various microbiological systems (Kaznacheev and Michailova, 1981; Sarkisyan *et al.,* 2015). The obtained results are controversially discussed, e.g. in the framework of magnetic vector potential (Rampl *et al.,* 2009) or new physical fields (Shipov, 1993).

The interest to long-range interactions in technical systems is explained by telecommunication purposes (Puthoff, 1998; Akimov *et al.,* 1992; Ochatrin *et al.,* 2000). These systems are expected to have specific properties such as low energy consumption, high-penetrating properties that are suitable e.g. for underwater communication, and several security features.

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These topics were investigated in different projects of the USSR and USA during the cold war (Kernbach, 2013c; May *et al.,* 2014). For example, the paper (Akimov *et al.,* 2001) describes the performed in 80x experiments with technical emitters and biological sensors at the distance of 22 km. During 90x and 00x these experiments have been extended with a variety of sensors and emitting devices (Zamsha and Shkatov, 2012b, a; Gorokhov *et al.,* 2012; Shkatov and Zamsha, 2015; Kernbach, 2015), the distance was increased up to 10000km. Since the consumed/emitting power in these systems is very low, e.g. (Akimov *et al.,* 2001) had 39mW, our system - only 1mW (max. distance 13798km), a long-range signal transmission is difficult to explain with the classical electromagnetic approach.

The performed experimental work indicated an interesting property of observed non-local phenomena - the possibility to emit and to receive signals with both biological and technological systems. For instance, biological organisms, such as yeasts or bacteria are employed as sensitive sensors (Bobrov, 2006; Anosov and Truchan, 2003). Human operators are frequently involved also as a source of long-range signals (Vasiliev, 1976). Commonly, such experiments are structured along the *device-device* and *device-operator* approaches and denoted as combined or bio-hybrid systems (Kernbach, 2012b).

The experiments in this paper are performed in the framework of non-local interactions in bio-hybrid systems. They conclude the series of experiments from (Kernbach, 2013b, 2012a, 2013a), which investigated interactions between optical emitters and sensors on electric double layers (EDL). Additionally, this paper extends the approach (Zamsha and Shkatov, 2012b,a) in terms of emitter- receiver synchronization. The previous works demonstrated effects that can point to a high-penetrating emission of presumably non-electromagnetic character generated by LED/laser emitting devices working in a specific powering mode. In particular, it was shown that a signal from the LED generator can be detected by EDL sensors at distances of 0.25-1650 meters in laboratory and field conditions. Moreover, we observed a reaction of EDL sensors on LED emission also indirectly through water illuminated 0.5 - 72 hours before experiments. In total, results of about 900 measurements have been described in those papers.

Mechanisms of interaction between LED/laser emission and deeply polarized electrodes is not fully understood at present. It is assumed that the diffuse Gouy-Chapman layer, e.g. (Lyklema, 2005; Belaya *et al.,* 1987), is sensitive to factors polarizing water dipoles. Corresponding electrokinetic phenomena are described by the Gouy-Chapman-Stern model (Belaya *et al.,* 1987; Lyklema, 2005). Spatial polarization of water dipoles is investigated in a number of works, e.g. (Stenschke, 1985; Gruen and Marcelja, 1983; Belaya *et al.,* 1987). Since the dipole polarization changes dielectric properties of the electrode-water system, the degree of polarization and thus the influencing factors can be measured by a small current using two or four electrode conductometric schemes, e.g. (Spillner, 1957; Kirkham and Taylor, 1949; Bristow *et al.,* 2001; Orion, n.d.).

Both, the original works (Bobrov, 2009, 2006) and their replications/extensions (Kernbach, 2013b, 2012a, 2013a) reported some effects that point to a probable non-local impact on devices. Experiments at the distances of 10, 15, 20, 50 and 1650 meters demonstrated that increasing the distance did not essentially worsen the signal-noise relation (taking into account some temporal dynamics of this system). Reducing by 50% emitting power also did not significantly worsen the received signal. There were recorded experiments, when an emotional state of operator, being at a large distance away from sensors, also changed the current through 'electrode-water' system. Thus, both *device-device* and *operator-device* experiments indicated a possibility of non-local interactions. Since the same equipment, approaches and techniques are used in both cases, it is assumed that psychokinetic phenomena and a high-penetrating component of LED/laser emission might have similar mechanisms impacting the EDL sensors.

This work has two main goals. Firstly, it is intended to demonstrate nonlocal effects at distances of > 1 km, > 100 km, > 10000 km of both types - *device-device* and *device-operator.* Two different types of sensors (EDL sensors and the IGA-1 device) and two different types of generators (LED generators and a semiconductor laser with twisted optical fiber) are used to demonstrate an independency of this phenomenon from implementation details. It is also aimed to investigate how the interaction between devices and operators can strengthen or weaken this influence.

Secondly, there are many emitters at long ranges, which are potentially capable of influencing the EDL sensors. These are, e.g. LED flat screen monitors, electro-magnetic devices, people in different emotional states and others. Since the EDL sensors demonstrate only a small number of perturbations in a normal state, we assume some 'synchronization mechanism', which selectively passes some signals to sensors and blocks all others. A number of different works investigated the phenomenon of such a selective influence (Perov, 1984; Vasiliev, 1976; Zamsha and Shkatov, 2012b; Maslobrod, 2012, 2011) - this also represents the second goal of this work.

Performing experiments, we took into account reports of other research groups, e.g. (Janhn *et al.,* 2000; Dulnev and Ipatov, 1998; May, 1996; Puthoff, 1996), which pointed out a careful selection of operators. Several groups of operators are contacted, two of them agreed to participate in the experiments. A long-term cooperation is established with one of these groups indicating that operator capabilities can be improved by corresponding training with an objective feedback from devices.

From all performed experiments (Kernbach, 2013b, 2012a, 2013a), this work has intense controversial character since it touches on such issues as non-local interactions, mind-mater phenomena, 'macroscopic entanglement' effects and others. We presume a number of critical notes will develop towards this paper. Thus, we must clarify our own position concerning observed phenomena - first of all, we carefully register all changes in dynamics of EDL sensors, paying attention that these are not caused by environmental factors on the receiver side: variation of temperature, EM fields, mechanical, or acoustic factors. All these environmental factors are measured by several corresponding sensors, which are also recorded in parallel to the data from six or nine current sensors. In total we were recording 25 data channels each second. Secondly, an incoming signal is registered only when several EDL sensors demonstrated a change of current dynamics. Normal sensitivity of EDL sensors is about 40%-45% reaction, i.e. when 4 from 9 sensors demonstrated a reaction (an EDL sensor can lose its sensitivity for a short time after a previous reaction). In this work we consider also an approach 'three best sensors' from (Kernbach, 2013a) - when three EDL sensors demonstrated changes in the expected time frame - this corresponds to 50% and 33% of all sensors and is statistically significant, see Sec. 5. Each experiment is repeated at least 4 times with 36 measurements. All changes outside of the time frame are ignored. Finally, we do not attempt to give any explanation to the observed phenomena - because of open and controversial discussion and also because of missing theoretical background explaining these effects.

This paper has the following structure: Sec. 2 shortly describes the selected methodology, devices and the structure of experiments. The *device-device* and a few *device-device-operator* experiments are described in Sec. 3, *operator-device* experiments - in Sec. 4. Finally, Sec. 5 summarizes this work.

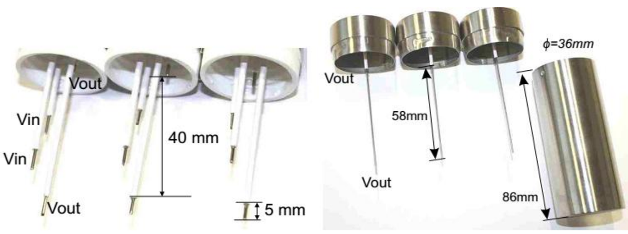
2 Short description of devices and used methodology

In this work we used two different sensors (EDL sensors and the IGA-1 device) and two different generators (LED and laser emitters). Most of the experiments have been performed with the EDL sensors and LED generators, their description can be found in (Kernbach, 2013b; Bobrov, 2006; Kernbach, 2013a) in more detail.

2.1 Receiving devices

The EDL system

This sensor represents a DC conductometric system with deeply polarized electrodes in thermally stabilized environment. The EDL sensors are glass or metal containers with several stainless steel and platinum electrodes in bi-distilled water, see Fig. 1.



(a) (b)

Figure 1. (a) Electrodes in the third setup; (b) Electrodes in the fourth setup. Images are from (Kernbach, 2013b).

All containers are placed into several brass boxes with thermal shields made from foam rubber and wool (in later versions we used active thermostatic system). In total there are 9 EDL sensors, three of each type, which are combined into three setups, see Fig. 2(a). Digital part of all sensors is based on the PSoC ship (programmable system on chip), which receives data from 9 current sensors, 8 temperature sensors, 3 accelerometers and one EM-fields analyzer (ME 3951A made by 'Gigaherz Solutions'), and perform data pre-processing. The microcontroller is connected with PC via USB, all data is stored on HDD. All handling procedures are done remotely, an operator does not enter into the room with sensors. All setups are carefully isolated from EM-fields, variation of temperature and mechanical/acoustic impacts and are closed in the metal cup board made from 3mm steel. The laboratory with EDL sensors is located in the basement of the building with thick concrete walls without windows and with a metal door.

In all experiments nine EDL sensors record the current data in parallel. Besides this, the system records temperature in 8 different places with resolution < 0.01C, vibration in three places and supply voltage in all setups. In total 25 data channels are recorded with sampling rate 1Hz, ADC resolution - 20 bits. All data are marked by the time marker, the system records all data continually all the time. For further analysis, we consider the recorded data two hours before the experiment, during the experiment, and two hours after.

(a) (b)

Figure 2. (a) Images of setup three, four and five; (b) Stationary version of IGA-1 device.

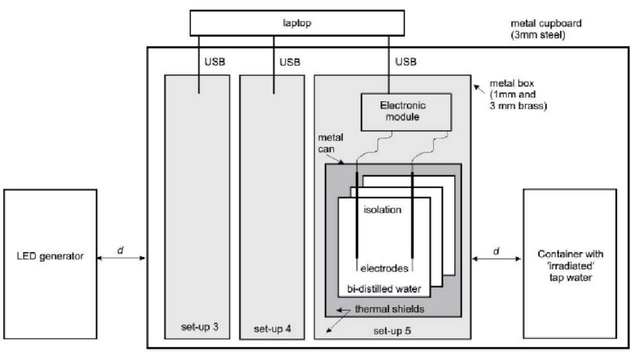


Figure 3. Structure of the setup, image from (Kernbach, 2013b).

The IGA-1 sensor

IGA-1 is a highly sensitive device for sensing electromagnetic field, see Fig. 2(b). It is developed for measuring the electromagnetic component of geomagnetic Earth's field in the range of 5 ... 10 kHz, its sensitivity is from a few to hundreds picovolt. As an output parameter the device uses the integral of the phase shift of analyzed frequency. The device is designed as a portable sensor with analog and digital indication. The main application areas of IGA-1 are environmental science, measurements for medical diagnostics, underground exploration of metallic and nonmetallic pipelines, voids, water veins and burials. It can be used to detect the impact of anomalous terrestrial radiation on human, including electromagnetic one. IGA-1 is available in three versions: the in-door version, the version for operations in field conditions and the stationary version for test purposes.

2.2 Emitting devices

LED and semiconductor lasers

Laser and LED generators, see more in (Bobrov, 2006; Kernbach, 2013a), have a common structure, shown in Fig. 4(a). The difference between them lies in the powering mode, e.g. semiconductor lasers are powered by 3 volt, LED - up to 48 volt. In this work we used mostly LED generators, see Fig. 4(b). For the LED generator we used 169 blue-light (470nm) LEDs LC503FBL1-15Q-A3 with intensity of 11 cd and opening angle of 15 degree. All LEDs are placed on the area of 120 x 120mm^2, see Fig. 4(b). Polyspectral generator has 4 emitting spectra, see Fig. 4(c). All generators have 8 switchable fields, which can be modulated independently from each other. LEDs operate in a nonstandard mode of 48 volt with primary and secondary modulation.

Laser with twisted optical fiber

In the experiments we used also two modifications of a laser generator with twisted optical fiber, see Fig. 5 (Shkatov and Zamsha, 2015). The cylindrical generator (diameter 25cm, height - 12cm, wall thickness - 5mm, made from Plexiglas) has reeled by optical fiber SM-28 of the diameter 0.9mm with 125 turns in one layer and a total length of about 100 meters. The conic generator has a similar structure. The optical fiber is connected to a semiconductor laser of DFB type with the wavelength of 1310nm. The generator consumes an electric power of about 30mW, the emitted optical power - 1mW.

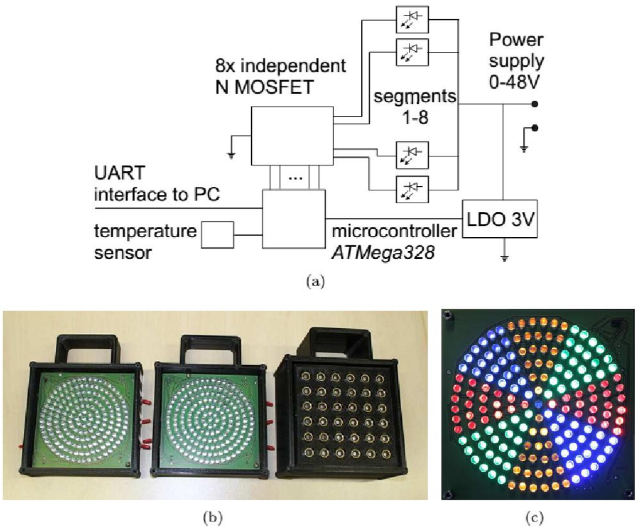


Figure 4. (a) Structure and (b) images of the LED and laser emitters without polymer cover; (c) polyspectral LED emitter.

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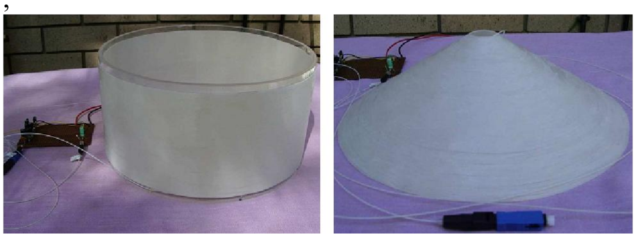


Figure 5. Cylindrical and conic laser generators with twisted optical fiber.

2.3 'Synchronization' of emitter and receiver

As shown in (Kernbach, 2013a), sensors and generators, working as one emitter-receiver pair at small distances, are still capable of transmitting signals even when increasing a distance between them. However, such a 'synchronization' of emitter-receiver pair is worsening with time - e.g. in (Kernbach, 2013a) we did not register a signal transmission 552 hours after begin of experiment. In the literature, e.g. (Zamsha and Shkatov, 2012b; Maslobrod, 2012; Maslobrod, 2011), authors proposed to introduce some elements, which 'synchronize' emitters and receiver. Here an analogy with the well-known phenomenon of quantum entanglement (Zbinden *et al.,* 2001) is assumed. The long-range, e.g. spin-spin, interactions are well established research topic (Hunter *et al.,* 2013). Moreover, multiple works discuss this phenomenon also for macroscopic multibody systems (Vedral, 2008). However, the 'macroscopic entanglement' is still in controversial discussion in scientific community.

To 'synchronize' receiver and emitter and thus to create a kind of 'entanglement' for signal transmission at long distances, we utilize the twins phenomenon, which is well described in the literature, e.g. (Blackmore and Chamberlain, 1993; Powell, 2008). Not only humans but also animals possess these properties, for instance the famous Perov's experiment with twins rabbits (Perov, 1984). The twins phenomenon supposes 'a macroscopic entanglement' between elements of a pair, which enables a signal transmission for long distances. Based on the vast literature, we experimentally tested the following assumption: a pair 'an object and its digital representation' possesses some degree of 'macroscopic entanglement'. This approach was successfully applied in experiments with biological sensors, where a large statistic was accumulated (Maslobrod *et al.,* 2014a, b), and in some telecommunication systems (Zamsha and Shkatov, 2012a). This paper also uses the 'object-representation' approach for 'synchronizing' emitter- receiver pair for a signal transmission at long distances.

Despite our original skepticism - we underline this fact - in this work we decided for such experiments being motivated by other 'strange' properties of the assumed non-electromagnetic component of LED and laser emission.

3 Overview of *device-device* experiments

In these experiments the generators and sensors are at distance 1.65 km (Stuttgart- Stuttgart), 360 km (Stuttgart-Halle), 2068 km (Stuttgart-Moscow), 3227km (Stuttgart-Ufa) and 13798 km (Stuttgart-Perth, West Australia), all distances are estimated based on google maps[2]. Three series of experiments are performed: (1) generators are switched on/off without any 'synchronization' with sensors, (2) generators are switched on/off with a 'synchronization' with sensors, (3) generators and operators work together for impacting sensors (these *device-device-operator* tests are performed only at the distance of 1.65 km). Results of these experiments are collected in Table 4.

[2] Distance Measurement Tool at maps.google.com.

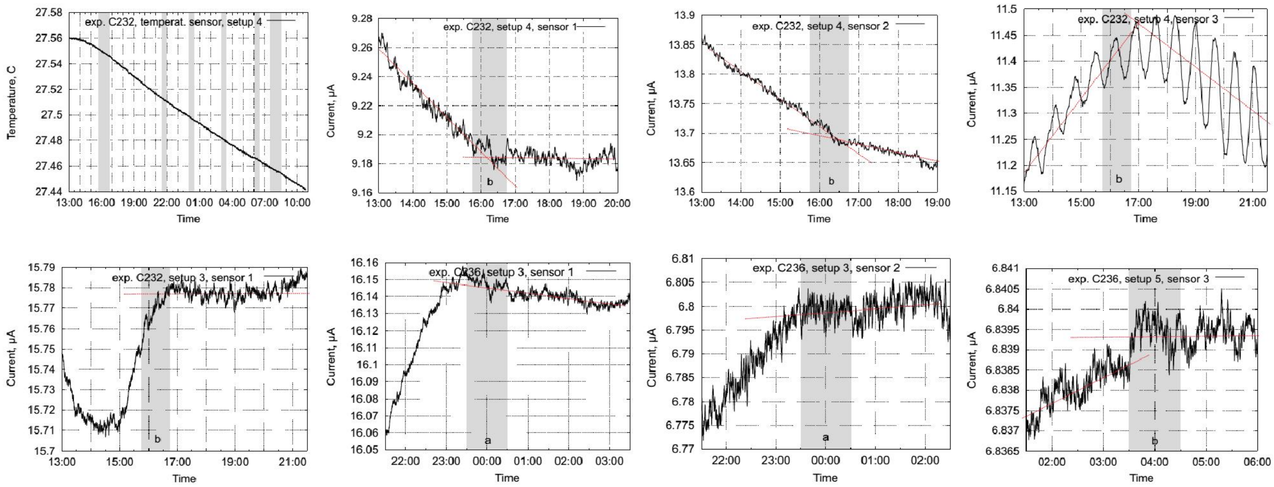


Figure 6. Results of some measurements in experiments C232 and C236 at distance 1.65 km between generators and sensors within 24 hours after transporting generators into a new place.

3.1 Distance of 1.65 km

For performing these experiments, the generators were transported on the distance 1.65 km away from sensors and placed in the basement of a building. Horizontal and vertical orientation to sensors was done by using a compass and map. Accuracy of orientation was assumed to be about ±25°.

Device-device interaction without 'synchronization'

Four experiments were performed: immediately after transport of the generators, 24 hours after, 144 hours after, and 552 hours after. In total 90 measurements are performed. In the experiment C232 generators were transported to a new position after they worked with sensors for about six months at short distances. In C232 two measurements (a) and (b) are performed, however the measurement (a) was excluded from consideration because of variation of temperature at that moment. The experiment C236 was performed 24 hours later. Several diagrams from current sensors are shown in Fig. 6. We did not find any substantial differences in sensor data at distances 10, 20, 50, see (Kernbach, 2012a) or 1650 meters within 24 hours after transporting generators. Periodical modulation of the signal by the generators with period 4 hours is shown in Fig. 7. In total, about 40%-45% sensors demonstrated the reaction. In the experiment C241 (144 hours later) we observed much weaker response - only 12 from 36 sensors, i.e. 33%. In the experiment C254 (552 hours later) only 4 sensors from 36 demonstrated a reaction, i.e. 15%, see Fig. 24. Corresponding the selected methodology, results of the experiment C254 are statistically not significant, i.e. it is negative.

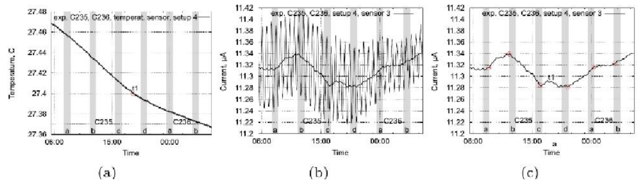


Figure 7. Experiments C235-C236 at distance 1.65 km between generators and sensors within 24 hours after transportation. Signal modulation (4-hour period) is well visible.

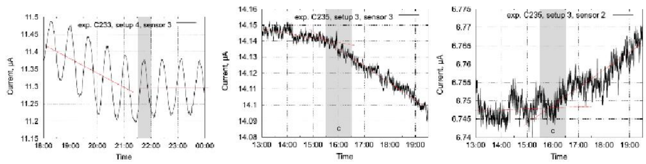


Figure 8. Experiments C233 and C235c.

Device-device interactions with 'synchronization' are explored in experiments C234, C235 and C237b, c, see Fig. 8. Exposition time in C234 was approximately 30 minutes, however, it seems this time was too short and no changes in dynamics of current were registered. In C235 and C237b, c the exposition time was increased up to 60 minutes.

Device-device-operator interactions. We also performed 4 tests with 36 measurements, when generators and an operator from the group 'chaosWatcher', see Sec. 4.1, simultaneously interacted with sensors. In C233 an operator concentrated on sensors, however we observed a reaction outside of the time windows of this experiment - this result was ignored according to our methodology. In C235a,b,c the exposition time by the LED generator was about 60 minutes and by operator about 30-40 minutes. We registered 44% reaction of sensors. C235d was similar to the previous experiments, however here sensors demonstrated a strong change of current, see Fig. 9.

Such a strong reaction is similar to a mechanical impact on sensors, which changes a spatial structure of dipoles in the diffuse layer. However, the accelerometers did not register any impacts, other sensors also did not record strong changes. It must be noted that from 60 minutes of experiment, an operator started a mental concentration 20 minutes later and finished 15 earlier, a large growth of current happened exactly at this time. We refer this result to psychokinetic impacts, similar dynamics was also registered in experiments with only operators.

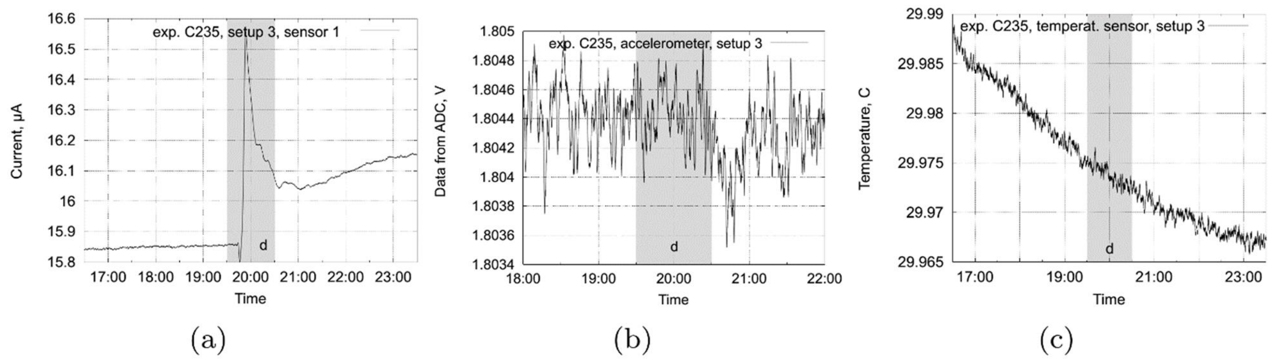


Figure 9. Experiment C235d with operator, (a) data from current sensors, (b) data from accelerometer, (c) data from temperature sensor.

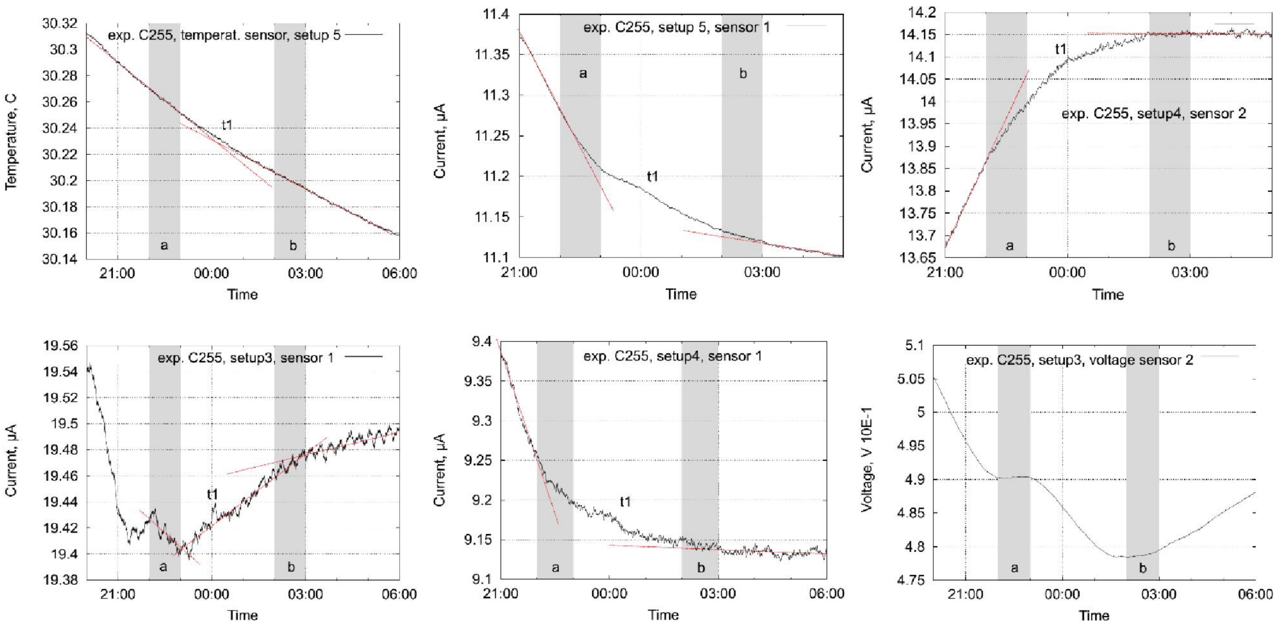


Figure 10. Experiment C255 at distance 360 km between Stuttgart and Halle.

3.2 Distance 360 km

This experiment was performed on 3.09.12 in Halle, Germany, the distance between sensor and generators was 360 km. Since only one night was available for this experiment, the generators was turned on at 22.00 in the mode: one hour - on, three hours - pause. This relative early start time correlated with a daily variation of temperature - the measurement at 6.00-7.00 was discarded due to this reason. Generally, 8 from 18 sensors recorded an impact in this experiment, see Fig. 10.

3.3 Distance 2068 km

These experiments were performed 14-18 September 2012 between Moscow and Stuttgart, the distance between sensor and generators was 2068 km, all settings are similar to the previous experiments. Due to time shift of 2 hours, several measurements were correlated with evening and morning variations of temperature and thus were ignored. In total there was only one measurement per night. It must be noted that 16 of September was a new moon.

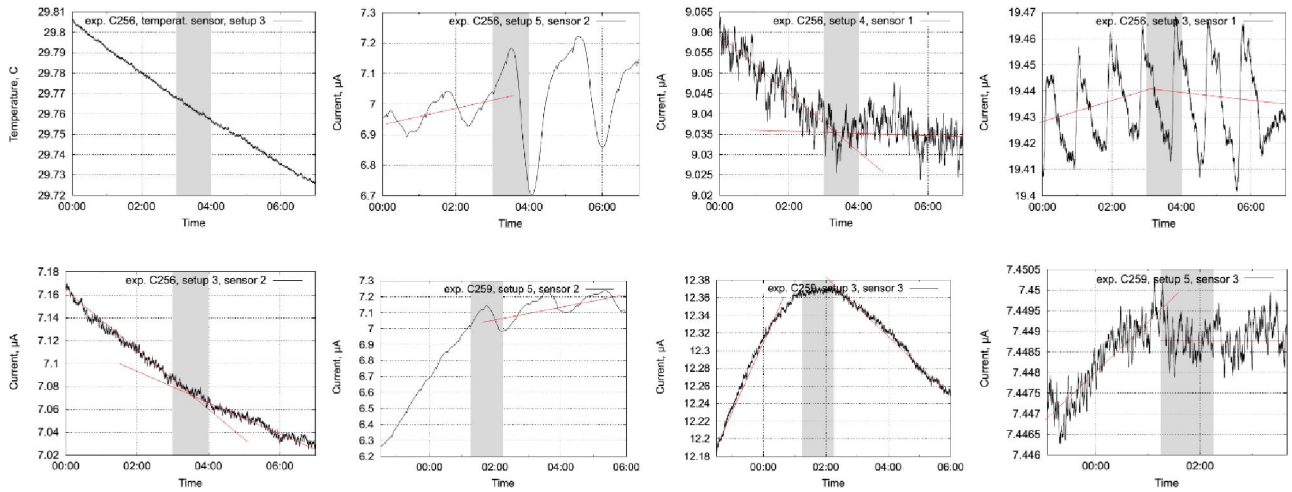


Figure 11. Experiments C256, C259 at distance 2068 km between Stuttgart and Moscow.

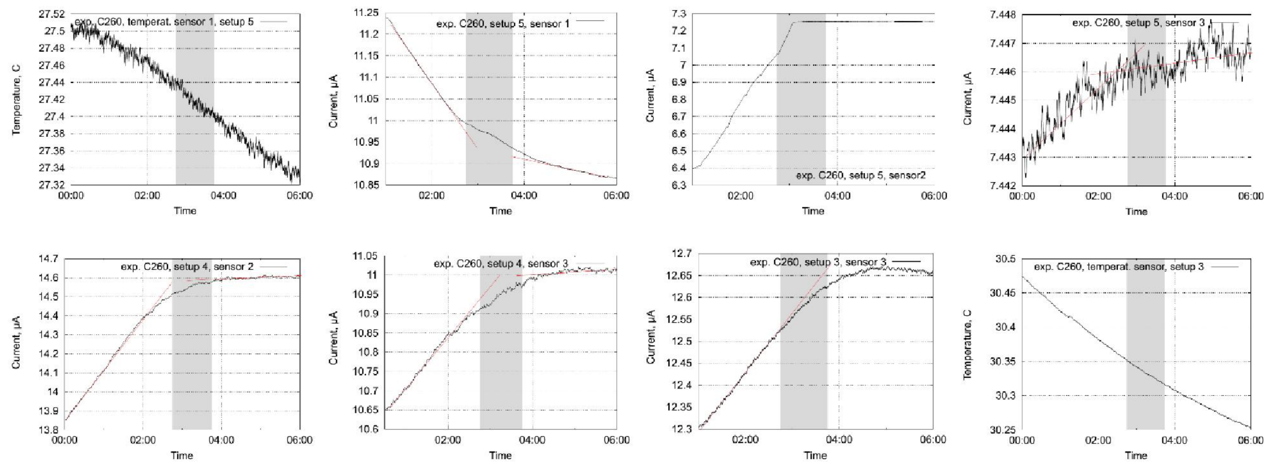


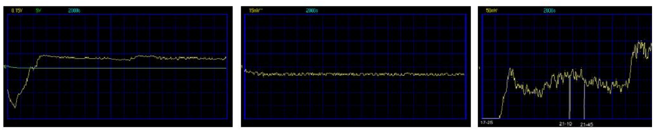
Figure 12. Experiment C260 at the distance 2068 km between Stuttgart and Moscow.

The first experiment C256 on 14 September demonstrated a usual response of about 45%, see Fig. 11. Also the final experiments C259 and C260 on 18 and 19 September were successful, see Fig. 11. However, intermediate experiments C257, C258 on 15 and 16 September did not indicate any changes of current. Since conditions of all experiments C256-C260 are absolutely the same, we do not have any plausible explanation why some experiments are successful and others not. Some authors proposed a possible impact of astronomic events on long range interactions - similarly to an impact of sun on long range radio communication.

3.4 Distance 3227 km

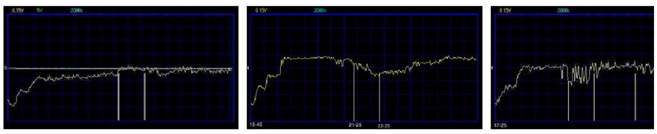
These experiments are performed between

Stuttgart and Ufa. The receiver was in Ufa (IGA-1), the emitter was in Stuttgart (two LED generators). Three series experiments are performed: a) control measurements; b) experiments before 14.09.12; c) experiments after 20.09.12. In experiments b) two blue light LED generators are used, in experiments c) additionally a polyspectral LED generator was switched on. In all these experiments LED generators had a power supply 48 Volt from a battery. Overview of all experiments is done in Table 4. Control measurements have been performed several times, e.g. on 19.01.12, 18.06.12, 04.09.12 in DC mode and on 12.09.12 in AC mode, see Fig. 13.



(a) (b) (c)

Figure 13. Control measurements done by IGA-1: (a) 18.06.12; (b) 12.09.12; (c) the experiment on 2.10.12.



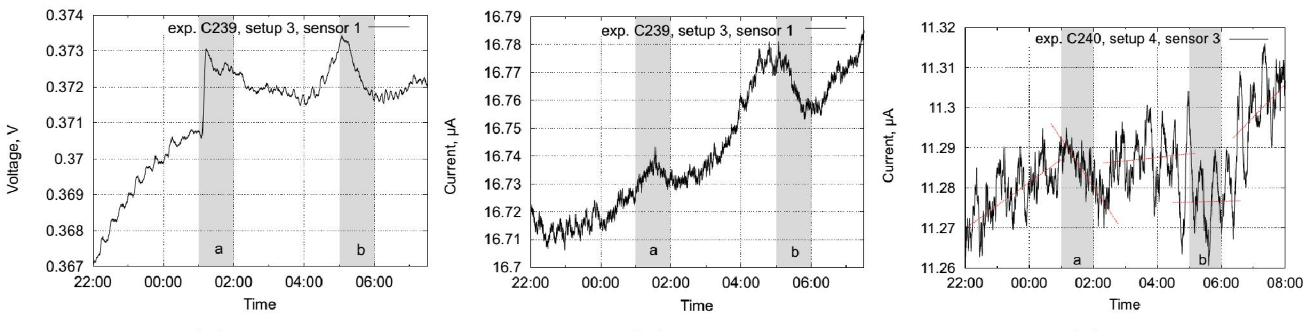
(a) (b) (c)

Figure 14. Experiments on: (a) 05.09.12, (b) 26.09.12, (c) 27.09.12 at distance 3227 km between Stuttgart and Ufa, each graduation corresponds to 32 minutes.

Generally, the IGA-1 device is characterized by a flat diagram of output voltage when there is no influence. In the first two hours of operation the device was distorted by environmental impacts, thus the LED generators were switched on three hours later than IGA-1, in total only 1-2 experiments per night were performed.

The first session was on 5.09.12. Generators were turned on at 14.11 and 18.11 of Stuttgart's time. Since the first measurement was within the forbidden two-hour zone, it was ignored. However, the second measurement indicated some irregularity of the output voltage, which appeared almost simultaneously with turning on the LED generators, see Fig.14.

Three following experiments on 10.09.12, 11.09.12 and 13.09.12 (additional control measurements were performed on 12.09.12) did not reveal any visible changes of output voltage. The next series of experiments was performed on 26.09.12, 27.09.12 and 2.10.12. Here we also observed several variations of the signal during the LED generators were turned on. However, these signals are not unambiguous in term of their origin and statistical significance. Thus we stopped further experiments. Despite the receiving device needs further improvements, these experiments are of interest because they demonstrated a possibility of receiving a distant impact also by non-EDL sensors, i.e. independently from a hardware implementation.



(a) (b) (c)

Figure 15. Data from most intensively responded sensors in experiments C239 and C240 at the distance of 13798 km: (a) data from the four-electrode voltage sensor S1 from the third setup; (b) data from current sensor S1 from the third setup; (c) data from the third current sensor from the fourth setup.

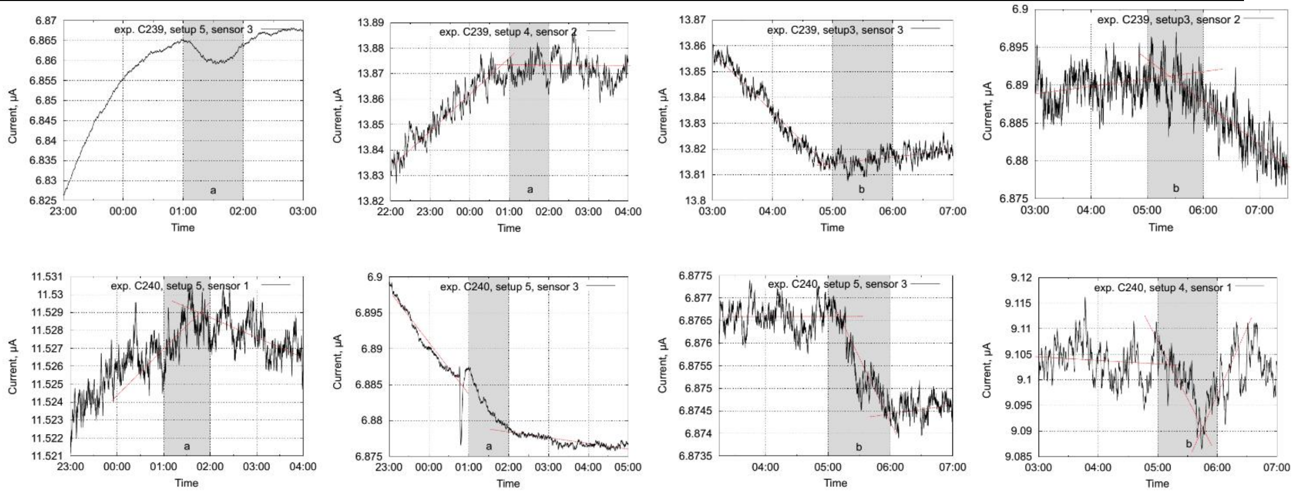


Figure 16. Responses of several sensors for experiments C239 and C240.

3.5 Distance 13798 km

Super long range interactions are performed between Perth, West Australia and Stuttgart, Germany, the distance between receiver and emitter is about 13798 km. Researchers in Australia used two generators: the cylindrical one was turned on at 1.00-2.00 and the conic one - at 5.00-6.00 of CET on 16 and 17 August 2012. In total four independent experiments with 36 measurements were performed: C239a, C239b - on 16 August 2012, and C240a, C240b - on 17 August 2012.

Data from temperature sensor, supply voltage of the PSoC chip and from the accelerometer for all experiments are shown in Fig. 25. It is well visible that no temperature, mechanical or electric influences impacted the EDL sensors during these experiments. The most intensively responded sensors in experiments C239 and C240 are shown in Fig. 15.

We observe very evident changes of trend during the influence. The three best responses of current sensors from C239a,b and C240a,b are shown in Fig.16 for further analysis. In total 20 sensors are responded from 36 sensors, i.e. the result is within > 50% of reaction. Based on these results we judged positively the attempt of receiving a 1mW signal from Australia by sensors in Germany.

We registered an anomalous behavior of some temperature and current sensors. They demonstrated activity surges for 70 minutes after the experiment C239a with duration of exactly one hour (the impact time of generators is also one hour), see Fig. 26. Usually such irregularities are related to environmental changes and ignored. However, such a small variation - 0.003°C - cannot be explained by local changes because university and laboratories are closed at night time. Several researchers pointed out a possibility of receiving echo-signals for long range interactions. Moreover, a sensitivity of the semiconductor and resistance temperature sensors to non-electromagnetic influences is also well-known. Thus, we note this irregularity without any further conclusion.

4 Overview of the *operator-device* experiments

Experiments with operators are performed at distances < 10 meters (two separate rooms), 1.65 km (Stuttgart-Stuttgart) and 2105 km (Stuttgart-Donetsk). Two group of operators are in Stuttgart and in Donetsk. Results obtained at short distance are finally discarded because an operator could impact EDL sensors by weak emission of human body (Kobayashi *et al.,* 2009). Results of all experiments are collected in Table 5.

As mentioned by operators, the sensors responded on a specific mental concentration as well as on the 'energetic' state of the operators. Important is not only an intensity but also a duration of concentration. Operators expressed they feel a kinesthetic contact with sensors. Moreover, it was discovered that a person's emotional state plays a role: the more intensive the emotional level, the more intensive the reaction of sensors. Several operators pointed out a necessity of excited emotional state, a relaxed state does not affect sensors. Also a simple mental concentration on sensors does not impact the dynamics of current.

Some operators described they feel a clear kinesthetic effect when 'virtually touching' sensors. They also described effects when 'an energetic hand was detached from a physical hand'. This caused some 'burning pain' on the skin. Some operators also mentioned that a physical or mental exhaustion impacted negatively their capability to interact with sensors. The level of concentration was important. For instance, observing the plotted curves provided an online feedback, however decreased the concentration. Operators proposed to analyze data from sensors after the experiment.

4.1 Distance 0.2-1 and 3-10 meters

Preparing the works (Kernbach, 2013b, 2012a, 2013a), several preliminary mind-matter experiments were performed in order to estimate the level of sensitivity of EDL sensors. In the first kind of such experiments, sensors registered unintentional emotional impact from different neighbor persons. In the second kind of those experiments, operators from the group 'chaosWatcher' intentionally influenced the sensors to develop a specific training approach with online feedback from devices.

These experiments demonstrated a potential possibility to impact mentally the devices on short distances of about 0.2-1 and 3-10 meters. An operator was in vicinity of sensors or in a nearby room and obtained a feedback in graphical form on a notebook computer. Overview of the performed experiments is shown in Table 5.

However, we doubted these results. There is a number of factors that can impact sensors on such short distances, e.g. a weak emission of human body (Kobayashi *et al.,* 2009). Operators agreed to stop short-distance experiments and to transport sensors on the distance of 1650 meters in another building. We do not consider results on 0.2-1 and 3-10 meters as reliable and do not show current curves. The overview in Table 5 reflects only the fact of performing these short range experiments.

4.2 Distance 1.65 km

These experiments extended further the previous attempts. Operators from the group 'chaosWatcher' visited the laboratory with installed sensors, and had a clear idea of position and working principle of EDL sensors. Operators from this group described their approach as 'mind projection' that is related to achieving a deep meditative trance state. Duration of the experiments was about 30-40 minutes; preparation of an operator took about 15-20 minutes. Thus, a common duration of an experiment was similar to *device-device* experiments. These experiments are performed in summer and autumn 2012.

An overview of these experiments is provided in Table 5. Usually, the experiment was performed evening around 23.00 or morning around 6.00. Since operators are quite busy, the decision to undertake an attempt was taken on the same day and all other experiments with sensors are postponed. Since operators were developing their own technique of training *psychokinetic* capabilities, not all experiments were successful. After discussion in the group it was decided that only several successful attempts will be described here, but in turn operators will prepare a more detailed work on this topic. From our side we estimate the number of successful to not successful experiments as one to three in about a hundred of experiments.

The experiment B191 was performed by the operator '1' from 21.45 (preparation) to 22.50 (end of experiment). At this moment only the setup five was operational, all others are in the maintenance. Thus only data from two sensors are shown in Fig. 17. In this experiment we obtained an essential psychokinetic reaction that caused a large variation of current.

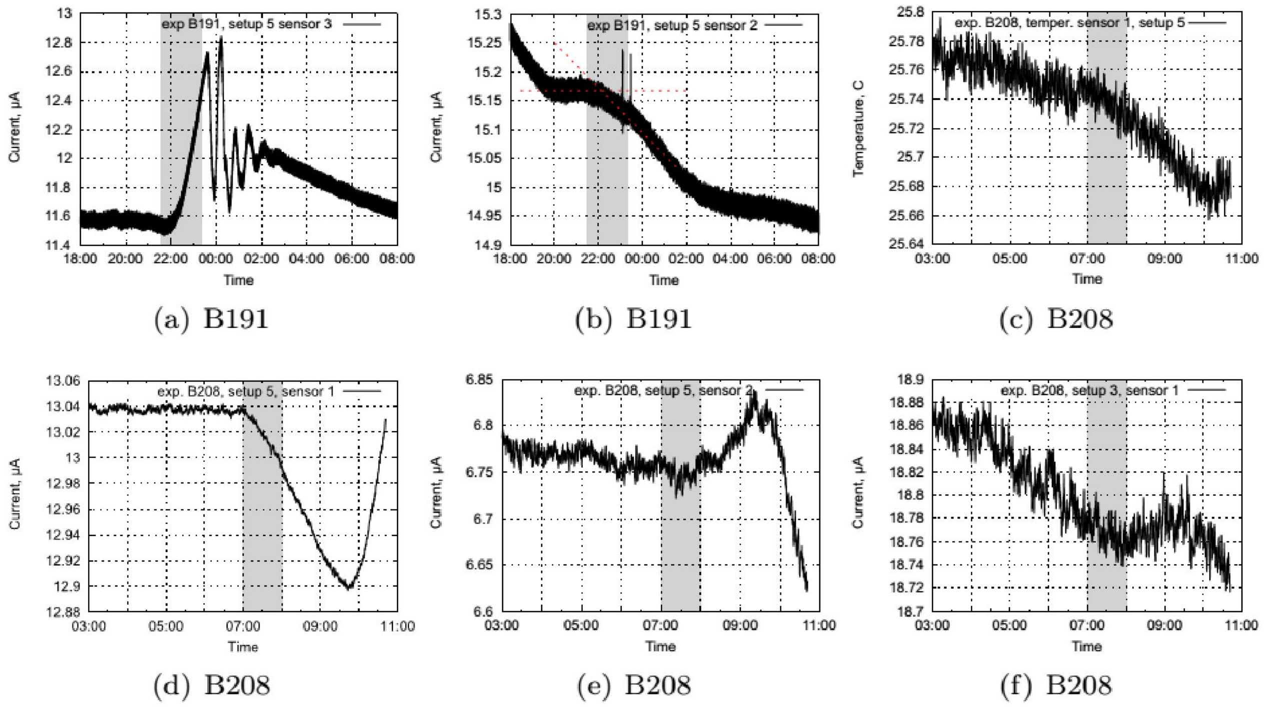


Figure 17. Experiments B191 and B208.

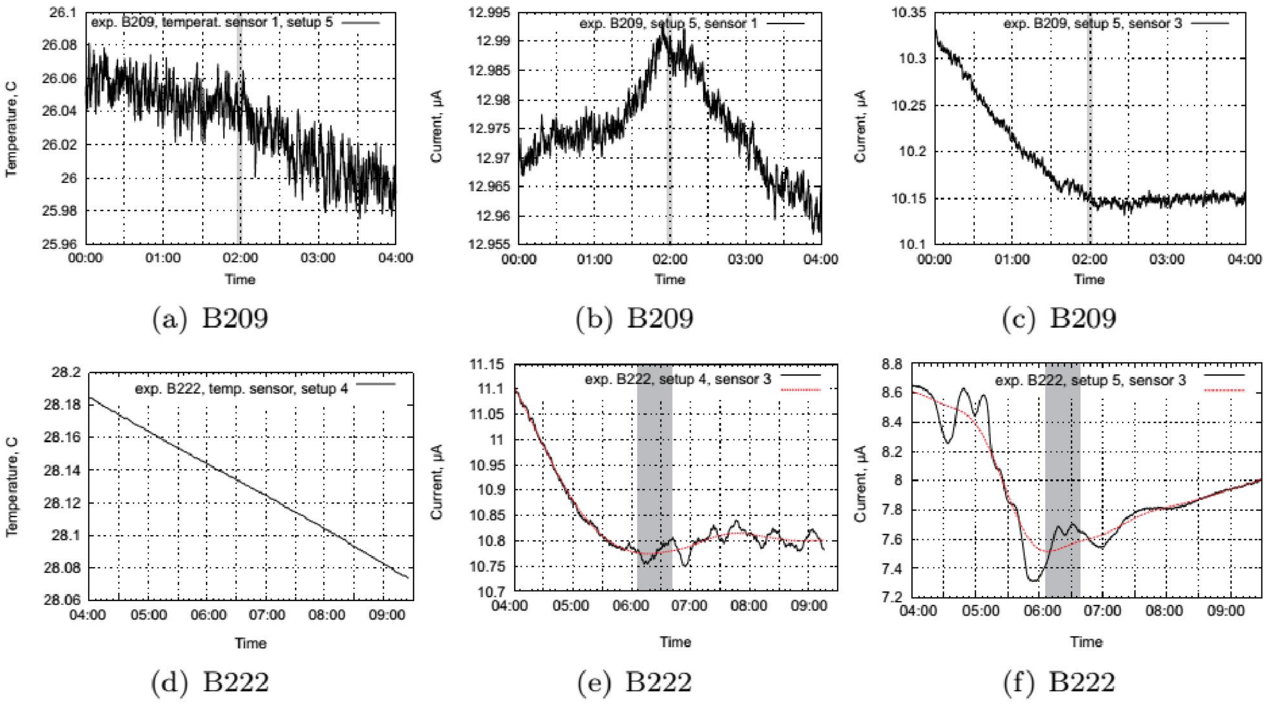


Figure 18. Experiments B209 and B222.

The experiment B208 was performed by the operator '1' in the morning hours, from 7.00 (preparation) to 7.20-7.45 (the first attempt) and 7.45-8.00 (the second attempt). Reaction of six sensors is well visible, see some sensor responses in Fig. 17. It must be noted that at the morning, some variation of temperature occurred. This increased sensitivity of sensors and we observed two reactions T1, which are typical for short distances.

The experiment B209 was performed by the operator '2' at night hours, about 2.00 with duration of 10 minutes. As stated by this operator, he 'felt a desire to impact the sensors', therefore this session was so short. Current data are shown in Fig. 18, temperature sensors did not record any variation of temperature at that time. The experiment B222 was performed by the operator '1' in the morning at 6.00 with duration about 40 minutes. This time was selected before morning's variation of temperature, in total 4 sensors from 9 recorded an impact, see the three best responses in Fig. 8.

4.3 Distance 2105 km

These experiments are similar to ones described in the previous section, however with another group of operators and other techniques. The goals were: (a) to obtain an objective confirmation from devices for subjective feelings during meditations and trances; (b) to develop a training approach for those psychokinetic techniques. The distance between Stuttgart and Donetsk is approximately 2105 km. The 'MSU' [3] group practices a 'lucid dreaming approach' for impacting the sensors. Since this group had more members than 'chaosWatcher', it was of interest to explore appearing collective phenomena. One week from 21 to 26 of August 2012 was reserved for these experiments was of interest to explore appearing collective phenomena. One week from 21 to 26 of August 2012 was reserved for these experiments.

Since nobody from this group was in Stuttgart, images of laboratory and sensors are sent to Donetsk. During videoconference the developers demonstrated the laboratory, the building and answered all questions. The methodology of these experiments assumed that all members of the 'MSU' group perform the influence without informing the group in Stuttgart. After the session, the time was told to Stuttgart for generating diagrams, which were then sent to Donetsk. Analysis was performed on both sites. For the experiment on 24 and 25 August the time of attempts was not transmitted to Stuttgart. The Stuttgart's group should recognize the time and the attempt (yes or no) based on the data from sensors. The analysis procedure from the previous experiments (Kernbach, 2012a, 2013b) was applied: duration of an attempt - 30-60 minutes, time between attempts - about 120 minutes. Only changes of current during the experiments (±15 minutes) were considered. Three best responses are plotted.

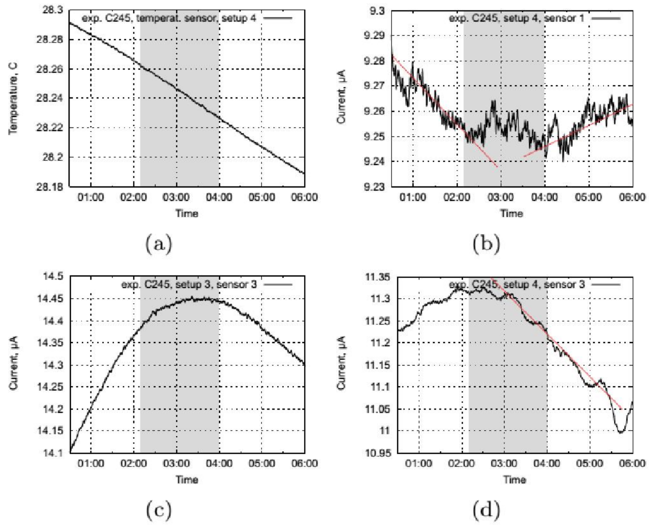


Figure 19. The experiment C245, data from **(a)** temperature sensor, **(b-d)** current sensors.

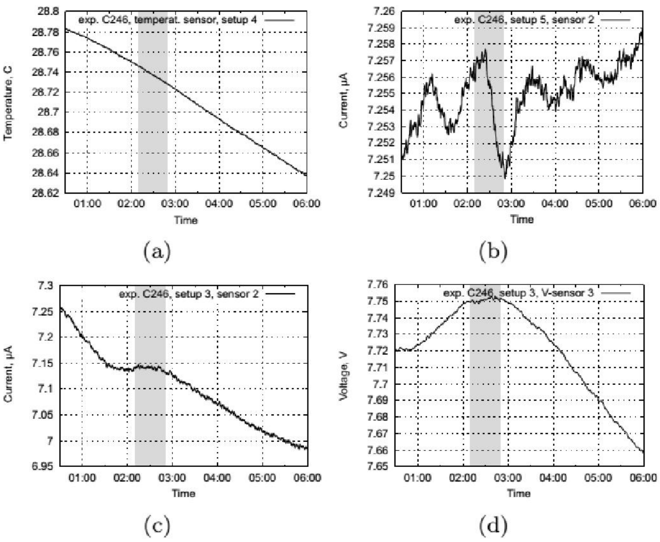


Figure 20. The experiment C246, data from **(a)** temperature sensor, **(b-d)** current sensors.

During the first experiment C245 one operator noted a subjective feeling of a successful influence during 2.10-3.50 (and up to 4.00). Sensors demonstrated an essential change of current around 1.50-3.00, see Fig. 19. Beside these changes, we noted several other variations also later. Moreover, the reaction of sensors was to some extent spread in time in contrast to the case of *device-device* interactions with almost

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simultaneous reaction of all sensors. It seems this can be explained by some desynchronization between operators. In total, 6 from 9 sensors demonstrated a reaction in that experiment.

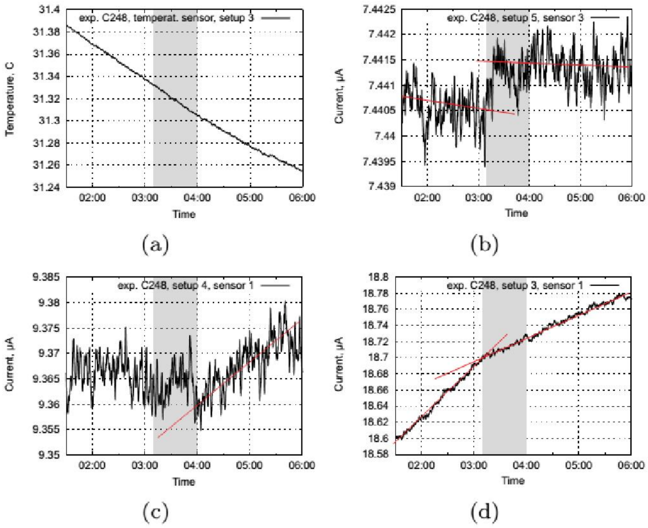

Figure 21. The experiment C248, data from **(a)** temperature sensor, **(b-d)** current sensors.

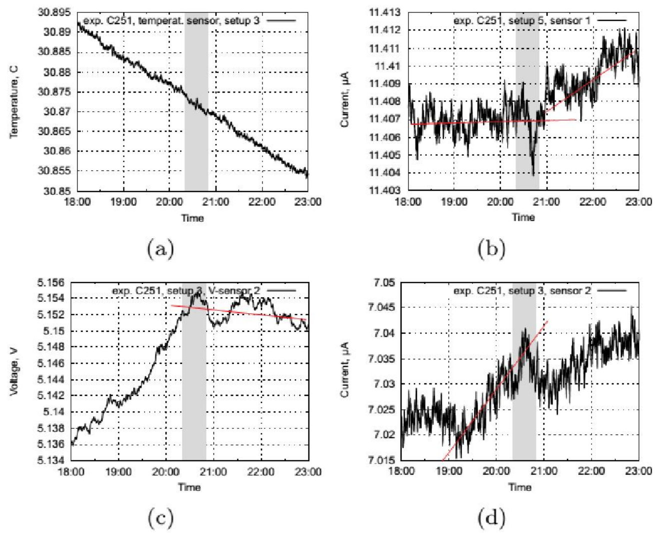

Figure 22. The experiment C251, data from **(a)** temperature sensor, **(b-d)** current sensors.

To avoid spreading of sensor data, it was agreed for the second experiment C246 that all operators will start the influence at the same time. At least one operator reported a feeling of a successful attempt at 2.33 (±20 minutes). Sensors demonstrated an essential variation of current at that time, see Fig.20. It is unclear whether this was an individual and collective result. In total, 4 current and 2 voltage sensors responded.

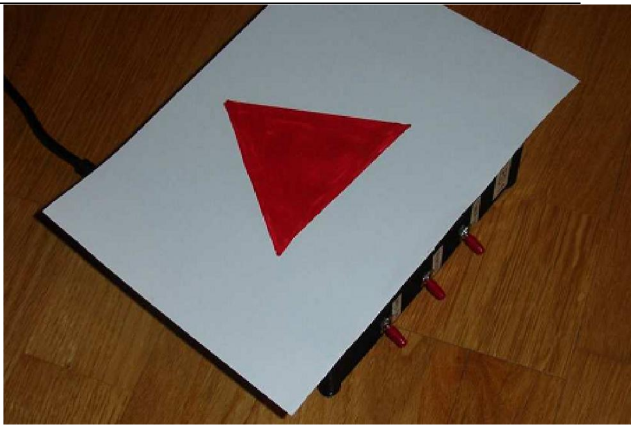

Figure 23: Symbol of a red triangle on the LED generator used for a 'synchronization' between operators in the experiment C251.

The planned experiment on 23 of August was not performed. It is unclear whether a tiredness in the group or a working LED generator was the reason for this. For the next experiments the strategy was changed. Based on the recorded data by sensors, the Stuttgart's group should express an assumption about performed experiment and the group form Donetsk should confirm or reject it. For the experiment on 24 of August two assumptions were expressed: 1.00-2.00 with 6 current changes or 3.00-4.00 with 5 current changes. The second assumption was correct. Results of this experiment C248 are shown in Fig.21, in total 6 from 9 sensors changes their behavior at that time.

For the experiment on 25 of August an assumption has been expressed about the time 1.30-2.00. It was not correct, because this day was planned by Donetsk group as a control experiment (i.e. no influence). It is unclear what is reason for multiple responses of current sensors around 1.00-2.00 on 24 and 25 of August.

For the last experiment on 26.08.12 it was decided to undertake a common experiment with two groups of operators and with some synchronization between them, e.g. by a symbol that modulates an emission of LED generator, see Fig. 23. Both groups tuned up for the symbol by using the 'scrying' approach. Besides influencing the sensors, both groups intended to identify the presence of each other and to estimate the number of participating persons. Sensors demonstrated only a weak reaction on this experiment - from 9 sensors only 3 can be identified as responded. Despite weakness of the response, we still counted this experiment as successful. Both group identified each other and correctly estimated the number of male/female operators. Overview of all performed experiment is shown Table 5.

Summarizing the experiments from Stuttgart' side, C245, C246 and C248 can be evaluated as positive. Time expressed by Donetsk' group coincide with the response of sensors. Moreover, approximately 50% of sensors demonstrated an essential change in dynamics of current/voltage. It seems also that by using statistic approaches it is possible to estimate correctly the time of influence without having information about such an influence. However, it needs to note that some environmental noise as well as large confidence interval can lead to an absolutely wrong estimation. The experiment C251 with a common influence is weaker than a single impact from one of those groups. It seems also that ESP as well as psychokinetic capabilities can be improved by using LED generators and sensors.

From anomalous data, it needs to point to the strong synchronized noise from unknown source - this effect was not encountered previously. It is unclear whether it represents a side effect of the preformed experiments or there are environmental reasons for it.

5 Analysis of results and conclusion

For the analysis we represent the output of EDL sensor as '1' when time of its reaction coincided with the time of influence (during one hour), and '0' when not. Two control groups are formed: A1 - all values equal zero and A2 - one value is equal to one and others are equal to zero. Thus, we consider the case of ideal sensors in A1 and a random process in A2, which can 'correctly guess' the influence time. Similarly, two groups of results are formed: B1 - three from nine sensor values (6 from 18) are correct and B2 - five from nine (10 from 18) are correct. We perform the Mann-Whitney U test for the following cases: A1-B1, A1-B2, A2-B1, A2-B2, see Table 1.

Table 1. Results of the Mann-Whitney U test for groups A and B.

	9 sensors		18 sensors	
	U-test (z)	significance	U-test (z)	significance
A1-B1	-1.743	0.081	-2.646	0.008
A1-B2	-2.405	0.016	-3.669	0.000
A2-B1	-0.981	0.326	-2.076	0.038
A2-B2	-1.772	0.076	-3.211	0.001

The goal is to estimate when the difference between groups A and B will be statistically significant. Based on measurements in (Kernbach, 2013b, 2012a, 2013a), we use in these experiments the case A2-B1 (6 from 18) with $a = 0.038$ and in several cases A1-B1 (3 from 9) with $a = 0.081$, which are statistically significant regarding corresponding random processes.

To demonstrate a statistical significance, we select two typical experiments: EXP1 - C239-C240 (13798 km) for the *device-device* and EXP2 - C245-C246- C248-C251 (2105 km) for the *operator-device* experiments. In each of these experiments 4 attempts with 9 sensors have been performed. As mentioned, EDL sensors can lose their sensitivity - this is related to relaxation processes in the Gouy-Chapman layer - therefore it needs to make some assumptions about a temporal operability of sensors. In Table 2 we show results of the xi-square test for EXP1, EXP2 regarding null hypothesis of a random character of these results.

Table 2. Results of xi-square tests for EXP1 and EXP2.

not operable sensors	EXP1		EXP2	
	xi-square	signifi-cance	xi-square	signifi-cance
1	2.000	0.157	1.125	0.289
2	5.143	0.023	3.571	0.059
3	10.667	0.001	8.167	0.04

Table 3. Overview of all results.

type	total expe-riments	total sensors	total suc-cessful experiments	total not successful experiments
device-device	42	289	29	13
device-device-operator (LED-gen.)	6	54	5	1
operator-device, gr. CW	—	—	4	—
operator-device, gr. MSU	4	36	4	0

We can reject the null hypothesis with the level of significance $a < 0.03$ and $a < 0.06$ for EXP1, EXP2 correspondingly, if to assume that two from nine sensors can lose their sensitivity. Overview of all results is shown in Table 3. About 69% *device-device* experiments were successful and 31% - not successful, 13 *operator-device* experiments were successful and one not. Four (C233, C254) *device-device* experiments were expectedly-not-successful, i.e. only in 21% we did not succeed in a signal transmission. Reasons are, a new technology with IGA-1, which needs further development, as well as a possible impact of astronomic events, whose influence on long range interactions is still not fully explored.

We note the following main results:

- analyzing results of all performed experiments, we cannot reject the hypothesis about non-local interactions. Taking into account statistical significance and a clear correlation between turning on/off generators and a reaction of sensors we also reject the null hypothesis about a random character of results.
- both *device-device* and *operator-device* interactions used the same sensors. It can point to a common mechanisms underlying these two types of interactions.
- used EDL sensors, comparing with known capacitor, inductive and other sensors (Zamsha and Shkatov, 2012 b, a) possess a great sensitivity. Despite a relatively complex maintenance and a need of temperature, EM and mechanical shields, they enabled performing many successful experiments. Using more advance microelectronic solutions, it is possible to develop a compact device for mobile and stationary applications even in hazardous or underwater environments.
- the 'macroscopic entanglement' created a number of open questions. The used 'object-representation' approach seems to work, despite our original skepticism. With digital b/w or color printed images in *device-device* experiments the connection was established and worked in almost all undertaken attempts. Apparently, an involvement into a joint process can also create a 'macroscopic entanglement'. Long time jointly working devices, after splitting, can support a communication channel up to three weeks. Without these approaches, we did not succeed in creating a communication channel at long distances.
- increasing intensity of interactions, e.g. simultaneous impact of several devices or operators, we did not always observe more intensive reaction of sensors. However, we observed the effect when frequency desynchronizing between two generators leaded to better response of sensors (Kernbach, 2012a).

Several comments must be noted. Firstly, in order to recognize the remote impact, it requires knowing of a temporal confidence interval for the impact. From three attempts to recognize the impact without a priori information, only one attempt was successful. The reason was a correlated noise from unknown source, which caused simultaneous reaction of several sensors. In (Kernbach, 2013a) we expressed the idea that generators are not a single source of a possible non-EM field. We can assume also some emergent properties of these phenomena (Kornienko *et al.,* 2005, 2001; Levi *et al.,* 1999).

Secondly, it is argued that an operator or a developer represents the origin of interactions in device-device experiments. Considering Fig. 7, we observe a modulation of a signal during 24 hours with the period of 4 hours. Despite we cannot discard an operator as an origin of interaction, such a regular modulation points to a device as an origin of impact. However, in several experiments we observed more intensive reaction of sensors when device and operator jointly impacted the sensors. It seems that such a joint operation is possible and corresponding approaches need to be developed.

Thirdly, the used sensor system is relatively slow, for a reliable recognition of signal from noise a modulation with the period of four hours was used. Since the sensors reacted mostly on turning on/off generators, the dynamic performance of sensors can be essentially improved. Even in the current configuration we see two main applications of this technology: for training different psychokinetic capabilities and as a device for super-long-range emergency communication underground, underwater or in Space. For instance, the generators used in the experiments Stuttgart-Perth had only 1mW of optical power.

Concluding the whole series of works (Kernbach, 2013b, 2012a, 2013a), it seems that further development of 'non-EM technologies' with EDL sensors has a large potential, especially because of sensitivity of these sensors. New software and hardware solutions should improve this approach and enable new medical, biological and hybrid experiments. This represents future works.

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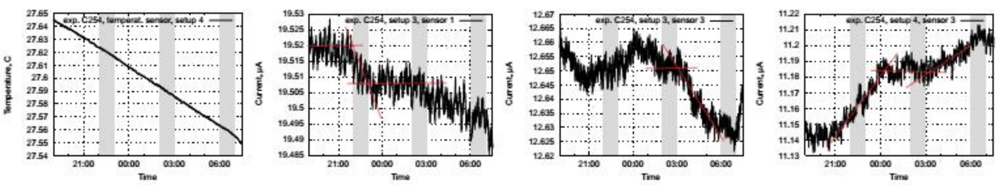
A Supplementary Tables and Figures

Table 4: Results of *device-device* experiments, exposition – time when the generators are switched on.

N	distance, km	exposition, min	synchronization	mental influence	total experiments	total sensors	total reaction T2	no reaction	comments
C232	1.65	60	no	no	1	9	4	5	0 hours[1]
C236	1.65	60	no	no	2	18	8	10	24 hours
C241	1.65	60	no	no	4	36	12	24	144 hours
C254	1.65	60	no	no	3	27	4	23	552 hours, negative
C234	1.65	30	yes	no	3	27	7	20	
C235	1.65	60	yes	no	1	9	5	4	
C237 b,c	1.65	60	yes	no	2	18	4	14	
C238	1.65	60	yes	no	2	18	9	9	
C255	360	60	yes	no	2	18	8	10	
C256	2068	60	yes	no	1	9	4	5	
C258	2068	60	yes	no	2	18	2	16	negative
C258	2068	60	yes	no	2	18	2	16	negative
C259	2068	60	yes	no	1	9	4	5	
C260	2068	60	yes	no	1	9	6	3	
05.09.12	3227	60	yes	no	1	1	1	0	IGA-1
10.09.12	3227	60	yes	no	2	2	0	2	IGA-1, negative
11.09.12	3227	60	yes	no	2	2	0	2	IGA-1, negative
13.09.12	3227	60	yes	no	2	2	0	2	IGA-1, negative
26.09.12	3227	60	yes	no	1	1	1	0	IGA-1
27.09.12	3227	60	yes	no	2	2	2	0	IGA-1
02.10.12	3227	60	yes	no	1	1	1	0	IGA-1
C239	13798	60	yes	no	2	18	10	8	
C240	13798	60	yes	no	2	18	10	8	
C233	1.65	30	yes	yes	1	9	1[2]	8	negative
C235 a,b,d	1.65	60	yes	yes	3	27	12	15	
C237a	1.65	60	yes	yes	1	9	4	5	
C244	1.65	60	yes	yes	1	9	5	4	

[1] After generators are transported into a new place.
[2] Three other sensors demonstrated a reaction about ±30 minutes outside of experiment.



(a) (b) (c) (d)

Figure 24: Experiment C254 at distance 1.65 km between generators and sensors 23 days after transportation. Almost no changes of current can be detected when the generators are on.

Table 5: Results of *operator-device* experiments.

N	distance	duration, min	synchronization	mental influence	total experiments	total sensors	total reaction T2	no reaction	notes
B11	0.5-1m	15	no	yes	1	1	1	0	
B17b	0.5-1m	25	no	yes	1	1	1	0	
B72, B73	0.5-1m	35	no	yes	1	6	4	2	
B80, B81	0.5-1m	30	no	yes	1	6	2	4	
B98	0.5-1m	40	no	yes	1	6	2	4	
B99, B100	0.5-1m	30	no	yes	1	6	3	3	
B17a	3-5m	25	no	yes	1	3	1	2	
B22	3-5m	30	no	yes	1	3	3	0	
B32	3-5m	30	no	yes	1	3	1	3	
B39	3-5m	40	no	yes	1	3	3	0	
B41a,b	3-5m	40	no	yes	1	6	2	4	
B70, B71	3-5m	40	no	yes	1	6	3	3	
B74, B75	3-5m	45	no	yes	1	6	2	4	
B76, B77	3-5m	60	no	yes	1	6	3	3	
B78, B79	3-5m	60	no	yes	1	6	2	4	
B82, B83	10m	45	no	yes	1	6	0	6	
B101, B102	10m	40	no	yes	1	6	3	3	
B191	1.65km	65	no	yes	1	3	2	1	
B208	1.65km	40	no	yes	1	9	6	3	20.07.12
B209	1.65km	10	no	yes	1	6	2	4	21.07.12
B222	1.65	40	no	yes	1	9	4	5	
C245	2105km	100	no	yes	1	9	6	3	21.08.12
C246	2105km	40	no	yes	1	9	4	5	22.08.12
—	—	—	—	—	—	—	—	—	23.08.12[1]
C248	2105km	50	no	yes	1	9	6	3	24.08.12
—	—	—	—	—	—	—	—	—	25.08.12[2]
C251	2105km	30	yes	yes	1	9	3	6	26.08.12

[1] Experiment was not performed due to several subjective reasons.
[2] Control attempt (no experiment) from Donetsk' team.

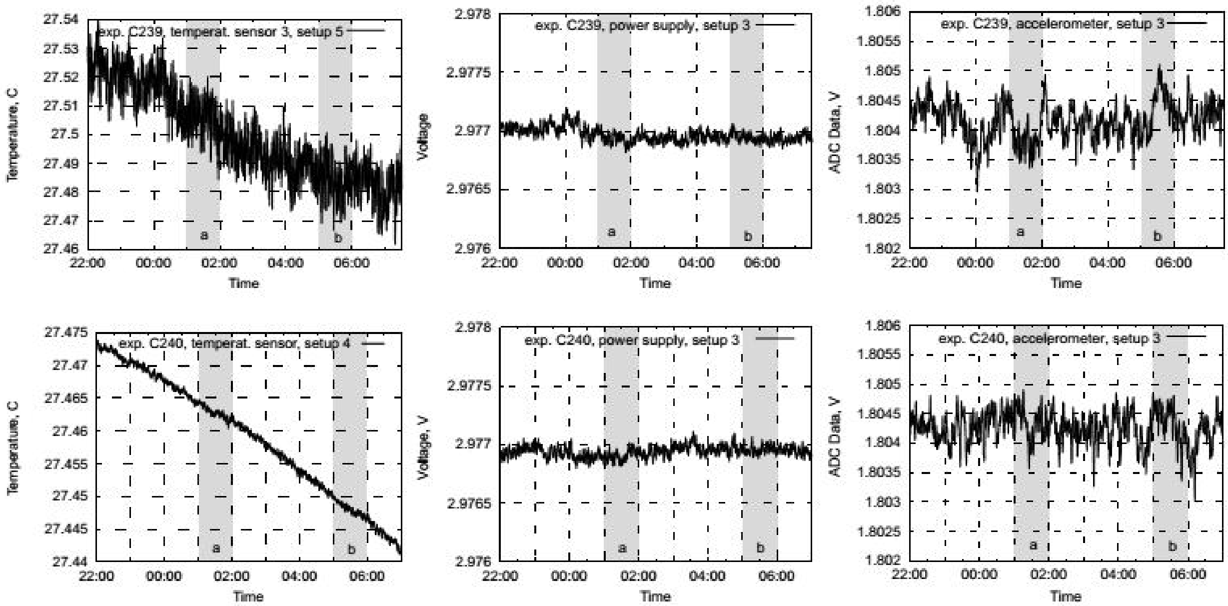


Figure 25: Data from temperature sensor, supply voltage and accelerometer during experiments C239 and C240. No anomalous environmental conditions are recorded during these experiments.

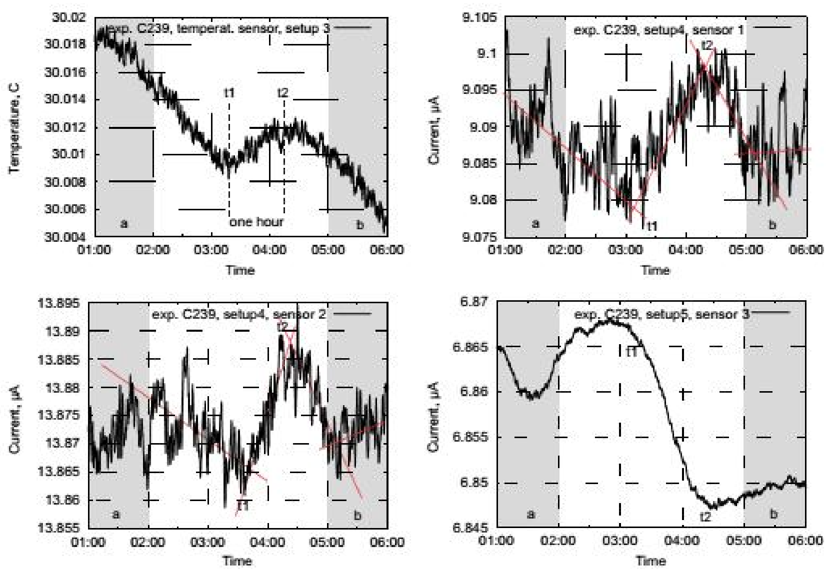


Figure 26: Activity surges for some temperature and current sensors 70 minutes after C239a with duration of one hour.