

Biophysical testing of the  
effect of the product  
«**Harmonizer Mobile/Bluetooth/WiFi**»  
including stress resistance



Report no.	51/2015
Date	May 15 <sup>th</sup> , 2015
Contractee	<b>Symbioceuticals -Harmonizer GmbH</b> Mr Jürgen Lueger Gangsteig 2 AT-5082 Grödig
Contractor/ Expert	<b>IIREC Dr. Medinger e.U.</b> Mag. Dr. Walter Hannes Medinger Ringstrasse 64 AT-3500 Krems an der Donau
Number of pages	<b>11 (excluding annex)</b>
Anlage	16 illustrations

<b>Contents</b>	<b>Page</b>
1. Subject of Investigation .....	3
2. Testing of Effects in the Magnetic Field.....	4
2.1 Method of measurement and evaluation .....	4
2.2 Detailed investigations and results .....	6
2.2.1 Test with iPhone .....	6
2.2.2 Stress test - Repetition of test with iPhone .....	7
3. Expert's Opinion.....	8
3.1 Metrological significance of results .....	8
3.2 Biological relevance of results .....	9
3.3 Awarding of test seal .....	10
Annex .....	following page 12

### **Important notes:**

The right of exploitation of this report lies exclusively with the contractee. Not touching this right, this report remains, according to valid law, intellectual property of the contractor, IIREC Dr. Medinger e.U. The contractor keeps the right of use, as well, for the complete report or any part of it that was not explicitly declared confidential by the contractee.

In case of exploitation by the contractee, the report must not be handed on in an abbreviated version or a modified version.

The scope of this report is exclusively the documentation and evaluation of effects that were assessed by objective physical measurement. Neither the investigation of manufacturing nor of mode of operation of the product was contracted. It is up to the manufacturer to care for constant product quality.

© by IIREC

## I. Subject of Investigation

The international institute IIREC was mandated by Symbioceuticals – Harmonizer GmbH to test the effect of the product «Harmonizer Mobile/Bluetooth/WiFi» (v. title photograph) by objective measurements (with physical meters, independent of the subjective sensitivity of humans) in combination with a cellular smart phone.

According to experience by IIREC the procedure of grid measurement of the vertical component of magnetic flux density, or induction, in the static (DC) and extremely low frequency (ELF) magnetic field ( $\pm 3$  dB range up to 18 Hz) including the evaluation of the divergence of the magnetic field gradient ist appropriate to give evidence if a product of this kind is able to **smoothen magnetic field gradients** («**magnetic field equalizing effect**»).

Although the range of application of the product in quest (mobile phones, Bluetooth, WiFi) comprises radio technologie with radio frequency carrier waves, with the respective devices and radio waves additional static magnetic fields or low frequency modulations, resp., are found which possess particular biological significance. The metrological procedure applied here grasps, in the usual “DC mode“ of measurement, the vertical component of magnetic fields up to a frequency of 5 Hz. From the results thereof, conclusions are drawn regarding biologically effective magnetic field disturbances or measures against them, by use of a patented evaluation procedure.

In the study documented here **questions** relevant to the user were examined, such as:

- ❖ Will the product unfold its effect reliably, and
- ❖ will this be impaired by disturbing influences?

A satisfying answer to these question is a precondition for awarding the biophysical test seal by IIREC.

Two **test samples** were handed over to IIREC by the manufacturer. One of them was attached in the original condition to an iPhone, the other one was applied after having undergone a stress test.

The **test field** was a relatively smooth background field in which a smart phone (iPhone) was operated. The measuring field was set up by a wooden measuring board with 11 x 11 measuring points stenced into it.

## 2. Testing of Effects in the Magnetic Field

The magnetic field has particular biological relevance because it permeates the body, it is not easily shielded, it influences all life processes and exerts an immediate impact on the ions, the electrically charged particles in the body (e.g. sodium, potassium, calcium, magnesium, zinc and many others in our cells, iron in hemoglobine etc.). Signals imprinted to cell water and body water are magnetic in nature.

Testing in the magnetic field, therefore, is the first choice when examining the coherent effect of resonance products. (In physics, coherence is defined as a constant phase correlation between oscillations of single elements. Coherence is the principle that maximises the impact of subtle microscopic effects, e.g. it converts normal light to laser light.)

### 2.1 Method of measurement and evaluation

Test measurements were conducted according to the **grid measurement procedure** of IIREC in the static and lowest ELF magnetic field (DC measurement up to 5 Hz). The magnitude measured was the **vertical magnetic induction** in microtesla ( $\mu\text{T}$ ). At each measuring site, a test field of 0.5 by 0.5 m was measured. In this measuring field there were  $11 \times 11 = 121$  measuring points at a distance of 5 cm.

As a **meter** for the magnetic flux density, or induction, the digital teslameter FM 302 by Projekt Elektronik (Berlin) was applied, with a probe that is sensitive to direction, and immediate transfer of measurement data to the measurement computer. The most significant particulars of the measuring system were compiled in **table 1**.

The measurement board representing the measuring field contains the measuring points stenciled into it, with the latter equally serving as holders for the probe. This measurement **setting** makes it possible to fix the probe at any measuring point avoiding deviations by inclination or torsion. Thus an optimal precision of measurement is guaranteed.

For measurements involving a mobile phone the measuring apparatus provides a drawer. Positioned in this drawer, the cellular is situated beneath the measurement plane, in the center of the measuring field.

Teslameter FM 302	DC
Measurement range	$\pm 200 \mu\text{T}$
Frequency range ( $\pm 3$ dB)	DC - 100 kHz
Measurement deviation (@25° C)	< 0,1 % $\pm 2$ Digit DC
Signal assessment	average
Axial probe "AS-UAP Lot"	Fluxgate, sensitive to direction
Frequency range of probe ( $\pm 3$ dB)	0 - 500 Hz
Deviation of the probe (@ 25° C)	< 0,8 % $\pm 0,2 \mu\text{T}$

**Table 1:** Significant technical data of teslameter

The **evaluation and mapping of measured data** was performed by the **data analysis software Surfer** by Golden Software. The values measured at single measuring points were interpolated by the software and mapped for the measurement area of 0.5 by 0.5 m. Contour lines were drawn along points of equal magnetic induction. The coordinate axes were labeled with lengths in m.

In the **diagrams** of the annex the areas between contour lines are colored. The respective value ranges of the vertical magnetic induction in  $\mu\text{T}$  can be read from the color scale. For a maximum of color differentiation a rainbow spectrum was applied in these diagrams.

The contour lines can be read in the same manner as the well-known lines of equal height in geographical maps. Lines lying close to each other indicate a strong gradient. Larger distances between the lines indicate a region with low gradients. A transition from a low gradient to a strong one or vice versa causes a disruption that will exert a biological irritation characteristic for geopathogenic zones. A smooth or "equalized" field is characterised by balanced gradients.

The effect of the product in the field can be seen when contrasting the situations without and with the impact of the product.

In order to be able to read this effect immediately from a diagram, **difference maps** were generated. In these diagrams, the mapped values are differences of measured values with and without the tested product, resp. For easy reading, these maps show threefold color: Blue color indicates a decrease, yellow color an increase (and white color constancy) of the measured value.

A **third type of diagrams** stellt maps the degree of biological disturbance for each measuring point. From the view of mathematical physics, this is calculated as the divergence of the field gradient (**field gradient divergence FGD**). More details are found in the comments to the diagrams in the annex, and in the following sections, as well.

## 2.2 Detailed Investigations and Results

In the first run, the measurements recorded the values of the measuring field as it was found without bringing in the mobile phone or the product to be tested: a neutral background field for measurements with an iPhone (figures 1 and 9). For a precise comparison to following results, this drawer (though still empty) was present during the background measurement. The extraordinary sensitivity of the measurement procedure can be seen from the fact that even a minute influence of the side boards of the drawer placed below the measurement plane was registered.

### 2.2.1 Test with iPhone

Another measurement in each measurement series was conducted to record the disturbance caused by a non-harmonized iPhone (figures 2 and 10).

The last measurement in each measurement series was a repetition of the foregoing measurement, but in this case an Harmonizer Mobile/Bluetooth/WiFi was attached to the iPhone 30 minutes before the measurement.

The iPhone was activated during measurements and operated in transmission (conversation) mode. In order to guarantee a constant quality of transmission the background noise of a TV set was transmitted instead of speech.

### **2.2.2 Stress test – Repetition of test with iPhone**

As a matter of experience, products well suitable to perform an effective balance of magnetic field disturbances may lose or even revert this effect when exposed to a strong inhomogeneity of the magnetic field. Therefore, this type of stress test forms a standard element in the testing routines of IIREC.

The stress test was conducted by exposition of the test sample of the product during a period of 72 hours to a magnetic field that was generated by two permanent magnets of an induction of 7 mT each in an orthogonal configuration, at a distance of 30 cm..

After this period the test sample was taken back to the test field and the first series of three measurements was repeated, as outlined above. The results of the second series of measurements can be seen from figures 9ff.

This repetition of the field measurement under the impact of the Harmonizer having undergone the stress test reveals that the Harmonizer was as effective as before. From this we conclude that the exposition to the stressing magnetic field did not result in an impairment of the efficacy of the product.

**Summing up, the field with the iPhone and a test sample of the product (independent of this having been put to the stress test or not) is characterized, on the whole, like a field in which the mobile was not present. Only at the position of the iPhone itself a distinct magnetic field disturbance occurs, but this would not be prevented by other means than by shielding. But the measurements brought forth even a reduction of this disruption.**

### 3. Expert's Opinion

#### 3.1 Metrological significance of results

The **effects found in the measurements** – on one hand the disturbing effects of the iPhone in the test field, and on the other hand the alterations after activation of the Harmonizer Mobile – have an order of magnitude that is distinctly above the measurement uncertainty, so they are clearly classified as **significant**.

The reading of DC values on the teslameter (including the ELF contribution) exhibits variations of  $0,05 \mu\text{T}$ . Measured values, therefore, are certain if exceeding  $0,1 \mu\text{T}$ . For effects evaluated as differences (between a “disturbed“ field and a “balanced“ one) according to laws of metrology, the threshold of certainty is computed at  $0,14 \mu\text{T}$  (=  $0,1 \mu\text{T}$  times square root of 2). Accordingly, DC effects from  $0,15 \mu\text{T}$  upward are classified as certain.

The ranges of values in the difference maps (figures 4 to 5 and 12 to 13) immediately tell us that this criterion is fulfilled at numerous measuring points. *The effects found exceed distinctly the measurement uncertainty and thus are metrologically significant.*

Moreover the results that were outlined in detail in section 2.2 and in the illustrations in the annex give the following answers to the themes of investigation presented in the introduction:

- ❖ The Harmonizer unfolds its **measurable impact of balancing the magnetic field within 30 minutes on technogenic magnetic field disturbances in the ambience of a smart phone (iPhone), keeping it up in transmission mode.**
- ❖ The efficacy of the product is not lost after a 72 hours' **exposition to a strong and extremely inhomogeneous magnetic field.**



### 3.2 Biological relevance of results

The human body, as a “receiving antenna”, is endowed with maximal biological sensitivity in those ranges where natural electromagnetic fields prevail or variate. The variations of the geomagnetic field e.g. range to an order of magnitude of  $0,2 \mu\text{T}$ . In the measurement series conducted we gave evidence of the ability of the product to balance disturbances in this range of tenths of microtesla. This property is of **utmost biological importance, because it reduces the degree of disturbance to a scale that does no biological harm.**

To be sure in this point, the degree of biological disturbance, or irritation, was evaluated for the measuring points in the test field (**field gradient divergence FGD**, figures 6 to 8 and 14 to 16). The mapping of results of this data analysis reveals the improvement brought about by impact of the Harmonizer

In the study documented here the **impact of the Harmonizer in combination with an iPhone** (as a representative transmitter of radio frequency waves with magnetic side effects in DC and lowest ELF range, or Sub-ELF range, resp.) was tested. Immediately at the position of the transmitting device magnetic field disturbances were found that can not be avoided (only eliminated by a sumptuous magnetic shielding). This study focussed on **magnetic field disturbances in the ambience of the transmitter.**

Magnetic disturbances of these types imponder biologically particularly in the practical situation of phoning. **When holding e.g. an iPhone close to one’s ear**, magnetic disruptions in the ambience of the mobile **extend to sensitive regions such as the inner ear, the brain, the eye hole, the mouth hole, etc.**

To **avoid** (“harmonize“, “neutralize“) **magnetic field disturbances in these body regions** contributes essentially to the **prevention of harmful biological effects.** This applies particularly to persons who **are frequent or long-term mobile phone users.**

The same is true of frequent or prolonged stay in the radiatin field of cordless (DECT standard), of bluetooth transmitters or WiFi routers.

### 3.3 Awarding of test seal

The **effects of the Harmonizer** established here, namely its **balancing of magnetic field gradients in the ambience of a mobile phone**, but moreover its **resistance against strong magnetic field disruptions**) give evidence of the reliability of the product tested here.

Thus, by **objective physical measurements** with meters sensitive to **magnetic induction** the reliability and stress resistance of the biologically beneficial effect of the Harmonizer Mobile/Bluetooth/WiFi, namely its balancing of magnetic field gradients, was proven.

With this being evidenced, the conditions for awarding the test seal of IIREC to the product are fulfilled. The manufacturer/contractee is entitled – under the additional terms and premises quoted below – to declare the product «Harmonizer Mobile/Bluetooth/WiFi» as »tested by IIREC« and to attach the following test seal to the product:



**Terms:**

- (1) The validity of the test seal shall be prolonged in due time before expiration.
- (2) IIREC shall be informed immediately of any alteration of the terms of manufacturing or of the effect of the product.
- (3) The test seal shall not be applied any longer, should future testing by IIREC find a decline of product quality, or one of the terms of application not to be met any more.

**Premises:**

- (1) The consumers of the product shall be notably informed on the proper application of the product, and that a combination with a different product might be counterproductive and should be avoided.

**Important notes:**

- (1) The test seal may be applied with the product, the product documents, or the product wrapping, wherever a seal is attached by the manufacturer.
- (2) IIREC will offer to the contractee in due time, before expiration of the validity of the test seal, a periodic audit and prolongue, in case of a positive result, the validity of the test seal.
- (3) If desired, IIREC will elaborate suggestions for an extended quality assurance of the product.
- (4) It is up to the manufacturer to care for constant product quality.

By his signature the expert confirms that the measurements and evaluations were conducted under his supervision, and the results being correct within the precision limits of measurement and evaluation.



Walter Hannes Medinger, MSc, PhD

Generally Sworn and Certified Expert at Court

Scientific Head of IIREC

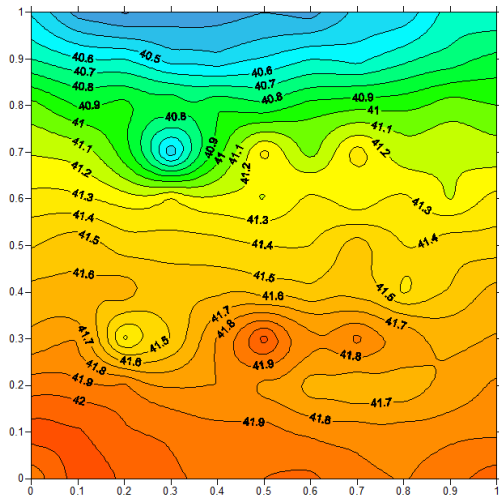
International Institute for *EMC* Research

*E*lectro*M*agnetic *C*ompatibilty on a biophysical foundation

**Annex:**  
16 illustrations

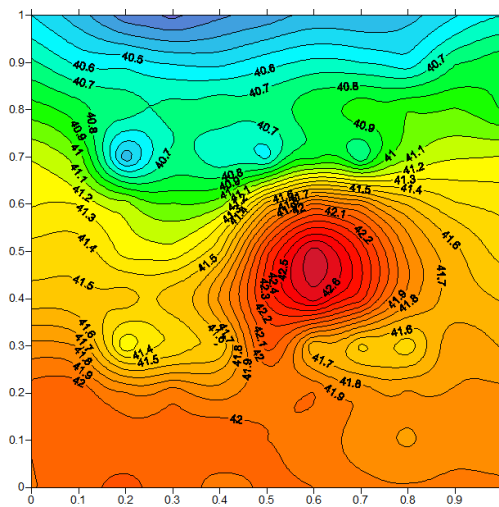
## I. Measurement with Harmonizer test sample before the stress test

A. Topographic maps of measured values of the vertical magnetic induction (DC and lowest ELF range): The following diagrams map the measured magnitude in microtesla ( $\mu\text{T}$ ) according to the color scale and contour lines. The values displayed at the measurements point match exactly the measured values. At intermediate points, the values were interpolated by the software. The lengths along the coordinate axes are labeled in meters (m). Interpolations and diagrams were generated by the data analysis software Surfer by Golden Software (Interpolation method: Kriging).



**Fig. 1: Basis measurement - background field**

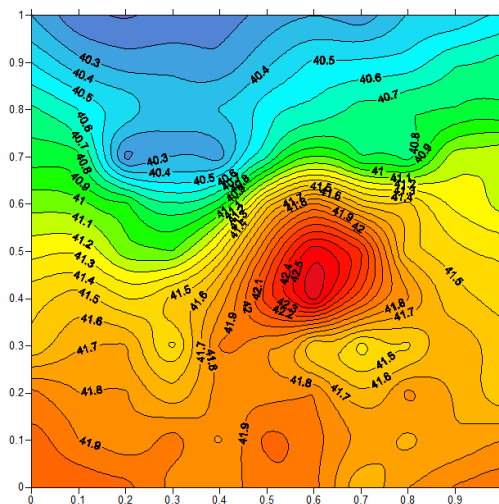
These values were measured before bringing in the iPhone and the Harmonizer. Note that the measured values are quite well graduated. Yet the measurement is so sensitive that at the height of  $y = 0.3$  and  $y = 0.7$  an influence of the side boards of the drawer placed below the measurement plane shows up. This drawer was designed for the storage of the iPhone in the following measurements. For a precise comparison to following results, this drawer (though still empty) was present during the background measurement.



**Fig. 2: Measurement of the same field with iPhone in transmission mode**

In analogy to fig. 1, this diagrams maps the measured values in the field, but this time an iPhone was placed in the drawer, and a transmission line was opened.

In contrast to fig. 1, a strong increase of measured values is noticed in the center of the measuring field (amounting at approx.  $1.5 \mu\text{T}$ ), due to magnetic parts of the cellular phone. But we give particular regard to alterations in the vicinity of the mobile phone, because in the phoning situation these extend to sensitive regions of the head.

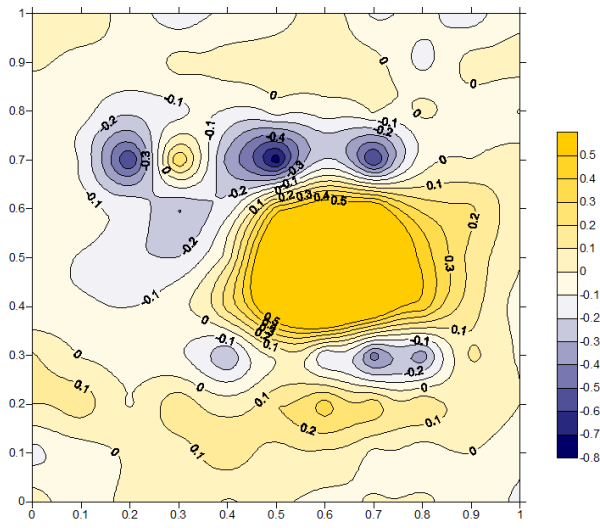


**Fig. 3: Measurement with iPhone and Harmonizer**

This diagram displays the measured values in the test field with the iPhone in transmission mode, with an Harmonizer Mobile attached to the iPhone. The measurement was conducted after 30 minutes impact of the Harmonizer.

Compared to fig. 2 the effect above the mobile is damped by approx.  $1 \mu\text{T}$ . In the vicinity of the iPhone, as well, alterations show up as an effect of the Harmonizer. The diagrams to follow will display more distinctly the effects of the iPhone and of the Harmonizer.

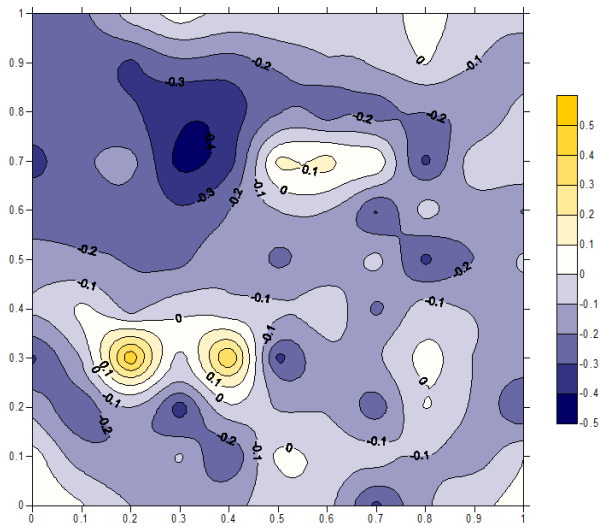
**B. Difference maps** of the vertical magnetic induction: The following diagrams display for each measurement point *differences* of values measured in two different situations (cf. diagrams 1 to 3), thus representing the *net effect* of the iPhone (without an Harmonizer) and of the Harmonizer.



**Fig. 4: Effect of the iPhone in transmission mode**

The values in this diagram were calculated as differences between the values of fig. 2 minus those of fig. 1, in other words: the net effect brought about by the operation of the iPhone against the background.

Blue color indicates a decrease of measured values, yellow color an increase.

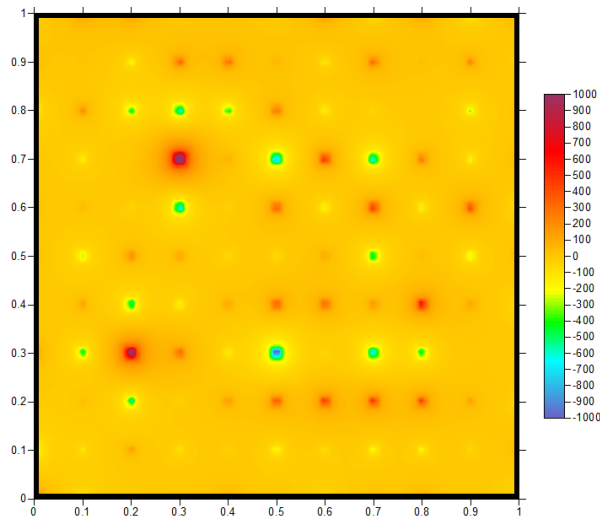


**Fig. 5: Effect of the Harmonizer in combination with the iPhone**

This diagram represents the difference between the measured values of fig. 3 minus those of fig. 2, thus pointing out the effect of the Harmonizer against the iPhone without harmonization.

The increase of measured values having been predominant in fig. 4 (yellow color!) is now compensated for by a decrease (blue color!). Vice versa, at some points showing up in blue in fig. 4, an increase of values (marked by yellow color) is displayed now. The maximal effects amount at  $\pm 0.4 \mu\text{T}$ .

C. In the following series of diagrams, for each measurement point the **degree of biological disturbance** in the magnetic field is displayed as field gradient divergence (FGD). The values indicated here have the unit microtesla/m/m.

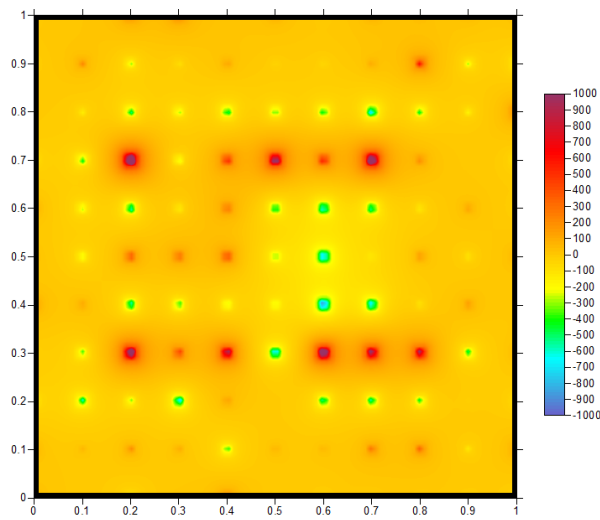


**Fig. 6: Degree of disturbance at the points of the background field (cf. fig. 1)**

This diagram represents a particular evaluation of the data displayed in fig. 1 for each measuring point.

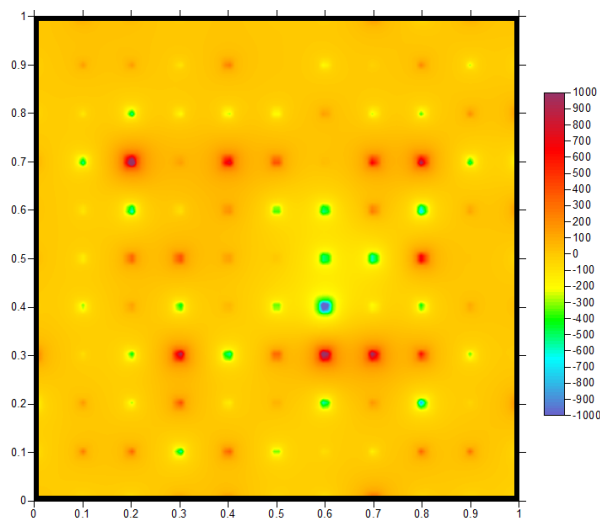
The degree of biological disturbance can be read from the intensity of color and the diameter of color circles at the single measuring points.

Disturbances are mainly due to the side boards of the drawer beneath the measurement plane (cf. comments to fig. 1).



**Fig. 7: Degree of disturbance with iPhone, but without an Harmonizer (cf. fig. 2)**

Compared to fig. 6 an increase of biologically relevant disturbances is noticed (red circles with center in violet).



**Fig. 8: Degree of disturbance with iPhone and Harmonizer (cf. fig. 3)**

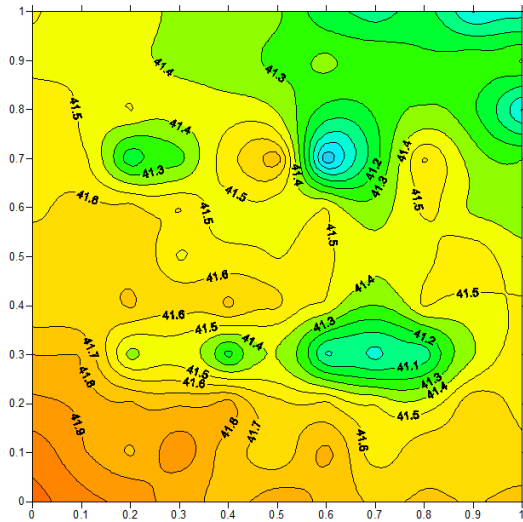
The intense disturbances (cf. fig. 7) were widely reduced to the number of points and amount of values as previously found in the background (fig. 6). Only at the position of the mobile itself disturbances prevail that did not appear in fig. 6.

As a result, biologically effective disturbances were balanced successfully in the ambience of the iPhone, that is in places where sensitive parts of the body need protection in the phoning situation.

Two lay persons, the differences between the diagrams are not recognizable except in case of close examination. Yet to experts, they are as distinct as an "X ray".

**II. Measurement with test sample of the Harmonizer after stress test**

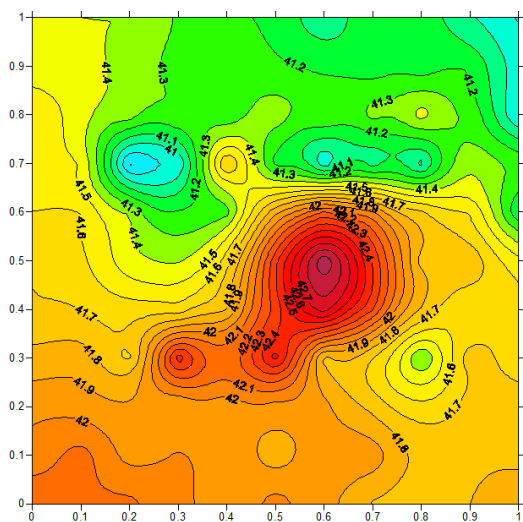
A. Again, the results of measurements are displayed as topographic maps in the first place. The focus is once more the occurrence of **magnetic field disturbances in the ambience of the iPhone** in transmission mode (with an open line). But an additional question is **whether the Harmonizer has lost efficacy thru the stress test conducted between the measurement series I and II.**



**Fig. 9: Basis measurement - background field**

The background field measured with the measurement apparatus including the drawer resembles the field in fig. 1 quite a lot.

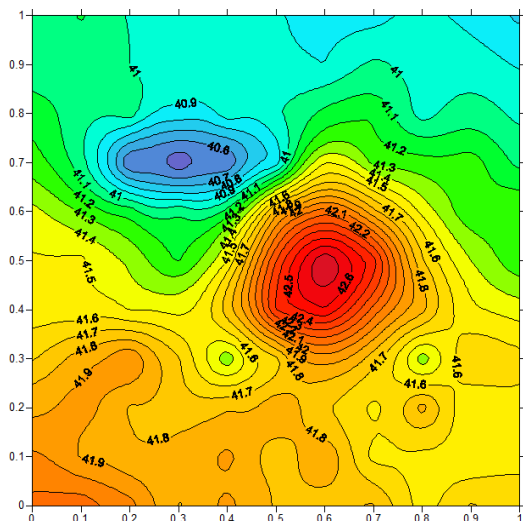
Again, a close look reveals the measurement to be so sensitive as to exhibit deviations of values caused by the side boards of the drawer.



**Fig. 10: Measurement with the iPhone in the field (without Harmonizer)**

The influence of the iPhone can be recognized in this case very distinctly where it was positioned (in the center at the height  $y = 0.5$ ), but in the ambience it is express less distinctly.

Detailed evaluations (fig. 12 and 13) will display these magnetic disturbances in the ambience of the iPhone more openly. We will examine whether these are influenced by the Harmonizer.



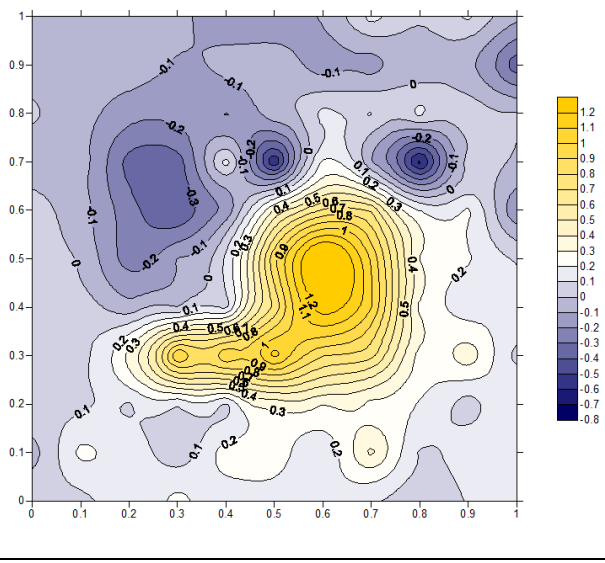
**Fig. 11: Measurement with iPhone and Harmonizer (after stress test)**

This diagram represents the same situation as in fig. 10, but with the Harmonizer attached to the mobile (and with an open line, as before). Contrasting from the measurement represented in fig. 3, the test sample of the Harmonizer had undergone a 72 hours' stress test thru an exposure to a magnetic field with an extreme divergence of gradient.

At the first glimpse, an alteration is recognized against the results of the reference measurement (fig. 10). Detailed assessment will discriminate whether this effect is due to the impact of the Harmonizer or to alterations of the background.



B. Now will follow - in analogy to fig. 4 und 5 - **difference mappings** representing the net effect of the Harmonizer Comfort.

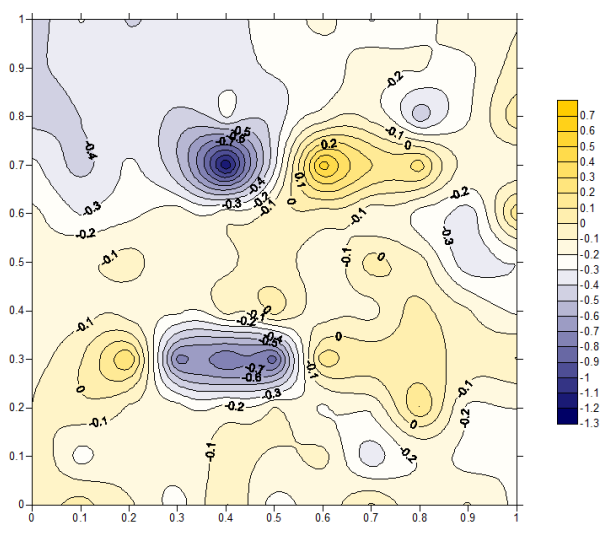


**Fig. 12: Effect of the iPhone (without an Harmonizer)**

This diagram maps for each measuring point the difference of measured values from fig. 10 minus fig. 9.

Apart from the strong effects immediately above the iPhone showing up in the center of the field additional magnetic field disturbances are recognisable in the surroundings amounting up to  $+1/-0.5 \mu T$ .

This is the amplitude of natural magnetic field variations. It is of great biological relevance, because the body is very susceptible to this amplitude, and in the phoning situation these disturbances extend to sensitive regions inside the head.



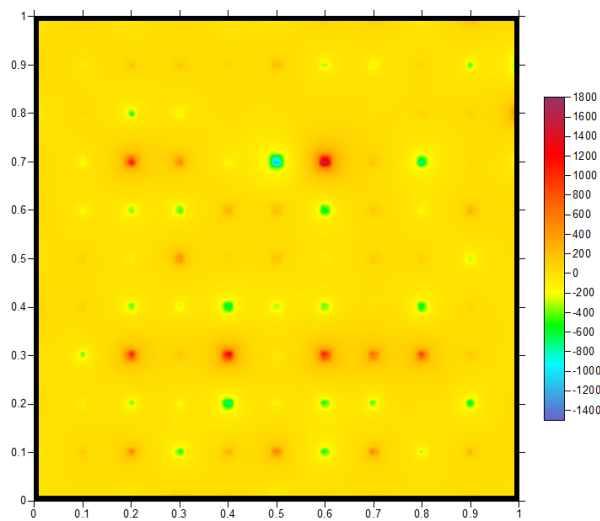
**Fig. 13: Effect of the Harmonizer**

This net effect is mapped in the neighbouring diagram as the difference of the values from fig. 11 minus fig. 10.

This diagram answers to the question, what was the impact of the Harmonizer on the situation with the iPhone in the field.

It can be recognised that these alterations have considerable amounts (up to  $+0.5/-1 \mu T$ ) balancing the effects in the ambience of the iPhone. Man beachte z.B. die Punkte auf der Höhe  $y = 0.3$ . (Where in fig. 12, e.g. at  $y = 0.3$ , an increase of values was indicated in yellow color, a decrease is indicated in fig. 13 in blue etc.)

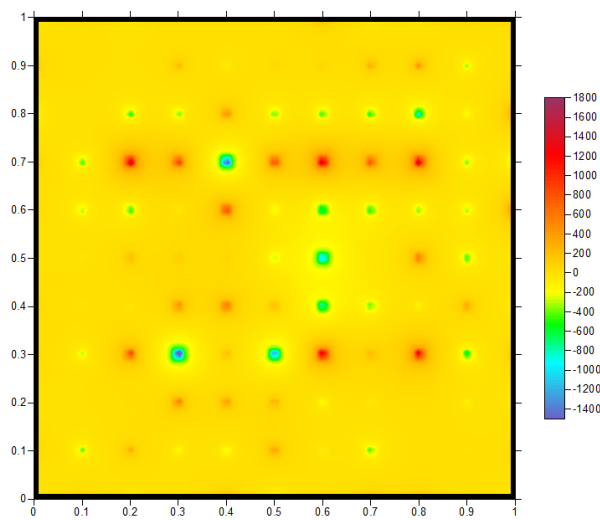
C. At last, the **degrees of biological disturbance** in the measuring field are mapped as in fig. 6 to 8.



**Fig. 14: Degree of disturbance in the background field**

The mapping shows a relatively low level of disturbance in the background field.

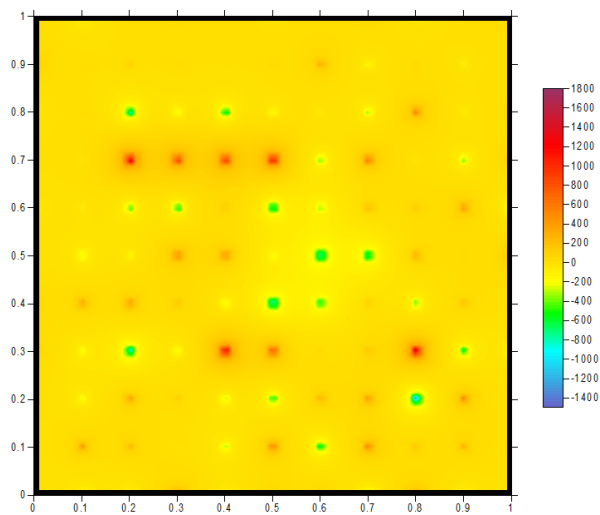
It is notable, however, that the degrees of disturbance are markedly higher than in fig. 6. (Note that the scale of values was shifted compared to fig. 6!)



**Fig. 15: Degree of disturbance with iPhone in the field**

Analogously to fig. 7, the mapping of degrees of disturbance exhibits the strongest effects in the center of the field (immediately above the iPhone, somewhat rightwards of the center of the field) by an accumulation of points colored in green/blue.

Additional disturbances are indicated by red and green/blue colors in the ambience, as well, that were not noticed in the background.



**Fig. 16: Degree of disturbance with iPhone and Harmonizer**

As an effect of the Harmonizer, it can be clearly seen here that the maximum disturbances were concentrated very close to the iPhone.

On the whole the intensities and the distribution of disturbances are reduced about the level of the background field. In other words, **the field seems to be free of the iPhone. The test sample of the Harmonizer that has undergone the stress test exhibits the same efficacy as before** (cf. fig. 8).