

ELF Magnetic Fields and EEG Entrainment

Edited March 10, 1978

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Clinical research indicates that somewhere between 25% to 75% of human and animal subjects may exhibit marked psychophysiological sensitivity to extreme low frequency magnetic and electric fields. Brainwave entrainment can be demonstrated electroencephalographically when subjects are in the vicinity of oscillations in the frequency range of approximately 3 to 20 Hz at intensities of below 100 nanoteslas. (1 tesla = 104 gauss)

ELF fields of 6.67 Hz, 6.26 Hz and lower tend to produce symptoms of confusion, anxiety, depression, tension, fear, mild nausea and headaches, cholinergia, arthritic-like aches, insomnia, extended reaction times, hemispheric EEG desynchronization, and many other vegetative disturbances.

H and B field (magnetic vector) oscillations of 7.8, 8.0 and 9 Hz produce anxiety-relieving and stress-reducing effects mimicking some "meditative" states. It has been speculated that frequencies in this range may be the universally permeating "clock frequencies" or carriers on which "mind" or "consciousness" states can be impressed and interact with other life-forms in the nebulous realms of ESP, psychotronics, distant healing, radiesthesia, and related paranormal but anecdotal phenomena.

Coherent ELF energies have the unique and interesting property of almost lossless propagation within the earth-ionosphere cavity waveguide, and attenuation of these signals due to distance

from transmitter sites is negligible. Power losses are 0.8 db per Mm (million meters) . The magnetic vectors, unlike electrical (E-wave) components, permeate any substance and cannot be effectively shielded, even by iron, mu-metal, lead, copper, "Faraday cages", etc.

The established physics of radio propagation therefore suggests that vast geographical areas can be readily mood-manipulated by transmissions of EM energy within the earth-ionosphere cavity wave guide. The accidental discovery in 1938 of the "Luxembourg Effect", by which a transmitter of relatively low power, fed to an antenna array producing a circularly-polarized signal, can "piggy-back" to any preexisting RF energy source and produce disturbances of the ionosphere at any frequency desired (which then "modulates" all other energies within that "waveguide" is fully described in the literature of 40 years ago but probably forgotten or overlooked by today's technologists.

HISTORY AND BACKGROUND

My personal interest in EEG and consciousness dates to 1969 when I became fascinated with the (re)discoveries of Joe Kamiya and the conscious control of brainwaves via biofeedback. I developed sensitive and reliable monopolar instrumentation for this purpose under the Alpha-Metrics trademark.

In the course of traveling, lecturing, teaching classes and demonstrating this EEG equipment, and because one of my personal interests was in parapsychology and consciousness research, I had the unique opportunity (and reliable instrumentation at hand) to make

electroencephalographic recordings of the brain wave patterns of a number of truly exceptional subjects in the U.S and Hawaii who were famous or who had demonstrated established reputations as psychics , healers , medicine-men , dowsers, etc.

Since I had a wealth of personal contacts in both the "scientific" establishment and "psychic underground" communities, I was fortunate for the opportunity of meeting and being allowed to wire up and instrument a cross-section of "sensitives" from vastly different disciplines, ranging from charismatic Christian faith healers, to an authentic Hawaiian Kahuna, to practitioners of Wicca, hex, Santaria, radiesthesia-radionics, seers, ESP "readers", psychics, etc., etc.

A striking number of these authentic "sensitives" exhibited a nearly identical EEG signature when reporting that they were in their "working" state of consciousness, a state persisting from one to several seconds intermittently during the "altered state of consciousness" phase of the paranormal activity. The signal appeared to be an almost pure sine-wave of up to 25 microvolts as read MONOPOLAR, frontal to occipital, midline; and 7.8 to 8.0 Hz in frequency; or on the "alpha-theta" borderline.

This serendipitous discovery was unexpected, in that although the subjects were practicing opposing disciplines, and coming from totally disparate teachings and viewpoints, and would barely acknowledge the existence or authenticity of practitioners outside of their belief system, they all appeared to be "marching to the sound of the same cosmic drummer" when in an altered state of consciousness.

After replicating this observation a number of times at sites thousands of miles apart, the obvious question arose that if these exceptional people, unbeknown to each other, were falling into the same "cosmic consciousness" mode, what or where was the signal to which their brain waves became entrained? What was the "drummer"? Is there a "clock" or "synchronizing" signal present?

In 1952, physicist W. O. Schumann postulated mathematically that our earth and ionosphere constituted a cavity wave guide whose physical constants and magnetic field would oscillate at a resonant frequency identical to the range of human brain waves. In 1962, our National Bureau of Standards division' of Radio Propagation reported the actual physical detection and instrumental recordings of these signals; and as predicted, tracings were indistinguishable from encephalographic recordings from human brain waves. This newly-discovered phenomenon was dubbed "earth brain wave".

Since there is a pronounced node in these "Schumann Resonances" at 7.8 - 8.0 Hz, the question of possible EEG and ELF interconnectedness appears to be a irresistible area for investigation.

In 1973 a professional coil fabricator duplicated the "Schumann" pick-up described on page 313 in the Journal of Research of the National Bureau of Standards, Division of Radio Propagation, Vol 66D No.3 May-June 1962, and I perfected an extremely low noise, highly-filtered amplifier capable of recording and displaying the naturally-occurring magnetic oscillations surrounding our biosphere.

My intention was to re-contact as many of the "sensitive" subjects from my first study as feasible, and this time make simultaneous EEG and ELF records and compare the signals for frequency and phase coherency. This was done on a more limited scale than in the original phase of investigations. In a few instances, careful analysis revealed episodes of absolute entrainment during the brief seconds when sensitives reported being in their altered states of consciousness. Unexpected variables emerged, such as reliability factors dependent on lunar phases and time of day.

This study was extended to test the theory that if a very small percentage of subjects, by virtue of hereditary factors, or religious or metaphysical discipline, or meditative practices, had sensitized some portion of their minds or brains to act as an extremely sensitive " dual-conversion superheterodyne receiver"; would it be possible to remotely sense, amplify, and display this real-time "drummer" to less sensitive subjects whose heads were as unresponsive and un-selective as a crystal set, so that they too could mimic the highly organized "psychic" abilities of the trained "seer"?

Late in 1973, apparatus was built for pulsing a miniature lamp held in an empty eyeglass frame as a real-time photic stimulus that would cause an evoked potential in step with the ELF "cosmic drummer". This was moderately promising, but marginally successful because of the individually variable delay-time (of about 100 milliseconds) between the onset of the stimulus and its response.

The next effort at inducing psychic awareness was to place a 9 ft. diameter coil of about 100 turns of #28 magnet wire on the floor of the laboratory, and expose subjects to the real-time magnetic replica of the highly-amplified "Schumann" signal sensed at a remote location to avoid feedback. Results with individuals and groups experiencing this "magic circle" were dramatically successful. The third generation investigations were extended to determine if subjects brainwaves could be influenced by artificially generated magnetic oscillations of sine-waves of low intensity and at specific frequencies within the ranges occurring naturally.

Some subjects exhibited absolute brainwave entrainment over the range of approximately 6 to 14 Hz and at signal strengths of approximately 100 nanoteslas. Onset of phase/frequency lock-on averaged from one second to four seconds from the time of switching on the artificial ELF generator, and would sometimes last for the duration of the stimulus, usually 10 second episodes.

One subject (Mr. A.P., aged 54) displayed absolute entrainment when he was placed inside a triple-shielded magnetic (iron) and triple electrostatic (copper) Faraday cage. The artificial ELF stimulus was originating from a pocket-sized battery powered device positioned outside the shielded room and 12 ft. removed from the subject. Tuning the device over a wide frequency range caused subjects EEG to exactly follow the stimulus.

After demonstrating the neurological responses of sensitive individuals, and doing preliminary mapping of subjective states as reported for various specific frequencies (defined to 1/100 Hz on a digital frequency counter attached to the ELF generator), experiments were undertaken on

a broader scale with totally unaware subjects, such as customers at local coffee shops during rush hours. This obviated the variables of "suggestion", "expectancy" or "hypnosis".

Anecdotal data amassed suggesting that a pocket-sized transmitter at power levels of under 100 milliwatts could drastically alter the moods of unsuspecting persons, and that vast geographical areas could be surreptitiously mood manipulated by invisible and remote transmissions of EM energy. Tests were rapidly abandoned after dramatic proof because of ethical considerations.

It is well known that naturally-occurring earth-ionosphere magnetic oscillations will vary slightly in frequency diurnally, monthly (full vs. new moon), and in definite cycles related to sunspot activity. This may well explain observable "full moon craziness".

Resonant frequencies are also affected by earth-venus-mercury-moon-Jupiter-sun gravity vectors. And there is well-documented correlation between these geophysical phenomena and episodes of political unrest, mood alteration, and health cycles; as supported by a vast technical and medical Literature. Our "Drummer" seems to affect all life-forms. An excellent reference source of widely unrelated phenomena dramatically tied to our earth's geomagnetic cycles is Peterson's Man. Weather. Sun. cited in the bibliography.

And by artificially amplifying or altering or distorting these geomagnetic fields, or transmitting specific and coherent frequencies, vast segments of earth's populations could be affected. This now becomes an attractive modality of psychological or psionic warfare; or intentional modification of moods that could reflect in areas ranging from time-specific insomnia to stock

market fluctuations. (There have been recent epidemics of 4:00 to 5:30 AM "worry", insomnia coinciding with the 9 Hz "Schumann" drop-out as observed in journals of geomagnetic research.)

On several occasions within the last few years, our laboratory began detecting wavetrains in the ELF ranges that could not be of natural origin. These may or may not be related to recent Soviet transmissions of radio energy spread over broad segments of the frequency spectrum ranging up to 28 MHz. Danish monitoring stations report that peak powers of these signals are on the order of 40 megawatts. Transmitters are presumably located near Riga or Gomel. Transmissions have disrupted lawful radio communications throughout the world, and have been protested by many nations. The Soviets have not given an adequate explanation of the purpose of these tests. An early supposition assumed Soviet experiments with over-the horizon radar. Perhaps the psychoactive EM components are unexpected side-effects of this new technology.

Canadian Department of Transport monitoring sources have established that spectrum analysis of these strange signals appear to be higher harmonics of a fundamental frequency of 6.67 Hz. (The Tesla fo) . The signals are modulated with pulses with repetition rates of 5 to 15 pulses per second, usually 10 Hz.

Besides modifying the electrical, ionic, and stratospheric jet stream equilibrium weather-motion factors, the signals fall precisely within the windows known to be psychoactive.

The Canadians report alarming mood-alterations in certain areas of Eastern Canada, such as near Timmins and Kirkland Lake, Ontario, which observers believe are linked to Soviet transmissions.

Since both theory and laboratory tests prove that magnetic (H-wave) shielding is impossible at these psycho-active frequencies, even with highly sophisticated multiple iron or mu-metal shielding, it can be speculated that ELF signals can be a powerful potential weapon with global capabilities in psycho-physiological warfare. (The wavelength of an 8 Hz signal is 22,159 miles).

I feel that tests should be undertaken with a number of remote ELF sensors that can be made directional in order to establish by triangulation the sources of these recently detected manmade disturbances, whether originating from offshore or domestically. ELF data should be correlated with data monitored from Soviet transmissions that can be detected on commercial short-wave receivers. These two modalities can be in turn correlated with human or animal EEG recordings. (Note: this was done 5/25/78 with positive correlations; R.C.B.)

ELF as a modality for mood-manipulation is a demonstrated reality. And there is a strong possibility that it has been implemented since 1975 by the Soviets, intentionally or accidentally as an unpredicted side effect of local standing waves or re-radiation of power lines.

This speculation is being explored currently by a network of independent scientists working in the disciplines of psychophysiology, geophysics, radio propagation, pharmacology, physics, electronics, and psychotherapy.

A bibliography of pertinent medical and technical articles and books is attached to this report.

Possible countermeasure proposals embrace psychopharmacology, adaptive desensitization, and the utilization of personal low-powered (milliwatt) magnetic oscillators which by the law of inverse-square will override hostile signals, man made or natural, with beneficial frequencies.

An interesting device of this nature with possible "countermeasure" capabilities is the "Vitasette" instrument designed by W. Ludwig for limited distribution and testing in West Germany. One model of this device is the size of a cigarette lighter and has a claimed battery life of two years. Frequencies are user programmable over the range of 1.25 to 19 Hz by activating specific combinations of switches. This "transmitter" generates spike-wave pulses when a mu-metal core of extremely high permeability is driven to beyond saturation with a single transistor and coil.

Effective range is claimed to be about one meter. This is sufficient to insure proper synchronization of the wearer's biological clocks", circadian rhythms, and possible coherency of left and right hemisphere neuronal firings. Ludwig claims cures for a broad spectrum of vegetative disturbances

Similar to the characteristics of a frequency-modulation discriminator (Foster-Seeley) the brain cells appear to "latch" to the highest amplitude pulses in their proximity, and unlike "A.M." detectors, will reject background noise and pulses of lower intensity. The analogy would be that a small transistor radio held up to a listener's ear would drown out a nearby rock-music band with thousands of watts of audio amplification. Similarly, a milliwatt device worn on the body could override a hostile transmission of megawatt power at a distance.

While almost everyone is familiar with electronic "heart pacers" capable of insuring proper heart rhythms, few are aware of recent research establishing that brainwaves and other biological functions can be influenced at great distances by magnetic pulses of critical frequencies.

There is promise that such devices, when tuned to highly specific "beneficial" rates, could be of value in stress-modification, tension and anxiety relief, dyslexia; psychotherapy, insomnia, "confusion" states if caused by left and right hemisphere desynchronization, headaches, sexual dysfunction, and many other conditions. However, much like the initial application of atomic energy, the first large-scale implementations of ELF discoveries appear to be destructive.

I invite other interested investigators to replicate and verify my observations.

A brief disclosure of my procedures follows.

A human subject, selected for sensitivity, is wired to a battery-powered, totally isolated EEG amplifier. The output is recorded on one or more channels of chart, or (preferably) fed as an

FM/VCO to channel(s) of magnetic tape. Monopolar electrodes were frontal to occipital, midline.

Simultaneously, but with electrical or optical isolation sufficient to eliminate cross-talk, the output of a magnetic-signal detector (Schumann coil) is chartrecorded or fed to its separate magnetic tape channel.

The "Schumann" coils typically consist of 50,000 to 250,000 turns of #38 magnet wire wound on a ferrite, soft-iron, or mu-metal core. Coil axis is oriented to magnetic N-S and connected to a separate amplifier having a bandpass of 2-40 Hz, a noise figure capable of seeing 0.1 micro-volt rms at 10 k ohms, and 100 db. or better rejection of frequencies of 60 Hz and higher.

With proper subjects, phase and frequency EEG "lock-ons" can be easily observed by inspecting the chart recordings, or if measurements are made in the field, by later observation of the magnetic tape records after signal recovery on paper charts or dual-trace storage scopes (Tektronix 214).

My initial transmitter of ELF signals consisted of a phase-shift, pure sine-wave oscillator whose output was fed to a 10 Hy soft iron core inductance of 1200 ohm dc resistance. Power level was 9 volts at 0.7 ma, or 6.3 milliwatts. This device could cause EEG modification and mood alteration in subjects at up to 10 ft. A higher power device constructed in 1973 provided greater effective range, as was expected. Highly specific modulating and carrier frequencies

must obviously be withheld for fear of potential mis-use, as are "keyhole" and waveform data, also details of the multiple-source devices producing "soliton" ELF magnetic standing waves.

My investigations began in 1970. Early research in consciousness-modification by external non-chemical stimulus was undertaken in the following areas.

Photic stimulation of the subjects by miniature lamps, both cold-cathode (phosphors) and filament, and "strobe". These light sources were either driven by oscillators or by the subject's amplified brainwaves in real time and later) with delayed and phase-modified pulses to "pump" EEG's.

Exposure of subjects to voltage-gradient oscillating fields, and electrostatic (modulated) fields.

Exposure of subjects to pulse-modulated negative ion generators, typically (-)20 kv dc sources of corona discharge modulated by mechanically rotating screen-shields or by carefully adjusted spark gaps that would arc over and short the output at frequencies centering on the 8 Hz. range.

Exposure of subjects to actinic stimulus of nearly monochromatic red-green-blue pulses of light through a fiber-optic display device, held close to the left or right eye. Phase and frequency of each channel was selectively varied in efforts to excite red-green-blue rod and cone receptors independently and evoke "standing wave" potentials in specific sites of the occipital cortex. By selective excitation of both eyes with delayed pulses, evoked "standing waves" occurred.

Audible "click" stimulus was explored, as were infrasonics , ultrasonics (28 k Hz) and phase-shifted sound fed to left and right ears. Audio-modulated 100 kHz electrostatic fields were tested.

In two series of tests, the amplified, filtered, and clipped (about 200 mv) real-time "Schumann" signals were fed directly to the head via surface electrodes. This approach was dramatically psychoactive, and abandoned in 1974 as dangerous aftersubjects experienced "LSD" type visions.

At this time, we prefer SINUSOIDAL (not pulsed, triangular, square, saw-toothed, etc.) waveforms. Fundamental frequencies are psychoactive, but can be enhanced by audio-modulating them onto compound carrier frequencies, hetrodyning multiple sources, generating "soliton" waves; etc.

We feel that much data has been overlooked by other researchers not specifying the precise frequencies under investigation to accuracies of .01 to .001 Hz. There is evidence that long-chain molecules near liquid-crystal boundaries may simulate coherent dipole arrays with very high Qs. Biological signals are after all at the opposite end of the electromagnetic spectrum where communications frequencies in the VHF and UHF bands are specified to .005% and better.

These investigations have been undertaken privately as a personal interest by the author. They have been totally funded by myself, and are in no way connected with any outside interests,

either governmental or commercial. Results have been reported on an informal basis via limited personal communications with other interested parties. Highly specific frequency and advanced waveform data are proprietary.

Precise technical details on low-noise biological and geomagnetic amplifiers, filters, Schumann detector coils (now into our forth-generation devices), practical and inexpensive voltage-controlled oscillator and F.M. discriminator circuits for cassette tape recording of ELF and EEG signals and data, practical and inexpensive modifications to digital frequency counters extending their ranges to 1/100 Hz, suggestions for recording and displaying and analyzing these signals, etc., etc., can be made available to other serious and informed research workers who have a responsible interest in this subject. We feel it wise to withhold only the data on hemispheric desynchronization frequencies. The instruments and hardware used in this study can be made available for inspection and evaluation.

Emphasis in this report on ELF magnetic phenomena rather than details of results of related psychoactive modalities is based on the conclusion that the physics and propagation characteristics make this the most viable choice of technically feasible global mood manipulation.

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Edited March 5, 1978