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The Effect of MRET Noise Field Generator on SAR Values of RF Phones

Igor Smirnov
Global Quantech, Inc., Encinitas, CA 92024
igor@gqusa.com

ABSTRACT

This article is related to the experimental data regarding the ability of MRET Noise Field Generator (MRET NFG) placed at the distance of 7 feet from "phantom head" exposed to RF phones radiation to reduce specific absorption rate (SAR) of the water based solution inside "phantom head". The core part of Generator is MRET polymer compound. Due to the fractal geometry structure of MRET polymer compound and the phenomenon of piezoelectricity, this polymer generates subtle, low frequency, non-coherent electromagnetic oscillations (composite noise field) that can modify RF signals as a result of superposition phenomenon. The superposition of composite noise field generated by MRET Generator on RF microwave signals leads to amplitude modulation of RF signals where random low frequency signal generated by MRET Generator is a modulating signal and original microwave signal is a modulated one. The low frequency, non-coherent electromagnetic oscillations (noise field) can affect the hydrogen lattice of the molecular structure of water and subsequently modify the electrodynamics properties of water [Smirnov 2008]. The increase of dielectric permittivity of water finally leads to reduction of the absorption rate of electromagnetic field (SAR) of the water-based jelly which simulates living tissue. The reduction of SAR values is confirmed by the research conducted at FCC certified RF Exposure Laboratory, Escondido, California. The influence of MRET Noise Field Generator signals on RF phones in this experiment does not change location of "Hot Spot". The "Hot Spots" remain in the same location as without the influence of generator, and their amplitudes decrease in 80% of data points. This test also confirmed that the placement of MRET Generator at the distance of 7 feet from "phantom head" exposed to RF phones does not significantly affect the air measurements of RF phone signals and subsequently does not lead to any significant distortion of transmitted RF signals [Moulton 2007].

Keywords: *SAR value, MRET Noise Field Generator, piezoelectric effect, fractal matrix, optimal random field, superposition, dielectric permittivity, electrical conductivity, water molecules, cell water.*

1. INTRODUCTION

While many polar polymers are highly flexible and form an amorphous solid upon the process of polymerization, a large number of polymers, such as epoxy, actually form partially crystalline structures. The epoxy polar polymer material is a good example presenting all qualities of volumetric fractal matrix.

A number of studies show that external electromagnetic field can affect local orientations and phase transitions in polymer crystalline systems of longitudinal chains. The longitudinal polymer crystalline system is a macromolecule of consecutively copolymerized liquid crystals and flexible polymer sequences. Polar polymers possess comparatively low values of relative dielectric permittivity (3-15) which means that macromolecules in the molecular structure of these polymers can be easily displaced by external electromagnetic force. Subsequently the external electromagnetic field can seriously modify the local orientation order of the system and affect phase transition parameters and dielectric properties of the polymer compound. The orientation of the polar groups in electromagnetic field affects the backbone orientation and determines the resulting anisotropy of crystalline structure of epoxy polymer introduced to electromagnetic field. The existence of orientations and phase transitions in crystalline systems of epoxy polymer introduced to external electromagnetic field leads to the origination of subsequent relaxation and strain phases in macromolecular structures that induces the phenomenon of piezoelectricity. Several investigations conducted on polymers with cholesteric elastomer structures including epoxy indicated that uniaxial compression parallel to the helicoidal axis of the cholesteric structure leads to a compression of the helix. Simultaneously an electric charge at the surface of the elastomer is observed. The correlation between the piezoelectric coefficient and the order parameter reflects a coupling and shows that the piezoelectric effect of polymer compounds directly depends on the state of order of the liquid crystalline phase structures [Meier and Finkelmann, 1993]. It means there is direct correlation between the topology of polymer molecular structures and the intensity of piezoelectric phenomenon.
The topology of polymer molecular structure is scientifically based on the principles of formation of fractal systems.

The first principle of fractalization is realized through the iterative algorithm of formation of complex structural systems based on the existence of the initial prototype matrix which governs the formation of the object. Any small fragment of fractal system reproduces the structure of the whole system under the increasing scale. This principle clearly describes the hierarchy organization of fractal system. This principle can be seen in the formation of

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ARPN Journal of Science and Technology

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crystalline lattice of mono crystals, development and growth of biological systems where genetic prototype is developed through the certain algorithm of replication from single cell into the organism, where all cells have a unique basic matrix in the form of DNA structure.

Another principle that governs formation of the fractal system is the principle of complementarily. The main criterion of the integrity of fractal system is minimization of tendencies leading to spontaneous formation of "inside" conflicts and contradictions in the system. It states that in order to achieve stability of any complex system the level of inside "contradictions" of this system should be directed to null. This statement is correct for any three dimensional system as well as any volumetric system that has the infinite number of different kinds of structural vectors. The basis of formation of stable complex system should be the structural module which has precise, balanced matrix structure and can clone self projections in the surrounded environment. The fractal cloning of structures consider the formation of self-similar replications of the initial basic module with specific coefficient of similarity. The object which is formed as a result of fractal cloning process has dimensions that are proportional to the dimensions of initial basic module.

The next basic principle that governs the formation of fractal system in nature provides the idea of existence of the lattice of "barrier" membranes. Any fractal system is separated by barrier membranes relative to central zone of the system, and those membranes play roles of transformers and converters of the previously existing algorithm or signal into another algorithm or signal which is more adequate for the present level. In this case the transmission of the signal from the central zone of the fractal system to the peripheral zone of the same system and vise a verse is related with its step by step adaptation. This principle can be interpreted as a process of quantum transformations of the entropy of the object. In this case each barrier membrane of the system is considerate to be some kind of a fractal "space – wave" filter which modifies previously existing algorithm or signal into the new form of algorithm or signal. This concept provides some evidence that the encounter of fractal matrix with the electromagnetic field has ability to affect this field in a way obviously characterized by the matrix's structure [Serov 2003].

In case of epoxy polymer the kinetics to a large extent determine the final crystalline structure of the polymer. The introduction of foreign agents (substances) in the parent lattice of epoxy polymer leads to the effect of superimposed periodicity and, as a result, develops modulated crystalline structures with specific fractal microstructure, phase transition, network topology and polarity. Due to the fractal structures of MRET polymer compound and the phenomenon of piezoelectricity this polymer generates subtle, low frequency, non-coherent electromagnetic field (composite noise field) when exposed to the periodic low frequency electromagnetic field of MRET Generator solenoid. Such composite noise field can modify RF signals as a result of superposition phenomenon. The superposition of composite noise field generated by MRET Generator and RF microwave signals leads to amplitude modulation of RF signals where random low frequency signal generated by MRET Generator is a modulating signal and original microwave signal is a modulated one [Smirnov 2011].

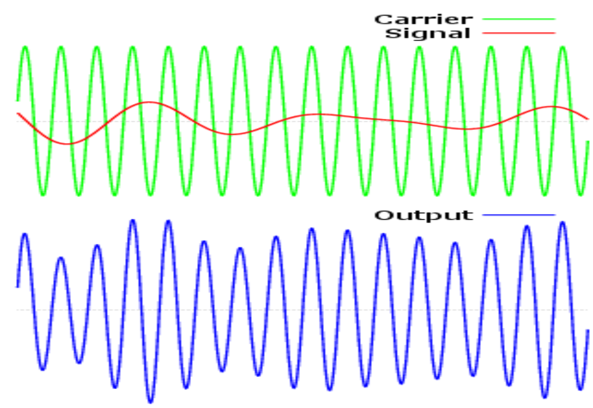

Fig 1: Amplitude modulated signal

Amplitude modulation consists encoding information onto a carrier signal by varying the amplitude of the carrier (Fig.1). Amplitude modulation produces a signal with power concentrated at the carrier frequency and in two adjacent sidebands. The lower sideband (LSB) appears at frequencies below the carrier frequency; the upper sideband (USB) appears at frequencies above the carrier frequency. The sideband power accounts for the variations in the overall amplitude of the signal. Realizing mentioned above it is possible to conclude that MRET Noise Field Generator low frequency signal superimposed on RF carrier microwave field makes the resulting modulated spectral components of microwave field to resemble the characteristics of spatial incoherent field.

Such composite, incoherent low frequency electromagnetic field can affect the hydrogen lattice of the molecular structure of water and subsequently modify the electrodynamics properties of water. The resonance interaction, including both a spatial resonance and a resonance of the oscillating frequency of microscopic orbital currents of protons in water-molecular hexagons, leads to the process of deviation from the stochiometric composition of water and to the reorganization of water clathrate structures

ARPN Journal of Science and Technology

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with minimum input of energy. The modification of molecular structure of water can lead to the modification of the electrodynamics characteristics of water such as dielectric permittivity and electrical conductivity [Smirnov 2008].

Below is presented the theoretical concept of electrodynamics processes which lead to the reduction of the rate of absorption of electromagnetic field (SAR) composed of microwave radiation and oscillations of very low frequencies and amplitudes in cell water. Under the influence of applied EMF polar molecules tend to align themselves with the field. Although water has polar molecules, its hydrogen bonding network tends to oppose this alignment. The level to which a substance does this is called its dielectric permittivity. Dependent on the frequency of applied EMF the dipole may move in time to the field, lag behind it or remain apparently unaffected. The ease of the movement depends on the viscosity and the mobility of the electron clouds. In the wide range of EMF frequencies lower than GHz frequency level (corresponding to microwave thermal effect) the water dipoles move in time to the field. In the range of extremely low frequency of 0.1 – 1000 Hz (corresponding to the extremely low velocity of movement) the dynamic viscosity of water and the resistance of water dipoles to the alignment (dielectric permittivity) are extremely high (up to 10^8 at 0.1 Hz) due to hydrogen bonding between molecules (molecular coupling). In this extremely low range of frequency of applied EMF the water dipoles are able to move in time with low frequency electromagnetic field and as a result they can form multilayer molecular formations which oscillate in accordance with applied low frequency EMF. In the higher frequency range of kHz to GHz generated by RF phones the reorientation process may be modeled using a “wait and switch” process where the water molecule has to wait until favorable orientation of neighboring molecules occurs and then the hydrogen bonds switch to new molecules. This range of frequencies of RF phones is related with the ease of the movement of water dipoles resulting in chaotic Brownian movement of water molecules. In the process of Brownian movement water molecules located in close proximity to each other develop the “friction effect” that results in the increase of the level of absorption of EMF energy emitted by RF phone and in the generation of heat (called “dielectric loss”). [Chaplin 2005]

The low frequency oscillations generated by MRET Generator and superimposed on the carrying frequency of RF phone support the tendency of water dipoles to align and to move in time with low frequency field keeping their normal structures of hydrogen bonding and water molecular formations. It supports the existing proper molecular structuring in water and counteracts to the tendency of RF to break hydrogen bonding between water molecules and to ease their chaotic movement.

SAR test was developed on the basis of multiple measurements of electric potentials inside the water based jelly (the simulated living tissue in “phantom head”) exposed to external electromagnetic radiation. SAR value is defined as the time derivation (rate) of the incremental energy (dW) absorbed by an incremental mass (dm) contained in a volume element (dv) of a given density (p):

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{pdv}\right) \qquad (1)$$

There is a direct correlation between the absorption of non-ionizing electromagnetic radiation by the exposed tissue and the magnitude of the electric component of the field applied to the tissue. Specific Absorption Rate can be related to the electric field at a point by the following equation:

$$SAR = \frac{\sigma|E|^2}{p} \qquad (2)$$

where σ – conductivity of the tissue (S/m); p – mass density of the tissue (kg/m^3); E – electrical field strength (V/m), [http://www.flomerics.com/floemc/applications/indexsar_files/]

The equation for the electrical field strength at the point in space which is distant from the source of electromagnetic radiation is the following:

$$E(r) = q/4\pi\varepsilon r^2 \qquad (3)$$

where q – electrical charge (V); ε – dielectric permittivity (F/m); r – distance from the source of electromagnetic radiation (m).

According to the standard methodology for SAR measurements for the “phantom head” [IEEE Standard 1528-2003], the electrical conductivity (σ) of simulated brain tissue (hydroxethylcellullose jelling agent) and mass density of the simulated tissue (p) are considered to be a constant. Considering this fact it is possible to conclude that any modifications of the measured SAR values have a direct correlation with the modifications of the measured electric field strength magnitudes.

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There is scientifically proven evidence that extremely low frequency electromagnetic field can dramatically affect the dielectric permittivity and electrical conductivity of water and water based solutions. Particularly, the scientists of Novo control Technologies GmbH & Co. KG (http://www.novocontrol.com) provide the following results for measurements of electro dynamic characteristics of water when the body of water is exposed to the wide range of electromagnetic oscillations (Fig 2).

Electrodynamics Characteristics of Water

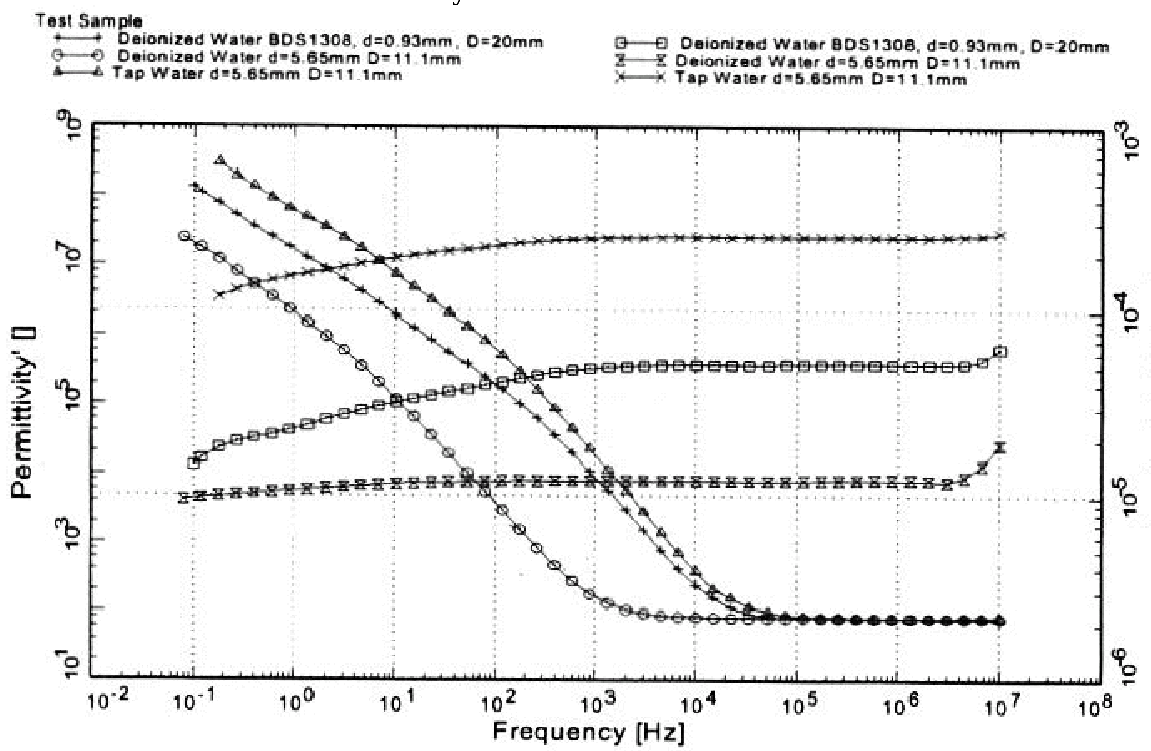

Fig 2: The relative dielectric permittivity of water significantly increases from 80 up to 10^8 and electrical conductivity of water samples decreases up to 10 times in the frequency range of 0.1 – 1000 Hz. Measurements were conducted on the samples of deionized and tap water in measurement units with different size (length and diameter) at 20°C.

In the range of low frequencies of 0.1 – 1000 Hz the relative dielectric permittivity of water increases from its regular value of 80 up to 10^8, and electrical conductivity decreases up to 10 times. These facts confirm that water as a subject to applied EMF of extremely low frequency range undergoes molecular structural modifications. It is reasonable also to admit that these structural changes can affect the electrodynamics characteristics of water in the range of RF frequencies as well. Taking into consideration that MRET Generator creates extremely low frequency oscillations, it is reasonable to admit that these specific signals can affect the electrodynamics characteristics of the water based jelly in the "phantom head" slightly increasing the dielectric permittivity (ε) and decreasing the conductivity (σ) of hydroxethylcellullose jelling agent. Subsequently the increase of dielectric permittivity (ε) leads to the decrease of the strength of electric field (E) inside the "phantom head" in compliance with equation (3) and to the decrease of SAR values in compliance with the equation (2).

In compliance with the equation (2) the decrease of electrical conductivity (σ) of the simulating tissue jelly should lead to the additional decrease of SAR values, but it is not reflected in this test results due to the standard methodology of SAR test [IEEE Standard 1528-2003]. According to the standard methodology only the electric field magnitudes are measured by the probe and the value of conductivity of the water based jelly is measured before each test and considered to be a constant during the computerized calculation of SAR values.

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ARPN Journal of Science and Technology

http://www.ejournalofscience.org

The research "R&D Testing SAR Evaluation", Test Report No: R&D 20071102 was conducted at FCC certified RF Exposure Laboratory, Escondido, California. It showed the reduction of SAR values in 80% of experimental points inside the "phantom head" for three different models of RF phones functioning at 835 MHz (242 points were measured for each RF phone with and without MRET Noise Field Generator placed at the distance of 7 feet from "phantom head").

2. METHOD

RF phone was attached to "phantom head" in standard operation position. The SAR values were calculated based on the measurements of E-field with the help of FCC certified software program. The series of measurements in 242 points were accomplished for RF phones without MRET Noise Field Generator and with MRET Noise Field Generator placed at the distance of 7 feet from the Uni-Phantom head exposed to RF phones radiation. The tested 'phantom head" was filled with head tissue simulating liquid of the following electrical parameters measured before the test at 835 MHz:

Relative Di electricity	41.04	± 5%
Conductivity	0.89 mho/m	± 5%

The brain and muscle simulating mixtures consist of a viscous gel using hydroxethylcellullose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired simulated tissue.

Fig 3: Measurement of head tissue depth.

The APREL Laboratories ALSAS system with a dosimetric E-field probe E-020 was used for the measurements. The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom and dipole was oriented parallel to the body axis (the long side of the phantom).

Fig 4: ALSAS system configuration.

The standard measuring distance was in the range of 10mm from the dipole center to the solution surface. The coarse grid with a grid spacing of 10mm was aligned with dipole. The 5x5x8 fine cube was chosen for the cube integration. The dipole input power (forward power) was 250mW ± 3%. The results are normalized to 1W input power. The laboratory environment conditions were as follows during the calibration sequence:

Ambient Temperature of the laboratory:	22 ˚C ± 1.0 ˚C
Temperature of the Tissue:	20 ˚C ± 1.0 ˚C
Relative Humidity:	41%

The investigation was conducted on cellular phones: Samsung Model SCH-A670, Kyocera Wireless Model KWC 2325, and Qualcomm Model QCP 2035; TX frequency range: 835 MHz; Maximum RF output: 23 dBm conducted; Signal modulation: CDMA; Antenna type (length): Standard with each model;

The wireless mobile phones have been evaluated in this experiment for localized specific absorption rate (SAR) for controlled environment/occupational exposure limits specified in ANSI/EEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in IEEE 1528-2003 and OET Bulletin 65. The RF phone was

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ARPN Journal of Science and Technology

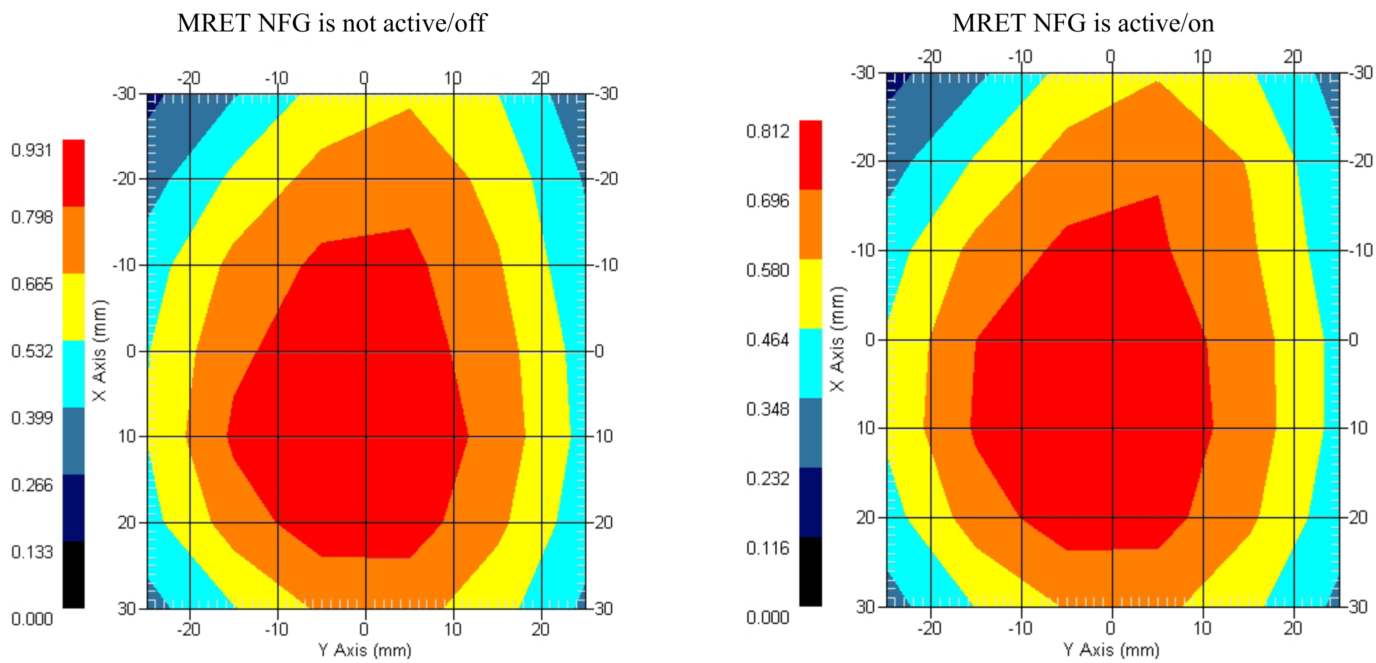
http://www.ejournalofscience.org

placed into simulated transmit mode using the manufacturer's test codes. Such test signals offer a consistent means for SAR and are recommended for evaluating of SAR data. Each SAR measurement was taken with a fully charged battery. In order to verify that each phone was tested at full power, conducted output power measurements were performed before and after each SAR test to confirm the output power. SAR measurement results were obtained, analyzed and compared to provide the scientific conclusion of the experiment.

3. RESULTS

This investigation provides the following results of SAR value measurements:

"Hot Spot" Area Scan Diagrams



1 gram SAR value: 0.858 W/kg
10 gram SAR value: 0.621 W/kg
Area Scan Peak SAR: 0.928 W/kg
Zoom Scan Peak SAR: 1.061 W/kg

1 gram SAR value: 0.771 W/kg
10 gram SAR value: 0.573 W/kg
Area Scan Peak SAR: 0.811 W/kg
Zoom Scan Peak SAR: 0.980 W/kg

Fig 5: Phone Model: Kyocera KWC 2325; Frequency: 835.00 MHz; Max. Transmitted Power: 0.48 W; Phantom data: APREL-SAM Left Ear; Probe Sensitivity: 1.20 1.20 1.20 μV/ $(V/m)^2$.

The analysis of "Hot Spot" Area Scan data provides evidence that the influence of MRET Noise Field Generator signals on the resulting microwave signal of RF phones does not change location of "Hot Spot". The "Hot Spots" remain in the same location as without the influence of generator, and their amplitudes decrease in 80% of data points.

In 65% of the data points there was observed a significant decrease of SAR values in the range of 10% to 40%. The installation and function of MRET Noise Field Generator at the distance of 7 feet from the "phantom head" leads to the reduction of the majority of SAR values. 9 SAR values out of 12 meaningful SAR values in this experiment were reduced in the range of 2.1% - 12.6%, and only 1 SAR value increased by 3.5%.

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Table 1: SAR Data Summery – 835 MHz Head

Measurement Results: Frequency 836.52 MHz; Channel 384; Modulation CDMA; Battery standard						
Phone used	1 gram SAR value (W/kg)		Decrease (Increase) %	10 gram SAR value (W/kg)		Decrease (Increase) %
	NO Generator	MRET Generator		NO Generator	MRET Generator	
Samsung	1.035	0.972	6.09	0.639	0.617	3.57
Kyocera Wireless	0.858	0.771	10.14	0.621	0.573	7.73
Qualcomm	1.070	1.064	0.56	0.758	0.753	0.66
SAR standard for Muscle Tissue 1.6 W/kg (mW/g)			SAR standard for Muscle Tissue 2.0 W/kg (mW/g)			
Phone used	Area Scan Peak SAR (W/kg)		Decrease (Increase) %	Zoom Scan Peak SAR (w/kg)		Decrease (Increase) %
	NO Generator	MRET Generator		NO Generator	MRET Generator	
Samsung	1.038	1.074	(3.47)	1.601	1.471	8.12
Kyocera Wireless	0.928	0.811	12.61	1.061	0.980	7.63
Qualcomm	1.141	1.109	2.80	1.431	1.401	2.10

The level of Uncertainty for the mean values of SAR for 1 gram of tissue is 6.7% and for 10 gram of tissue is 2.8%. [Moulton 2007]

4. CONCLUSIONS

The measurements in this investigation are taken to simulate the RF exposure effects under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested RF phone complies with the requirements in respect to all parameters subject to the test.

The influence of MRET Noise Field Generator signals on the resulting microwave signal of RF phones does not significantly affect the air measurements of RF phone signals and subsequently does not lead to any significant distortion of transmitted RF signals. In each experiment SAR values were measured in 242 points of "phantom head". The influence of MRET Noise Field Generator signals on RF phones in this experiment does not change location of "Hot Spot". The "Hot Spots" remain in the same location as without the influence of generator, and their amplitudes decrease in 80% of data points.

In 65% of the data points there was observed a significant decrease of SAR values in the range of 10% to 40%. The placement and function of MRET Noise Field Generator at the distance of 7 feet from the "phantom head" leads to the reduction of the majority of SAR values. 9 SAR values out of 12 meaningful SAR values in this experiment were reduced in the range of 2.1% - 12.6%, and only 1 SAR value increased by 3.5%.

The reduction of SAR values calculated on the basis of E-field probe measurements inside the "phantom head" confirms that incoherent low frequency oscillations generated by MRET Noise Field Generator actually increase the value of dielectric permittivity of the simulating brain tissue jelly resulting in the reduction of SAR values in the "phantom head."

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