

# Observed Cell-biological Electro-stress Reduction Effects at Artificial Differing Radiation Conditions Caused by Copper Tube Accessories

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## Abstract

Man-made technologies are influencing our urban living environment more and more. The rising number of electromagnetic field sources and increases in their intensity, could negatively affect humans living in these surroundings. This was examined, by Ahlbom and Feychting (2003). Evaluating these sources is usually done by taking electro-physical intensity measurements or using a much more direct biological effects, for instance measuring human cell culture reactions as suggested by Schwan (1974). On the other hand, the probable man-made radiation impact seems to be influenceable by adding installed field-in-coupling devices named RD's or ERS seeing the work of Dartsch and König (2017). The measurable field intensity remains consistent using these RD's or ERS. The aim was to prove this in electro-physics, to see a noticeably different relationship repeating in correlation to a maximum biological effect. By applying ERS on a mobile phone field source exposed to cultivated human cell lines, their vitality was used as the primary effectiveness indicator.

To address this topic, we have already investigated again in human cellular effects related to commonly used smartphone field source or earlier into DECT phones and additionally using electro-stress relief systems (RD's or ERS). These ERS or RD's were placed around cell shells or were connected directly to the radiations source like a mobile / DECT phone.

For this new research project, connective tissue fibroblasts (cell line L-929) were exposed to the radiation of an actively transmitting, commercially available mobile phone with 1.25 W/m<sup>2</sup> at the level of the cells both with and without the ERS. This was done mainly by observing cell vitality values in four different experimental setups. Unexposed cells in a similar incubator served as corresponding controls. The resulting cell vitality was checked by measurement of the enzymatic activity of mitochondrial dehydrogenases by the color change of the sodium salt 2,3-bis[2-methoxy-4-nitro-5-sulfo-phenyl]-2H-tetrazolium-5-carboxyanilide (XTT).

The investigation results clearly demonstrate that mobile phone radiation emissions caused a significantly increased effect on the cell vitality with an additional use of ERS repetitively. This was accompanied by marked morphological changes in the cells such as intracellular vacuolization, rounding and detachment. Moreover, the increased of cell vitality was much more given if the ERS coil windings were placed in closer proximity to the cell culture holes (hint: effect hotspot) and if the wires of the ERS were directly connected to the mobile phone (see maximum increase of the cell vitality values).

In an equally present research context, it was proven that the role of the ERS direction, due to the special ERS coil arrangements, which were directed or trimmed around 90 degrees in two axis ways related to the cell shells, extracted a different effectiveness of the ERS (coil), which could be proven as an experimental starting hypothesis. Besides, this the ERS coil direction and emitted probable bi-lateral coil field effect on cell culture seem to have a correlation to electro-physical laws like the "induction law" or "LENZ rule", in the arena of studying magnetic fields as well. And finally, the optimized received experimental results and use of only one ERS was correlating to the cell culture effecting level using RD's in earlier experiments as the experiment used multiple devices.

**Keywords:** Radiation, Electromagnetic Field, Wireless Phone Radiation, Cell Culture, Cell Vitality

## Introduction

### Basic Research Extract on Electromagnetic Fields and Cell Tests

The use of electrotechnical devices and their progeny, telecommunication devices have caused man-made, synthetic alternating field propagation for more than 100 years now. This has been observed for decades with regards to their biological effects. For example, to what extent such practically useful signals of, for example, 50/60 Hz voltage-supplied electrical engineering devices in the household or office, up to modulated wireless data transmission technologies with their usage of signal emissions. What is known of their impact on earth organisms [1-15]? In this context, a cell test method, mainly used for research in the pharmaceutical industry has proven to be useful and understandable in the recent past, this method can determine an electromagnetic comparison of low / high-frequency man-made harmful versus harmless to health radiations [16-20]. Thus, it is possible to identify the quality of radiation sources or to compare them to other sources as well as to correlate them in tests procedures around the electromagnetic compatibility or collect more epidemiological studies on the subject of "electro-smog". This will also compare and evaluate so-called portable "electro-stress reduction (relief) systems" (ERS) including different types of what are known as "harmonizers" in their effectiveness bio-chemically [16, 16a, 17] [21].

So-called RD are cavity resonators described later and in more detail in, which react to exposure to radiation sources in a vertical bearing arrangement or interact with other radiation sources [16, 16a]. In contrast, ERS are also constructed RD's, only that here a cable harness or a wire runs through these RD's or galvanically such a wire is capacitively coupled to a power line (or antenna line connection) embedded in the cavity resonators [17].

Precisely because of the difference in structure of the RD's and ERS and their varying applications, the present experimental approach is pursued in the present investigations. This despite the historical background that the applied RD's and ERS have their constructive origin in high-frequency signal transmission technology; More on this at a later chapter with regard to copper waveguide elements or the so-called "wave sump" [16, 16a, 17].

These experiments used radiation sources like wireless telephones based on the DECT standard or cell phones / smartphones (see 4G, GSM). In summary, it was therefore firstly stated that alternating field emitters or their emitted health influencing biochemical effects on biological systems can also be "manipulated". Second, depending on the RD / ERS technology, it is not clear whether. In electrophysical or other manners, for example RD / ERS or the above mentioned existing, commercially available "beneficial harmonizers" work; and whether there should be demonstrable correlations to electrophysical engineering textbook laws [18]. For this purpose, the LENZ rule and induction law applied to directed field propagations according to a HELMHOLTZ coil arrangement (and supposed bilateral incoming or outgoing alternating field mode interactions) [22-24].

### Earlier Practical Background on the use of Rd and Ers

Based on empirical observations it is postulated as an experimental starting hypothesis, that the artificial coils generate alternating field action directions or interact with radiation sources. Thus, those ERS coils (as HELMHOLTZ coils) standing vertically or tilted 90 degrees, i.e. arranged in a planar / vertical axis-like manner, can interact with action detectors, which in an exper-

imental form preferably takes place with exposed cell cultures (several cell samples in a group of holes in a cell dish / cell shell). In our thought hypothesis, this should lead then to different cell vitality values as a reaction between four respective planned experiments. Anyway, as final experimental step, the RD / ERS should even be galvanically connected directly to a mobile phone interface, which provokes a direct interaction between the RD / ERS and the smartphone; not only an observation of bi-directionally effecting fields of sources and influencing elements. This provokes a differing observation view in alternating field influences and signal influences on exposed cell lines. It should also be emphasized, and it has already been proven in previous attempts, that in such experiments with the RD / ERS, no electromagnetically detectable changes in the alternating field form over the intensity, time or frequency (spectrum) is or was given [16, 16a, 17]. Nevertheless, there are often repeated changes in the effect that are now specifically checkable on the basics of the field line direction (see ERS coil alignment towards the field or towards the cell shells) as a test manipulated variable factor, whereby variable or different effect would be assumed.

## Materials and Methods

### Aim

The motivation for this study and in particular comparative analyzes with earlier results is that not only the use of the "wave swamp" as a direction-finding device called ERS on radiation sources (such as powerlines) and on the other hand current-carrying conductors repeatedly led to the same cell vitality change results around the values of the observed beneficial enhanced cell vitality [16, 16a, 17]. This concerned an optimized application of RD's and ERS i.e. also the direct irradiation of radiation sources and now also the galvanically conductive coupling which turned out to be the most effective in that study. The resulting causal question is: Are there electrophysical as well as biochemical correlations to uncover the influence of radiation sources and their impact on living beings and/or their cells? This should be clarified and discussed as far as possible [16, 17].

### Experimental Design

#### Hardware and Analysis basics on Cultivated Cell Cultures

The background of this study and recently presented studies was based on cultured connective tissue fibroblasts (cell line L-929) as a standard cell line for toxicological studies. Cells were used over several passages and a total experimental period of approximately 3 months [16, 16a, 17]. The cells used were routinely cultivated in the moist atmosphere of an incubator at 37 °C and gassed with 5 % CO<sub>2</sub> and 95 % air to yield a constant pH value of 7.4. The culture medium used was RPMI 1640 with 10 % growth mixture and standard amounts of gentamycin. All culture reagents were from Capricorn Scientific, 35085 Ebsdorfergrund, Germany.

For the earlier designated tests, cells were seeded from 80 to 90 % confluent mass cultures at a density of 20,000 cells/wells into at least 14 wells in the middle part of a 96 well plate. After 24 hours to ensure cell attachment and metabolization, culture medium was exchanged to Leibowitz L-15 medium containing 10 % growth mixture and standard amounts of gentamycin. The latter culture medium guaranteed a pH value at 7.4 at normal atmospheric conditions. Each plate used was transferred to an external mini-incubator and cultivated further at 37 ± 1 °C without CO<sub>2</sub> gassing. Directly into the mini-incubator a commercially available radiation source, like a mobile phone having a contin-

uous operation mode was placed. Radiation intensities were observed each experimental day at the level of the cells at the same conditions as used later on for the assays with a measuring device (Spectran HF-4060; Aaronia, Strickscheid, Germany) with a calibrated area antenna of 1 cm<sup>2</sup>. An intensity of 1.8 W/m<sup>2</sup> was measured for the actively transmitting mobile phone at the level of the cells. When a corrugated cardboard as already used in previous experiments [16, 16a, 17] was placed between the mobile phone and the cells to avoid thermal influence by microwave radiation, the intensity was 1.25 W/m<sup>2</sup>. Hereby, when the corrugated cardboard (see cell shell) was used, a value of 37.5 to 38 °C at the cover lid of the multiwell plates with the cells (see cultured cell shell) was measured. In conclusion it is important to point out, that the experimental design omitted local thermal effects. The incubator temperature was kept constantly at 37 ± 1°C. Every cell test was conducted with unexposed control cells at the same cultivation conditions, but approximately 15 meters distant from the exposed cells.

### Experimental Timeline and Observation basics Due to Cell Vitality Values

Cells in multiwell plates were exposed to mobile phone radiation for 2 hours. Then, medium was exchanged to the primary culture medium and cells were cultivated for another 22 hours to allow cells to react after the radiation.

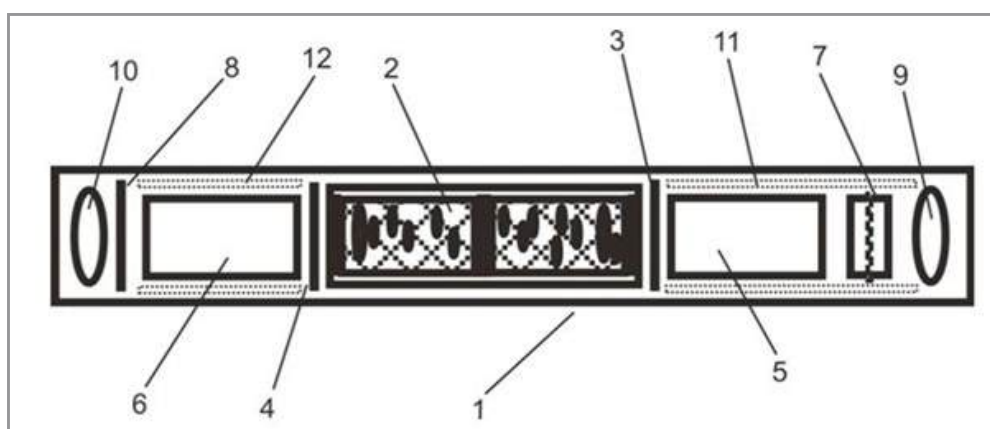
The main investigative factor cell vitality was checked by morphological observation of the cell cultures and by enzymatic activity. Regarding the second method, cell culture medium was finally replaced by fresh culture medium containing 10 % of 2,3-bis[2-methoxy-4-nitro-5-sulfo-phenyl]-2H-tetrazolium-5-carboxyanilide (XTT; Xenometrix AG, Allschwil, Switzerland) and additionally incubated for 120 minutes in the incubator at 37 °C. By the mitochondrial activity in viable cells, the yellowish XTT is cleaved to an orange formazan. Accordingly, the amount of formazan dye formed directly correlates to the number of metabolically active cells in the culture [25, 26].

The optical density was measured as a differential measurement  $\Delta OD = 450 - 690$  nm after 4 seconds shaking interval using an ELISA reader (BioTek Slx808 with software Gen5 version 3.0;

Bad Friedrichshall; Germany). Statistical analysis of all test assays was done using the two-tailed Wilcoxon-Mann-Whitney test.

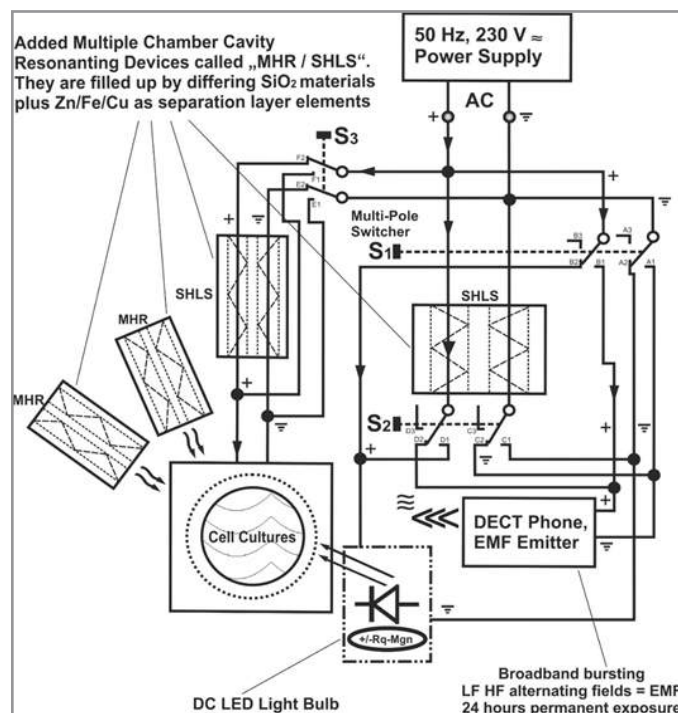
### Summary of Previous Experiments

As already described, experiments were undertaken in based on the cell test method known in the pharmaceutical industry [16, 16a, 17]. Different test setups and two different passive systems were used as follows: Basically, the first generation of RD's consisted of passive elements or compartments with a length of around 35 cm and a tube diameter of 5 cm without any electronic parts (see Figure. 1). The so called "copper resonance tube devices" or abbreviated RD's described previously was filled with layers of material of iron, zinc, copper, magnetized metal parts, cardboard, carbon or carbon related granulate materials and varying quartz granulate minerals. The use of hollow conductor elements was assumed from the usual high frequency electromagnetic signal transmission [16, 21]. The use of carbon and quartz (SiO<sub>2</sub>) is well known by microelectronics (microprocessors) or semi-conductors and solar cells. On the other hand, combinations of different versions of these RDs were used together or in parallel in the experiments. In addition, a simplified modification of the RD with a two-pole current wires feed-through was routed through the heart of the RD, namely current wires through "chamber 2" according to Figure 1. As a result, variable test arrangements of the RD's were used individually, doubled and / or in combination with a resulting current-carrying RD, called "RD connector strip" (RD-modified 50 Hz / 230-volt power supply from radiation sources), as can be seen in Figure 2 as an experimental variety of compositions. This is particularly relevant because it was able to detect a type of optimum "radiation masking effectiveness" on the exposed cell cultures to radiation conditions. The radiation conditions were realized by use of digitally enhanced cordless telecommunication (DECT) phones as emitters. The cell vitality value, which was initially roughly halved on average, was brought to the value with pure irradiation compared to the control group (repeated measurements according to almost to a residual fluctuation or residual deviation of a few single-digit percent, as the cell control groups without irradiation, see Figure 3. Such a resulting connection of this extraordinary effect with singular / multiple and different RD devices is relevant for the subsequent context and has not been published so far [16, 16a, 17].

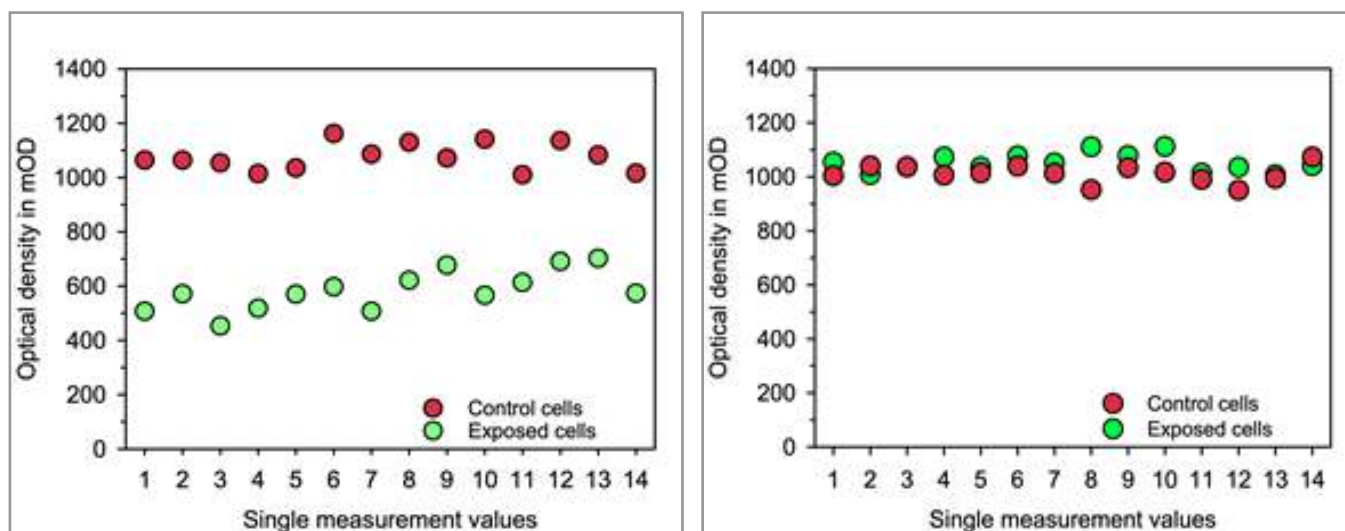


**Figure 1:** Schematic presentation of standard resonance devices consisting (so called RD) of a housing (1), a copper hollow conductor filled up with varying quartz/FE granulates (2), carbon and zinced FE/iron sheet (3), copper sheet (4), tube elements filled with quartz (5,6), magnet element (7), zinced FE/iron sheet (8), rose quartz pieces (9,10) and some cardboard anti-shake elements (11,12). It consists of two additional AC power supply wires inside from right (input) to left (output) crossing the element number (2) as a copper/iron hollow conductor plus its wire surrounding elements (7,10). The novel resonance device has a water filled tube near to the rose quartz element (10) at the opposite side of the magnetized tube end





**Figure 2:** Overview of various experimental setups until 2019 including the additive passive systems called multi-chamber cavity resonators (“RD” = MHR and “RD connector strip” = SHLS) and a DC LED lamp. There were 14 parallel cell measurement samples for each experimental design (made setup’s) realized to have varying results. Previously, trials were only repeated ten times with active DECT phones without active field neutralization attachments to provide reproducible cell test results in trial design. Specifically, the RD’s or MHR’s were aimed vertically at the cell cultures. Something similar was also practiced, aiming vertically directly at the radiation sources. Notes: Deviating angular bearings on cells / radiation transmitters of < 90 degrees vertically, i.e. holding them parallel or dissimilar, render the RD’s ineffective. As well it is to remember to the “laws of magnetic induction” or “LENZ’s rule” in electro-physics, which is important for the later content with coil formation and galvanic coupling experiments.



**Figure 3:** 3A (left graph) and 3B (right graph): Graphical presentation of the original measurement data of cultured connective tissue fibroblasts exposed to non-thermal DECT phone radiation for 2 hours followed by a 22 h incubation period. (left graph) Cell vitality without any RD’s or “RD connector strip” (green exposed cells; red control cells). Right graph shows at the same manner the detected cell vitality values in two independent experiments by use standard resonance devices (so RD’s) directed towards the cells plus an “RD connector strip” (see the power supply of the DECT phone base station as radiation emitter).

### Essential and Historical Hardware Background: Electro-Stress Relief Systems (ERS)

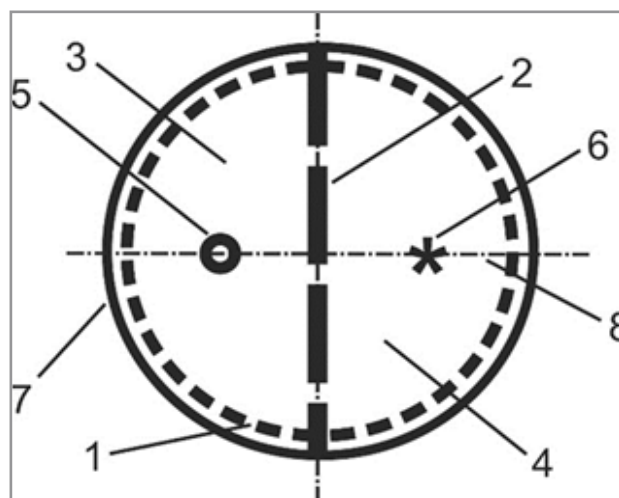
Fundamentally, another type of passive ERS consisted of filled up room compartments / waveguide with a length of around 35

cm and a tube diameter of 5 cm without any additional electronic parts. Thus, the previously described ERS was provided with layers of material of iron, zinc, copper, carbon or carbon related granulate materials and varying quartz (SiO<sub>2</sub>) granulates [21].

The utilization of these so-called hollow conductor elements (or ERS) was adopted from the usual high frequency electromagnetic signal transmission technologies [1-15, 21]. Furthermore, this ERS construction was motivated by a so-called broadband signal absorbing “wave swamp” as it is common for high frequency circuit corner (antenna) element purposes [27, 28].

Now for the present experiments was used an extended system in which a copper partition was inserted in the middle of the layered provided waveguide ERS (similar to the ERS filled up

identically in two chambers inside the copper tube). Besides, two wires are inserted or embedded into one end of the filled copper tubes and separated into two chambers up to the opposite tube end; see figure 4 [21]. Thus, two pieces of wire protrude from one end of the copper tube, which can either be used to form a continuous, coil-like element, such as the earlier named HELMHOLTZ coil in idle mode or they are directly connected to a radiation source (see a plug-in connection or interfaces on electronical devices like mobile phones).

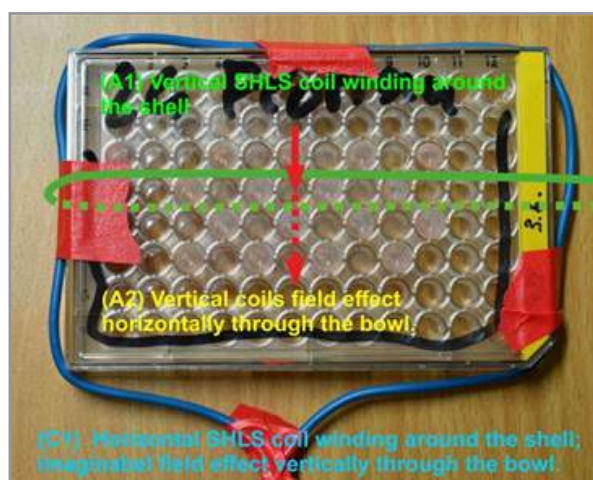


**Figure 4:** An ERS is illustrated in a top view of a technical drawing. The element number 1 shows a copper tube (length: 5 to 10 centimeter's), 2 a dividing copper partition element (realizes two chambers), 3 the filling different granulate layers in chamber I (see “wave swamp” materials like carbon or carbon related and varying FE/quartz {SiO<sub>2</sub>} granulates). The element 4 shows different granulate layers in a chamber II having the same granulate materials. The element 5 and 6 illustrate the wires or wire ends inside the chambers I and II. Finally, the element 7 shows the case or device housing.

#### Four Different Ers Applications Related on Cell Culture Tests

For the present investigations, four different test arrangements were set up. Three of them contained an ERS with a HELMHOLTZ coil winding and one a direct cable connection, i.e. a galvanic connection to a smartphone, and finally irradiated dishes equipped with cells as follows:

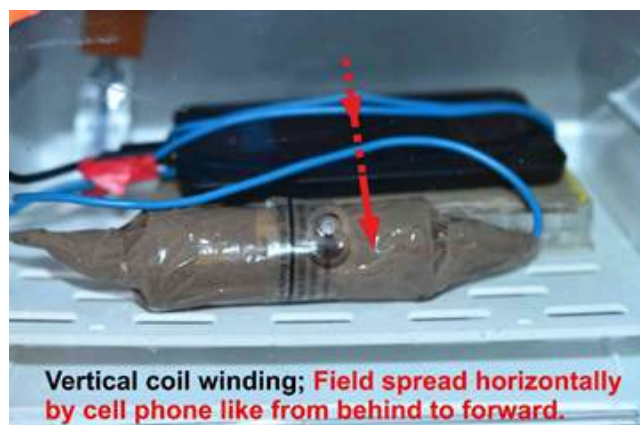
**Experiment 1:** A coil was wrapped vertically or vertically in the center around the cell shell. The assumed main ERS (field influencing) action or interaction of the ERS coil (cf. red arrow) is perpendicular to the coil alignment and thus horizontal / parallel to the cell shell plane or to the shell perforations (see Figure. 5).



**Figure 5:** There are shown the setups of experiment 1 and 2 having vertical (A1) and horizontal coil winding (C1) around the cell shells; the green or blue colored coil was immersive built-in to the ERS for these experiments 1 and 2. On the other hand, it is illustrated the imaginable coils field effects direction on the cell cultures by a red colored arrow vector (A2) for the first experiment.

**Experiment 2:** A coil was wrapped horizontally around the cell shell. The assumed main ERS (field influencing) action or interaction of the ERS coil is perpendicular to the coil alignment and thus vertically crossing the cell shell plane or the shell perforations (see Figure. 5).

**Experiment 3:** A coil was wrapped vertically or vertically around the smartphone. The assumed main ERS (field influencing) action or interaction of the ERS coil (see red arrow) is horizontal to the coil orientation and thus horizontal and parallel to the cell shell plane or to the shell holes (see Figure 6).



**Figure 6:** It is shown a vertical coil winding of the experiment 3 and an illustrated imaginable coils field effect direction on cell cultures (see red colored arrow vector). The blue colored coil was connected to the ERS (brown color device; it is placed nearby the cell shell inside the mini incubator).

**Experiment 4:** From the two ERS chambers I and II (as a dipole cable element 3 and 4 in Fig. 1) two wires according to elements 5 and 6 are led out and directly connected to a smartphone inter-

face in an electrically conductive manner. Thus, the dipole cable was first immersed in the ERS and then it was plugged in directly into the headphone socket of the smartphone (see Figure. 7).



**Figure 7:** It is shown a wired connection between the ERS directly to the headphone plug-in of a smartphone.

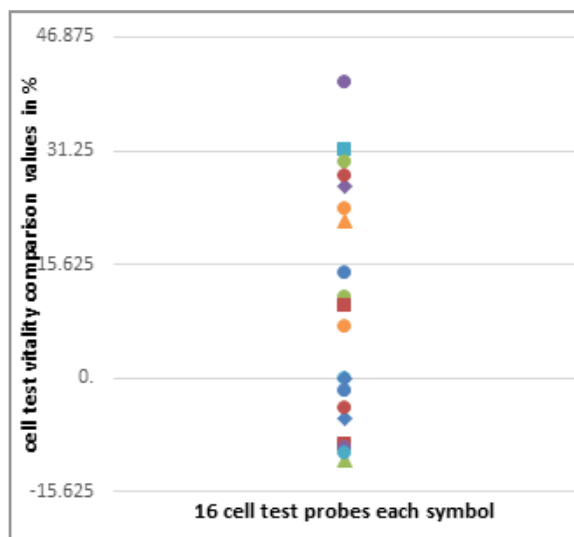
In the present four partial experiments and the associated following statistical measurement results evaluation, the cell vitality values obtained were compared with the initial state with additive irradiation via the mobile phone (and without ERS) using a difference value calculation. A measurement without additive irradiation via the mobile phone, let alone without using the ERS, was also implemented as control result basics. It should also be emphasized that extraordinary result parts were marked with regard to a hotspot in which the ERS coil or wire windings were in the immediate vicinity of the cell culture holes; relevance, see later by interpretations of the investigation results based for instance a proven existence of the LENZ rule.

## Results

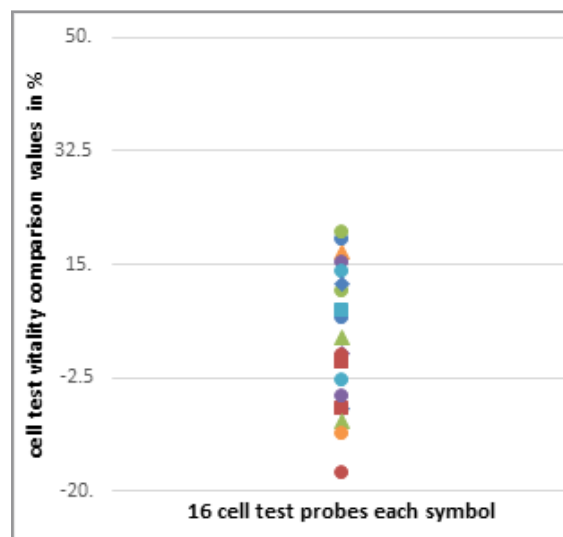
### Investigation Cell Tests Results of the Four Different Ers Applications

Accordingly, a statistical evaluation of the cell vitality values / samples obtained was carried out using the four different test arrangements mentioned above. In the summarizing table the experiments were named in an ascending order of the mean values, which demonstrate the test tendencies in such a way that the ERS effectiveness correlates by an increase of the cell vitality with; hint: Given parallel comparison test "without / with ERS" related to the test design or the application of the ERS results as follows:

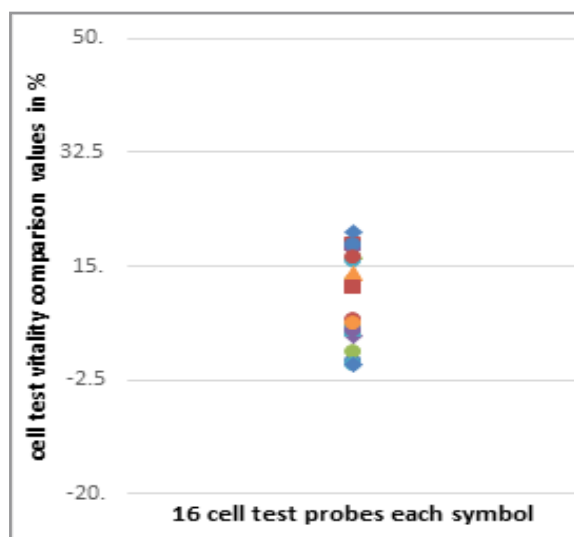
1. **Experiment 1** - A coil was wrapped vertically or vertically in the center around the cell shell mean = 9.91875%; see Figure 8.
2. **Experiment 2** - A coil was wrapped horizontally around the cell shell; Mean = 3.71875%; see Figure 9.
3. **Experiment 3** - A coil was wrapped vertically or vertically around the smartphone; Mean = 11.66875%; see Figure 10.
4. **Experiment 4** - The dipole cable immersed in the ERS was plugged directly into the headphone socket of the smartphone; Mean = 21.1875%; see Figures 11.



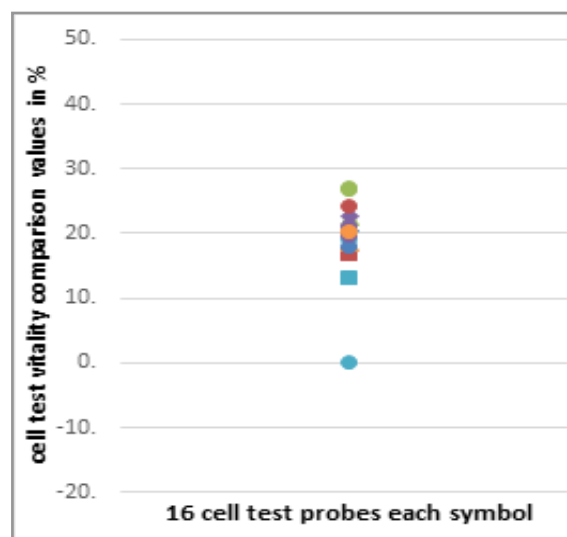
**Figure 8:** It is shown the results of experiment 1; vertical coil. The abscissa illustrates each cell tests or probe number (1 to 16 / left to right); in addition, it is shown the “hot spot mean value” (23,4 % marked as orange stroke) and the “total mean value” (beneficial effect = 9,9 % marked as rectangular rose-colored element) in percent again. Seeing this experiment results each cell test comparison value is determined at the ordinate in “%”; means it’s cell vitality difference calculation values in percent regarding “mobile phone radiated cells” compared to “mobile phone radiated cells plus ERS coil constructions added”.



**Figure 9:** It is shown the results of experiment 2; horizontal coil. The abscissa illustrates each cell tests or probe number (1 to 16 / left to right); in addition, it is shown the “hot spot mean value” (11,9 % marked as blue stroke) and the “total mean value” (beneficial effect = 3,7 % marked as rectangular grey-colored element) in percent again. Seeing this experiment results each cell test comparison value is determined at the ordinate in “%”; means it’s cell vitality difference calculation values in percent regarding “mobile phone radiated cells” compared to “mobile phone radiated cells plus ERS coil constructions added”.



**Figure 10:** It is shown the results of experiment 3; vertical coil around the mobile phone. The abscissa illustrates each cell tests or probe number (1 to 16 / left to right); in addition, it is shown the “hot spot mean value” (6,2 % marked as orange stroke) and the “total mean value” (beneficial effect = 11,7 % marked as rectangular rose-colored element) in percent again. Seeing this experiment results each cell test comparison value is determined at the ordinate in “%”; means it’s cell vitality difference calculation values in percent regarding “mobile phone radiated cells” compared to “mobile phone radiated cells plus ERS coil constructions added”.



**Figure 11:** It is shown the results of experiment 4; the ERS was connected directly to the smartphone / mobile phone. The abscissa illustrates each cell tests or probe number (1 to 16 / left to right at the bar graph). And finally, right side at the graph it is shown the “total mean value” (beneficial effect = 20.1 % marked as orange stroke; something like a maximum “beneficial ERS effectiveness”) in percent again. Seeing this experiment results each cell test comparison value is determined at the ordinate in “%”; means it’s cell vitality difference calculation values in percent regarding “mobile phone radiated cells” compared to “mobile phone radiated cells plus ERS directly connected to it”.



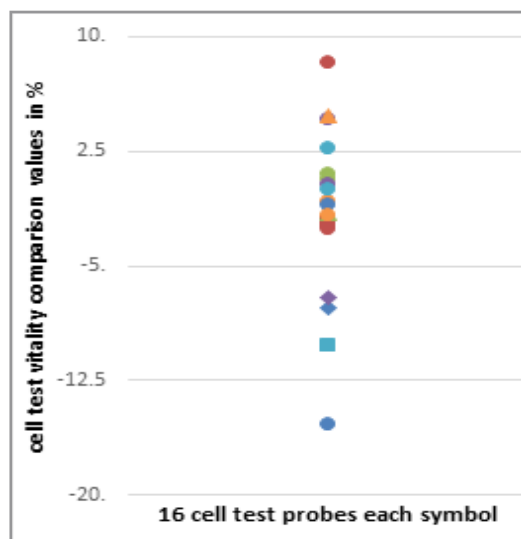
On the other hand, there are existing slight changes in the upper named sequence 1. to 4. when the focus is on the hotspot values of the evaluation considerations, i.e. where the ERS coil / wire is very close to the cell sample holes; this shows the following sequential listing of experiments in order:

1. Experiment 3 - A coil was wrapped vertically or vertically around the smartphone; Mean = 6.225%; see Figure 10.
2. Experiment 2 - A coil was wrapped horizontally around the cell shell; Mean = 11.9125%; see Figure 9.
3. Experiment 4 - The dipole cable immersed in the ERS was plugged directly into the headphone socket of the smartphone; Mean = 21.1875% (see overall mean); see Figure 11.
4. Experiment 1 - A coil was wrapped vertically or vertically in the center around the cell shell; Mean = 23.3625%; see Figure 8.

Experiment 4 (compare to the illustrated results of Figure 11) cannot or should not actually be counted because the direct wire connection to the smartphone prevents such a statement. However, the result should still be included in the "hotspot" sequence above; see relevance and consequences in the discussion of the results below.

The changes in the cell vitality values obtained recorded primary the connection between radiation effect of high-frequency mobile phone signals (4G smartphone as source) and their effects on human cell lines. In addition, in the four different test set-

ups, results were shown using ERS additionally / in parallel with an electro-magnetic field emitting smartphone. The presented results offer similar tendencies to earlier investigations seeing beneficial effects on exposed human cell lines [16, 16a, 17, 18, 24]. "Similar" as well, because the ERS device constructions in the actual experimental use are not identical; hint for instance: The ERS now are smaller and they have differing made two chambers as illustrated in Figure 4. However, this given ERS for the actual given discussed experiments obviously demonstrates this correlation again: With a measurably unchanged electro-magnetic radiation disposition by the smartphone used in the near field to cell shells it was generated a cell vitality-increasing effects at each four experiments. Essentially, depending on the transmission antenna cable harness and the different types of wire wrapping implemented, a different effectiveness or impact quality of the ERS emerged. Consequently, something like the HELMHOLTZ coil winding type arrangements formed "cell vitality beneficial" effects around the exposed cells. Furthermore, a directly connected ERS on a smartphone has specifically different more intensive "cell vitality beneficial" effects, which in comparison to each other experimental setup can be clearly interpreted via the laws of the field line direction (see LENZ rule, induction law, etc.) or in its action depth; see comparative percentages of the ERS benefits by four varying test setup results in each of the following Figures 8 to 11 plus comparison difference calculations by Figure 12. Besides this, we saw the same value tendencies as shown in the earlier experiments up to where the exposed cell cultures plus used / attached RD's induced almost the same cell vitality values as the control cells (without irradiation and without RD's); see Figure 3 [16, 16a, 17].



**Figure 12:** It is shown the results of experiment 4; the ERS was connected directly to the smartphone / mobile phone. The abscissa illustrates each cell tests or probe number (1 to 16 / left to right at the bar graph). And finally, right side at the bar it is shown the "total mean value" (comparison neutralization value = -1,6 % marked as orange stroke) in percent again. Seeing this experiment results each cell test comparison value is determined at the ordinate in "%"; means it's cell vitality difference calculation values in percent regarding the "control case" (which is "no used mobile phone and no ERS") compared to "an active mobile phone, which radiated cells plus a mobile phone directly wire connected ERS".

## Results Discussions

As explained at the beginning, the test results should be used to examine the extent to which the respective coil alignment, rotated by 90 degrees, correlates with the induction law and the

electrotechnical LENZ rule; so also, the suspension hypothesis, which had to be confirmed. The postulated effect of the ERS coil winding could also be almost the same over experiments 1 to 3, which did not occur and especially the direct connection of the



ERS to the actively radiating mobile phone reveal the maximum "beneficial" effect on the exposed cell lines. In total, it was confirmed with Experiments 1 to 4 that:

the explicitly applied coil alignment and the field direction created with it on the cells are most effective when there is complete penetration or extraordinary proximity to the wire of the coil (see hotspot position), i.e. the field line perpendicular to the cell lines. This effect of the coil wire winding in the vicinity of the cell perforations thus seems to be interpreted according to the LENZ rule or so-called "right hand rule", i.e. a wire / conductor through which a current flow and the field lines spreading around the coil wire / conductor. Otherwise, the mean hotspot value the experiment 1 wouldn't be the highest or higher than the existing at the experiments 2 and 3.

And at least this hotspot mean value (in experiment 1) is higher than the cell vitality over all mean value of experiment 4 having a direct wire connection to the smartphone headphone plug-in.

Besides, if the ERS is galvanically coupled directly to the radiation source (see headphone socket), the cellular electromagnetic field impact reduction quality of the ERS is the highest on average according to an increase in cell vitality. Thus, the highest effectiveness due to the smartphone field exposed cell lines seems to be found precisely here in this experimental set-up 4; see the highest "over all mean" here. In other words: Experiment 4 was the most cell-biological "beneficial" effective, which means that there was no ERS coil winding, but a galvanically conductive cable connection directly to headphone amplifier electronics of the potentially, but probable health damaging mobile phone. Again, the data transmission radiation intensity or spectrum did not decrease measurably in the present experiments, nor in earlier experiments in this arena of examination [16, 16a, 17, 24].

### Experimentally Inherent Derived Conclusions

The evaluation of the test results of the cell vitality values in the immediate vicinity of the ERS wire or coil windings is the most interesting, because of the resulting higher increase in cell vitality in all experiments; see Figure 8 to 10. What kind of electromagnetic field corresponding relationships via ERS wires / coils and the correlation in effects on cell culture can't be described in textbook technical explanations and definitions, but the evidence of an existing field directional effect (see vector of Figures 5 and 6) ERS coil arrangements around the cell and mobile phones was clearly confirmed as the initial declared experimental thesis. From a purely functional point of view, the ERS coil arrangement or the direct insertion of the ERS wires into a smartphone seem to work "like a kind of cellularly detrimental biological IMPACT vacuum cleaner", which in the future must be followed up in terms of electrophysical system theory. Thus, the directional effect according to field line observations of the ERS coils (compare to), on the other hand, has been demonstrated and is consequently highly relevant or significant as a bio-chemical or at cellular levels influencing efficiency or manipulated variable of the action effectiveness of ERS supposed on human health condition optimizations at the modern wire-less data transmission technology using urban living areas [21-24]. This is important as well because of the rising number of published international studies around the (wire-less / telecommunication) electro-magnetic field impact [1-15].

In summary, the hypothesis set out at the beginning was confirmed to be correct experimentally: Electrophysical laws were influenced by having different arrangements of ERS coils (and its field directions) in relation to smartphone / mobile phone irradiated cell shells. Therefore, the experiment demonstrated the experimental or practical application of used ERS, including placing its coils around cell cultures plus said high-frequency mobile phone alternating field exposures. This procures an emphasis of a cell vitality value reduction between an increase of more than only 3% (on average) up to almost "cell vitality reduction neutralization" based on alternating fields if a mobile phone and ERS were used optimized by a direct wired connection to the field source shown by Figure 12. This means the experiment observed and registered a missing cell vitality loss (in comparison to the control) of only -1,6 % (mean). In other words, due to the mobile phone's radiation emissions or field's impact on these cultured and exposed cells, we saw and registered an overall averaged reduction of -23 % (mean) cell vitality directly. On the other hand, using a mobile phone connected ERS, the field provoked something like a "masking effect" on the radiating source which gave a rest cell vitality reduction of only 1,6 % (mean; see Figure 12).

Just to compare the results from the experiment in 2019 versus the results of this more clearly documented experimental results and maximized ERS efficiency (in order to connect one ERS to mobile phones as field source directly), we observed was correlating more or less to the cell culture effecting level using RD's in earlier experiments there were used multiple devices [16, 16a, 17].

Finally, it should be emphasized that in February 2022 further basic experiments were performed to demonstrate something like a weather sensitivity of cell cultures during extreme weather conditions [29]. This is based on the use of a special "harmful weather field" emission (sferics) application previously tested in a long-term study [30]. This was the only way to cover or mask the weather-specific, impulsively stimulating sferics extreme weather field or radiation. In order to offer this "nice weather preserve" a maximum impact-free effect or no additional impact factor seeing the realized sferics radiation rendering, the DC voltage supply of a radiation source given by a sferics emitting headphone was galvanically connected by an USB-A standard connector way to an ERS as a "probable addition impact precaution". The results showed the first time such cell cultures as "weather (radiation) sensitivity", because on the other hand the results obtained would have been lost in the statistical noise or would have been skewed. Furthermore, the repeated application on the cell lines over several days of the experiments and the comparative comparison of values with the control cell cultures would not have revealed repeated percentage changes, especially shortly before the high points of the low-pressure weather situation (before a preferred actual minimum air pressure) in the observed cell vitalities.

### Observed Effect Causal Considerations

If you critically question these extraordinary investigation results and statements by a different calculation mode or view, the mean reduction in cell vitality was almost neutralized by an "ERS exiting effect" of +21.4% (mean). This means as well, that the smartphone 4G alternating field IMPACT was neutralized

when examined with a bio-cellular testing modality but NOT by using measurable electro-magnetic field level differences: They were constantly stable or evenly its electromagnetic field exposition was untouched (identical to before without the ERS). In standard electro-physics, such a statement is not permitted or marked as not possible, unless the field-theoretical modeling of electric and magnetic wave parts would be extended by an additional wave component according to [31]. Here the existence of a so-called scalar wave is postulated. This could also correlate with the study's results from which showed marginal changes in mass when using RD's. In addition, personal references by the author to the "wave swamp" are indicated, in which he spoke of a leak of around 20% in the law of conservation of energy in the transmission of electromagnetic waves and the use of the "wave swamp". In any case, further research work is necessary for this to be able to find definitive scientifically tenable explanations how this RD's and ERS work in electrotechnics and biological or bio-cellular manner as field influencing devices [27, 28].

Last but not least, an expanding hypothesis can be set up as follows, that in addition to the useful electromagnetic wave for communication purposes as well as wired signal transmissions, it may also trigger a further "third waveform" due to technical, artificial (synthetic) device artifacts (see "wave swamp") that do not occur in nature and thus, considered separately, "could" provoke a biological impact. According to this wave hypothesis, this theoretically assumed artifact would be assessed as given by pure measurements of the electromagnetic wave or signal intensities (see "thermal effects" of the transmitters and radiation intensities of the useful radio signals for e.g. Wi-Fi, 4G / 5G , Bluetooth, etc.), but the named independent field form component or waveform correlation that may have a biological effect on living beings is nowadays not separated in daily investigation views as a "non-thermal effect" (or biologically active effect) [27, 28, 31]. In other words, theoretically in the electromagnetic field law or theoretical modeling, it could be "extended" by a third wave component according to (see "scalar component"), independent of the electromagnetic wave components. The observed effects would then be describable despite the common, but incomplete knowledge that the measured alternating electromagnetic field "could remain unchanged", but the biological impact effects of technical transmitters can be neutralized by devices therefore, this is no contradiction or its electro-physically then permissible [16, 18, 31].

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