More than 400 Dual Source installations worldwide
More than 100 peer-reviewed publications

- Faster than every beating heart – with 83 ms true temporal resolution and no need for beta-blockers, proven by more than 25 publications.
- Full cardiac detail at half the dose – down to 2.5 mSv average dose, proven by 5 publications.
- One-stop shop in Acute Care – fast diagnosis to save time, lives and money, proven by 4 publications.
- Beyond visualization with Dual Energy – with 10 released applications and Optimum Contrast, proven by 14 publications.
- etc.

More than 400 SOMATOM Definitions are in clinical use worldwide, not only for daily clinical routine, but also for cutting-edge research. Meanwhile, more than 100 peer-reviewed publications have been released, documenting Dual Source CT, focusing on DSCT´s unique strengths.

Dual Source CT on Scientific Center Stage

By Peter Seitz

Business Unit CT, Siemens Healthcare, Forchheim, Germany

Seldom does a new technology find its way to a leading role in the world of scientific publications within only a few months. But after Dual Source CT was announced at the RSNA 2005 and made available commercially in summer 2006, it took over center stage almost immediately. In the 2 years since then, more than 100 peer-reviewed articles have already been published. Dual Source CT virtually introduced the topic of Dual Energy CT into most major congresses – and scientific discussions regarding Cardiac CT were brought to a whole new level. This impressive success was crowned by the offer to devote an entire issue of the European Journal of Radiology on Dual Source CT, resulting in 12 new publications featured in the December 2008 issue.

DSCT in Cardiology

The foremost capability responsible for this development is, without doubt, the ability of Dual Source CT to utilize 2 X-ray tubes to achieve a true temporal resolution of 83 ms and thereby, for the first time, allowing robust cardiac imaging without beta-blockers. The clinical effect of this improvement has been best demonstrated by Achenbach et al[1] in a randomized study of 200 patients. 100 patients were examined using single source, 64-slice CT and the other 100 with Dual Source CT. Within both sub-groups around half of the patients received oral and intravenous beta-blockade for a target heart rate ≤ 60 beats/min, whereas the other half did not receive any pre-medication. Results confirmed a clear advantage of Dual Source CT, no matter if the analysis was performed per-patient, per-vessel or per-segment. In the case of single source CT, with beta-blockers 91-93% of all studies proved evaluable. Without beta-blockers this number dropped to 69-82%, depending on the analysis approach. On the other hand, imaging with or without beta-blockers didn't show a significant impact on the number of evaluable patients, vessels or segments when using Dual Source CT. In all cases results remained above 96%. First studies even suggest that Dual Source CT allows for robust diagnosis of significant stenosis in patients with atrial fibrillation[2,3], in the past a common rule-out criteria on single source CT.

But while the impact of DSCT on increased temporal resolution is unquestioned, the more robust cardiac CT imaging gets the more it is brought into the spotlight on the topic of radiation exposure. Recently a special focus has been put to the question: What dose values can be reached reliably with a low-dose approach such as a step-and-shoot mode?

In their study on 120 patients, Scheffel et al.[4] from the University of Zurich found that DSCT allows mean effective doses of 2.5 mSv, while 98% of all segments provided diagnostic image quality and 97% of significantly obstructed segments were classified correctly, compared with conventional coronary

angiography. While further improvements on dose reduction are clearly warranted, these results confirm that effective DSCT doses below average diagnostic catheter doses are becoming more and more common.

DSCT in Acute Care

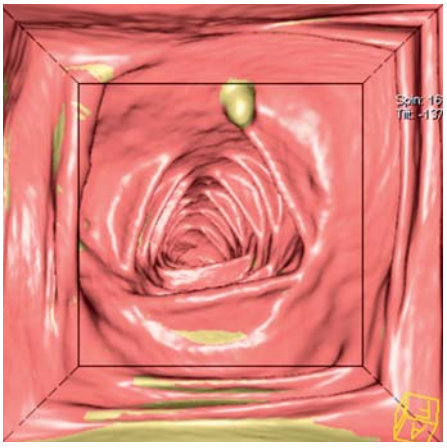
A completely different approach is taken by recent publications on DSCT in Acute Care, where, next to clinical effectiveness, economical aspects are considered increasingly important for the everyday question of evaluating patients with suspected acute coronary syndrome. Researchers from the University of Pennsylvania compared conventional approaches, e.g. serial cardiac markers as well as stress testing, with the outcome of an immediate CT coronary angiography[5]. While the immediate CTA approach was as safe and able to identify as many patients with coronary artery disease as the other approaches, it resulted in the lowest cost and shortest length of stay. Overall, an immediate CTA reduced average costs to $1,240 vs. $2,318 - $4,024. The average length of stay could be shortened to 8.1 hours vs. 20.9 – 30.3 hours for the other strategies. As the number of CT systems in dedicated emergency department environments is increasing, further studies with larger patient groups are under preparation.

DSCT and Dual Energy

Finally, a whole new field of research was opened with the introduction of DSCT Dual Energy, made possible by applying different energy spectra (of 80 kV and 140 kV) to the two X-ray tubes simultaneously. The results are two spiral data sets acquired simultaneously in a single scan providing diverse information that permits differentiation or characterization of the imaged tissue and material. Possible applications are, e.g. an accurate subtraction of bone in CTAs or iodine removal from liver scans to generate a virtual unenhanced image. A brand-new application, the visualization of iodine content in the myocardial blood-pool to diagnose perfusion defects, has just been evaluated by Ruzsics et al. from Medical University of South Carolina[6]. They evaluated this approach on 35 patients, and correlated the results with SPECT. Initial results are promising, proving 91% accuracy in comparison with SPECT (per-segment) for detecting any type of myocardial ischemia.
In the meanwhile, more than 400 Dual Source scanners have been installed worldwide, generating a rising number of publications on the cutting-edge of CT imaging.

Sources

1 Achenbach S et al. – JACC, VOL 1, NO. 2, Jan 2008.
2 Oncel D et al. – Radiology 2007 Dec; 245(3):703-11.
3 Wang Y et al. – Eur J Radiol Nov 2008.
4 Scheffel H et al. – Heart Jun 2008.
5 Chang AM et al. – ACADEMIC EMERGENCY MEDICINE 2008; 15:649-655.
6 Ruzsics B et al. – Eur Radiol 2008 June.



VC has been validated as a screening test for colorectal cancer and detection of large and medium-sized polyps.

First U.S. Payor Reimburses CT Colonography (CTC) for Screening

By Joachim Buck, PhD, *Business Unit CT, Siemens Healthcare, Forchheim, Germany*

According to the ACRIN* 6664 trial, CT Colonography (CTC) – respectively Virtual Colonoscopy (VC) – was comparable to the gold standard colonoscopy for screening intermediate and large-sized polyps. Based on these results, VC has been validated as a screening test for colorectal cancer and detection of large and medium-sized polyps. Results from other VC trials (IMPACT, Munich Colorectal Cancer Prevention Trial and Wisconsin Trial) have also shown positive results for VC. Thus, the American Cancer Society (ACS) recently added virtual colonoscopy to their new colorectal cancer screening guidelines. This decision is, for the first time, triggering reimbursement for colon cancer screening in the U.S. Colon Health Centers of America (CHC), a provider of VC services for gastroenterology specialists, has signed a contract with Blue Cross Blue Shield of Delaware (BCBSDE). This agreement represents the first major commercial payor in the United States to reimburse VC screening. BCBSDE has agreed to reimburse CHC of America's patent-pending, integrated colon screening model, followed by therapeutic colonoscopy for those with discovered polyps. They provide a single, bundled, episode-of-care payment 'per screening event'. The payor believes that it is essential to have the capability to provide same-day, same-prep therapeutic colonoscopy for patients who need it. This is the first step toward future reimbursements in the U.S.

*ACRIN (American College of Radiology Imagin Network).

The SOMATOM Definition AS 20-Slice Configuration

By Jan Chudzik, *Business Unit CT, Siemens Healthcare, Forchheim, Germany*

Since its introduction at RSNA 2007, the SOMATOM® Definition AS, the world's first adaptive scanner, has already become the fastest selling single source CT in Siemens history with 200 installations worldwide within the first months from market introduction. In its multiple configurations (40-, 64- and 128-slice), it describes another success story for Siemens Healthcare. At this year's RSNA, the Definition AS platform introduced a further expansion with its new 20-slice configuration attracting the interest of a wide range of healthcare facilities by providing easier and more economical access to the latest innovations of high-end CT. This enables a broad spectrum of clinical applications at a great price-performance ratio. And, with its full, onsite upgradeability, the 20-slice configuration is able to grow with clinical needs, allowing a continuous expansion of radiology offerings in the future, improving the services for referring physicians and patients. The new SOMATOM Definition AS 20-slice configuration, with its large 31 inch (78 cm) gantry bore, the optional 660 lbs (300 kg) patient weight capacity and its high scan speed, is designed perfectly for high patient throughput, even for obese patients. With this new SOMATOM Definition AS family member, clinicians have access to excellent image quality and clinical capabilities in a very affordable and compact unit, greatly improving patient care.

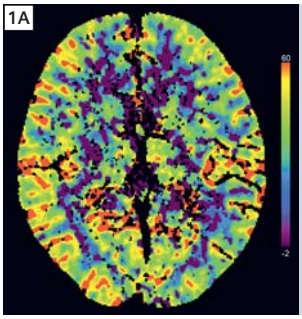
The new SOMATOM Definition AS 20-slice configuration

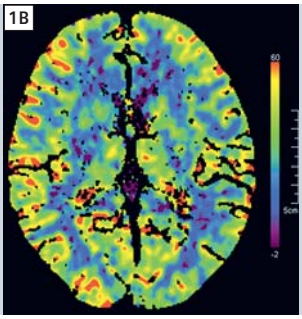
4D Noise Reduction: New Filter Setting for Dose Decrease and Image Enhancement

By Rainer Raupach, PhD, *Business Unit CT, Siemens Healthcare, Forchheim, Germany*

With the introduction of multi-slice CT making scans with large volume coverage possible, dynamic CT examinations have stepped into clinical routine. With modes like organ perfusion or 4D CT, angiography time series* can be taken, exposing a large part of the body to time-dependent X-rays. Therefore, patient dose has to be considered carefully. 4D image data are routinely acquired by means of multi- or adaptive 4D spiral scans. Applying a newly developed, elaborate filtering technique, the radiation dose of dynamic CT exams can be reduced by a substantial amount, while retaining equivalent diagnostic information. The procedure is as follows: At a fixed time point, the data from the time series mentioned above are separated into soft contents and sharp edge information, containing the major amount of image noise. By combining the sharp portion of different time points, the dose can be used more efficiently, thereby leading to an image with significantly reduced noise and improved image quality.

The effect of this method can, on the one hand, be utilized to reduce radiation dose while obtaining the same image quality as without 4D Noise Reduction. On the other hand, the spatial resolution of the CT perfusion images can be increased or the reliability of the perfusion parameters improved while maintaining the same dose (Fig. 1). In the perfusion study shown, the perfusion parameters of many pixels cannot be evaluated due to noise (Fig. 1A). Using 4D Noise Reduction mode, these pixels can be reduced, yielding tissue perfusion information with higher quality (Fig. 1B).





1 CT perfusion evaluation (blood volume) of the original images (Fig. 1A) and results after image enhancement (Fig. 1B). The number of pixels where perfusion parameters could not be determined due to noise (violet) is significantly reduced.

* Images from a defined body region or organ during a defined period of time.

The Success Story of the SOMATOM Emotion Continues

By Steven Bell

Business Unit CT, Siemens Healthcare, Forchheim, Germany

In June 2008, the Portsmouth Imaging Centre in Rhode Island installed the 6,000th SOMATOM® Emotion system – making this system the most popular CT in the World. The success of the SOMATOM Emotion continues with installations now heading towards 6,500. "At our new Portsmouth Imaging Centre, we use a Siemens SOMATOM Emotion CT scanner because it provides speed and extremely high resolution that is essential for fast and accurate diagnoses," said Todd Cipriani, vice president, Professional Services, Newport Hospital. "Both patients and physicians like knowing that image clarity is excellent."

With the SOMATOM Emotion, the combination of high-end image quality, efficient gantry design, low running costs, high reliability and the smallest installation space requirements, underpin the success. These factors were some of the driving forces behind Newport Hospital's purchasing decision and the decisions of over 6,000 other SOMATOM Emotion customers.

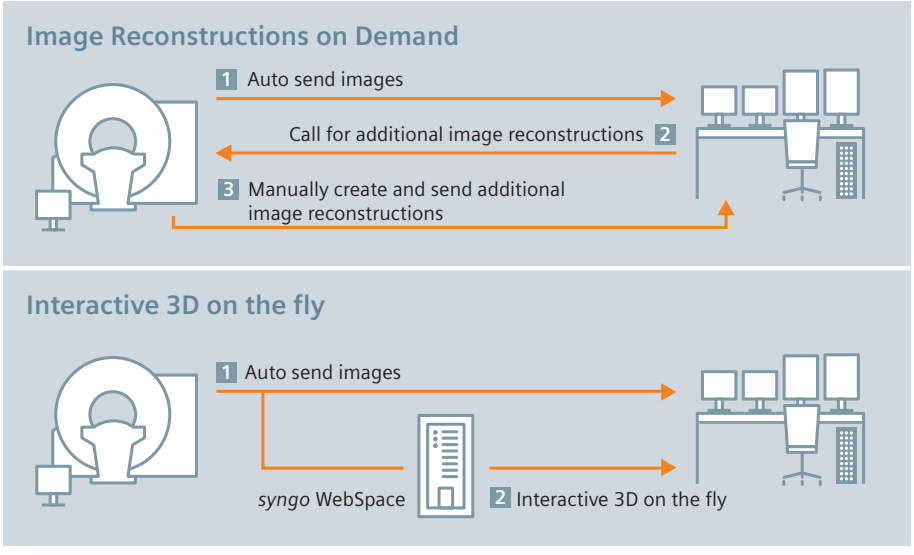
Simon Shaw (US Product Marketing Manager for SOMATOM Emotion, right) hands a plaque commemorating the 6,000th SOMATOM Emotion installation to David Card (CT/MR Manager, Portsmouth Imaging Center, left).

3D on the fly with new *syngo* WebSpace 2008B

By Christoph Hachmöller, MD

Business Unit CT, Siemens Healthcare, Forchheim, Germany

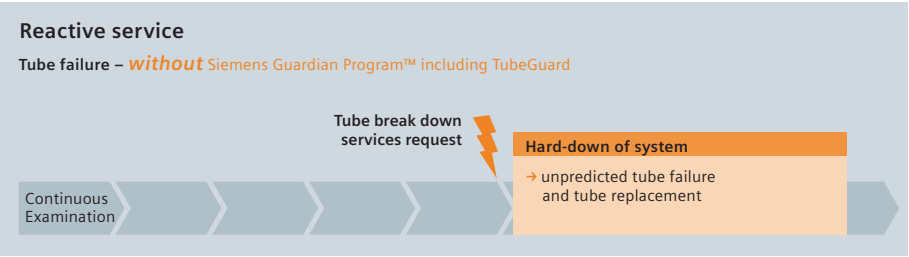
Previously, radiologists who were seeking additional reconstructions in coronal, sagittal or other planes to support their diagnosis, needed to call the technologist at the scanner and request them. The technologist then needed to manually start the recon jobs and send the images to the PACS – a time consuming and cumbersome procedure, not to mention the additional amount of data that needed to be archived in the PACS. Now, with the latest functional enhancements of *syngo* WebSpace 2008B, this annoying work step can be eliminated. The time consuming, traditional "image reconstructions on demand" are being replaced by the interactive "3D on the fly". With a click on the *syngo* WebSpace button in the PACS environment, the same case opens in 3D at the very same workplace. The interactive 3D functionality of *syngo* WebSpace can provide a coronal, a sagittal or any other view on the image data. These views do not need to be prepared beforehand. They are dynamically created on the fly by *syngo* WebSpace.

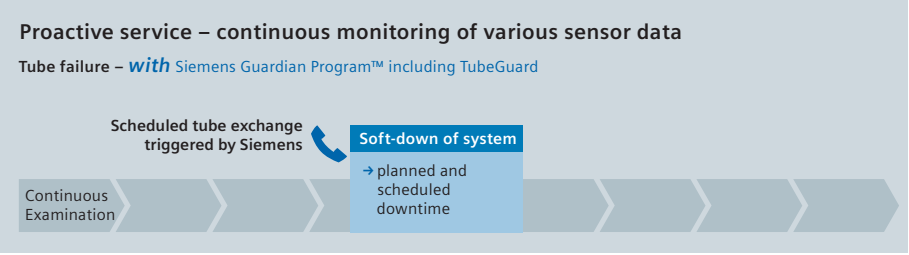


Proactive Tube Failure Prediction: Siemens Guardian Program now Includes TubeGuard for the SOMATOM Definition Family

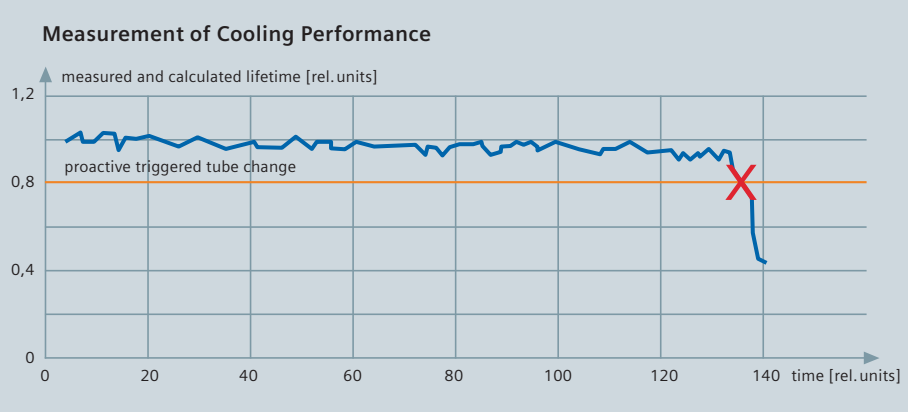
By Ulrike Dräger-Klar and Holger Reinsberger

Business Unit CS, Siemens Healthcare, Erlangen, Germany





CT systems are crucial for clinical diagnosis and important to support emergency processes like trauma patient examinations. Doctors as well as patients are dependent upon the reliable availability of their systems. The CT tube is a component with a usage-dependent life span. It is absolutely vital to system availability. But a tube can also fail, causing a hard-down of the CT system. This can lead to disruptions of the clinical workflow, and the immediate need for patient rescheduling or transfer to another department. This was the motivation for a new and innovative idea: the Siemens Guardian Program™ including TubeGuard for the SOMATOM® Definition family is Siemens' new proactive solution that allows prediction of potential tube and system failure in advance.



How does it work?

Cooling, vacuum, filament, anode, rotation, focal spot and high voltage all have a significant impact on the operation of the CT tube. Once TubeGuard has been installed, sensors proactively monitor the tube functions via real-time data flow with Siemens Remote Service (SRS) – the efficient and comprehensive infrastructure for medical-equipment-related remote services. By doing this, deviations can be detected before problems occur. One example of sensor monitoring is the measurement of cooling performance. The measurement via SRS is based on sensor data of oil temperature, gantry temperature and oil pressure. If the cooling performance falls under defined limits, the tube could possibly fail, Siemens will schedule a tube change at a convenient time for the customer before the failure occurs. This program brings it all together: state-of-the-art technology to assess and transfer information to the Siemens Service Center, expert analysis through our support engineers, and the development of a plan together with the customer to convert system downtime into a planned service visit.
With the Guardian Program including TubeGuard, the majority of all tube failures are predicted well in advance, proactively and efficiently.

1 Biograph mCT (Fig. 1A) offers excellent resolution and contrast in PET•CT imaging, such as in this primary squamous cell carcinoma in the left lung with hilar lymph metastases (Fig. 1B).

Molecular CT – Imaging in Living Colors

Siemens Biograph mCT opens doors to earlier disease detection and integrated diagnostics in radiology.

By Claudette Yasell, *Business Unit MI, Siemens Healthcare, Hoffman Estate, USA*

The recent past has seen monumental advances in CT technology, proving the clinical value of multislice capabilities, speed and resolution. But even exquisite CT images can leave unanswered clinical questions and could benefit from the addition of molecular contrast to add metabolic information. Using the most advanced PET (positron emission tomography) technology combined with Siemens adaptive CT technology (known from SOMATOM Definition AS) makes Biograph mCT the crossover scanner that is destined to change the way radiology looks at integrated diagnostics.

To move oncology forward, the next innovation in CT should include a "smart" contrast agent. The concept of using molecular contrast with PET and CT has already been applied in the molecular imaging arena with unprecedented success. With this knowledge in hand, together with the increasing demand for PET, asserting that every CT can have molecular imaging capabilities clearly addresses the need for more effective imaging in oncology. Molecular CT makes this technology more widely available, offering personalized and very specific information about patients' diseases.

Patients will benefit from higher quality diagnostic information that can lead to definitive changes in disease management. Providers could benefit from the potential cost savings from the purchase of one all-encompassing scanner like the Biograph mCT instead of two, a PET scanner and a CT.

Biograph mCT was specifically developed for an integrated imaging environment – designed to obtain functional, anatomical and molecular information from one non-invasive diagnostic exam. Using Siemens premium CT technology, it adapts to virtually any patient and clinical need for higher resolution, contrast and speed. Biograph mCT comes in a powerful, small package. It boasts a large bore, short tunnel and a very small footprint for unparalleled patient care and comfort. Biograph mCT is available with up to 128 slices and a table that can accommodate patients up to 500 pounds (227 kilograms).

In addition to cutting-edge CT technology, Biograph mCT maximizes the most advanced PET technology available, including features such as unique PET extended field of view and ultra high-definition imaging technology with time of flight reconstruction, enabling the possibility of a routine, five-minute PET scan. It offers the ultimate in PET image quality and count rates for faster, more comprehensive scanning, and provides maximum patient comfort and workflow efficiency. Latest applications in oncology from CT and PET include the ability to delineate target volumes for diagnosis, staging and re-staging of cancer, providing exquisite anatomical detail plus a measurement of cell metabolism. Future functionalities may include correlation of information about organ perfusion derived from CT and tumor metabolism derived from PET. Physicians as well as patients will benefit from the valuable information provided by molecular CT.