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Ljubljana, 1st July 2015
No.: 38/15
Certificate No.: 0024

TEST REPORT FOR PROTECTIVE INFLUENCE ON HUMAN ORGANISM

FOR THE PRODUCT

POZITRON PLUS – MOBITEL

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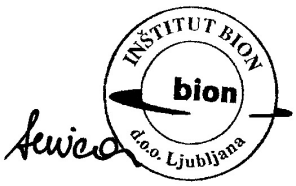


CONTENTS

1. INTRODUCTION 3
2. MATERIALS AND METHODS 4
2.1. MESSURING PHYSIOLOGICAL PARAMETERS 6
3. RESULTS AND DISCUSSION 7
4. CONCLUSIONS 11
5. LITERATURE 12

1. INTRODUCTION

One of the scientific fields of research at Bion Institute is measuring effects of (ultra)weak radiation. This radiation cannot be measured with conventional measuring devices. Even unconventional devices are not yet capable of measuring this kind of radiation (in physical or chemical effects) reliably enough – but the technology is constantly developing also in this direction. This kind of radiation and its effects mostly cannot be explained by a commonly accepted theoretical interpretation, although some scientists have offered possible explanations.

Bion Institute is specialised for measuring biological effects of weak emission of devices made by various manufacturers. They cannot confirm their statements in a conventional way nor with unconventional detection devices. In many years of research, Bion Institute developed a series of tests which enable us to use human organism to detect such weak emission and determine its general physiological effects. This is why we can give a valid assessment of the supposed activity or non-activity of weak emission devices; be it a stimulating or a protective activity against negative radiation from the environment. If we confirm the effects of the supposed emission are statistically significant, we issue the adequate certificate.

The customer MEDI SPA d.o.o. ordered a testing of their device »Pozitron Plus - Mobitel« (from now on referred to as Pozitron), for which they claimed to have a protective influence on humans against radiation of mobile phones.

In the tests, we monitored the short-term effect of the product on various physiological parameters (skin conductance, heart rate, muscle activity, respiration rate, body temperature and some other derivate parameters). We monitored ten volunteers with the device for measuring physiological parameters for five minutes during the call (calling phase) and fifteen minutes afterwards when mobile phone was in stand-by mode (sitting phase; at that time, the mobile phone was installed near the head). With the use of various statistical methods, we compared and evaluated the data gained by measuring the physiological parameters mentioned above during calling and during sitting phase. We tested each person two times – once with the Pozitron protection and once without it (control).

2. MATERIALS AND METHODS

The tests were conducted from 11th and 24th June 2015 at the Bion Institute with ten volunteers (hereafter testees) aged from 25 to 80 (seven women and three men). Before the tests, we instructed the testees not to have a big meal at least one hour before the tests, and not to drink coffee, alcohol, or energy drinks at least three hours before the tests. We tested each person two times (in two different days), each time at the same hour. This ruled out as much as possible the effects of other factors (e.g. the testee was tired after an 8-hour work shift both times).

When the tests were in process, the testees sat for approximately half an hour in a comfortable chair and the whole time, we were measuring their skin conductance, heart rate, muscle activity, respiration rate and body temperature at the tip of the finger. The first two minutes of the measurements (preparation phase) were intended to obtain the reference values for the particular testee on the particular day prior to the radiation exposure. After preparation phase, the test assistant gave a cell phone to the testee and the latter called a number where no one answered. The testee repeatedly called the same number for five minutes, holding the phone in their right hand against their right ear (calling phase). For the next 15 minutes testees sat in a chair with a mobile phone attached 5-10 cm from their heads (sitting phase). During this phase mobile phone was in a stand-by mode. We used three mobile phones of various brands and ages: Nokia 5800XM, Samsung Galaxy S5, Huawei U8650, each testee used the same phone on both days.

All the electrodes needed for the tests were placed on the left hand (positive electrode and ground for heart rate, both electrodes for muscle activity, and at left hand fingertips – electrodes for skin conductance and body temperature), and on the right leg (negative electrode for heart rate). The right hand had to be free, which enabled the testees to freely use the mobile phone. In this way, we have mostly avoided the interference with electrodes that could be caused by holding the mobile phone in the same hand during the calling phase.

During preparation and calling phase (i.e., first seven minutes), the test assistant was present in the testing room to supervise the process, but for the third phase (sitting phase), the testee was left alone. The phone was turned on all the time, however, incoming or outgoing calls were prevented during this phase. The Pozitron was placed between the cell phone battery and the cover (Figure 1). It was positioned with the inscription turned towards the battery and the graphics away from it.

Each testee had a Pozitron placed on the battery of a mobile phone one day but not the other. The order was selected randomly, the testing itself was performed according to the Double Blank Test. This means that neither the testees nor the test assistant knew whether the Pozitron was used or not. After completing the measurements and before the testees learned when Pozitron was used, they reported their feelings and any other feedback about the testing process.

Figure 1: Placement of Pozitron in mobile phone Huawei U8650 (battery and Pozitron were covered during the use).

After the measurements, we exported collected data to Excel with the sampling frequency of one second. The data were graphically represented and statistically analysed with the *Gnumeric* and *RKWard* software. For every testee, we first calculated thirty-second medians, and then we normalised the data to the median of the first two minutes. From these data, we then calculated common medians for all ten testees, and used this number to draw graphs for each measured parameter (Figure 2 – 6).

We searched for statistically significant differences in preparation, calling and sitting phase. Due to the lack of data, we used the sign test for the first seven minutes and the Wilcoxon signed-rank test for the next fifteen minutes. The statistical test was therefore performed on four (the first two minutes, i.e., preparation phase), ten (five minutes of measurements, i.e., calling phase), and thirty data (fifteen minutes of measurements, i.e., sitting phase).

Following the same procedure, we also carried out the Levene's test for equality of variances to check if the Pozitron caused any changes in data variability. The results of both statistical tests were corrected by the Holm-Bonferroni correction for multiple comparisons (Holm, 1979). From the thirty-second medians, we calculated for each testee the percentage of the Pozitron's radiation protection effect compared to control.

2.1. MESSURING PHYSIOLOGICAL PARAMETERS

Measuring physiological parameters enables us to monitor the changes in a certain person's body in real time. We measure the following parameters:

- **Heart rate** (frequency of heart rate, HR) is seen from electrocardiogram, from which we can deduct heart rate variability (HRV).
- **Muscle activity** (electromyogram, EMG) is measured on the left forearm. This shows us any artefacts that could appear on the EKG due to the testees moving arms.
- **Skin conductance** (SC) and **external body temperature** (TEMP) are measured on the fingertips of the left hand, where skin conductance varies the most. Monitoring skin conductance is also used in lie detectors because sweating and skin conductance are regulated by the parasympathetic nervous system. The latter is a part of the autonomic nervous system that is not controlled by our consciousness, so we cannot regulate it. In general terms, skin conductance is higher when a person is under stress (more sweating, higher blood flow), but responses can be much more complex.
- **Course of respiration** (RESP) is monitored with a special extendable elastic belt, measuring the expansion of thorax, which makes is possible to calculate the number of breaths per minute (BPM – respiration rate), and breathing depth (RESPV).

3. RESULTS AND DISCUSSION

Results showed statistically significant differences in several independent parameters (Table 1) - in heart rate, skin conductance, respiration rate and body temperature. For most parameters, the differences are evident from the graphs. The values of skin conductance parameter were lower with Pozitron during almost all the time of measurements compared to the control, although the initial values were slightly higher (Figure 2). Over time, the difference between Pozitron and control had still been increasing, and in the end, it was already greater than 10 % (Table 2). After the calling phase, statistical analysis also showed a significant difference in the variability of the skin conductance (Table 1, Levene's test), which was higher for Pozitron compared to control.

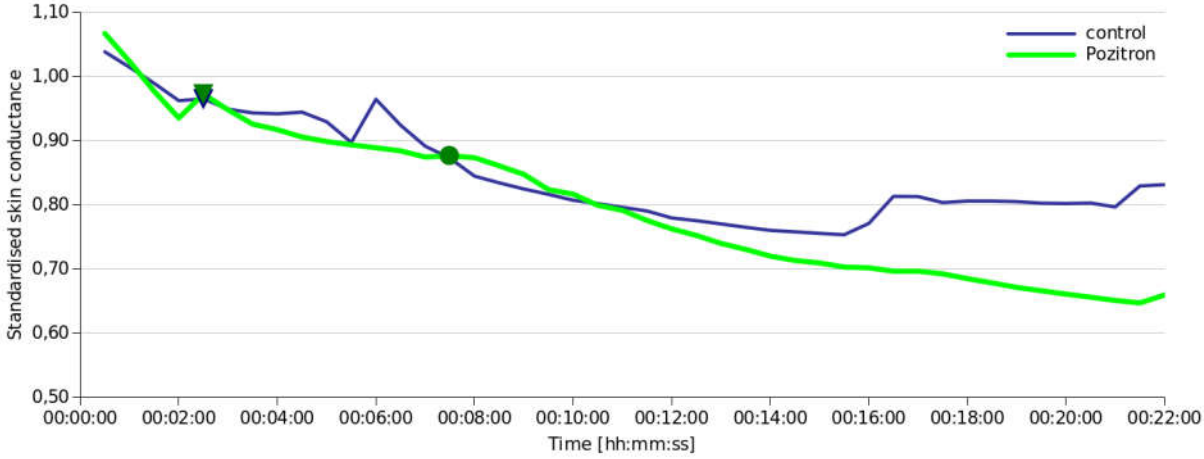


Figure 2: Standardised values for skin conductance (SC) calculated with medians of the ten testees for Pozitron (green line) and for control (blue line). The triangle on the line marks the beginning of calling phase, the circle marks the end of the calling phase.

The results of breathing parameters were also interesting. Respiration rate slightly decreased at the beginning of calling phase for both Pozitron and control test (Figure 3). In control test, the breathing rate during the calling phase was slowly increasing, while it was decreasing when the Pozitron was used. At the end of the calling phase, a significant decrease in breathing rate could be seen in control tests but not when Pozitron was used. From the collected data it is difficult to conclude why this decrease occurred, but we can assume that this was the consequence of relief the organism felt after the burden caused by mobile phone radiation ended. In the sitting phase, the differences in respiration rate between Pozitron and control test were the greatest, and then they slowly decreased. Ten minutes after the call ended, there were no noticeable differences between both tests.

Interesting results were also noticeable for the relative breathing depth (Figure 4). There was no difference between Pozitron and control during the initial two minutes (preparation phase), but it appeared immediately after the beginning of the calling phase. Again, there was a fierce response of testees in control test during the calling phase, as the respiration depth increased and eventually decreased rapidly. This response was almost unnoticeable when Pozitron was used, i.e., the depth was almost unchanged or only slightly lower.

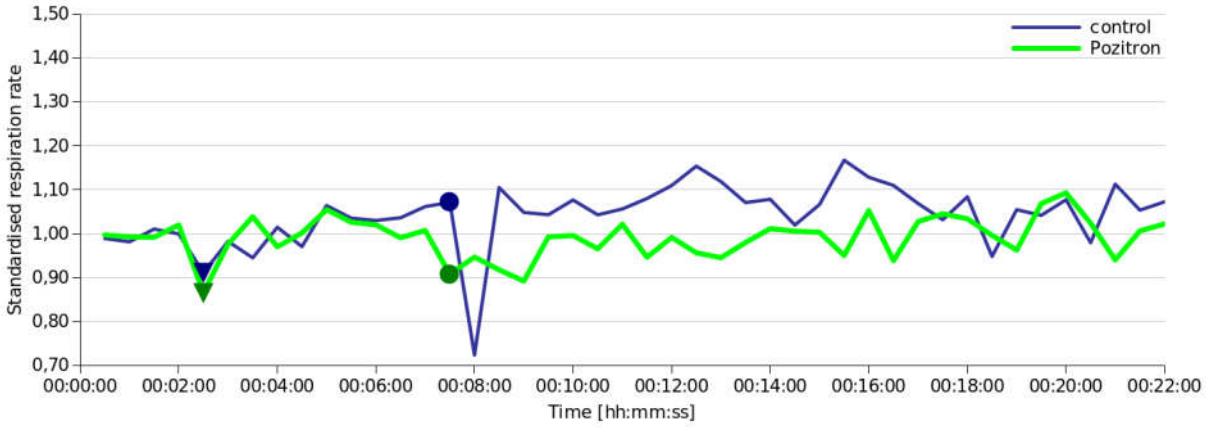


Figure 3: Standardised values for respiration rate (BPM) calculated with medians of the ten testees for Pozitron (green line) and for control (blue line). The triangle on the line marks the beginning of calling phase, the circle marks the end of the calling phase.

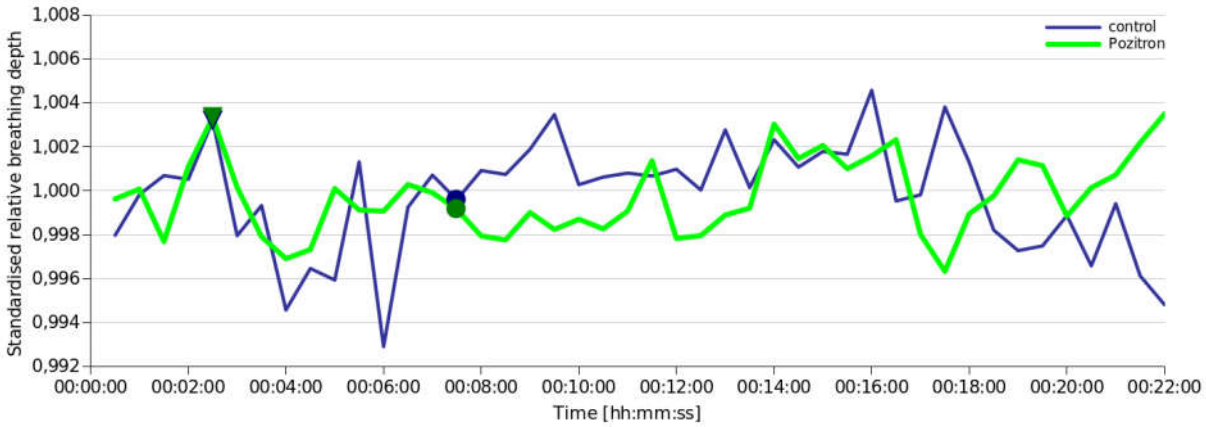


Figure 4: Standardised values for relative breathing depth (RESPV), calculated with medians of the ten testees for Pozitron (green line) and for control (blue line). The triangle on the line marks the beginning of calling phase, the circle marks the end of the calling phase.

The difference in body temperature between Pozitron and control test was noticeable in the sitting phase only (Figure 5). Over the time the difference increased in this phase. The body temperature (at the fingertip) remained constant during control, while considerably decreased when Pozitron was used.

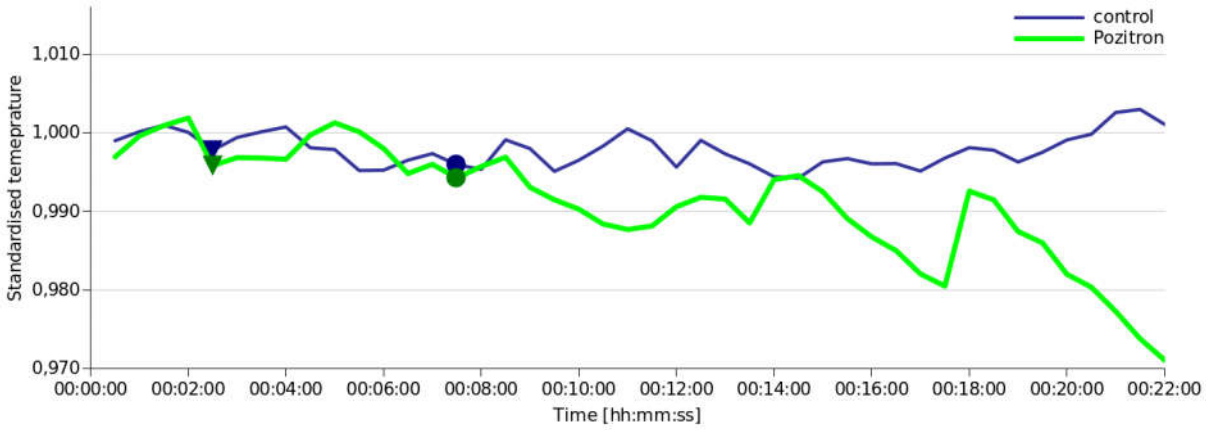


Figure 5: Standardised values for body temperature calculated with medians of the ten testees for Pozitron (green line) and for control (blue line). The triangle on the line marks the beginning of calling phase, the circle marks the end of the calling phase.

The effect of Pozitron's radiation protection on the heart rate was already noticeable in the calling phase (Figure 6), as the heart rate decreased shortly after the beginning. During the sitting phase, the heart rate changed mainly in control, as it decreased rapidly, while with a use of Pozitron, the decrease was more gradual and already began during the calling phase. Interestingly, towards the end of the measurements (after the 16th minute), the difference began to increase again, mostly due to increased heart rate in control.

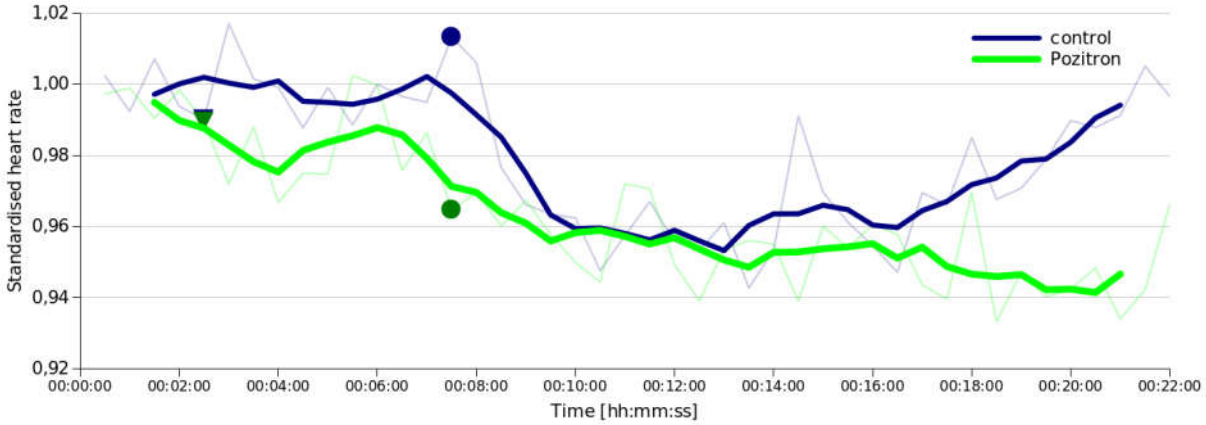


Figure 6: Standardised values for heart rate calculated with medians of the ten testees for Pozitron (green line) and for control (blue line). The triangle on the line marks the beginning of calling phase, the circle marks the end of the calling phase.

Statistical analysis showed significant differences between Pozitron and control only in the sitting phase. However, it is necessary to take into account the fact that due to the insufficient number of data during the preparation and calling phase, only sign test (with a lower statistical power) was used instead of Wilcoxon signed-rank test (Whitley and Ball, 2002 b). In addition, a smaller number of data also affects statistical power (Whitley and Ball, 2002 a).

Differences between Pozitron and control were also evident in the different variability of data (Table 1, Levene's test). Levene's test showed a statistically significant difference for skin conductance, body temperature and muscle activity.

Table 1: Summary of the statistical analysis made on the basis of thirty-second medians for each individual parameter in the three phases of the tests. Green background marks the statistically significant differences between control and Pozitron protection ($p<0,05$). Marks: EMG – muscle activity, HR – heart rate, SC – skin conductance, BPM – respiration rate, RESP – course of respiration, TEMP – body temperature, HRV – heart rate variability, RESPV – relative breathing depth. The values are corrected by the Holm-Bonferroni correction for multiple comparisons (Holm, 1979). First 7 minutes didn't have enough data for Wilcoxon signed-rank test, instead a Sign test was used.

	Sign test / Wilcoxon signed-rank test			**Levene's Test**		
	0-2 min	**2-7 min**	**7-22 min**	**0-2 min**	**2-7 min**	**7-22 min**
EMG	1,000	1,000	1,000	1,000	1,000	0,014
HR	1,000	0,430	0,005	1,000	1,000	1,000
SC	1,000	0,430	0,002	1,000	1,000	0,008
BPM	1,000	1,000	0,005	1,000	1,000	1,000
RESP	1,000	1,000	1,000	1,000	1,000	1,000
TEMP	1,000	1,000	0,000	1,000	1,000	0,010
HRV	1,000	1,000	1,000	1,000	1,000	1,000
RESPV	1,000	0,430	0,709	1,000	1,000	1,000

Compared to control, the values for most of the measured parameters decreased when Pozitron was tested (Table 2). The only exceptions were heart rate variability and partialy muscular activity and relative breathing depth. Decreased heart rate, skin conductance, breathing rate and body temperature indicated lower body stress (greater body relaxation) when using Pozitron (in comparison with control). Heart rate variability is the only parameter with consistently elevated values when using Pozitron compared to control. Variations in heart rate are necessary, since too low variations may indicate cardiovascular disease (Brosschot J. F., 2007). Sufficient heart rate variability is also important because it indicates the ability of the body to respond to unexpected events (Rajendra Acharya et al., 2006).

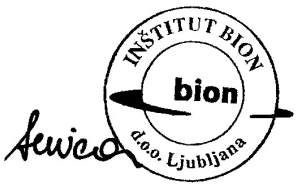
Table 2: Overview of Pozitron effects compared to control. The percentage of functioning is calculated as a difference between the standardised parameter of Pozitron and standardised value of the control. Negative values (i.e. the values that were lower for Pozitron than control) are marked in red. Marks: EMG – muscle activity, HR – heart rate, SC – skin conductance, BPM – respiration rate, RESP – course of respiration, HRV – heart rate variability, RESPV – relative breathing depth.

	EMG	HR	SC	BPM	RESP	TEMP	HRV	RESPV
0-2 min	0%	0%	0%	0%	0%	0%	2%	1%
2-7 min	-5%	-2%	-4%	-2%	0%	0%	16%	-11%
7-22 min	2%	-1%	-11%	-7%	0%	-1%	4%	14%

4. CONCLUSIONS

This study shows that the radiation protection of »Pozitron Plus – Mobitel«, influences the human organism in the sense of greater calmness (compared to control) during and after the active use of a mobile phone. This is demonstrated by various physiological parameters - use of Pozitron decreased the values of skin conductance, respiration rate, body temperature and heart rate with respect to control. With the use of Pozitron, the values of heart rate variability increased compared to control. The higher values of this parameter indicate that the body is more capable of adapting to unexpected changes. All this demonstrates lower body stress caused by the use of mobile phones when using »Pozitron Plus – Mobitel« cards.

The product »POZITRON PLUS - MOBITEL«
met all the criteria required to obtain the
Certificate of Protective Influence on Human Organism.



5. LITERATURE

Brosschot J. F., Dijk E. Van, Thayer J. F., 2007. Daily worry is related to low heart rate variability during waking and the subsequent nocturnal sleep period. Int. J. Psychophysiol., 63, 1: 39–47.

Holm S., 1979. *A simple sequentially rejective multiple test procedure*. Scandinavian Journal of Statistics 6, 2: 65–70.

Rajendra Acharya U., Paul Joseph K., Kannathal N., Lim C. M., Suri J. S., 2006. Heart rate variability: a review. Med. Biol. Eng. Comput., 44, 12: 1031–51.

Whitley E., Ball J., 2002 a. Statistics review 4: Sample size calculations. Crit. Care, 6: 335–341.

Whitley E., Ball J., 2002 b. Statistics review 6: Nonparametric methods. Crit. Care, 6: 509–513.