

## **Cardiomox: Cardiac screening**

Can a technology developed to locate submarines deep in the ocean be redeployed to improve detection of heart arrhythmias and blockages?

That was the question which confronted Isis Innovation in 2008 when it began working with the UK National Health Services' Institute for Innovation and Improvement to investigate the commercialization of this technology for medical applications. The cardiac scanning application of this magnetic detection technique was developed and already in limited clinical use in the Ukraine. The potential value of this technology was originally identified by the Science and Technology Center in the Ukraine, part of a joint program run by several western governments aimed at redirecting former soviet weapons scientists into commercial research and ventures. They encouraged Isis to investigate the possible commercialization of the science.

The original equipment developed in the Ukraine used superconducting quantum interference devices (SQUID's) to detect the contrast between a submarine and the earth's magnetic field. For the last 10 years, a Ukrainian scientist, Dr. Volodymyr Sosnytsky and research cardiologist, Dr. Ilyya Chaykovsky have been developing the hardware and software to make this scanning technique into a very valuable and practical clinical tool. Building on the basic SQUID detection science, they developed sophisticated electromagnetic filtering hardware and software to allow the system to be used in an ordinary, unshielded hospital room. Equally important, they developed unique algorithms to process the scan data and transform it into useful information on the electrical activity in the heart. The result is a system that has proved extremely effective for first level screening of patients at risk of heart disease, artery blockages and subtle heart arrhythmias often missed with the standard electrocardiogram (EKG) procedure.

EKG's measure only the total voltage of the heart's electrical impulses across and through the patient's chest wall, whereas the "Cardiomox" technology is capable of providing an image of the magnetic field generated from the heart's electric impulses. The movement of the electric charge through the heart can be mapped, showing the direction and intensity of the impulses at any point in time during the heart's cycle. Abnormalities such as ischemia, arrhythmias and other defects can be clearly detected and characterised. The procedure very quick, with the entire scan and image-processing taking approximately 12 minutes.

The system is completely non-invasive, requiring no radioactive dyes nor the insertion of catheters. The patient is not subjected any types of radiation or magnetic fields and the procedure is completely stress free.

An attempt at commercialisation earlier in the decade installed a number of prototype systems, conducted initial clinical trials and gained regulatory approvals. Some of these systems are still operating in routine clinical use for first-level cardiac screening in the Ukraine, China and South Korea. The equipment has been designed to be inexpensive to manufacture compared with other magnetocardiography equipment intended for research applications.

Isis Enterprise is assessing the intellectual property, developing a business plan with the aim of commercializing this promising imaging technique.

The next step will be to secure funding for further clinical trials in the UK, as well as equipment production.

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**Basic Diagnostic image: Current Density Vector Maps - Magnetocardiography displays the cardiac electric field in a healthy volunteer**

