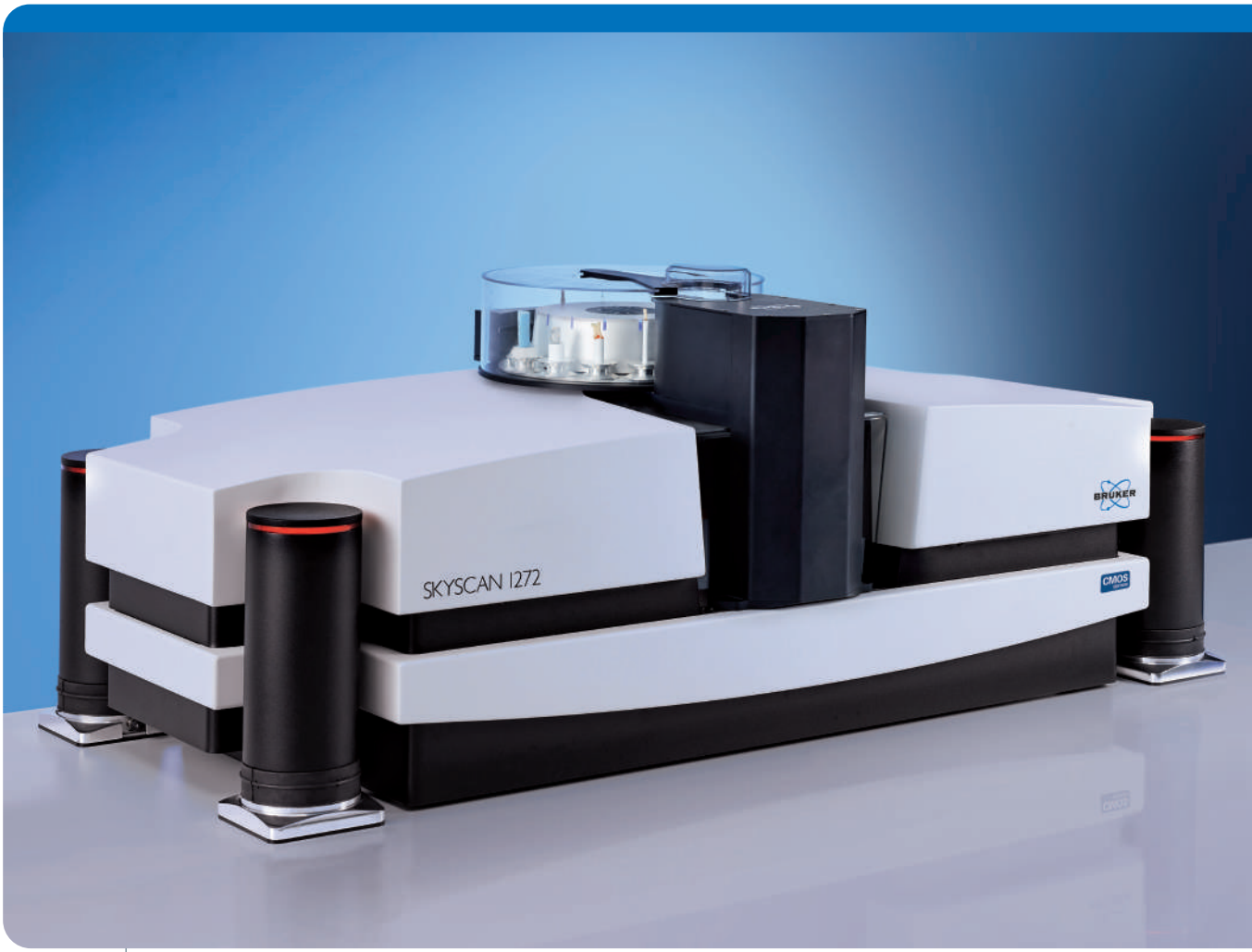


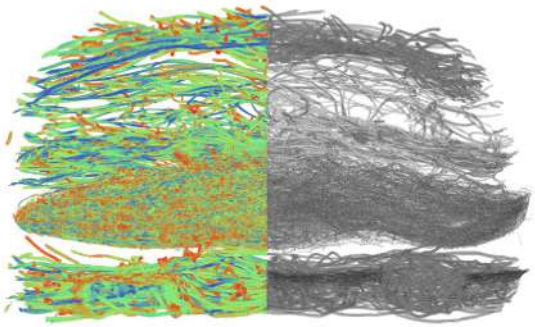
SKYSCAN 1272
CMOS Edition

- 3D X-ray Microscopy Solutions

Innovation with Integrity

Polymers & Composites

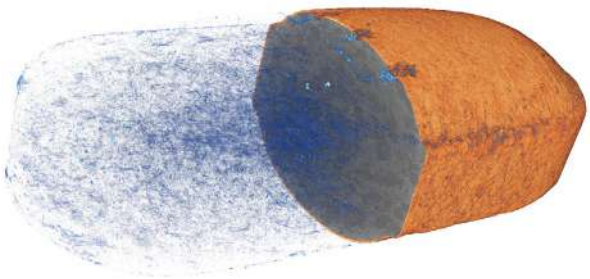
- Resolve fine structural details
- Assess the microstructural architecture
- Evaluate local fiber orientation, fiber-to-fiber distance and density
- Investigate microstructural changes under tensile or compressive load



FFP2 mask, color-coded fiber orientation

Pharmaceuticals & Packaging

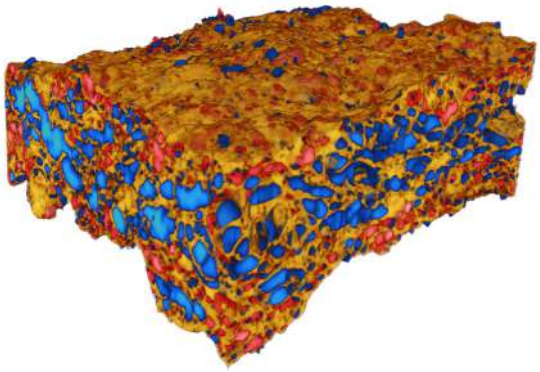
- Measure coating thickness and distribution of API's
- Check mechanical properties and defects
- Investigate pharmaceutical packaging up to a size of 7 cm x 7 cm x 8 cm
- Monitor and control the quality of metal and plastic components



Pharmaceutical tablet, color-coded coating thickness and visualization of pore distribution (blue)

Food

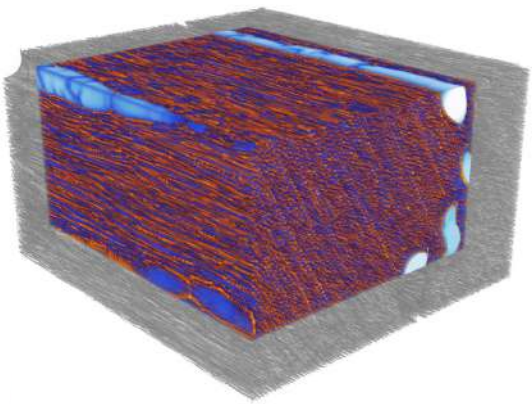
- Assess the microstructural architecture
- Evaluate porosity and wall thickness
- Investigate food packaging up to a size of 7 cm x 7 cm x 8 cm
- Investigate microstructural changes under non-ambient conditions



Deep fried chips, showing distribution of oil-filled pores (red) and unfilled pores (blue)

Biomaterials

- Quantify porosity, pore network, and local thickness in 3D
- Apply in-situ analysis of mechanical properties and dynamic processes
- Detect inhomogeneities and deviations in the printing process



Hartwood, color-coded structure thickness (red) and separation (blue) distribution

SKYSCAN 1272 CMOS – High-Resolution 3D X-ray Microscope

3D X-ray Microscopy (3D XRM) is one of the most advanced methods of getting 3D insights into samples of any material, shape, or size with little to no sample preparation.

Bruker, one of the XRM pioneers, established a benchmark for high-resolution desktop XRM systems with SKYSCAN 1272, as proven by several hundreds of installations worldwide. SKYSCAN 1272 CMOS builds on this trusted platform and incorporates the latest X-ray technologies to bring XRM to the next level.

SKYSCAN 1272 CMOS Edition –
the proven performer, just better.

3D X-ray Microscopy – Non-destructive Imaging of the Internal Structure

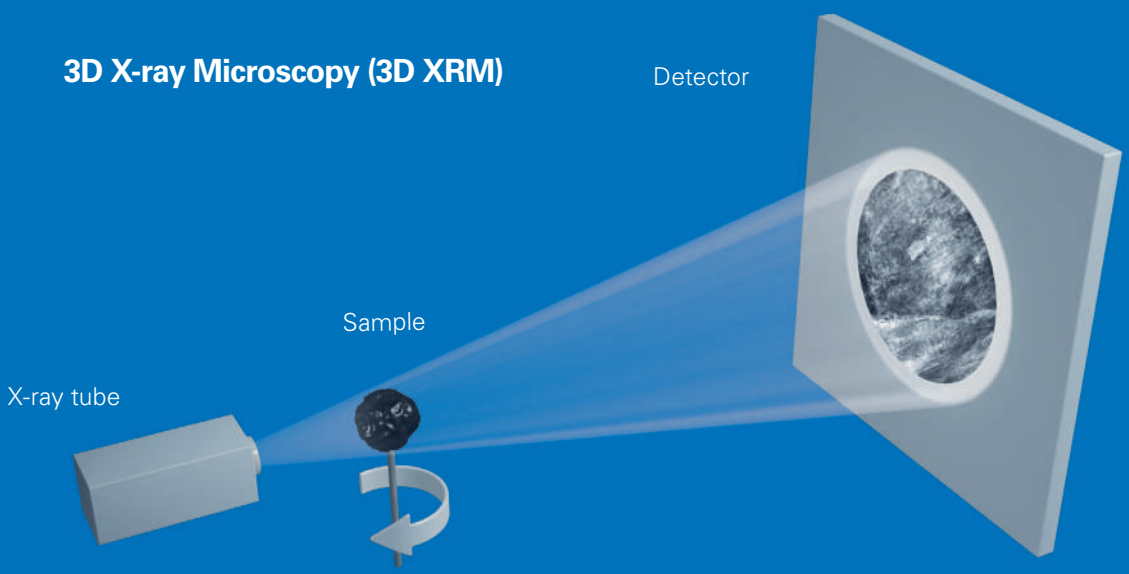
Microscopy is widely used for materials characterization. We see it, we believe it. Conventional microscopy uses light or an electron beam to directly image a sample by refocusing the radiation passing through the sample. Alternative microscopy techniques, such as Atomic Force Microscopy (AFM), use other sensors to probe the sample surface. They all provide detailed and local 2D images of surface or near-surface structures or properties.

With X-rays, you can also:

- image the 3D internal structure
- measure your whole sample at once
- start right away
- avoid extensive sample preparation that may alter or destroy your sample

With X-rays you can!

3D X-ray Microscopy (3D XRM)



When X-rays pass through an object the intensity is reduced by absorption proportional to the average atomic number along the trajectory.

In traditional radiography the resulting projection image visualizes the intensity reduction inside a 3D object as a 2D projection.

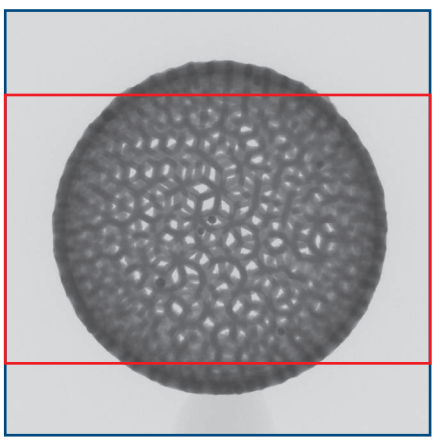
By taking projection images at many different rotation angles the full 3D information can be slice-wise retrieved through a mathematical process called backprojection. Computed tomography enables the reconstruction of the complete 3D volume.

SKYSCAN 1272 CMOS – State-of-Art Desktop X-Ray Microscope

SKYSCAN 1272 CMOS builds on the trusted SKYSCAN 1272 platform and integrates the latest X-ray technologies.

Its state-of-art 16 megapixel scientific CMOS X-ray detector provides high-contrast images with superior resolution. The extended detector field of view and enhanced sensitivity for X-rays result in up to two times faster scan speed. The extraordinary native resolution of up to 11 200 x 11 200 pixels per slice allows zooming into any part of the 3D volume without rescanning the sample. The new **Clean Image™** scan mode significantly reduces typical CT artefacts right from the start, thus providing great quality images without cumbersome a posteriori corrections.

This top performance is paired with low cost of ownership. Our desktop SKYSCAN 1272 CMOS can be placed on any laboratory desk and consequently does not occupy a large amount of expensive lab space. A standard domestic power plug is all you need to start running the instrument, no water chiller or additional compressor are needed. Finally, a maintenance-free industry standard sealed X-ray source ensures that there are no further hidden costs.



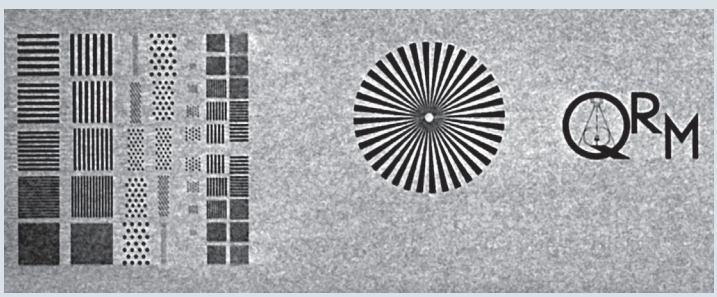
Projection image of an open Ti structure made with additive manufacturing. The complete structure fits in the field of view of the CMOS detector (blue), whereas the smaller field of view of the CCD detector (red) would require an oversize scan.

Plug'n Analyze

No Water Supply

Single-phase Power

Small Footprint

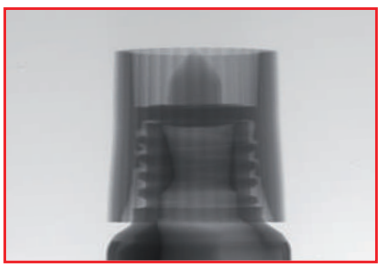


Several factors affect the true 3D spatial resolution: the focal spot size of the X-ray source, the acquisition geometry, the overall system stability, the mechanical accuracy of the rotation axis, as well as the reconstruction algorithms. The 3D spatial resolution is determined with special phantom structures after reconstruction. The SKYSCAN 1272 CMOS easily resolves better than 4 µm in both directions.

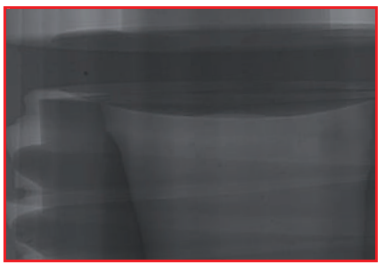
Let the Genius Work for You – Fully Automated

1. Moving to the **Best-Scan-Geometry™**

Thanks to SKYSCAN 1272 CMOS' movable camera and its extra large X-ray beam opening, Genius-Mode finds the Best-Scan-Geometry – as compact as possible with the largest magnification – automatically.



Sample is too far away from the X-ray source, low magnification

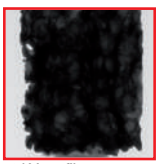
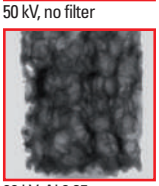
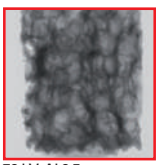
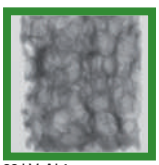
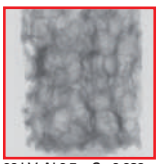
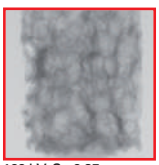


Sample is too close and does not fit the field-of-view

Best-Scan-Geometry means: maximum magnification and minimum scan time due to the most compact setup

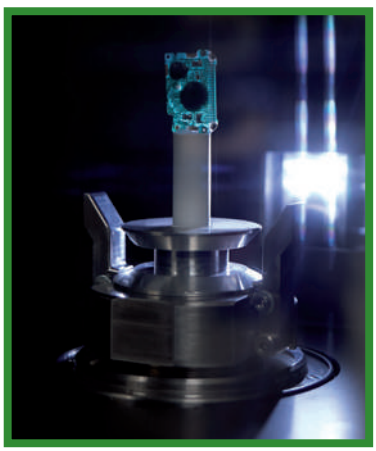
2. Finding the **Best-X-ray-Energy-Window™**

To find the perfect X-ray energy window, SKYSCAN 1272 CMOS automatically checks which of the six filters and X-ray energy best fits the sample's density in order to achieve the optimal image contrast.

Low Attenuation	High Attenuation
 50 kV, no filter	 50 kV, no filter
 60 kV, Al 0.25 mm	 60 kV, Al 0.25 mm
 70 kV, Al 0.5 mm	 70 kV, Al 0.5 mm
 80 kV, Al 1 mm	 80 kV, Al 1 mm
 90 kV, Al 0.5 + Cu 0.038 mm	 90 kV, Al 0.5 + Cu 0.038 mm
 100 kV, Cu 0.25 mm	 100 kV, Cu 0.25 mm

3. Starting with the **Best-Scan-Conditions™**

The SKYSCAN 1272 CMOS operating in Genius-Mode selects the best exposure time and rotation step automatically.



For highest resolution rely on the integrated micro-positioning stage and insert the sample manually

Conventional Systems with Fixed Camera Position

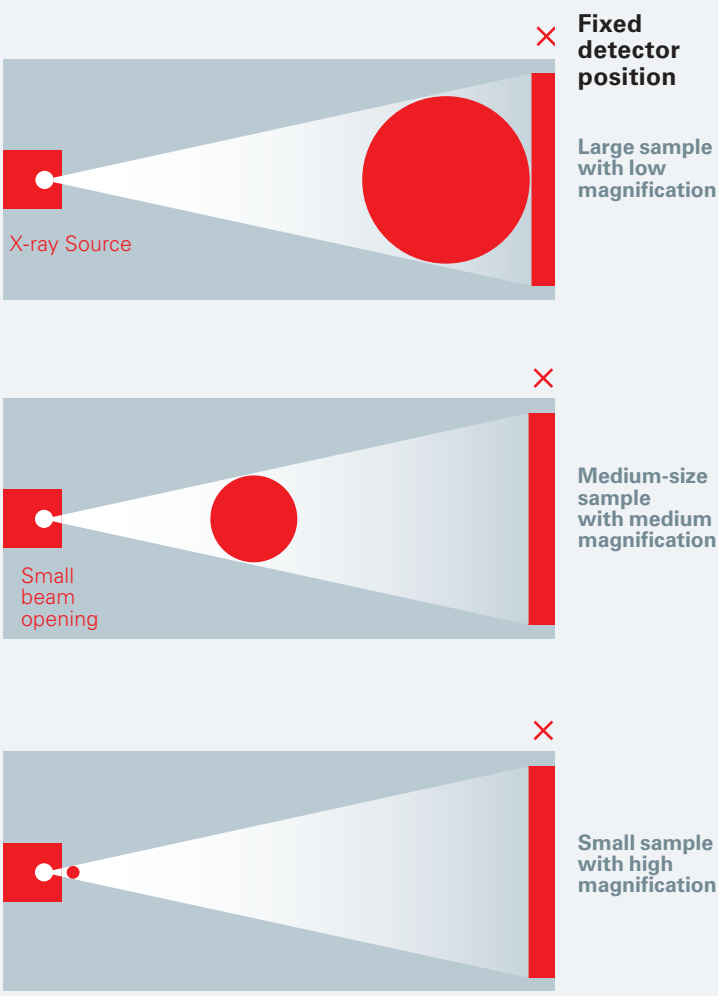
Fixed Position, Less Intensity, Less Speed

SKYSCAN 1272 CMOS with Best-Scan-Geometry™

Best Position, Best Intensity, Best Speed

No

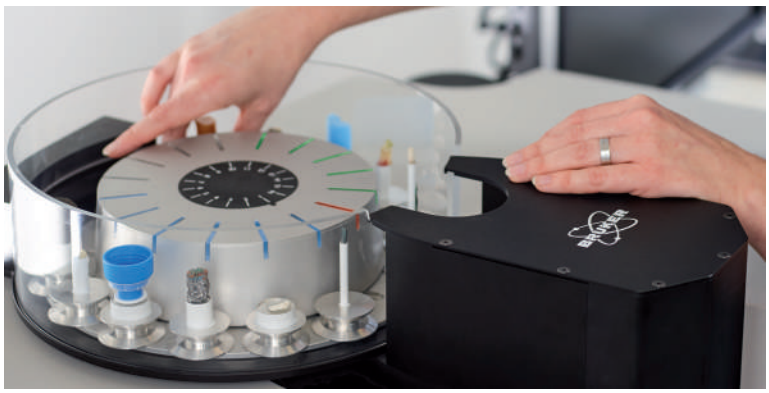
Yes

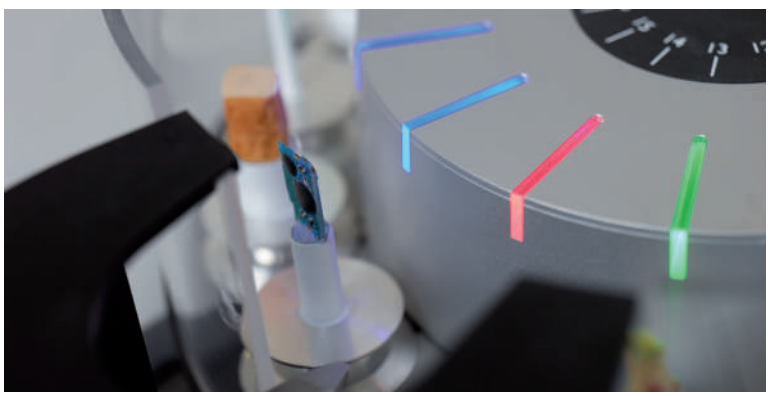


Conventional fixed camera systems are limited to one scanning speed, regardless of the sample size or magnification.

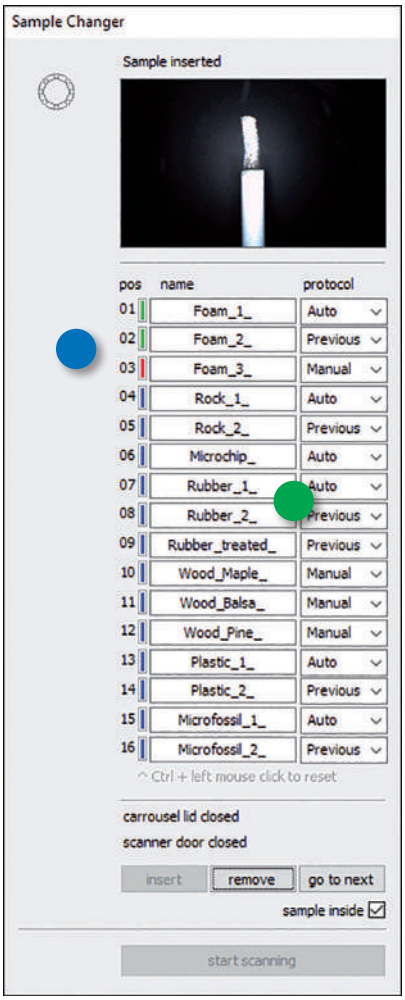
Moving both the sample and the sCMOS detector as close as possible to the source increases the measured intensity dramatically. That's why SKYSCAN 1272 CMOS scans faster than conventional systems.

Easy installation – just mount the sample changer on top of the scanner

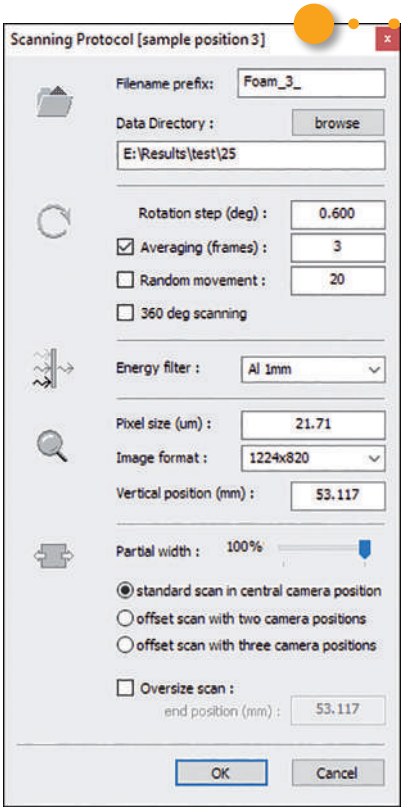




Autodetection of new samples and status LEDs for every scan: ready, running, done



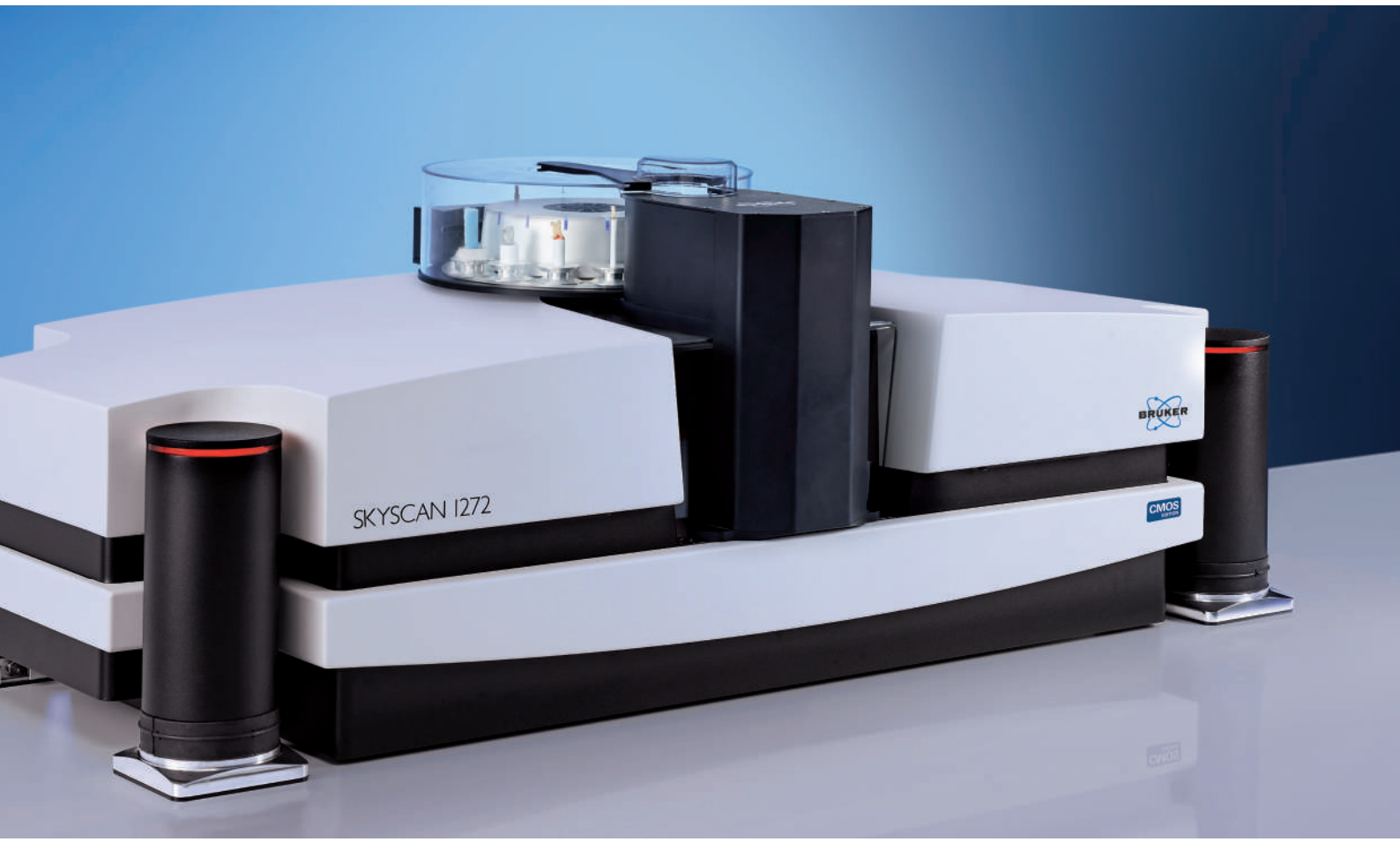
Sample changer window



Scanning protocol window

- **Status display of all 16 positions**
- **Automatic or user-selected parameters**
- **All types of samples in the same tray**

SKYSCAN 1272 CMOS – Ready to Run 24/7



SKYSCAN 1272 CMOS with sample changer can be operated in three ways:

Fully automatic

Simply load the sample changer, select "Auto" protocol, and then let the system take care of the rest! All scan settings are defined using Genius-Mode. Feel confident that your work is being done – anytime – with system-generated reports emailed directly to your inbox, including a link to access data remotely.

User selected

Want more control? Individually adjust scan parameters for one, some, or all samples. Once all "Manual" protocols are defined, simply press "Start" to initiate the full batch.

Prior selection

Streamline the workflow using the "Previous" command to apply the last settings. Because the sample changer operates outside the shielded X-ray chamber, new samples can be easily placed without interrupting the scanning process.

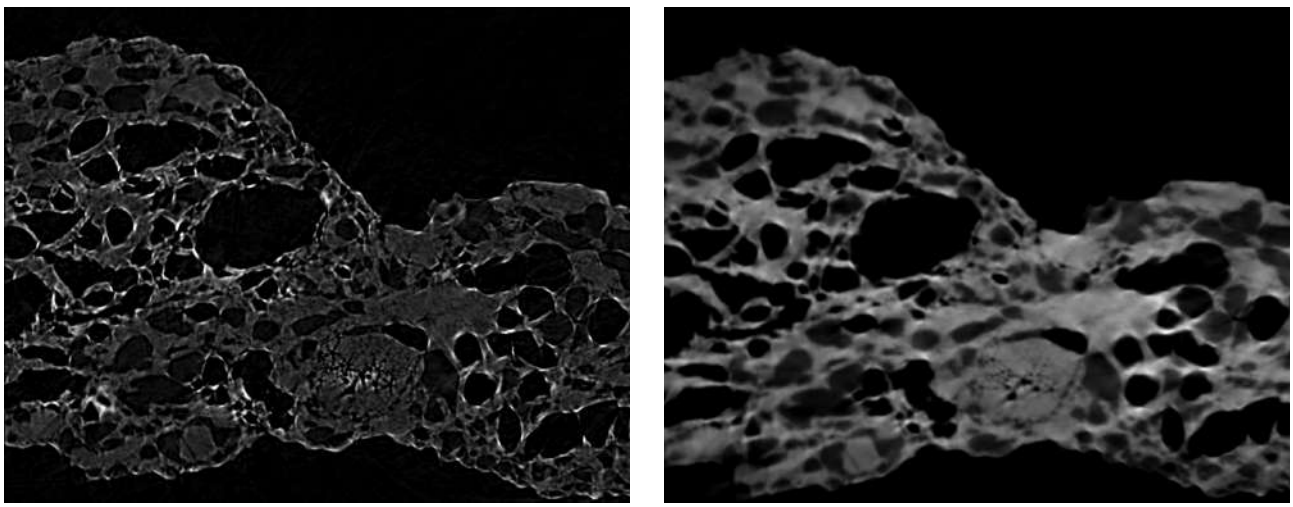
Always included –
Our 3D.SUITE Software

Intuitive, simple, yet powerful – our 3D.SUITE software that comes with every SKYSCAN 1272 CMOS is designed to inspire finding out what's inside. With the help of Genius Mode, even a novice user can intuitively start scanning right away. Genius Mode automatically moves detector and sample to the optimum scan geometry, selects the appropriate filter and X-ray energy to achieve best image contrast, and optimizes exposure time and rotation step for efficient scanning.

Reconstruction with NRECON readily transforms the 2D projection images into 3D volumes thanks to the supersonic GPU acceleration, no matter how large the image size. Advanced phase retrieval algorithms can reveal features that would remain hidden when using only standard absorption contrast.

3D.SUITE further includes all advanced software capabilities needed for 3D inspection, visualization, and analysis. So you are perfectly set up for starting with 3D X-ray microscopy.

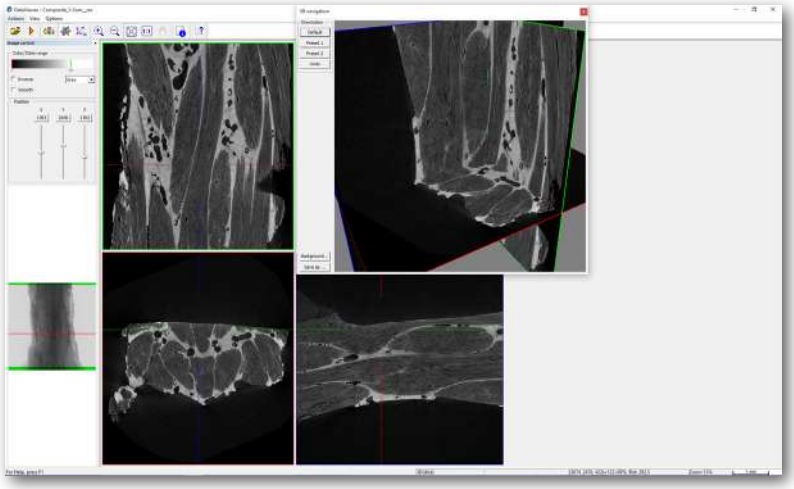
3D.SUITE – a perfect match for SKYSCAN 1272 CMOS



The images show a reconstructed slice through chips. When potato slices are deep fried, oil preferentially fills pores at the surface. With standard absorption contrast (left) it can be challenging to discern between oil-filled and unfilled pores. Applying a phase retrieval algorithm significantly enhances contrast (right).

3D Inspection with DATAVIEWER

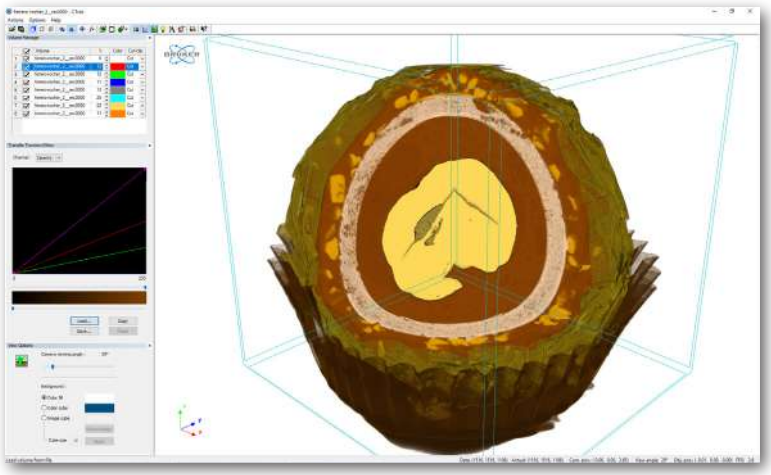
- Display reconstructed results as slice-by-slice movies or three orthogonal projections
- Smoothing, linear and non-linear grey scale transformations, color coding
- Differential image analysis between samples
- Exactly align multiple scans through image registration



3 orthogonal projections through a CFRP composite

3D Visualization with CTVOX and CTVOL

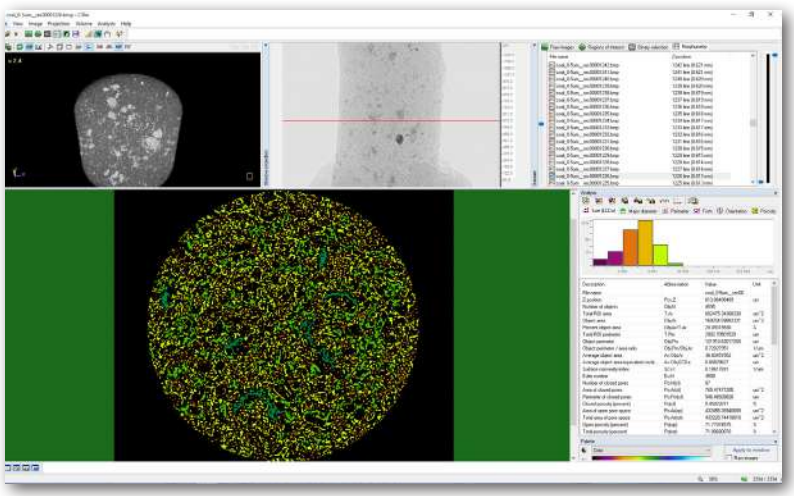
- Volume rendering to display reconstructed results as a realistic 3D object
- Create animated movies flying around or through the object
- Produce cut-away views
- Adjust coloring and transparency
- Export surface rendered models in STL format to 3D printers or to 3D CAD software
- Modelling using mobile devices



3D rendered volume of a hazelnut chocolate bonbon

3D Image analysis with CTAN

- Handles large data sets with ease
- Open/closed porosity
- Thickness and separation
- Fiber orientation
- Density analysis
- 3D distances and angles
- Extensive tool set for region-of-interest selection
- Various thresholding methods, morphological operations, and filtering algorithms
- Color coding of local orientation, thickness and separation
- Automated batch analysis

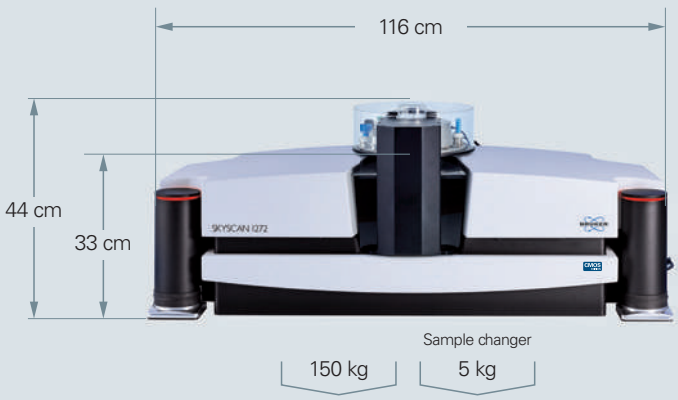


Morphometry analysis of a coal sample

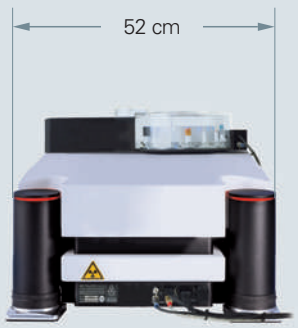
Technical Data

X-ray Source	40 – 100 kV, up to 10 W
X-ray Detector	16 Megapixel sCMOS camera 4 096 x 4 096 pixels
Reconstructed Slice Format	Up to 11 200 x 11 200 pixels
Resolution	Voxel size < 0.45 micron 3D spatial resolution < 5 micron
Max. Object Dimensions	Up to ∅ 75 mm Up to height 80 mm
System Dimensions (W x H x D)	116 cm x 52 cm x 33 cm, 150 kg 116 cm x 52 cm x 44 cm, 155 kg (with sample changer)
Power supply	100 – 240 VAC, 50 – 60 Hz, 3 A

Front



Right



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