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UNIQUE NEW X-TEK X-RAY SOURCE AT HEART OF BREAKTHROUGH IN BREAST CANCER TECHNOLOGY

Prof Robert Speller Develops Diffraction Enhanced Breast Imaging System

Tring, UK, 20 February 2003: A world leader in x-ray imaging technology, X-Tek Systems has developed a unique water-cooled, rotating anode, microfocal x-ray source for a pioneering new breast cancer detection system developed by Professor Robert Speller of University College London (UCL). This highly specialised x-ray source has been developed for Prof Speller's [Diffraction Enhanced Breast Imaging System](#) (DEBI) which uses both transmission and diffraction x-ray patterns to detect breast cancer at a much earlier stage than is possible using existing mammography.

Breast cancer is the most common female fatal cancer. The UK's nationwide breast screening programme already covers all women over the age of 50 and under 65 (the highest risk group) every two years. While this system has been successful in detecting the signs of cancer, conventional x-ray mammography does not normally actually show tumours. The denser breast tissue of women younger than 50 makes it much harder to detect these earlier signs of cancer. This is one of the reasons why screening programmes do not include younger women, because it is virtually impossible to achieve valuable results.

Interpretation of x-ray images by highly skilled and experienced personnel recognises visual indicators from which the presence of cancers can normally be implied. In order for a tumour itself to show up in a conventional x-ray image it has to be a minimum of 10mm in diameter, by which time it is likely that secondary cancers will have developed elsewhere in the body, adversely limiting the prospects for effective treatment. Any system which can detect the presence of much smaller tumours will considerably improve the benefits of detection of cancer at a much earlier stage.

Conventional x-ray images are transmission images. Around 10% of the x-rays transmitted pass straight through the body. By detecting these x-rays the transmission image gives information on the relative densities of different types of breast tissue, including potentiality cancerous tissue. However, especially in younger women, there is little difference in the density of healthy and cancerous breast tissue.

Professor Speller's research has concentrated on breast imaging using the 1-4% of x-rays which are diffracted (or scattered) by the breast. These x-rays can also be detected. At different energies the x-ray scatter generated by healthy breast tissue and tumours are very different. By contrasting the diffraction and

transmission patterns, it is possible to detect much smaller tumours than previously possible. In fact cancers as small as between 1 and 2mm in diameter can be detected, so this technique has the potential to detect tumours at a much earlier, life-saving stage. Designed specifically for this application, the X-Tek x-ray source is rated at 1500W continuous and can be focused down to just a 25µm square spot. The small focal spot of the X-Tek x-ray source (25µm) was essential for ensuring sufficient image magnification could be achieved to detect the smallest cancers.

In order to produce the type of x-rays required for this method, Prof. Speller first went to the Elettra Synchrotron Radiation Facility, Trieste, Italy. He was able to prove the principles of Spectral Selective Momentum Transfer Imaging (SSMTI) of breast tissue here, but needed to be able to reproduce the method using an x-ray source that is potentially practical for everyday medical applications. The X-Tek source was specifically developed to produce the same the “monochromatic” x-rays for a range of different, highly specific transmission energies that had initially proved the technique in Trieste.

Tumours that cannot be seen in conventional mammography can be imaged through a reversal of contrast using the diffraction-enhanced method. It is hoped that results achieved using the DEBI system will be published in a peer-review journal within the next year.

The DEBI system records stereoscopic transmission images on a large dpiX flat panel array with 127 micron pixels. Using a x4 magnification, excellent spatial resolution in the transmission images is achieved. The system also records diffraction signals using two different detector systems and a CCD camera for high spatial resolution information and an in-house designed Si-pad array for high sensitivity, low-resolution information.

About X-Tek Systems Ltd

X-Tek Systems is the premier manufacturer of real-time microfocus X-ray inspection equipment and high-resolution vacuum de-mountable X-ray sources. Its range of high quality microfocus X-ray systems offers high resolution, high-power, low maintenance and low cost of ownership. The X-Tek product range includes low cost bench-top systems, suitable for lightweight components, up to larger units with more complex functions, useful for inspecting electronic assemblies or engineering components in great detail.

X-Tek maintains a world-wide agent network and has a rapidly expanding international user base with installations throughout Asia, the USA and Western Europe. Major multinational companies using X-Tek equipment include AMD, Ericson, Ti, IBM, Motorola and ASAT.

X-Tek real-time microfocus X-ray inspection equipment is used in a wide range of applications including: Medical Research; Pharmaceutical; Food; Ceramics; Composites; Electronics; Semiconductor Packaging; Non Destructive Testing; Automotive; Aerospace; Nuclear; Construction, Defence and Security.

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**Note to editors: Photographs available on request from Mulberry Marketing Communications.
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