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Proposal for Research

SRI No. ISH 76-68

DETECTION OF REMOTE LOW-LEVEL EM SOURCES

Part One--Technical Proposal

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I INTRODUCTION

For the past three years we have had a program in the Electronics and Bioengineering Laboratory of SRI to investigate human registration and perception of remote signals. Of special interest is the ability of certain individuals to detect remote electromagnetic stimuli which appear to be well shielded against detection.

This includes a certain class of apparent coupling between remote electromagnetic (strobelight) stimuli and the human nervous system as detected by the measurement of variations in the subject's electroencephalogram (EEG), when overt responses (e.g., verbal reports) provide no evidence of such registration.

In this unsolicited proposal SRI proposes to undertake a one-month EEG research program to investigate the abilities and characteristics, with regard to remote EM source detection, of an individual whose services will be made available by the client.

II BACKGROUND

In a number of laboratories evidenee has been obtained indicating the existence of an as-yet-unidentified channel wherein information is observed to couple from remote electromagnetic stimuli to the human nervous system as indicated by physiological response, even though overt responses such as verbalizations or key presses provide no evidence for such information transfer. Physiological measures have included plethysmographic response[1] and EEG activity.[2,3] Kamiya, Lindsley, Pribram, Silverman, Walter, and others have suggested that a whole range of EEG responses such as evoked potentials (EPs), spontaneous EEG, and the contingent negative variation (CNV) might be sensitive indicators of the detection of remote stimuli not mediated by usual sensory processes.[4]

A pilot study was therefore undertaken at SRI to determine whether EEG activity could be used as a reliable indicator of information transmission between an isolated subject and a remote stimulus. Following the earlier work by others, we assumed that perception could be indicated by such a measure even in the absence of verbal or other overt indicators.

With regard to choice of stimulus, it should be noted that Silverman and Buchsbaum attempted, without success, to detect EP changes in a subject in response to a single stroboscopic flash stimulus observed by another subject.[5] Kamiya suggested that because of the unknown temporal characteristics of the information channel, it might be more appropriate to use repetitive bursts of light to increase the probability of detecting information transfer.[6] Therefore, in our study we chose to use repetitive light bursts as stimuli. The results, described below, have been reported in the open literature under the title "Information Transfer Under Conditions of Sensory Shielding," by R. Targ and H. Puthoff, Nature 252, 18 October 1974, and reprinted in the IEEE Communications 13, January, 1975.

In the design of the study it was assumed that the application of remote stimuli would result in responses similar to those obtained under conditions of direct stimulation. For example, when normal subjects are stimulated with a flashing light, their EEG typically shows a decrease in the amplitude of the resting rhythm and a driving of the brain waves at the frequency of the flashes.[7] We hypothesized that if we stimulated

one subject in this manner (a putative sender), the EEG of another subject in a remote room with no flash present (a receiver), might show changes in alpha (9-11 Hz) activity, and possibly EEG driving similar to that of the sender, either by means of coupling to the sender's EEG, or by coupling directly to the stimulus.

We informed our subject that at certain times a light was to be flashed in a sender's eyes in a distant room, and if the subject perceived that event, consciously or unconsciously, it might be evident from changes in his EEG output. The receiver was seated in a visually opaque, acoustically and electrically shielded double-walled steel room shown in Figure 1. The sender was seated in a room about 7 m from the receiver.

We initially worked with four female and two male volunteer subjects. These were designated "receivers." The senders were either other subjects or the experimenters. We decided beforehand to run one or two sessions of 36 trials each with each subject in this selection procedure, and to do a more extensive study with any subject whose results were positive.

A Grass PS-2 photostimulator placed about 1 m in front of the sender was used to present flash trains of 10 s duration. The receiver's EEG activity from the occipital region (Oz), referenced to linked mastoids, was amplified with a Grass 5P-1 preamplifier and associated driver amplifier with a bandpass of 1-120 Hz. The EEG data were recorded on magnetic tape with an Ampex SP 300 recorder.

On each trial, a tone burst of fixed frequency was presented to both sender and receiver and was followed in one second by either a 10 s train of flashes or a null flash interval presented to the sender. Thirty-six such trials were given in an experimental session, consisting of 12 null trials--no flashes following the tone--12 trials of flashes at 6 f.p.s. and 12 trials of flashes at 16 f.p.s., all randomly intermixed, determined by entries from a table of random numbers. Each of the trials generated an 11-s EEG epoch. The last 4 s of the epoch was selected for analysis to minimize the desynchronising action of the warning cue. This 4-s segment was subjected to Fourier analysis on a LINC 8 computer.

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FIGURE 1 SHIELDED ROOM USED FOR EEG EXPERIMENTS

Spectrum analyses gave no evidence of EEG driving in any receiver, although in control runs the receivers did exhibit driving when physically stimulated with the flashes. But of the six subjects studied initially, one subject (H.H.) showed a consistent alpha blocking effect. We therefore undertook further study with this subject.

Data from seven sets of 36 trials each were collected from this subject on three separate days. This comprises all the data collected to date with this subject under the test conditions described above. The alpha band was identified from average spectra, then scores of average power and peak power were obtained from individual trials and subjected to statistical analysis.

Of our six subjects, H.H. had by far the most monochromatic EEG spectrum. Figure 2 shows an overlay of the three averaged spectra from one of this subject's 36-trial runs, displaying changes in her alpha activity for the three stimulus conditions.

Mean values for the average power and peak power for each of the seven experimental sets are given in Table 1. The power measures were less in the 16 f.p.s. case than in the 0 f.p.s. in all seven peak power measures and in six out of seven average power measures. Note also the reduced effect in the case in which the subject was informed that no sender was present (Run 3). It seems that overall alpha production was reduced for this run in conjunction with the subject's expressed apprehension about conducting the experiment without a sender. This is in contrast to the case (Run 7) in which the subject was not informed.

Siegel's two-tailed t approximation to the nonparametric randomization test[8] was applied to the data from all sets, which included two sessions in which the sender was removed. Average power on trials associated with the occurrence of 16 f.p.s. was significantly less than when there were no flashes ($t = 2.09$, $d.f. = 118$, $P < 0.04$). The second measure, peak power, was also significantly less in the 16 f.p.s. conditions than in the null condition ($t = 2.16$, $d.f. = 118$, $P < 0.03$). The average response in the 6 f.p.s. condition was in the same direction as that associated with 16 f.p.s., but the effect was not statistically significant.

As part of the experimental protocol the subject was asked to indicate conscious assessment for each trial as to

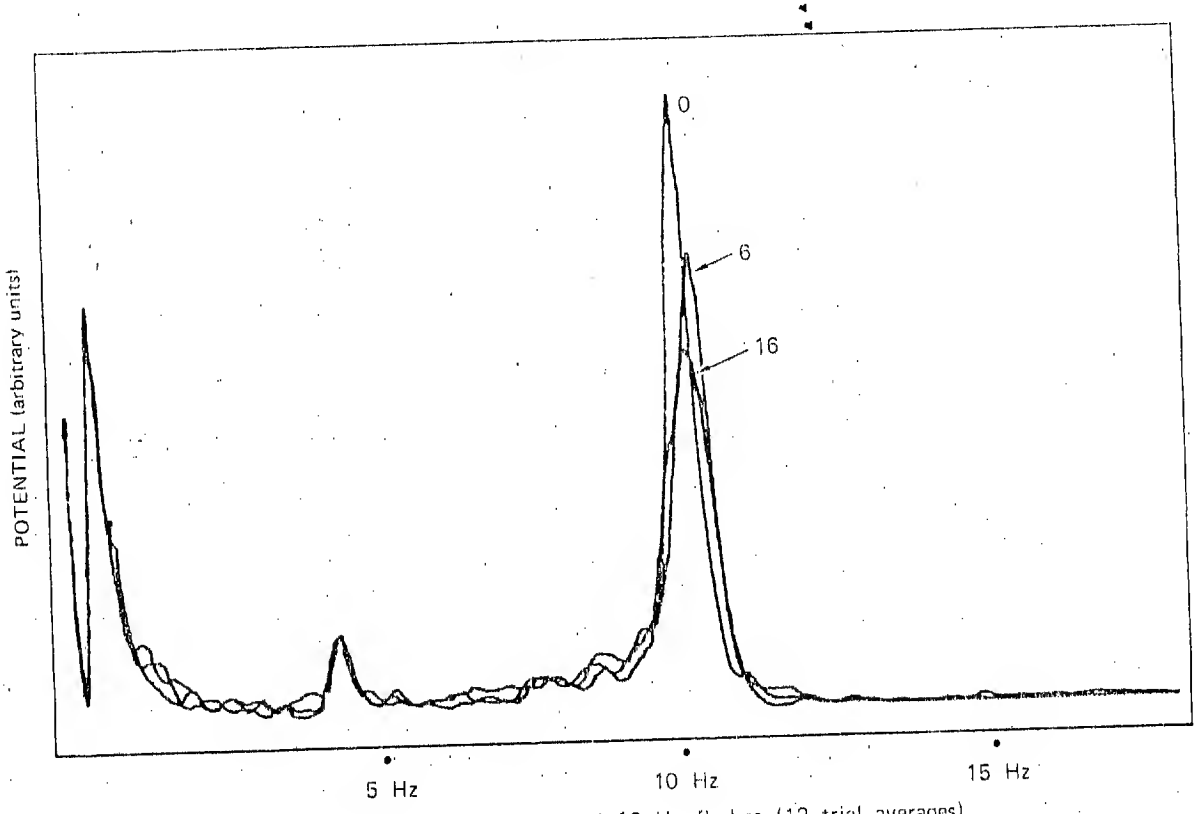

FIGURE 2 OCCIPITAL EEG FREQUENCY SPECTRA, 0 TO 20 Hz, OF ONE SUBJECT (H.H.) ACTING AS RECEIVER, SHOWING AMPLITUDE CHANGES IN THE 9-11 Hz BAND AS A FUNCTION OF STROBE FREQUENCY

Table 1

EEG DATA FOR H.H. SHOWING AVERAGE POWER AND PEAK POWER IN THE 9 - 11 Hz BAND, AS A FUNCTION OF FLASH FREQUENCY AND SENDER. EACH TABLE ENTRY IS AN AVERAGE OVER 12 TRIALS.

Sender \ Flash Frequency	Average Power 0	6	16	Peak Power 0	6	16
J.L.	94.8	84.1	76.8	357.7	329.2	289.6
R.T.	41.3	45.5	37.0	160.7	161.0	125.0
No Sender (Subject informed)	25.1	35.7	28.2	87.5	95.7	81.7
J.L.	54.2	55.3	44.8	191.4	170.5	149.3
J.L.	56.8	50.9	32.8	240.6	178.0	104.6
R.T.	39.8	24.9	30.3	145.2	74.2	122.1
No Sender (Subject not informed)	86.0	53.0	52.1	318.1	180.6	202.3
Averages	56.8	49.9	43.1	214.5	169.8	153.5
		-12%	-24% (P<.04)		-21%	-28% (P<.03)

which stimulus was generated. The guess was made known to the experimenter via one-way telegraphic communication. An analysis of these guesses has shown them to be at chance, indicating the absence of any supraliminal cueing, so arousal as evidenced by significant alpha blocking occurred only at the noncognitive level of awareness.

Several control procedures were undertaken to determine if these results were produced by system artifacts or by subtle cueing of the subject. Low level recordings were made from saline of 12 kΩ resistance in place of the subject, with and without the introduction of 10 Hz, 50 μV signals from a battery-operated generator. The standard experimental protocol was adhered to and spectral analysis of the results were carried out. There was no evidence in the spectra of activity associated with the flash frequencies, and the 10 Hz signal was not perturbed by the remote occurrence flicker.

In another control procedure a five foot pair of leads was draped across the subject's chair (subject absent). The leads were connected to a Grass P-5 amplifier via its high impedance input probe. The bandwidth was set 0.1 Hz to 30 KHz with a minimum gain of 200,000. The output of the amplifier was connected to one input of a C.A.T. 400C "averager." Two-second sweeps, triggered at onset of the tone, were taken once every 13 seconds for approximately two hours, for about 550 samples. No difference in noise level between the foreperiod and the onset of flicker was observed.

Finally, no sounds associated with flicker could be detected in the receiver's chamber.

From these experiments we conclude that

- A mechanism of extreme human perceptual sensitivity exists whereby the occurrence of remote electromagnetic stimuli can be detected by means of a perceptual modality not mediated by physical parameters as yet identified.
- The EEG procedure described appears to be a sensitive technique for detecting the occurrence of such information transfer, even in the absence of overt cognitive response.

we found evidence for EEG correlates (alpha reduction arousal response) of the detection of remote strobelight stimuli. The goal of such replication is the further delineation of the characteristics of the coupling mechanism under increasingly severe experimental conditions to completely circumscribe potential mundane mechanisms.

To accomplish the proposed research objectives, SRI will furnish the personnel and facilities required for the following efforts.

(1) Evidence for detection of remote strobelight stimuli as indicated by EEG correlates shall be investigated as discussed in Section II, with the addition of

a. Use of a self-contained battery-driven lamp with mechanical chopper to eliminate potential pickup and reradiation by a.c. power lines;

b. Use of increased distance between source and receiver (up to kilometers); and

(2) Independent experimentation and analysis on the part of consultant Dr. Robert Ornstein, Langley-Porter Neuropsychiatric Institute, University of California Medical Center, San Francisco, has been arranged to provide for intra-program checks and balances on protocols, data gathering, and analysis.

(3) Use of alternative stimuli (e.g., audio tones) to follow up previous work which suggests that physiological response to remote stimuli may constitute a class of non-specific arousal behavior in response to general stimuli.

(4) The exploratory nature of the program requires that 15 percent of the effort will be set aside to explore, with the client's cognizance, additional avenues of research that may surface as high-priority items during the course of the program.

SRI personnel shall undertake a research program of approximately one-month duration to investigate the abilities and characteristics of the designated individual to be supplied by the clients.

D. Reporting Schedule

A technical report detailing the tests and their results will be delivered 60 days after the commencement date of the contract.

Throughout the effort the investigators plan to remain in close telephone communication with the client.

IV QUALIFICATIONS OF SRI

SRI is an independent, nonprofit organization performing a broad spectrum of research under contract to business, industry, and government. The Institute, which was formerly affiliated with Stanford University, was founded in 1946. Its operations include the physical and life sciences, industrial and development economics, management systems, engineering systems, electronics and radio sciences, information science, urban and social systems, and various combinations of disciplines within these fields.

SRI has no endowment; payments by clients under research contracts and grants amount to approximately $80 million annually and are used to cover all operating costs. Such revenue also helps the Institute maintain the excellence of its research capabilities.

SRI's facilities include more than one million square feet of office and laboratory space and incorporate the most advanced scientific equipment, including unique instrumentation developed by the staff. The bulk of these facilities and most of the research staff are located at the Institute's headquarters in Menlo Park, California. Regional office locations include Washington, D.C.; New York City; Chicago; Houston; and Los Angeles.

Of SRI's total staff of almost 3000, approximately one-half are in professional and technical categories. Some 450 members of the professional staff have Ph.D. or equivalent degrees; 600 others have their Master's degree.

The project leader and other research personnel who would be active in the proposed work are members of the Electronics and Bioengineering Laboratory. This group currently occupies 40,000 square feet of laboratory space, divided into many separate laboratory rooms, technicians' work areas, a machine shop, and a computer room housing a LINC-8 and related terminals and equipment. In addition, a well-equipped computation center is available.

The Electronics and Bioengineering Laboratory employs a number of technicians and engineering assistants and has available electronics material and test equipment useful in the research proposed here. Especially suited to this work are a number of shielded rooms with various instrumentation available.

Finally, a backup team of psychologists and statisticians can be brought into the project on an internal consulting basis.

The proposed research will be conducted by SRI staff members within the Electronics and Bioengineering Laboratory under the management of its director, Mr. Earle Jones. The principal investigator will be Dr. Harold Puthoff. Mr. Russell Targ of the Electronics and Bioengineering Laboratory will be a co-investigator. Dr. Robert Ornstein of the Langley-Porter Neuropsychiatric Institute, University of California Medical Center, San Francisco, will act as consultant to this program.

In addition to the scientific personnel directly engaged in the research aspects of this investigation, Stanford Research Institute has established an internal technical advisory board. This board consists of several directors of SRI's operating divisions, together with our legal counsel, all under the chairmanship of the senior vice president for research. It is the function of this advisory board not only to make recommendations and approve or disapprove every new direction taken by the Institute in this research area, but also to monitor related ongoing projects as well.

EARLE D. JONES, DIRECTOR
ELECTRONICS AND BIOENGINEERING LABORATORY
INFORMATION SCIENCE AND ENGINEERING DIVISION

Specialized professional competence

- Analysis and design of electronic-optical systems, television, facsimile systems including bandwidth compression techniques, electrostatic printing, bioengineering instrumentation, and ultrasonics

Representative research assignments at SRI (since 1956)

- Director, Electronics and Bioengineering Laboratory; responsible for four research programs:
  - Optics: laser applications in oceanography, spectroscopy, and remote detection
  - Ultrasonics: real-time acoustic imaging for medical diagnostics and nondestructive testing
  - Electronics: electrostatic printing, television systems, and facsimile
  - Bioengineering: vision research instrumentation, prosthetic devices, and diagnostic medical instruments
- Manager, Electronics and Optics Group; project leader, Meteorological Satellite Facsimile System, color television cameras
- Research engineer; character generator design; electrostatic label printer; delay line scanning; high density photographic recording of television signals; frequency synthesizers; time domain equalizer; color facsimile; bandwidth compression

Academic background

- B.S. in electrical engineering (1956), Georgia Institute of Technology; M.S. in electrical engineering (1958), Stanford University; graduate work (1965-68) including statistics, communication theory, Fourier optics, and bioengineering

Publications and patents

- Many papers and reviews in the fields of character generators, circuitry, color television cameras, bandwidth compression, television recording, and ultrasonic imaging
- Seven issued U.S. patents in character generators, frequency synthesizer, and electrostatics

Professional associations and honors

- American Physical Society
- Eta Kappa Nu; Phi Eta Sigma; Phi Kappa Phi; Tau Beta Pi

June 1974

HAROLD E. PUTHOFF, SENIOR RESEARCH ENGINEER
ELECTRONICS AND BIOENGINEERING LABORATORY
INFORMATION SCIENCE AND ENGINEERING DIVISION

Specialized professional competence

- Tunable laser research and development; quantum electronics; biofeedback and biomeasurement research; "paranormal" perception

Representative research assignments at SRI

- Development of tunable ultraviolet laser source for pollution studies and medical research
- Development of high-power tunable infrared laser source (50-250 microns) for materials research
- Assessment of potential of fiber optics and lasers for use in optical computers
- Development of biofeedback monitors (GSR) for use in educational computers and other man-machine links
- Research and development of biofield measurements
- Investigation of "paranormal" perceptual abilities

Other professional experience

- Research associate, Hansen Laboratories of Physics and lecturer, Department of Electrical Engineering, Stanford University: teaching, textbook author, and research supervisor of Ph.D. candidates in the area of lasers and nonlinear optics
- Consultant on applications of lasers to industrial and medical problems and research assistant, Stanford University
- Lieutenant, USNR: in-house research and contract monitoring on DoD (NSA) contracts concerned with the development of ultra high-speed (GHz) computers
- Research engineer, Sperry Electronic Tube Division and Sperry fellow, University of Florida: design and testing of electron beam focusing systems for use in microwave tubes

Academic background

- B.E.E. (1958) and M.S.E. (1960), University of Florida; Ph.D. in electrical engineering (1967), Stanford University

Publications and patents

- Coauthor of textbook, *Fundamentals of Quantum Electronics* (Wiley); three reference book contributions; twenty-five papers in professional journals; seventeen national symposium papers; numerous technical reports
- Two patents

Professional associations and honors

- American Association for the Advancement of Science; Institute of Electrical and Electronics Engineers; Phi Eta Sigma; Phi Kappa Phi; Sigma Tau; Sigma Xi

RUSSELL TARG, SENIOR RESEARCH PHYSICIST
ELECTRONICS AND BIOENGINEERING LABORATORY
INFORMATION SCIENCE AND ENGINEERING DIVISION

Specialized professional competence

- Development of new gas lasers; FM laser and supermode laser techniques; laser noise reduction; optical modulation and demodulation; experiments in new gaseous laser media; microwave diagnostic techniques; microwave generation from plasmas

Professional experience

- Sylvania Corporation (1962-72); investigation of techniques for development of new gas lasers, making use of his research with compact, self-contained multi-kilowatt CO_2 lasers
- Technical Research Group (1959-62); experiments in new gaseous laser media
- Polytechnic Institute of Brooklyn; assisted in the establishment of the Electron Beam Laboratory
- Sperry Gyroscope Company, Electron Tube Division (1956-59); experimental work in microwave generation from plasmas; early work in the technology of ultrahigh-vacuum and ion-pump design

Academic background

- B.S. in physics (1954), Queens College, New York; graduate work in physics (1954-56), Columbia University, New York

Publications and inventions

- Author of "Optical Heterodyne Detection of Microwave-Modulated Light," *Proc. IEEE* (1964); coauthor of numerous articles on lasers and plasma oscillations
- Invention of the tunable plasma oscillator at microwave frequencies

Professional associations and honors

- IEEE; American Physical Society; The Optical Society of America
- Awarded the position of research associate with the Polytechnic Institute of Brooklyn

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