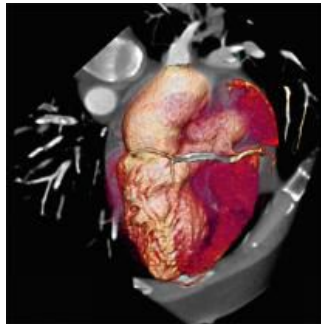

Innovative technology for computed tomography: higher-quality images at lower x-ray doses with the new Siemens Stellar Detector



Siemens Healthcare has developed a detector with a revolutionary new electronic design for its computed tomography (CT) scanners.

The Stellar Detector can transmit analogue data with minimal wiring, making it possible to digitise the measured signals with virtually no interference. The wiring used in traditional detector technology generates electronic noise that can diminish the quality of the medical images from low-intensity signals. The only way to reduce this noise would be to increase the radiation dose. Siemens has now succeeded in combining all the signal conversion electronics on a single chip. This is a critical breakthrough for enhanced CT image quality – at lower levels of radiation – and yet another demonstration of the innovative power of Siemens Healthcare and its “Agenda 2013” initiative.

The development of computed tomography (CT) is dominated by efforts to enhance the quality of the images and decrease the required doses of radiation. The detector – which, together with the x-ray tube, forms the scanner that is integrated into the ring-shaped gantry and rotates around the patient – is no less crucial. X-rays are absorbed by the body to varying degrees, depending on the type of scanned tissue. The detector measures this absorption and uses this information to create a digital signal.

Standard detector technology has very little potential for reducing doses and optimising images, as the signals have to pass through a complex wiring system several centimetres in length to reach the electronics that perform the analysis. This has a negative impact on the signal-to-electronic-noise ratio (SENR) – and ultimately on the image quality: the longer the wires, the greater the electronic noise. And the greater the electronic noise, the poorer the image quality. This is especially true at lower doses.

To reduce image noise, we had to minimise the signal wiring. The Siemens detector development team in Forchheim achieved this by combining all the analysis electronics on a single chip. The Stellar Detector is the first product to feature the newly designed electronics. The new detector can now convert the analogue signals from the photo diode to digital signals with almost no interference. The converted signals can then be processed digitally with no loss. This makes it possible to produce medical images with a noticeably higher SENR than before at the same radiation dose.

“The Stellar Detector reduces image noise by 20 to 30 percent compared to conventional detectors,” notes Prof. Dr. Jörg Hausleiter, director of the cardiac intensive care unit at the German Heart Centre in Munich. “This makes it possible for us to work with lower radiation in a broad spectrum of examinations – and the image quality has improved at the same time.”

Combined with the Somatom Definition Flash and Somatom Definition Edge high-end CT scanners, Stellar delivers extremely detailed images with a spatial resolution as fine as 0.30 millimeters that makes it possible for doctors to recognize even the finest vascular structures. The greater sensitivity of the Stellar Detector also helps doctors when they examine obese patients: the new detector provides diagnostically useful images despite much higher levels of x-ray absorption in larger body masses.

“The new detector is the first to deliver excellent images of even very obese patients with a body mass index over 35,” says Dr. Stefan Martinoff, director of the Department of Radiology and Nuclear Medicine at the German Heart Centre.

Siemens Healthcare is offering the Stellar Detector in its Somatom Definition Flash and Somatom Definition Edge CT scanners. All existing Somatom Definition Flash and Somatom Definition AS scanners can be upgraded to the new detector.

"Upgrading to the Stellar Detector lets us reduce the dose of all examinations by up to 30 percent," says PD Dr. Hatem Alkadhi, chief medical officer at the Department of Diagnostic and Interventional Radiology at the University Hospital in Zurich.

Launched in November 2011 by the Siemens Healthcare Sector, "Agenda 2013" is a two-year global initiative to further strengthen the Healthcare Sector's innovative power and competitiveness. Specific measures will be implemented in four fields of action: Innovation, Competitiveness, Regional Footprint, and People Development.

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Published on : Mon, 5 Nov 2012