BION, INŠTITUT ZA BIOELEKTROMAGNETIKO IN NOVO BIOLOGIJO, d.o.o.
BION, INSTITUTE FOR BIOELECTROMAGNETICS AND NEW BIOLOGY, Ltd.

Stegne 21, SI-1000 Ljubljana, Slovenia, EU
t: +386 (0)1 513 11 46 **m:** +386 (0)51 377 388
e: info@bion.si **i**: http://bion.si

Place and date: Ljubljana, 5th October 2018
No.: 70/18

SCIENTIFIC REPORT ON TESTING PROTECTIVE INFLUENCE ON HUMAN ORGANISM AGAINST WIRELESS ROUTER RADIATION

FOR THE PRODUCT

SOMAVEDIC MEDIC URAN

Customer

Somavedic Technologies s.r.o.
Smetanova 1246/22
410 02 Lovosice
Czech Republic, EU

Research institution

BION, Institute for Bioelectromagnetics and New Biology, Ltd.
Research organization code No.: 0431
Stegne 21
SI 1000 Ljubljana
Slovenia, EU

m: +386 (0)51 377 388
t: +386 (0)1 513 11 46
e: info@bion.si
i: www.bion.si/en

CONTENTS

1. INTRODUCTION 3
2. MATERIALS AND METHODS 4
 2.1. TEST DESIGN 4
 2.2. MEASUREMENT OF PHYSIOLOGICAL PARAMETERS 7
 2.3. DATA ANALYSIS 7
3. RESULTS WITH INTERPRETATION 8
4. CONCLUSION 13

1. INTRODUCTION

One of the scientific fields of research at Bion Institute is measuring effects of (ultra)weak radiation. This radiation cannot be measured by 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. Mostly, this kind of radiation and its effects cannot be explained by a commonly accepted theoretical interpretation, although some scientists have offered possible explanations.

Bion Institute is specialised for scientific measuring of biological effects of weak emission of devices made by various manufacturers. They cannot confirm their statements in a conventional way or with unconventional detection devices. In many years of research, Bion Institute developed a series of tests, which enable us to use the human organism to detect such weak emission and express their detection via easily measurable general physiological effects. This is why we can give a valid assessment of the supposed biological influence or non-influence 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 Somavedic Technologies s.r.o., ordered a testing of their device »Somavedic Medic Uran « (hereafter the SMU or the SMU device, Figure 1), for which they claimed to have a protective influence on humans against different types of harmful radiation in the radius of 60 meters. By using clinical testing methodology as far as possible we verified the supposed protection against radiation during active wireless router radiation (Figure 2). We monitored various physiological parameters (skin conductance, heart rate, muscle activity, respiration, finger temperature, and some other derivate parameters) in twelve volunteers. With the help of various statistical methods, we compared and assessed the data gained by measuring the physiological parameters. We tested each person in three different situations, two of them were blind test (volunteers did not know whether a real SMU device or a sham one was used) and one presented the marketing situation (volunteers knew that they were exposed to the SMU device).

Figure 1: The Somavedic Medic Uran (SMU) device used for the tests. The sham device looked the same, only it broadcasted no radiation on the human organism.

2. MATERIALS AND METHODS

2.1. TEST DESIGN

The claims of the manufacturer were verified by scientific, clinical tests on volunteers, meaning that the tests were:

- **prospective** (general criteria for the efficiency of the device's activity were determined in advance);
- **with placebo effect ruled out** (none of the volunteers knew whether they were exposed to the device's influence of not except in the marketing situation);
- **blind** (the volunteers didn't know whether the device was turned on or not);
- **randomised** (the decisions about control and real tests were made randomly).

In addition to the clinical test, we tested also a possible market situation with placebo involved, to verify the influence of the latter. In these tests the volunteers were told that they were exposed to the protective influence of the device.

We tested the influence of the Somavedic Medic Uran device on the physiological parameters of volunteers exposed to wireless router radiation (Wi-Fi hereafter). Volunteers were subject to three different test situations:

1. **control situation = control**: with the sham (not working) device (control) and without knowing whether they are exposed to the working SMU device or not exposed,
2. **blind situation = SMU-B**: with the working SMU device and without knowing whether they are exposed to the working SMU device or not exposed,
3. **marketing situation = SMU-M**: with the working SMU device and with full knowing they are exposed to the working device that protecting them against Wi-Fi radiation.

The tests were conducted from 10th to 28th September 2018 at the Bion Institute with 12 volunteers aged from 20 to 70 (seven women and five men). A testing of protective influence against wireless router radiation was preformed simultaneously with the testing of energy influence with the same volunteers. Prior to the tests, we instructed the volunteers not to eat 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 three times in three different days, each time at the same time of the day. This ruled out the effects of other factors as much as possible (e.g. the volunteer was tired after an 8-hour work shift). A random order of all three situations was applied to every volunteer.

The volunteers sat for approximately half an hour in a comfortable wooden chair and during that time skin conductance, heart rate, muscle activity, respiration and finger temperature were measured (Figure 2). The working SMU device (or the sham one) was located 4 m away from them (Figure 3). On a single day, either SMU or a sham device was used for the whole day because the device is said to influence its surroundings 24 hours after it was removed. Therefore, to be sure that any remanent influence would not work, our pause before control testing and after testing the working SMU device lasted 3 days. While testing the devices were turned ON every morning at least 1 hour before the arrival of the first volunteer. As Somavedic Medic Uran device is supposed to influence people even when it is turned off and have a working radius up to 60 m we kept it in a nearby building 150 m away from the test site when not in use.

Figure 2: A volunteers sat in a comfortable wooden chair and during that time skin conductance, heart rate, muscle activity, respiration and finger temperature were measured. All the electrodes needed for the measurements were placed on both hands.

A wireless router was used for testing purposes and was adjusted to work with central frequency 2,462 GHz (functioning range between 2,451–2,473 GHz). A computer used for the testing was connected to this router and was set to constantly download data. Computer screen was turned away from volunteers and the sound from the computer was muted. The wireless router was hidden beneath cardboard box and was positioned 1,5 m away from volunteers so that they didn't know whether it is turned ON or OFF (Figure 3 and 4).

All the electrodes needed for the measurements were placed on both hands (Figure 2). A negative electrode for heart rate, both electrodes for muscle activity and all three electrodes for skin conductance and finger temperature were placed on the right hand while positive and ground electrodes for heart rate were placed on the left hand. When measurements started test assistant left volunteers alone in the room.

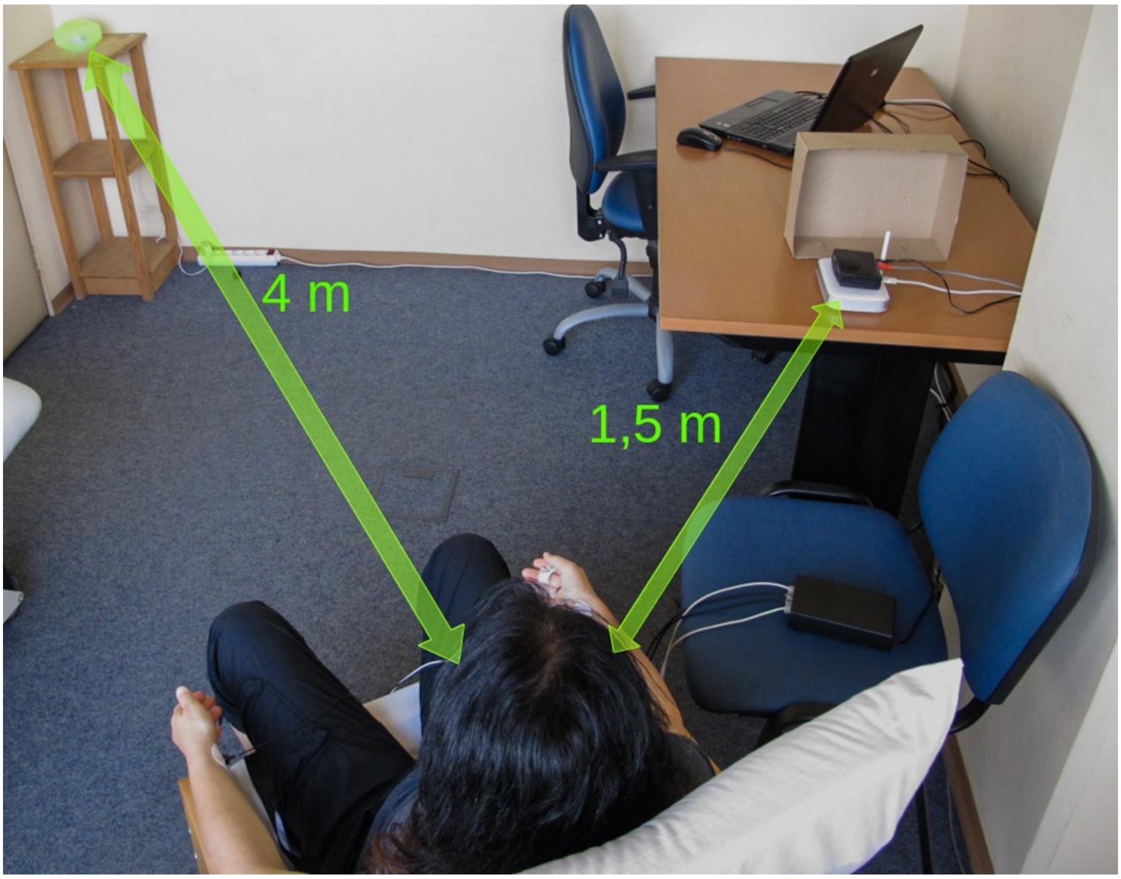

Figure 3: Test setup during testing of protective influence on human organism against wireless router radiation. The Somavedic Medic Uran device was positioned approximately 4 m away from volunteers while the Wi-Fi router was positioned approximately 1,5 m away.

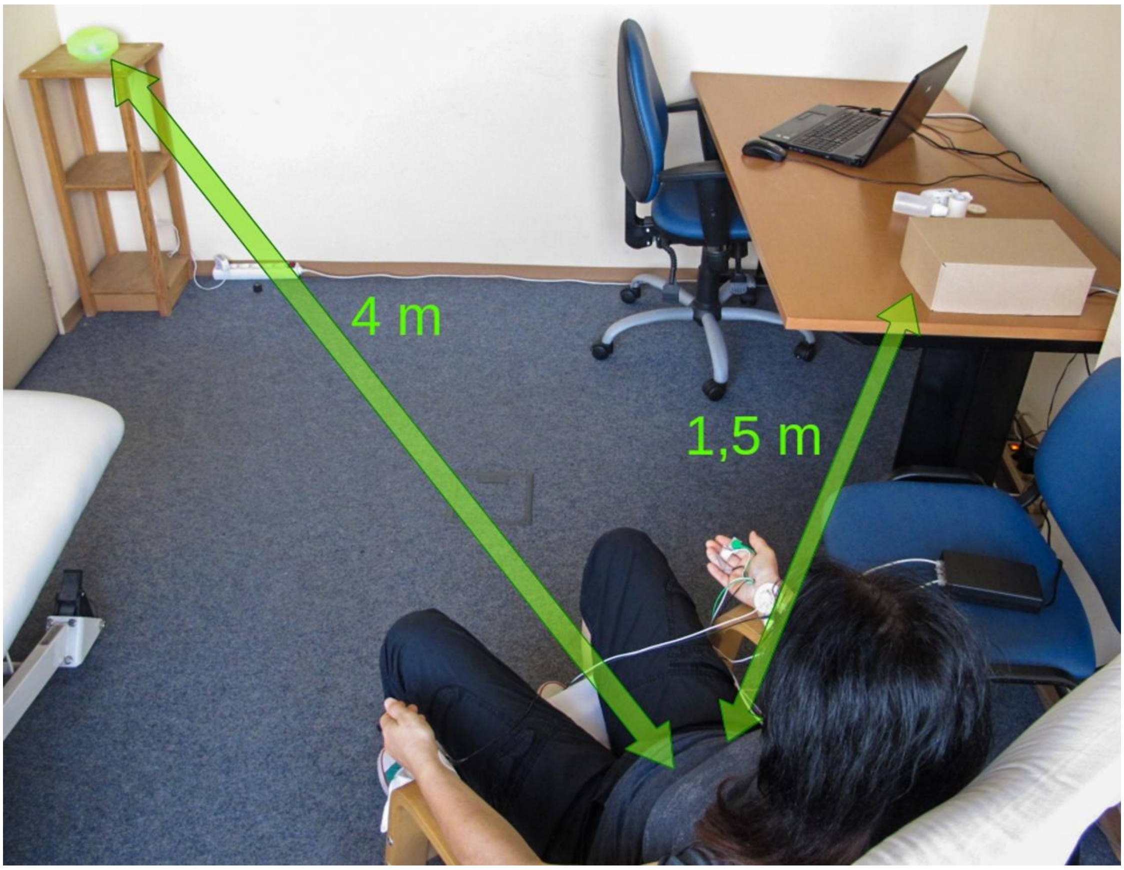

Figure 4: Wireless router was hidden beneath cardboard box so that the volunteers didn’t know whether it is turned ON or OFF and was positioned 1.5 m away from them.

2.2. MEASUREMENT OF PHYSIOLOGICAL PARAMETERS

Measurements of physiological parameters enable us to monitor the changes in the human organism in real time. We can monitor the state of a volunteer throughout the measuring time. We measure the following parameters:

- **Heart rate** (frequency of heart rate, HR) is calculated from an electrocardiogram, from which we can deduct heart rate variability (HRV).

- **Muscle activity** (electromyogram, EMG) is measured on the left forearm. This shows us any artifacts that could appear on the ECG due to the arm movements.

- **Skin conductance** (SC) and **finger temperature** (TMP) are measured on the fingertips of the left hand, where skin conductance varies the most. Skin conductance measurements are part of lie detectors because sweating as well as the blood flow affect skin conductance and 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, skin conductance is higher when a person is under stress (more sweating, higher blood flow), but sometimes responses can be much more complex.

- Respiration is monitored with a special extendable elastic belt, measuring the **thorax expansion** (TE), which makes it possible to calculate the **respiration rate** (RR) and **thorax expansion difference** (TED).

2.3. DATA ANALYSIS

After the measurements, we exported all data to Excel files with the sampling frequency of one second. The data was graphically represented and statistically analysed with the open source programmes *Gnumeric* and *R*. For every volunteer, we first calculated thirty-second medians and then standardized the data to the median of the first five minutes (quotient between the median of the given time and the median of the first five minutes). On the basis of these data, we then calculated common medians for all twelve volunteers and draw graphs for each measured parameter.

To check for the difference between all three test situations we used the Friedman test. For in-depth analysis we conducted post-hoc tests (Wilcoxon signed-rank test) to check the differences between different combinations between test situations. We used the Levene's test for equality of variances to check if the SMU device caused any changes in data variability. The results of all statistical tests were corrected by the Holm-Bonferroni correction for multiple comparisons.

On the basis of the thirty-second medians we calculated a standardized effect size of the SMU device on different physiological parameters. It was calculated as a difference between (a) the median values for SMU-B or SMU-M and (b) the median values for the control compared to (c) the standard deviation of the control or written as a mathematical expression (a-b)/c.

3. RESULTS WITH INTERPRETATION

Overview of results showed statistically significant differences between three test situations for the following parameters: muscle activity, heart rate variability, respiration rate, thorax expansion and thorax expansion difference. The analysis for heart rate, skin conductance and finger temperature did not demonstrate statistically significant differences between three situations (Friedman test, Table 1).

Table 1: Summary of the Friedman test made on the basis of thirty-second medians for each individual parameter. P-values are corrected with Holm-Bonferroni correction for multiple comparisons. Values shaded in green visualize statistically significant differences ($p < 0,05$). Marks: EMG – muscle activity, HR – heart rate, HRV – heart rate variability, RR – respiration rate, SC – skin conductance, TE – thorax expansion, TED – thorax expansion difference, TMP – finger temperature.

EMG	0,008
HR	0,173
HRV	0,000
RR	0,000
SC	0,638
TE	0,003
TED	0,000
TMP	0,058

Friedman test revealed that SMU device influenced volunteers in five out of eight different physiological parameters. However, Friedman test only confirms that there are statistically significant differences between different test situations. To find out exactly which situations were different from others we performed additional post-hoc tests. Wilcoxon signed-rank test was chosen for this task (Table 2). It demonstrated the highest number of differences between the SMU-B and the SMU-M and the lowest between the control and the SMU-M. This indicates that the SMU-M results were closer to the control ones than to the SMU-B ones, which means that besides the SMU device objective influence psychological effects also interfered with various physiological parameters in the SMU-M situation.

Levene’s test, which checks two datasets for differences in data variability, demonstrated similar trends as mentioned before. The SMU-B variability differentiated from the control in heart rate variability and thorax expansion, the SMU-B and the SMU-M differentiated in thorax expansion while there was no difference between the SMU-M and the control (Table 3).

Overview of the SMU-B and the SMU-M standardized effect size on different physiological parameters compared to the control revealed that in general, the knowledge about the protective situation diminished SMU device’s influence for most parameters (for heart rate variability, respiration rate, skin conductance, thorax expansion, thorax expansion difference and finger temperature, Figure 5).

Table 2: Summary of post hoc tests for Wilcoxon signed-rank test corrected with Holm-Bonferroni correction for multiple comparisons. Marks: SMU-B – blind test situation for the SMU device, SMU-M market test situation for the SMU device, cont – control test situation with the sham device; EMG – muscle activity, HRV – heart rate variability, RR – respiration rate, TE – thorax expansion.

	SMU-B - SMU-M	cont - SMU-B	cont - SMU-M
EMG	0,005	0,670	0,176
HRV	0,000	0,000	0,004
RR	0,007	0,000	0,085
TE	0,045	0,000	1,000
TED	0,010	0,000	0,074

Table 3: Summary of the Levene's test made on the basis of thirty-second medians for each individual parameter. P-values are corrected with Holm-Bonferroni correction for multiple comparisons. Values shaded in green visualize statistically significant differences ($p < 0,05$). Marks: SMU-B – blind test situation for the SMU device, SMU-M market test situation for the SMU device, cont – control test situation with the sham device; EMG – muscle activity, HR – heart rate, HRV – heart rate variability, RR – respiration rate, SC – skin conductance, TE – thorax expansion, TED – thorax expansion difference, TMP – finger temperature.

	SMU-B - SMU-M	cont - SMU-B	cont - SMU-M
EMG	1,000	0,052	0,301
HR	1,000	1,000	0,945
HRV	0,609	0,003	0,260
RR	1,000	1,000	0,833
SC	1,000	1,000	1,000
TE	0,000	0,004	0,137
TED	1,000	1,000	1,000
TMP	0,324	0,643	1,000

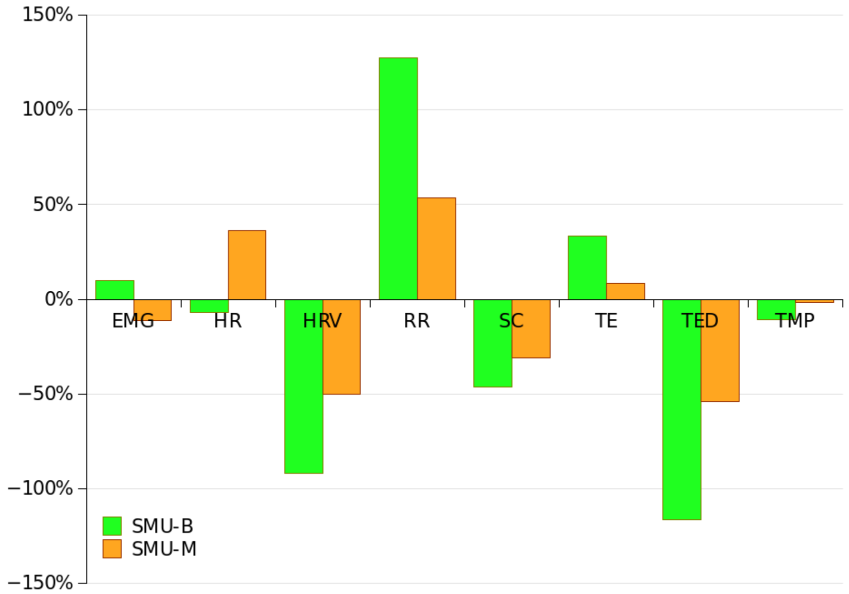

Figure 5: Overview of the SMU-B and the SMU-M standardized effect size on different physiological parameters compared to the control. It is calculated as a difference between (a) the median values for the SMU-B or the SMU-M and (b) the median values for the control compared to (c) the standard variation of the control or written as a mathematical expression (a-b)/c. Negative values signify that the SMU-B or the SMU-M lowered the parameter. Marks: EMG – muscle activity, HR – heart rate, HRV – heart rate variability, RR – respiration rate, SC – skin conductance, TE – thorax expansion, TED – thorax expansion depth, TMP – finger temperature.

Based on the experiences from similar previous tests of the protective influence we expected that parameters response would be different for different parameters. Although values for the SMU-M were somewhere between the SMU-B and the control for most of the parameters, some of them deviated from this norm. One of them was muscle activity, which responded to different tests situations with a complex response (Figure 6). Relations between values of different test situations varied with time. Values for both the SMU-B and the SMU-M were both more constant than for the control.

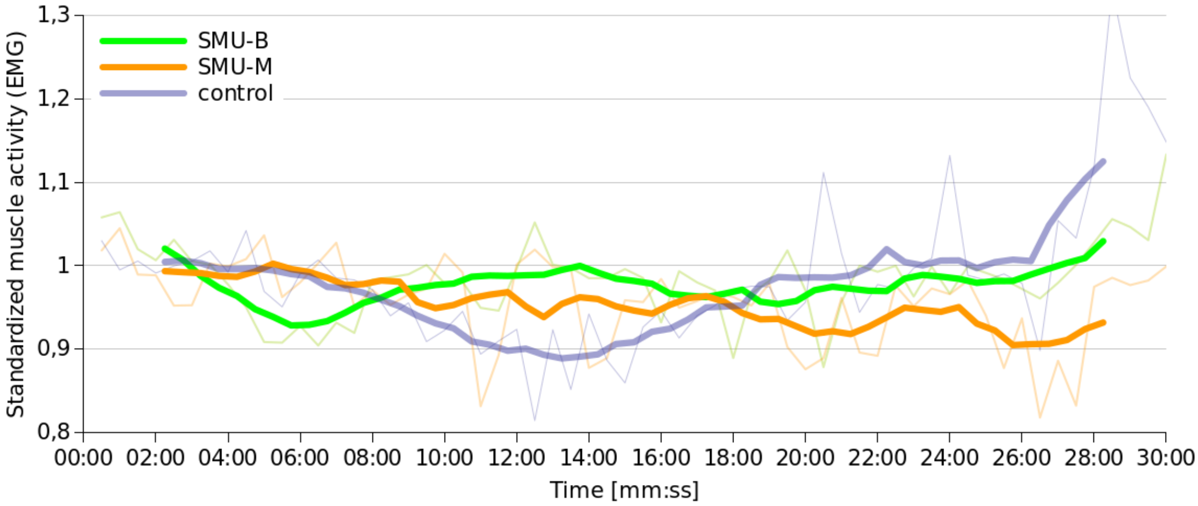

Figure 6: Standardised values of muscle activity (EMG) calculated with medians of the twelve volunteers for the SMU-B (green), the SMU-M (orange) and the control situation (blue). Thinner lines in the back show the thirty-second medians, over which we made the moving average (more intense lines in the front).

Similarly to the muscle activity, the thorax expansion deviated from other parameters as the relations between different tests situations varied over time (Figure 7). However, values for the SMU-M varied the most while values for the SMU-B were most constant. This indicates that volunteers' expectations affected the influence of the Somavedic Medic Uran device, as values for the SMU-M were closer to the control than to the SMU-B. A nocebo effect (=negative placebo) influenced the SMU-M situation because expectations reversed the Somavedic Medic Uran device's influence.

Other three parameters, where the Friedman test demonstrated significant differences between test situations, had all similar relations between them. Heart rate variability, respiration rate and thorax expansion difference had the SMU-M values between the other two test situations. This indicates the occurrence of nocebo effect, which diminished the SMU device's protective influence on volunteers. This effect, however, wasn't as intense as with thorax expansion because the values for SMU-M were mostly between SMU-B and control.

When exposed to the control situation, heart rate variability gradually increased over time while it gradually decreased for the SMU-B (Figure 8). The values for the SMU-M were between other two situations, oscillating around initial values.

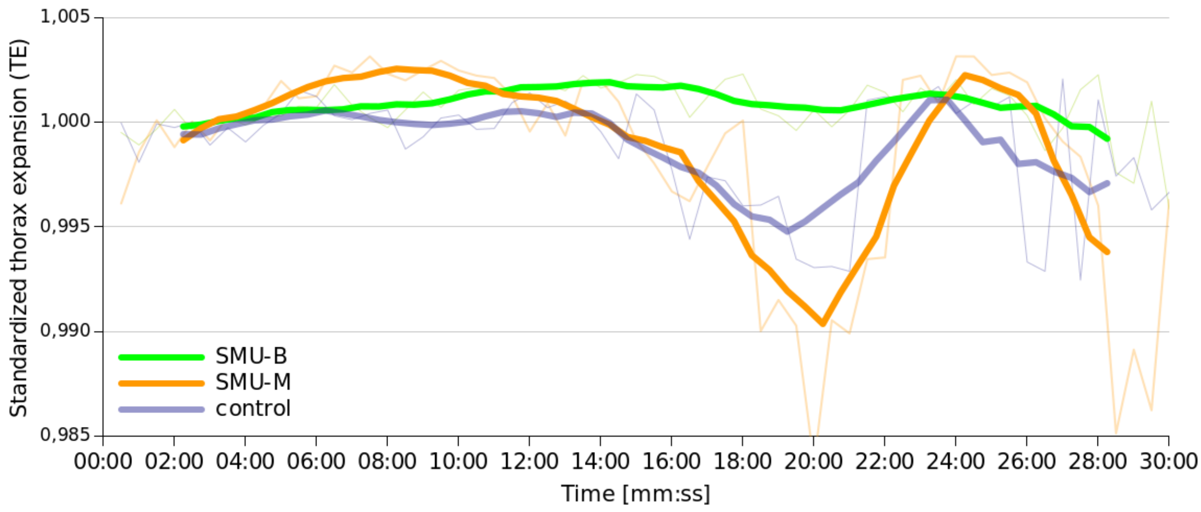

Figure 7: Standardised values of thorax expansion (TE) calculated with medians of the twelve volunteers for the SMU-B (green), the SMU-M (orange) and the control situation (blue). Thinner lines in the back show the thirty-second medians, over which we made the moving average (more intense lines in the front).

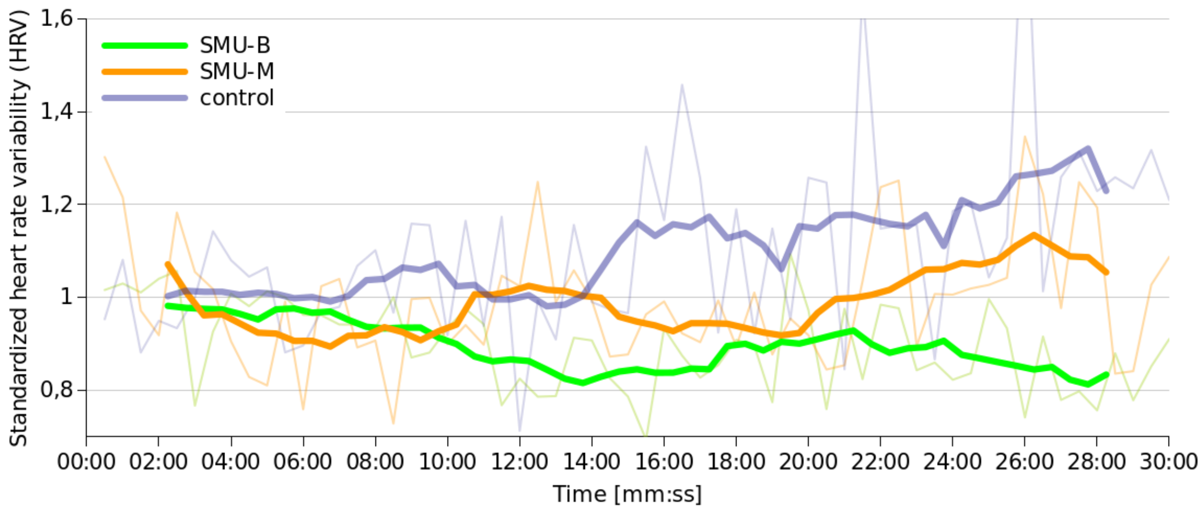

Figure 8: Standardised values of heart rate variability (HRV) calculated with medians of the twelve volunteers for the SMU-B (green), the SMU-M (orange) and the control situation (blue). Thinner lines in the back show the thirty-second medians, over which we made the moving average (more intensive lines in the front).

Respiration rate values were very close together for both, the SMU-B and the SMU-M for the first 10 minutes, but after that, the SMU-M values gradually decreased and after 18 minutes came close to the control (Figure 9). The nocebo effect for respiration rate (SMU-M) was demonstrated with a time delay.

However, the opposite was true for thorax expansion difference (Figure 10). Values for the SMU-M were closer to the control at the beginning and began to approach the SMU-B towards the end of the measurements. This means that the nocebo effect gradually faded for this parameter.

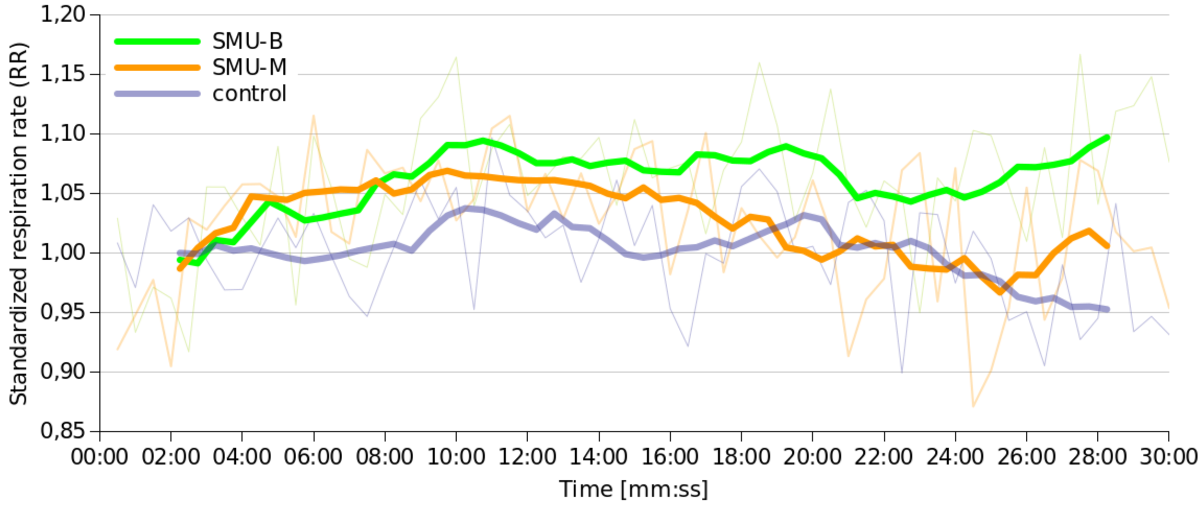

Figure 9: Standardised values of respiration rate (RR) calculated with medians of the twelve volunteers for the MU-B (green), the SMU-M (orange) and the control situation (blue). Thinner lines in the back show the thirty-second medians, over which we made the moving average (more intense lines in the front).

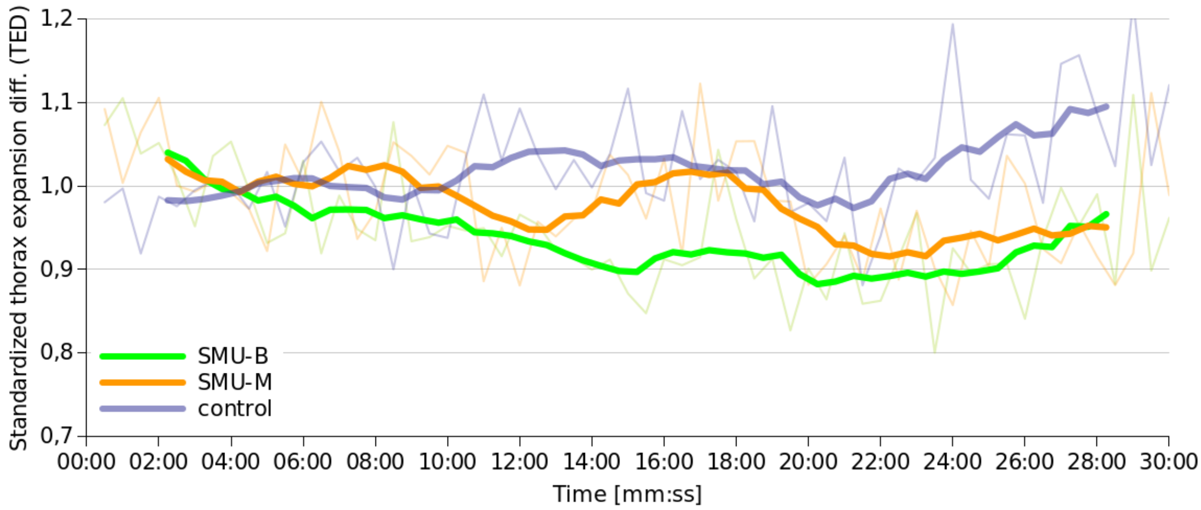

Figure 10: Standardised values of thorax expansion difference (TED) calculated with medians of the twelve volunteers for the SMU-B (green), the SMU-M (orange) and the control situation (blue). Thinner lines in the back show the thirty-second medians, over which we made the moving average (more intense lines in the front).

4. CONCLUSION

The systematic clinical testing of the protective influence of the product Somavedic Medic Uran (SMU device) on human organism against wireless router radiation demonstrated a significant influence on various physiological parameters of the twelve tested volunteers.

Statistical analysis demonstrated significant differences between blind situation (SMU-B), marketing situation (SMU-M) and control situation (control) for muscle activity, heart rate variability, respiration rate, thorax expansion, and thorax expansion difference (Friedman test, Table 1). We performed Wilcoxon signed-rank post-hoc test to figure out exactly which situations differed from each other (Table 2). It demonstrated that the SMU-B stood out from the other two, as there were five statistically significant differences between the SMU-B and the SMU-M, four between the SMU-B and the control and only one between the SMU-M and the control. This indicates that psychological effects stemming from the knowledge of the protective situation involving the exposure to the Wi-Fi radiation in general diminished the influence of the Somavedic Medic Uran device on volunteers in comparison to the protective situation with no knowledge. When the test assistant told the volunteers that the Somavedic Medic Uran device, which should protect them from harmful Wi-Fi radiation, is ON, it seems that the subconscious mind was more prone to focus on the word “radiation” than on the word “protection”. Therefore, to our surprise, the nocebo effect (=negative placebo) comes to fore, diminishing the protective influence of the Somavedic Medic Uran device.

Overall, the results convincingly confirmed the protective influence of the Somavedic Medic Uran device against wireless router radiation. When the results are compared to testing of protective influence against cell phone radiation (see *Report on Testing Protective Influence on Human Organism against Cell Phone Radiation for the Product Somavedic Medic Uran*) both demonstrate dominating nocebo effect for the market (protection disclosed, SMU-M) situations. However, this effect is more consistent in the present testing because most of the parameters were somewhere between the SMU-B and the control. Similarly to the previous report, we recommend Somavedic salesmen to pay more attention to the device’s positive (harmonizing and energizing) effects. Let them speak about the protection, but they should be careful not to put too much emphasis on the harmful radiation itself. Namely, the latter situation may result in the nocebo effect that would cancel some of the real protective effects, otherwise clearly demonstrated in our testing.

Based on positive results of the testing, protective influence of the product Somavedic Medic Uran on human organism against wireless router radiation met all the criteria required to obtain the certificate.

INŠTITUT BION bion d.o.o. Ljubljana