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## **COMMUNICATION SYSTEM**

Revision 1.0

Last Updated: April 03, 2004

### **KEYWORDS**

Phonoelectric, Logic Gates, VLSI, Moore's Law, Cellular phone service areas, Electromagnetic field, Electrostatic, Acoustic Heterodyne, Optical Heterodyne, Microtremors, Voice Stress Analyzer, Infinity Polygraph, Emerging Technologies, Technology Proliferation, Privacy

### **ABSTRACT: Bi-directional (control/command to personnel) communication system.**

Funding is requested to begin initial research to prove a concept for a new theatre communications system that is designed to better integrate communications with human (organic) systems.

Research communications technologies available or in development that can directly stimulate theatre personnel's anatomy (neuroscience) to reduce or eliminate the need for physical communications devices (on the part of personnel). [Deliverable Product: develop list of patents and other research (unclassified) projects underway in relation to this area. Given the author's current security clearance, this will be confined to unclassified technologies in the public domain.]

The basic concept of the system can be demonstrated in a stadium, where the Command and Control (C2) personnel speak to the personnel, and the personnel respond verbally.

At the most rudimentary level, this is accomplished by C2 yelling to the target. This was reduced decades ago using ear speakers (e.g. Walkman) and small portable receivers at the target and C2 despatching with transmitters. Simple as this seems, this evolution offered an order of magnitude increase in technology and use. This project attempts to perform a VLSI-type reduction to that concept, whereby the C2 personnel can use other remote technologies to communicate to, and receive responses from, theatre personnel, with no physical communications devices required on the part of the target.

Funding will help research to demonstrate the conceptual use of above system. The information age, urban warfare and terrorism have shown new theatres where conflicts can take place (RAND: MR-880-OSD/RC). [Deliverable Product: general diagrams of concept]

Demonstrate the broader issues raised by application of the above system: [Deliverable Product: Counter-proliferation of technologies, countermeasures, search Human Rights and Privacy laws and resources for corollary issues].

This project offers a glimpse of the future possibilities of communications technologies. It offers to explore existing and emerging technologies, in conjunction with basic human cognitive abilities in an effort to develop a new communications system.

This project will broaden understanding at various, multifaceted levels. The introduction of a remote communications system with little or no equipment on the part of theatre personnel offers stimulating new possibilities for a host of other security or defense issues.

Funding might very well contribute to a pre-eminence on the part of the sponsor, as practicable applications of said technology are immense (e.g. Remote intelligence gathering, covert / overt monitoring, etc.).

By combining a stimulating idea, with possible existing / emerging technologies, and broader issues like human rights, privacy and personal safety, this project offers the defense establishment a wealth of 'starting points' for future analysis.

Urban and other non-traditional warfare theatres make civilian areas targets. This project raises many issues: personal privacy (communications recipients), public safety. By provoking the response of organizations (Office of the Privacy Commissioner, Human Rights Commissioner), then a healthy debate on the merits and restrictions for said technologies will ensue.

## **TECHNOLOGY PRINCIPLES**

### **Phonoelectric**

Moving Magnet & Moving Coil Technologies (circa 1900s):

"For pickups deal with motions that can be measured only in hundreds of thousandths of an inch, and with electrical signals as small as a few one-thousandths of a volt-and many of them at once."  
(<http://www.enjoythemusic.com/cartridgehistory.htm>)

Recall that a phono cartridge merely transforms the analogue signal (created from vibrations of the record grooves / stylus) through moving coil / magnet to create an electrical signal (small MICROVOLT). It takes an amplifier to bring the signal to usable levels. Human beings produce vibrations of much higher levels than those retraced by a stylus on a record groove. It is sensible that similar technology can be applied to human "grooves" for eavesdropping techniques. The added benefit is our natural disinclination to acknowledge such responses, and said technologies as science fiction. Rather, they are science FACT.

## Logic Gates

The simplest Integrated Circuits can be found on common appliances dating back a century, for example a sound amplifier. At its simplest, such a circuit is designed to take an incoming signal and increase its level to one usable by other devices. As radiophonic recording and reproduction technologies advanced through the early part of the 20th century, we see gradually more complex "gating" on circuits. Today's stereo amplifier circuit board will be basically the same as one designed 50 years earlier, but somewhat more unrecognizable due to the increased complexity. This complexity is mostly due to the increase in circuits on the board, not from fundamentally different components.

## VLSI

Moore's Law (from <http://www.dictionary.com>):

<architecture> /morz law/ The observation, made in 1965 by [Intel </search?q=Intel>](#) co-founder [Gordon Moore </search?q=Gordon%20Moore>](#) while preparing a speech, that each new memory [integrated circuit </search?q=integrated%20circuit>](#) contained roughly twice as much capacity as its predecessor, and each chip was released within 18-24 months of the previous chip. If this trend continued, he reasoned, computing power would rise exponentially with time.

## Cellular phone service areas

The concept of service areas can be mapped to a military theatre directly. Communications service to the theatre will be limited by the technologies employed to ensure communications.

## Electromagnetic field

By creating a blanket EM field, either about a local target, or in a target area (theatre), we build a base upon which the communications system can be enabled (layered, or piggybacked). Based on the piezoelectric principle, we will use technologies to observe disturbances from the baseline (of the target, or theatre) to accumulate data.

We need to research the possible types of EM fields that may be easily created in a theatre.  
Issues: Triangulation, Noise and other Interference

## Electrostatic

adj : concerned with or producing or caused by static electricity; "an electrostatic generator produces high-voltage static electricity" (<http://www.dictionary.com>)

Electrostatic speaker technology recreates sound waves (vibrations) by a push-pull principle, usually on a charged mylar sheet (also known as a membrane). The human ear has a similar membrane known as the "eardrum":

"The thin, semitransparent, oval-shaped membrane that separates the middle ear from the external ear. Also called **tympanic membrane, tympanum.**" (<http://www.dictionary.com>)

## **Infinity Polygraph**

Create a similar electric "current" in a human subject, based on the vibrations of blood / tongue / eye / etc. Using the same principles as phonograph pickup cartridges, attempt to make a human subject an analogue of the "record", and an EM field the parallel to a "pickup cartridge".

Note the human body runs on electricity. The heart is a muscle. Synapses and neurons respond to electrical stimuli. Static electricity is about us all day. Perhaps with some inducement, that electricity can be used to "spark" the target (Medical side effects might include nervous ticks).

1) Create an electromagnetic field about a human head / neck. (e.g. direct radio signal at say XXXHz to subject's head)

2) Aim a measuring device (e.g. laser) to the field and measure modulations to the "norm" / baseline reading: For example, using a baseline XXXHz signal, use a laser to measure modulations - vibrations away from the baseline. Do these parallel the human voice of the subject "speaking" to one's self? Target the most sensitive portions of the anatomy: eye movements, vocal chords.

3) This might be as simple as amplitude modulation (say the words "one, two, three" to yourself) - try it out loud first, then more softly, then without opening your mouth. We tend to speak our thoughts as they are generated "in our head" - inevitably generating some muted vibrations in our throat or other areas or the head and neck - the difference is that we actively attempt to suppress "saying it out loud".

4) Measure modulations from the eye (Eye Process) or base of the neck (spinal cord), since these areas would generate the most sensible vibrations away from the norm / baseline reading - thereby causing the effect of intense stiffness (need to crack your back). Other target locations would be the main blood vessel feeding into the ear. (Ear Process)

5) Send (speaking) technology might derive from the reverse ability to generate vibrations to the EM field, paralleling electrostatic speaker technology.

RF signals pass through everything (a type of omnipresence) unless active countermeasures are invoked. In cases where the subject is out of a direct laser measuring device, perhaps send a second signal at a matching harmonic above the XXXHz or whatever baseline RF signal. Would use of a third RF signal successfully accomplish what the laser would (determine the distortion / modulation between the upper and lower harmonic)?

Recall that in our daily lives we almost all use RF filtering technologies - for example speakers. If you have a speaker with 1 "tweeter" and 1 "woofer", that speaker will have a "cross-over filter" - a (relatively) simple mechanical device that separates an audio signal above or below a certain frequency.

## **Acoustic Heterodyne**

Theremin (1920s technology) - Use current technology to recreate a theremin field about the head of the target. (Medical side effect might include a high pitched "hiss" or "whine" in the ears of a target. Current technology (lasers, etc.) can better pick up distortions to the field (look at voice stress analyzers for microtremors) - so the concept of eavesdropping remotely to a target's microtremors with such technology is very possible.

## **Optical Heterodyne**

## **Microtremors - Voice Stress Analyzer**

### **INTRODUCTORY DELIVERABLES**

- Develop list of patents and other research (unclassified) projects underway in relation to this area. Tentatively, this will be confined to unclassified technologies in the public domain.
- General diagrams of concept
- Proposed technology demonstration testing and research
- Search Human Rights and Privacy Acts and resources for corollary issues
- Explore Counter-proliferation of technologies, countermeasures

### **FUNDING REQUIREMENTS AND TIMEFRAMES:**

**(Estimated time frame: three months) - Concept development / proof of viability (Est. three months) - required funding \$50,000 (Fifty Thousand dollars)**

From time funding released:

0 - 45 days - preparation of contents, initial draft;

45 - 90 days - submission of project with references (peer review or comments would be beneficial, if so, another 45 day cycle to refine content further would be acceptable.)

**(Estimated time frame: Eighteen months - Two years) - Proof of technology, Laboratory demonstration - Cost to be determined**

**(Estimated time frame: Eighteen months - Two years) - Commercial implementation / Production development - Cost to be determined**

### **REFERENCES**

Arquilla, John and David Ronfeldt, eds. 1997. In Athena's Camp: Preparing for Conflict in the Information Age (RAND: MR-880-OSD/RC)