

University of Essex

# Short-term exposure to TETRA base stations

*Electromagnetics & Health Research  
Laboratory*

University of Essex

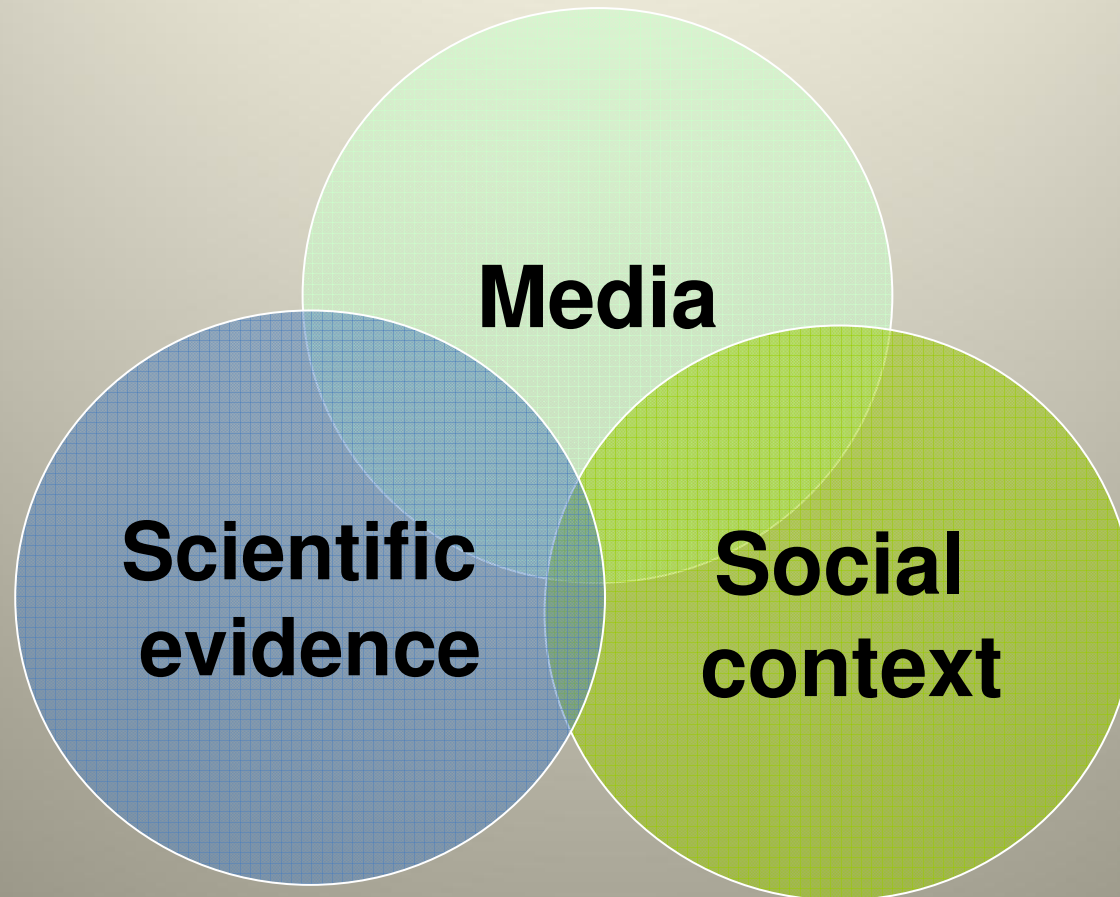
# Overview

- Why research into base station emissions is being conducted
- Aims and importance of this project
- The University of Essex research team
- Description of the testing process
- Results that will be reported

# Why research possible health effects from base stations?

- 2 issues:
  - Public concern
  - Small subgroup in the population report symptoms

# Public concern



# Media

## **Mobile phones in brain scare**

July 16, 1998

“Government researchers have advised the public not to be alarmed by a report that mobile phones cause short-term memory loss and sudden confusion”

Source: BBC

# Social context



# Scientific evidence: Steward Report (2000)

- Sir William Stewart (Independent Expert Group on Mobile Phones)
- Concluded that
  - Balance of evidence indicates that mobile phone technology not harmful, but...
  - Wireless technology has developed very rapidly compared to the peer-reviewed research into its safety.
- Therefore precautionary approach recommended

# Electromagnetic Hypersensitivity (EHS)

“Since the TETRA mast has been active, I have had sleep problems, fatigue, headaches, eye aches, ear aches, depression, dry skin and very bad psoriasis on my scalp...”



# Electromagnetic Hypersensitivity

- Substantial body of scientific evidence indicates *no* causal link between ambient EMFs and symptoms, therefore...
- Not a recognised medical condition
- WHO recently (2006) relabelled EHS as:  
“Idiopathic Environmental Intolerance with attribution to Electromagnetic fields” (IEI-EMF)
- The Swedish Association For the Electrically and VDT Injured
- Action groups: continued pressure to investigate the possibility of non-thermal effects of EMF radiation

# Aims of the study

- To determine whether EHS symptoms are related to exposure to radio frequency electromagnetic fields (RF-EMF) as produced by a TETRA signal, and
- To determine whether RF-EMF affect people who do not report sensitivity to electromagnetic fields.

# Method

- A double-blind provocation study
- Participants:
  - 132 EHS and
  - 132 control
- Exposure conditions:
  - TETRA signal (420MHz @ 10mW/m<sup>2</sup>)
  - SHAM

# Importance

- Scientifically valid evidence on the effect of RF-EMF on physiological, psychological and health functioning for people with perceived sensitivity to RF-EMF and for matched control participants.
- Evidence for the preparation of appropriate advice to be given to the general public on the possible effects of exposure to electromagnetic emissions from TETRA base stations.

# Funding

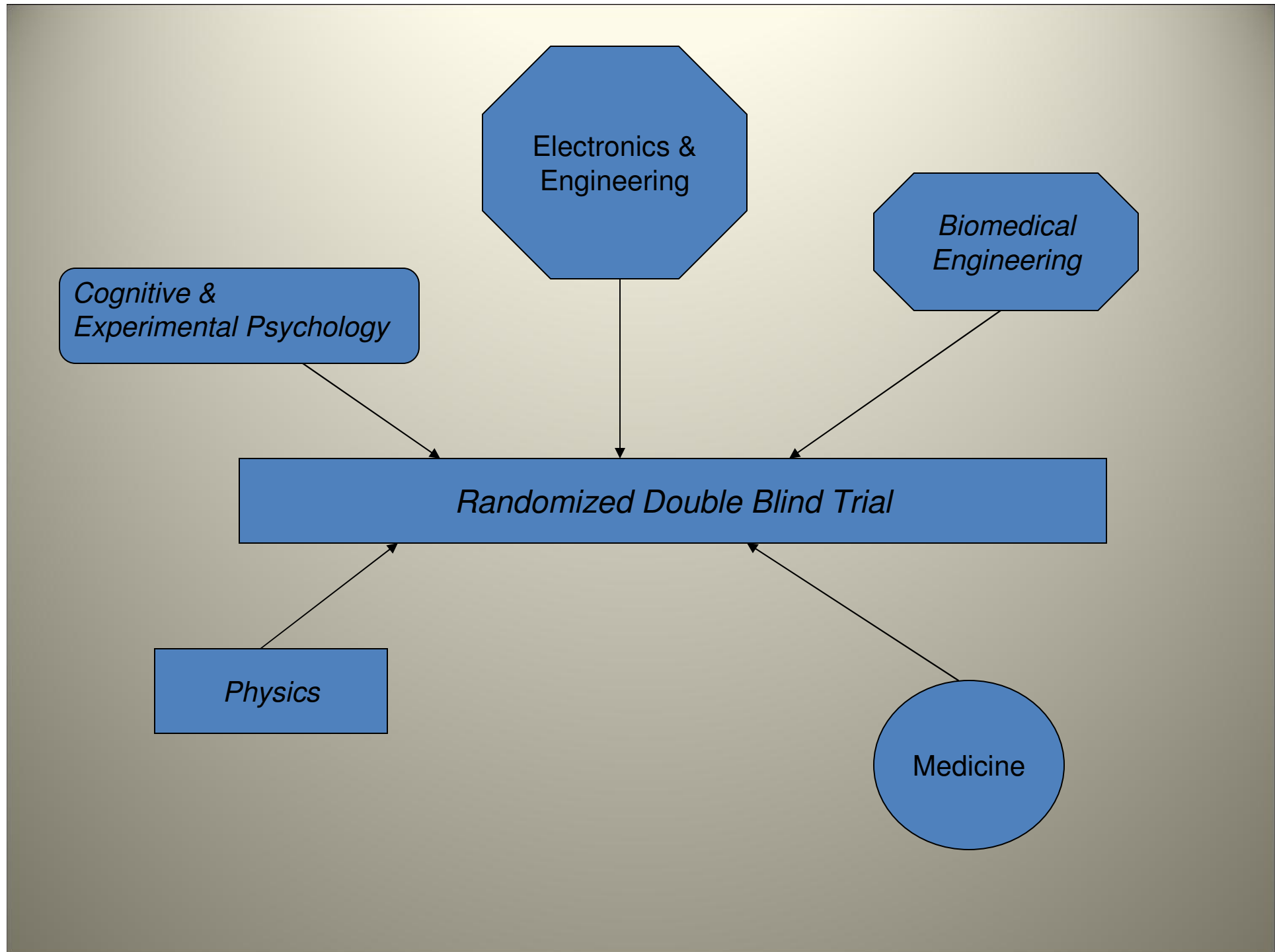
- The Mobile Telecommunications and Health Research programme ([www.mthr.org.uk](http://www.mthr.org.uk)) has provided the funding for this study.

# The Electromagnetics and Health Research Laboratory

- We established a screened laboratory specifically for electromagnetic and health research at the University of Essex.
- The laboratory was supplied by the National Physical Laboratory.
- A base station capable of transmitting a TETRA signal was developed and installed by Red-M.

# Multidisciplinary Team

- An important aspect of our team is that we have expertise across several disciplines.
- Another important point is that we are *independent* of both industry and action groups, etc.





# The Research Team

- Elaine Fox *Experimental Psychologist*
- Riccardo Russo *Experimental Psychologist*
- Denise Wallace *Experimental Psychologist*
- Anna Ridgewell *Experimental Psychologist*
- Kelly Garner *Experimental Psychologist*
- Stuart Walker *Electrical Engineer*
- Sandra Dudley-McEvoy *Physicist*
- Francisco Sepulveda *Biomedical Engineer*
- Sithu Maung *Medical Doctor*
- Roger Deeble *Electronic Technician*
- Red-M *Development of Exposure Simulation*

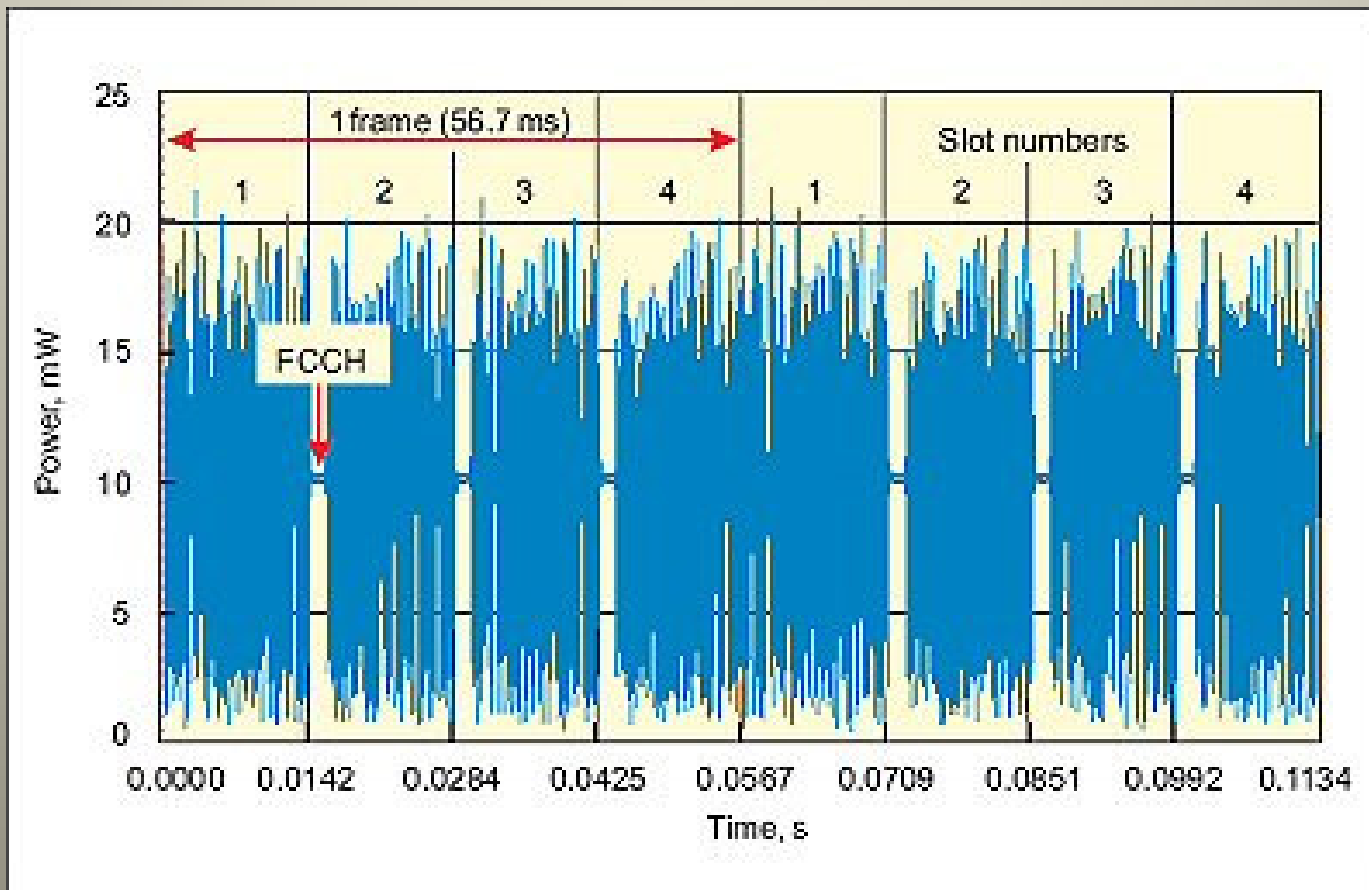
# Characteristics of the signal

- The signal:
  - The version in use for this project is Release 1 (ETSI spec 390 392-2).
  - The signal comprises a TDMA frame structure according to the ETSI standard using a high spec signal generator from Rohde&Schwarz.
  - 4 timeslots per frame on a single carrier.
  - Frequency is 420MHz.
  - Properties of the signal are modeled on Airwave TETRA system which is used by emergency services.

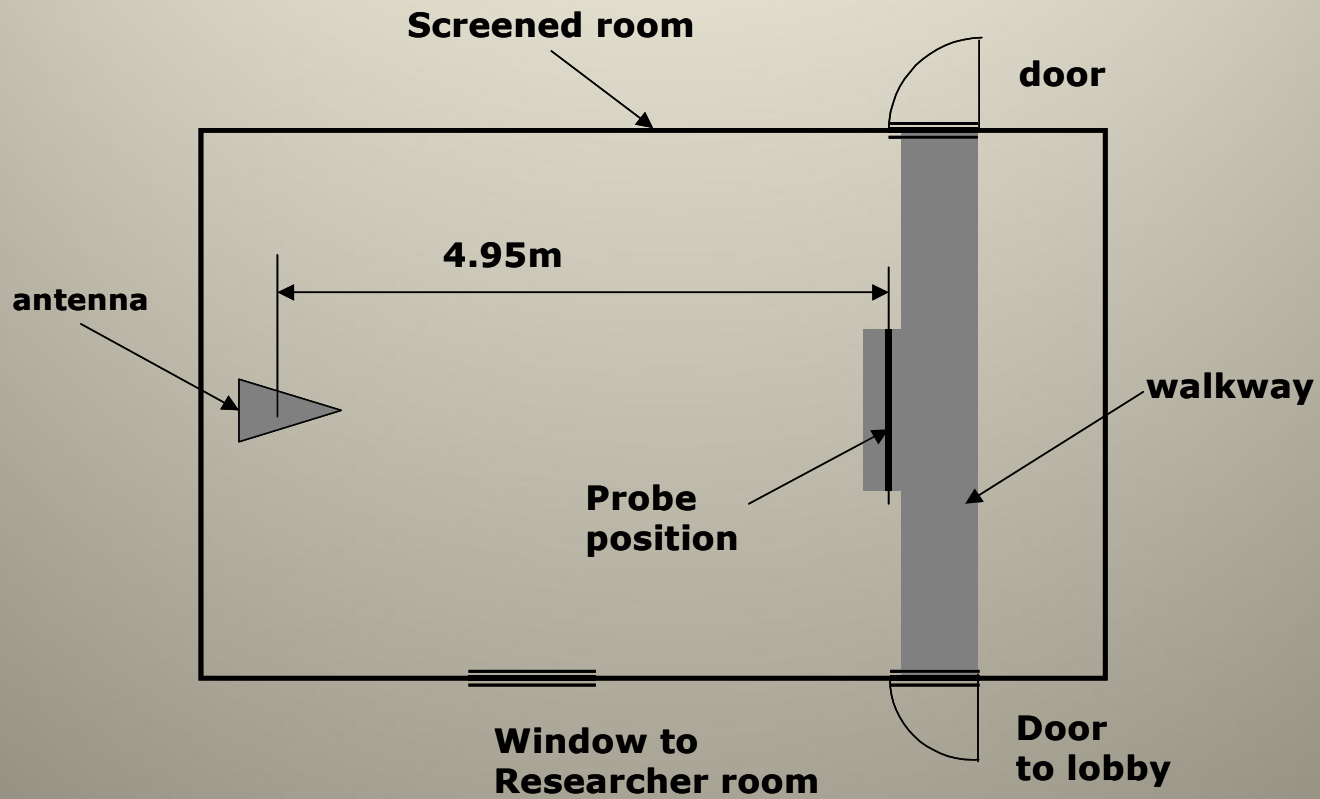
# Characteristics of the signal cont.

- Waveform:
  - There is a marked difference in the waveform depending on whether or not traffic is carried by the transmission due to the presence/absence of frequency correction in the bursts (FCCH).
  - Frequency Correction Channel (FCCH) is only present under 'no traffic' conditions.
  - A ratio of timeslot occupancy of 50:50 was therefore applied to enable an equal balance of the two states for the purposes of the study.

# TETRA BASE STATION WAVEFORM



# Testing room plan



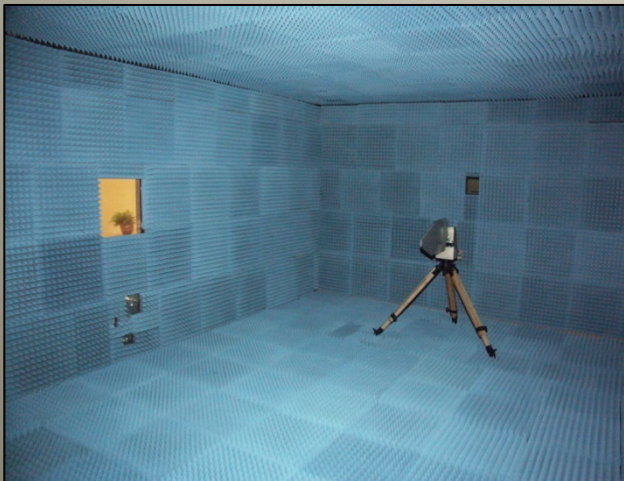
# The Electromagnetics and Health Laboratory



Reception and testing rooms lined with metallic fabric.



In addition to the metallic fabric, the testing room has been fitted with a pyramid shaped absorber which adds extra shielding and allows us to create a uniform electromagnetic field in the testing area.



Antenna and screened window in the testing room.



The reception room.

# Study Design

- Data is collected over 3 sessions.
- Session 1 is an open-provocation session.
- Sessions 2 and 3 are double-blind tests.

# Session 1 protocol

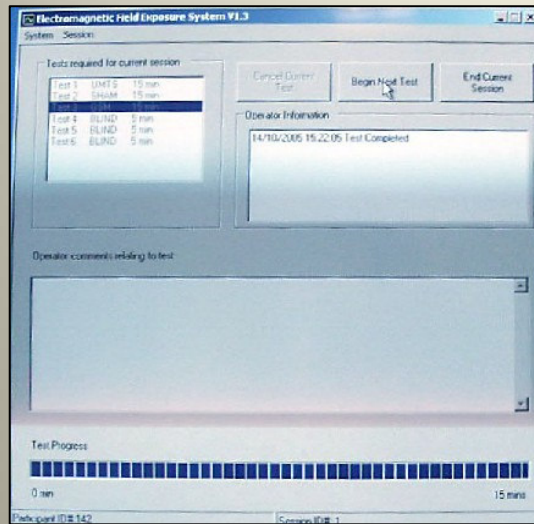
- Background information taken for each participant:
  - A brief medical history
  - Paper and pencil tests measuring psychological indices
  - Pattern-glare test
  - Verbal short-term memory test



# Session 1 protocol cont.

- Open provocation test:
  - 15 minute exposure to TETRA and 15 minute exposure to SHAM separated by a 2-minute wash-out period.
  - During each 15 minute exposure participants report how they are feeling at 5-minute intervals.
  - Baseline tests are administered for concentration and for short-term memory directly thereafter.

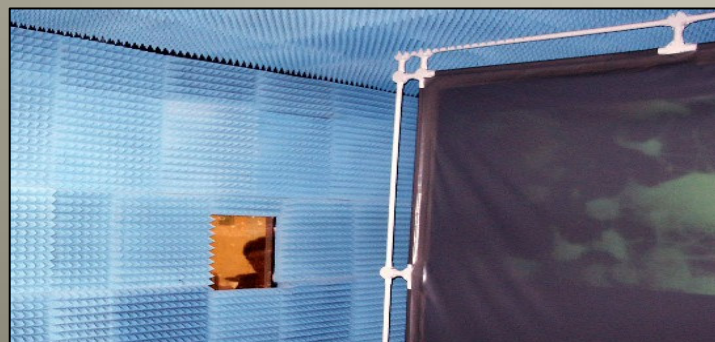
# Testing in progress



An example of the computer running a Session 1.



Participant ready to be tested



Screen in the testing room and window through to experimenter's room.



Participant reporting how they are feeling.

# Session 1 protocol cont.

- Physiological indices are also taken whilst exposure conditions and cognitive tests are underway.
  - Blood pressure (blood volume pulse)
  - Heart Rate
  - Skin conductance



The cuff on the middle finger records blood volume pulse and heart rate and the cuffs on the index and ring fingers record skin conductance

# Session 1 protocol cont.

- Collectively these physiological measures provide data for autonomic nervous system activity – more specifically, stress response.

# Session 1 protocol cont.

- After the open provocation test is complete we conduct a quick double-blind test to establish if participants can tell when the mast is on and when it is off.
- This test comprises four 5-minute exposures each separated by 2 minutes of wash-out. On two occasions the mast is 'ON' and on two occasions it is 'OFF' but neither participants nor researchers know the order of exposure conditions.

# Session 2 – 3 protocol

- Each session follows the same protocol:
  - 50-minute exposure.
  - Only one exposure condition is administered.
  - Cognitive tasks administered as in Session 1.
  - Participants are asked to judge whether the mast has been on over the 50-minute period they have just experienced.

# Session 2 – 3 protocol cont.

- We also measure the effects of mental pressure on cognitive ability by varying mental load over the exposure period.
- Last drop hypothesis

# Session 2 – 3 protocol cont.

- We administer two mental load conditions over the first 40 minutes of the exposure period:
  - For 20 minutes the participant relaxes, watching the BBC 'Planet Earth' movie and reporting how they feel at 5-minute intervals.
  - For 20 minutes the participant is put under mental strain by engaging in a mental arithmetic and memory task and reporting how they feel at 5-minute intervals.



# Session 2 – 3 protocol cont.

- After participants complete their session they go back into the reception room for debriefing and are also given a set of follow-up questionnaires to complete and return.
- The follow-ups provide data that track symptom patterns over a 6-day period after testing.

# Results to report

- Can people detect electromagnetic signals?
- Does short-term exposure to TETRA base-station signals affect physiological responses?
- Does short-term exposure to TETRA base-station signals affect subjective well-being?
- Does short-term exposure to TETRA base-station signals affect total number of symptoms experienced?

THANK YOU