

## New distributed remote measurement system for environmental noise

Environmental noise is a significant pollutant which is continually growing in importance throughout society, and increasingly, new legislation will require noise to be measured in a meaningful way. However, the ability to measure noise in a way that gives accurate, traceable data that can be trusted, is often constrained by the high cost and general availability of suitable instrumentation.

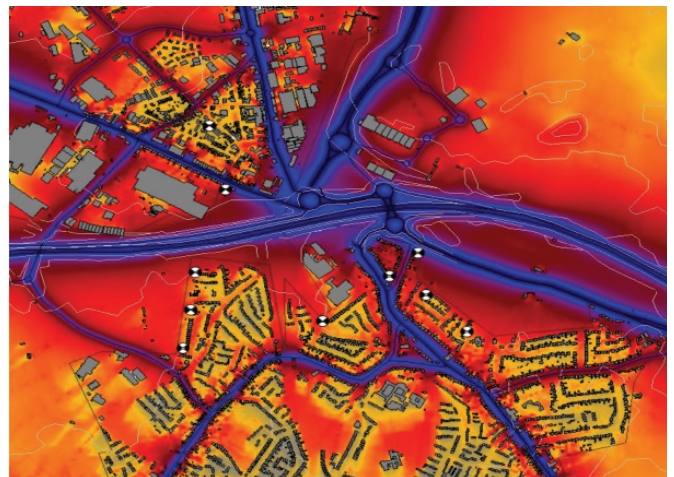
When the need is for noise data distributed over a wide area, or sampled over long periods of time, then measurements have in the past not been viable. As a result, alternative approaches such as modelling have been adopted, as has been demonstrated by recent noise mapping exercises.

However, modelling has severe inherent limitations, and can at best only provide an indicative value of noise data. Of necessity it must use a number of over-simplifying assumptions and can not easily indicate temporal characteristics or dependencies on, for example, meteorological conditions.

To address this problem, NPL is developing a new breed of acoustical measurement instrumentation that exploits the economic

benefits of MEMS microphones, and the convenience of wireless and GSM technologies. In collaboration with Castle Group, Hoare Lea Acoustics and QinetiQ, NPL is developing **DREAMSys** (Distributed Remote Environmental Array Monitoring SYstem).

**DREAMSys** consists of small, robust, weather-proofed instrumentation that enables noise data to be measured at a large number of points over an area. The data is stored locally, and periodically transmitted to a central database for further off-line processing.



*Example of a noise map produced by prediction*

## Benefits of DREAMSys include:

- ▶ Multi-point distributed measurements, giving the required degree of spatial resolution, thus enabling local variations to be assessed.
- ▶ MEMS and wireless technologies, leading to a highly competitive alternative to expensive, single-point measurement devices.
- ▶ Improvements to predictive noise maps through use of measurement data to constrain predictions.
- ▶ Potential for real time 'live' noise maps based on measurement as an alternative to modelling. Such monitoring systems could either be permanently installed at noise "hot-spots" like transport junctions, or deployed for periods of concern, such as during construction works.
- ▶ Flexible design, enabling system to be used for many other acoustic applications, such as machinery noise measurement, noise dose assessment or security systems.

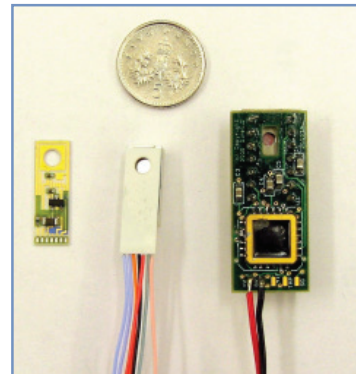
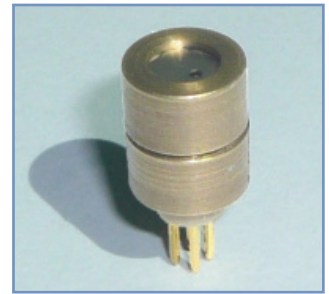
The development of **DREAMSys** allows NPL to offer new consultancy services to develop bespoke measurement-based solutions to problems that may previously have been unattainable.

## What are MEMS microphones?

Micro-Electro-Mechanical Systems technology uses techniques developed by the semiconductor industry to fabricate mechanical structures, often in silicon. Structures such as cantilevers, flexible diaphragm, springs and meshes can be produced in micro-sized packages, and combined with electrical components, to produce a myriad of devices.

MEMS technology is especially suited to the production of microphones, and the vast mobile phone market has driven the development of very low cost microphones, albeit not designed for measurement applications. NPL and QinetiQ are working together to develop MEMS-based measurement grade microphones for use in **DREAMSys**.

*NPL designed housing for a commercially available MEMS microphone normally used in mobile phones.*



*Prototype MEMS measurement microphones produced by QinetiQ according to NPL specifications.*

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