

# *Mag-03 used to Measure ELF Magnetic Field Emissions from Mobile Phones*

## Objectives

To measure ELF (extremely low frequency) magnetic fields produced by mobile telephone handsets.

## Instrumentation

- Mag-03MC three-axis magnetic field sensor

## Applications

Primary application is in health studies, investigating health concerns associated with the use of mobile phones.

## Background

In this context a magnetic field < 10kHz is classified as extremely low frequency (ELF). There have been concerns about the safety of mobile phones due to the increased magnetic field exposure to the brain. There is a guideline level to which members of the public should not be exposed.

The Mag-03MC is used to measure the total peak magnetic flux density and the static magnetic flux density from mobile handsets. The handsets' microwave transmission cycle follows industrially set protocols. Transmission occurs within the cycle during at least one of a series of time slots. The intermittent behaviour creates a time varying power demand on the battery, modulating its

electric current and hence producing a varying magnetic field.

## Method

Experiments are carried out to measure the fields produced for two types of mobile network protocol: GSM (Global System for Mobile communication) and TETRA (Terrestrial Trunked Radio) handsets. The modulating frequencies for these two protocols are 867Hz and 34Hz respectively. A Mag-03 is used due to its sensitivity and appropriate frequency response.

Four handsets are used, two of each system. To reduce noise and external fields the experiments are carried out in a set of Helmholtz Coils calibrated with a proton resonance magnetometer. The experimental set-up involves the end of the magnetometer being placed up against the handset as if the sensor is the user's ear. The phones are also moved to measure the drop in field strength with distance. Both DC and AC measurements are taken to determine peak magnetic flux density and the static magnetic flux density.

The GSM handsets are found to be within the recommended limits for the maximum peak flux density and the field strength dropped off sharply with distance.

1 Clarke R, Traceability for Mobile Telecommunications Health Research, Mobile Telecommunications and Health Research, 2003.

