

# Lung Screening at Ultra Low Dose - Made Possible With 3D Scanogram and SilverBeam Filter

CT of the thorax is a well-established technique for examination of the chest and upper abdomen, but has restricted applications in some groups, such as younger patients, due to concerns about radiation dose. Canon Medical's SilverBeam Filter for CT utilizes deep learning to enhance image quality, minimize image noise and significantly reduce radiation dose, while preserving overall image quality and diagnostic accuracy. Dr. Russell Bull, MD, Consultant Radiologist at the Radiology Department of Royal Bournemouth Hospital, Bournemouth, UK, explains how well it works in practice.

The Royal Bournemouth Hospital is a general (723 beds) hospital in Bournemouth, Dorset, UK, managed by the University Hospitals Dorset NHS Foundation Trust, and plays a key role in a £250 million transformation and development plan for the Trust's three hospitals. The Hospital's Radiology Department has collaborated with Canon Medical for many years. It has an Aquilion CT Serve scanner with SilverBeam technology.

"CT is a great test for detecting multiple pathologies. It is fast, it is robust, and is available everywhere while systems continue to get better and cheaper. Some people have lauded CT as the 'physical examination of the 21st century'," remarked Dr. Bull. "However, the problem is the radiation dose, which we aim to lower as much as possible, particularly for certain patient groups, such as young people."

## Reducing radiation dose with filtration

In 2017, the Royal Bournemouth Hospital became one of the first in Europe to change the filtration on their CT system to Canon Medical's PUREVISION Optics.

"Our radiation beam was replaced with PUREVISION Optics - Canon Medical's new filtration system at the time," said Dr. Bull. "This already made a big difference to our radiation doses. We reduced our DLP's for high resolution CT by a third and got pretty much the same image quality - just by using increased filtration and filtering out bad photons. This was a surprise."

"In one of my specialist fields - Coronary CT - not only is the dose much lower, but you actually get better images because there are less scattered photons hitting the detector," he explained.

## Introducing SilverBeam

"The successor of PUREVISION Optics is SilverBeam. With SilverBeam, you really aggressively filter out low energy photons and you end up with only the high energy photons," said Dr. Bull. "It's almost a monochromatic energy beam with very high energy. You filter out some of the high energy photons as well, so you end up with less photons in general going through the patient."

This very high-energy, monochromatic beam gives us the potential for non-contrast studies at very, very

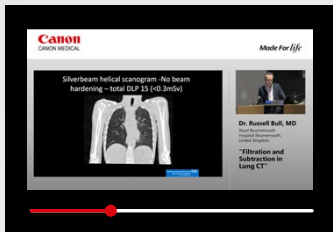
low radiation doses. You cannot use SilverBeam for examinations with IV contrast because you need low energy photons for the contrast enhancement."

## SilverBeam filtration

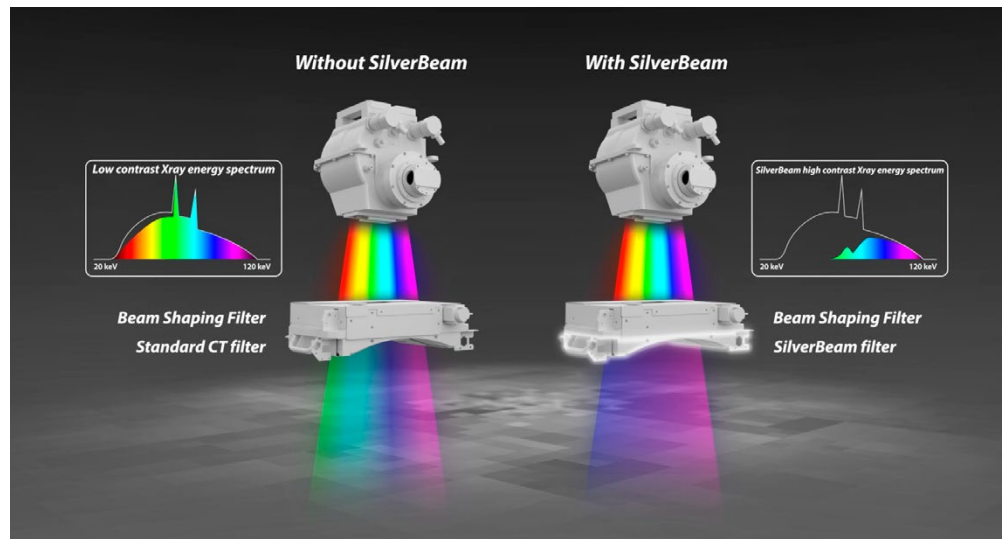
SilverBeam is a filter for Aquilion CT scanners that incorporates silver and selectively optimizes beam energy.

## How does SilverBeam work?

It removes low-energy photons from the beam spectrum, which do not contribute to image quality, but do increase dose and scatter. When combined with Canon Medical's Advanced intelligent Clear IQ Engine (AiCE) technology, this beam-shaping energy filter can harness the power of AI to deliver high resolution and low noise for applications such as lung screening.



Scan the code or click [HERE](#) to watch presentation of Dr. Bull given at the ESTI (European Society of Thoracic Imaging) 2022 congress.



SilverBeam, a beam shaping energy filter, leverages the photo-attenuating properties of silver to selectively remove low energy photons from a polychromatic x-ray beam leaving an energy spectrum as shown in the image above.

### Ultra-low dose 3D scanograms

Canon Medical's SilverBeam Filter enables 3D scanograms, ultra-low dose helical scans, to be made with significantly reduced dose, but superior image quality.

"Conventional 2D Scanograms are low dose but do not offer a great deal of information; we have just been using them for scan planning," explained Dr. Bull. "However, using the SilverBeam filter with a 3D scanogram, we actually get more useful data sets. By using SilverBeam filtration, the 3D scanogram is acquired at radiation doses as low as a conventional 2D scanogram.

With the 3D scanogram we already are picking up a lot of lung cancers. So, essentially, you've got an ultra-low dose lung screening.

"Some people find 3D scanograms somewhat noisy. However, they offer a vast improvement in what we can see compared to a 2D scanogram, in which the aorta, for example, can't be seen at all," said Dr. Bull. "You can measure all sorts of things, like aortic dimensions and see coronary calcification. The 3D scanogram is an incredible advantage over a 2D scanogram."



*"Canon Medical's SilverBeam Filter enables 3D scanograms to be made with significantly reduced dose, but superior image quality."*

*Dr. Russell Bull, Royal Bournemouth Hospital, Bournemouth, UK*

### **Dr. Russell Bull Consultant Radiologist at the Radiology Department of Royal Bournemouth Hospital, Bournemouth, UK.**

Dr. Bull has 22 years of radiology experience at consultant level and almost 20 years of experience in his special interests of cardiac CT and cardiac MRI scanning. He has also been involved in the development of Canon Medical's "PUREVISION" ultra-dose efficient detector for CT. This allows patients to be scanned more safely using lower doses of radiation and IV contrast.

He currently supervises and reports over 500 cardiac CT and 500 cardiac MRI examinations per year and is the immediate past president of the British Society of Cardiovascular Imaging (BSCI).

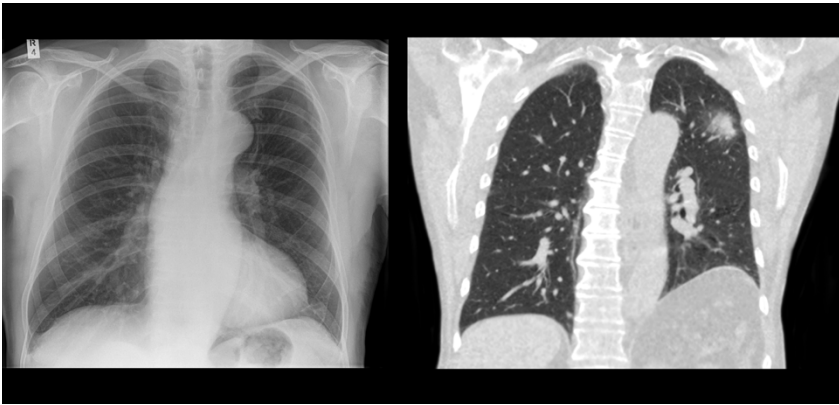


Figure 1, 3D scanogram clearly shows left upper lobe lung cancer in comparison to the chest X-ray



Figure 2, 3D scanogram shows severe emphysema.



Figure 3, Old tuberculosis is clearly visible on the images of the 3D scanogram.

### Extra clarity

Dr. Bull has many examples of how 3D scanogram with SilverBeam has supported diagnosis:

This is a whole chest 3D scanogram with SilverBeam with a DLP of 13 mGy.cm. You see left upper lobe lung cancer, which was not clearly visible on the chest X-ray. It was resected and the patient is probably cured because we did the 3D scanogram as part of a cardiac CT examination. [See figure 1](#)

In a patient presenting with dyspnea on exertion, the 3D scanogram, shows why they are breathless on exertion. "This image at very low dose clearly shows that the patient has very severe emphysema," said Dr. Bull. [See figure 2](#)

"This patient had old tuberculosis. The dose for the 3D scanogram is basically the dose of a lateral chest X-ray, he remarked. [See figure 3](#)

### Further potential

The Radiology Department is also

exploring the use of SilverBeam filtration in subtraction and perfusion studies.

"Normally for a Subtraction scan we are utilizing a pre- and post-contrast scan. The <sup>SURE</sup>Subtraction lung application isolates the iodine signal and displays the result as a color overlay and shows the distribution of contrast media in the pulmonary parenchyma. We wanted to find out if we could perform a Subtraction CTPA without a pre-contrast and use the 3D scanogram with SilverBeam as a mask," said Dr. Bull. "While it is early days, it would appear that you can achieve a very similar image, basically using the mask of the 3D scanogram."

"Currently we are exploring the use of 3D scanograms in combination with Automatic Landmark Detection (ALD) on our the latest Aquilion Serve CT scanner. **With ALD, the scanner is able to perform a complete automatic scanplan independent of patient size and weight, without any interference of the Radiographer.**"

### Meeting growing imaging needs

As part of the expansion of the University Hospitals Dorset NHS Foundation Trust, a brand new building will be constructed at the Royal Bournemouth Hospital by 2026 to provide new facilities in emergency and critical care, and women's and children's health. //

### Optimizing your assets

Canon Medical continually develops new technologies to improve product performance. Upgrading our products means that we can provide new functionality, help our customers benefit from the latest technology, and extend the longevity of their systems.

*The views and opinions expressed in this article are those of the clinician and do not necessarily reflect the views of Canon Medical.*