comet
yxlon

Cheetah / Cougar EVO
The smart choice for the smart factory

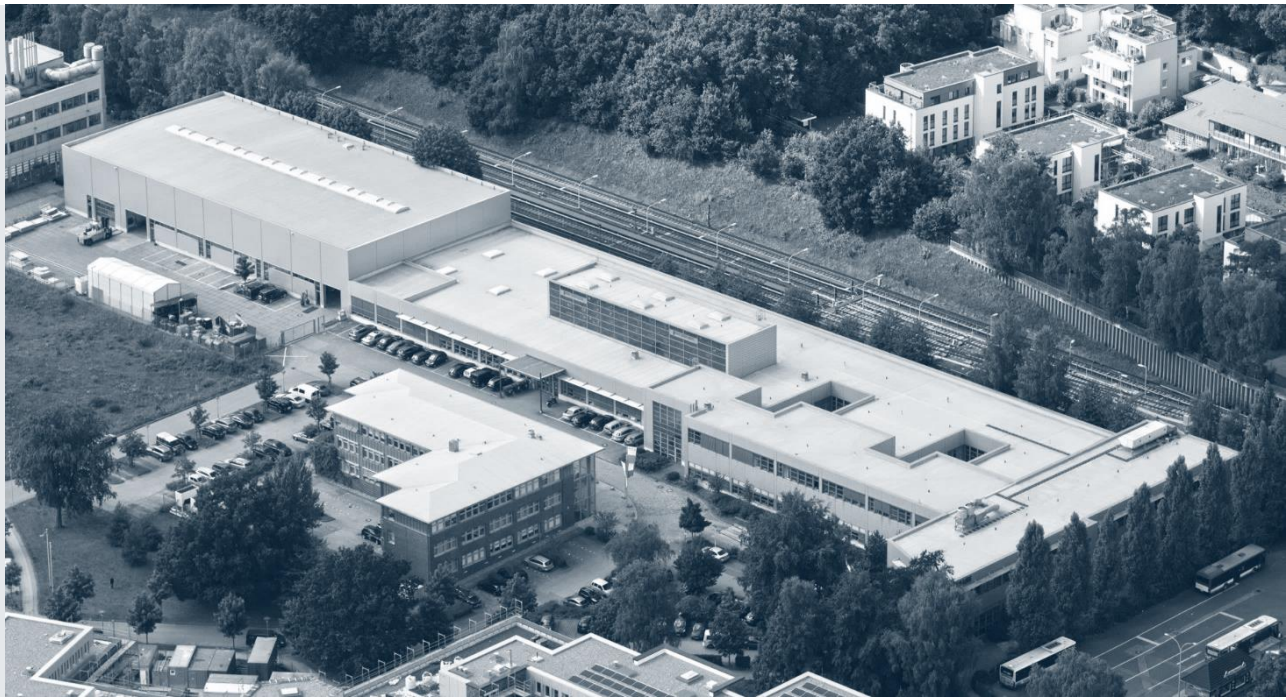
Accelonix
keeping you ahead.

Accelonix delivers innovative solutions to electronics organisations around the world
www.accelonix.nl

Comet Yxlon

- **Headquarters in Hamburg, Germany**
- **Active in all world markets**
- **Locations in Shelton (Connecticut), San Jose (California), Yokohama, Shanghai, and Hsinshu (Taiwan)**
- **Representatives in over 50 countries**
- **Worldwide at customer sites**

Comet Yxlon GmbH is a company of Comet Holding AG.
We develop, produce and market high-end X-ray and CT system solutions for industrial and scientific applications - from R&D laboratories to production environments, with integrated services based on artificial intelligence and data analysis.



Our roots go back to Wilhelm Conrad Röntgen

1895

Wilhelm C. Röntgen
discovers X-rays

1896

C.H.F. Müller
builds the first X-ray tube of the world

1927

Philips
acquires the C.H.F. Müller works

1998

YXLON International X-Ray GmbH
results from a management buy-out of Philips

2004

Comet Group
acquires FeinFocus

2007

Yxlon & Comet
YXLON becomes part of the Comet Group

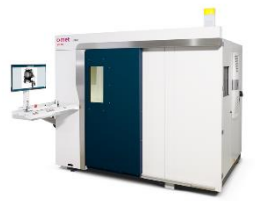
2008

Merger of Yxlon & FeinFocus
becoming YXLON International GmbH

2022

Renaming and Rebranding from YXLON International to Comet Yxlon

today



Comet Yxlon is one of the leading providers of X-ray and CT systems for the non-destructive testing and analysis of materials

…

Our approach:
“We provide the key to efficiency and innovation by making the invisible visible and measurable”

Technical milestones

1990

Philips

Development of the first 450 kV x-ray tube

1997

Philips Industrial X-Ray

Launch of universal system MU2000 and wheel system MU231

2004

Yxlon

Launch of CT Compact and tire system Y.MTIS

2007

Yxlon

Takeover of FeinFocus product line

2009

Yxlon

Launch of imaging system Y.HDR-Inspect

2014

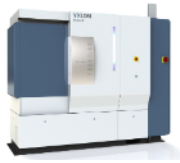
Yxlon

Launch of CT systems YXLON FF20/35 CT

2017

Yxlon

Launch of YXLON FF20/35 CT Metrology



2018

Yxlon

Launch of YXLON FF85 CT

2020

Yxlon

Launch of universal system YXLON UX20

2022

Comet Yxlon

Launch of CT system UX50

2023

Comet Yxlon

Launch of 3D X-Ray system for Advanced Packaging CA20

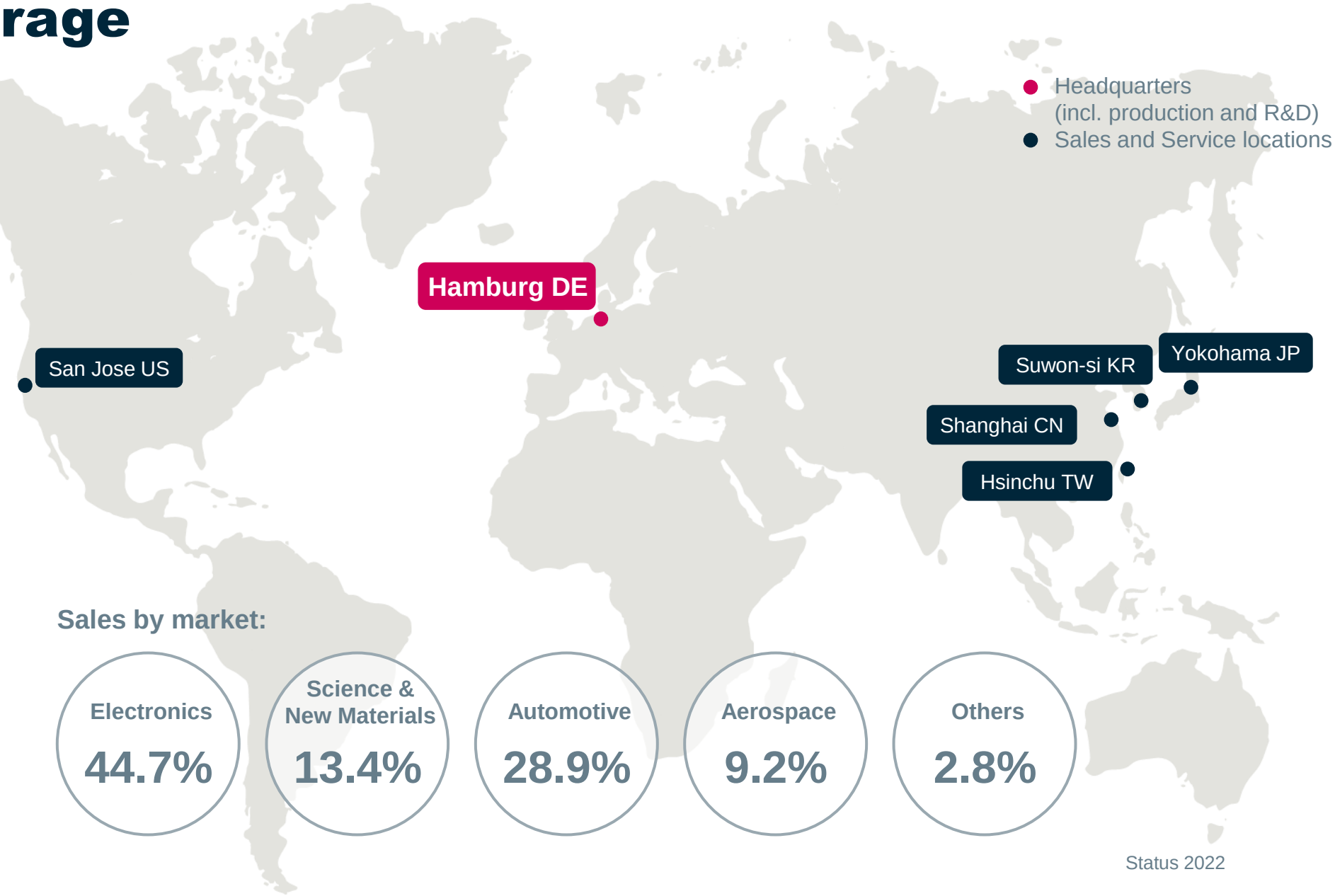
Global coverage

5
Locations

~50
Countries with representatives

430
Employees worldwide

130.4
Mio. CHF sales in 2022



Sales by market:

Electronics	Science & New Materials	Automotive	Aerospace	Others
44.7%	13.4%	28.9%	9.2%	2.8%

Status 2022

comet yxlon

CHEETAH / Cougar EVO
Grand performance for small devices

The Comet Yxlon Cheetah / Cougar EVO feature:

Large flat-panel detectors with up to 50% larger field of view for a better overview and faster working processes due to reduced steps in automated processes.

Best laminography with micro3Dslice, with detailed 3D visualization for quick and easy failure analysis – resulting in substantial cost-savings compared to micro sectioning.

Automatic void calculation with VoidInspect, the laminography-based inspection workflow enabling the rapid non-destructive analysis of voids inside the solder joints of board components.

Integration in the production line: Allows direct communication with inline AOI / AXI inspection systems.

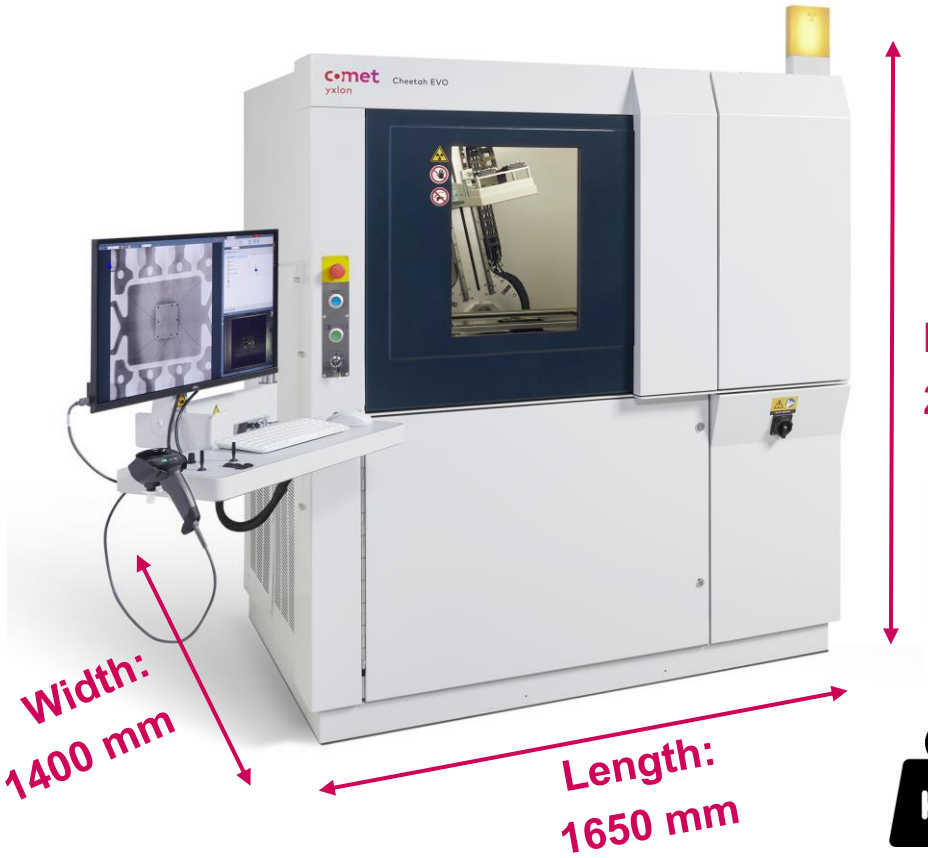
Optional high load capacity (< 20 kg) with reinforced table and mechanics: Several parts and electronic interconnects in fixed packages can be inspected at once – a real-time saver.

CHEETAH EVO
X-ray technology at its best

Technical Specifications

- 460 x 410 mm inspection area
- 800 x 500 mm sample size
- Open X-ray tube with TXI
- 64 W tube power, 10 W target power
- 15 W target power with HighPowerTarget
- Collision-free design
- Oblique angle viewing ±70º
- x3000 geometrical magnification
- CL and µCT-capabilities incl. Y.QuickScan®
- Flat-panel detector as standard
- 16 bit real-time image processing
- Advanced manipulation
- Air cushioning in all moving parts

CHEETAH EVO
X-ray technology at its best



KG **Weight:**
2200 kg

Advantage:
The inner workings of the system
can be pulled out to the front,
so there is no service door on the back
and the system can be placed with
the back directly against the wall.

Cougar EVO
X-ray technology at its best

Technical Specifications

- 310 x 310 mm inspection area
- 440 x 450 mm sample size
- Open X-ray tube with TXI
- 64 W tube power, 10 W target power
- 15 W target power with HighPowerTarget
- Collision-free design
- Oblique angle viewing ±70º
- x2000 geometrical magnification
- CL and µCT-capabilities incl. Y.QuickScan®
- Flat-panel detector as standard
- 16 bit real-time image processing
- Smallest Footprint – 1100 x 1100 mm

Cougar EVO
X-ray technology at its best

Height:
2200 mm

Width:
1050 mm

Length:
1000 mm

Weight:
1450 kg

Advantage:
The inner workings of the system can be accessed by the front, so there is no service door on the back and the system can be placed with the back directly against the wall.

Benefits

Best image in shortest time

Microfocus X-ray system for non-destructive testing featuring **highest resolution and magnification** (feature detectability < 1 µm).
Zoom+ for brilliant images and faster inspection without tube adjustments or software interpolation.
The **eHDR-filter** enables the contrast within an X-ray image to be emphasized dependent on the image content and realizes sharp high-quality images.

All X-ray options on the smallest footprint

2D scans, laminography and even CT.

Ease of use with 1-click solutions

1-click operation for rapid inspection with advanced technological functions e.g. *Click & Centre* and Frame & Zoom.
Wizard guided functions to perform simple inspections. Automated inspection workflows.

Stable image quality

Air suspension against unwanted vibrations.
(Cheetah only)

Deeper insights

With the high-resolution digital detector option, a superior detail detectability of less than 0.5 microns can be achieved.
Laminographic scans with highest magnification and ±70° oblique viewing result in high-quality 2.5D results.

Automatic tracing of the sample (AIM)

AIM-technology when pivoting the detector or rotating the sample, details under inspection remain in the middle of the image.

Variety of applications

Due to the optional 20kg "High load capacity" packages, the system provides a higher flexibility.
(Cheetah only)

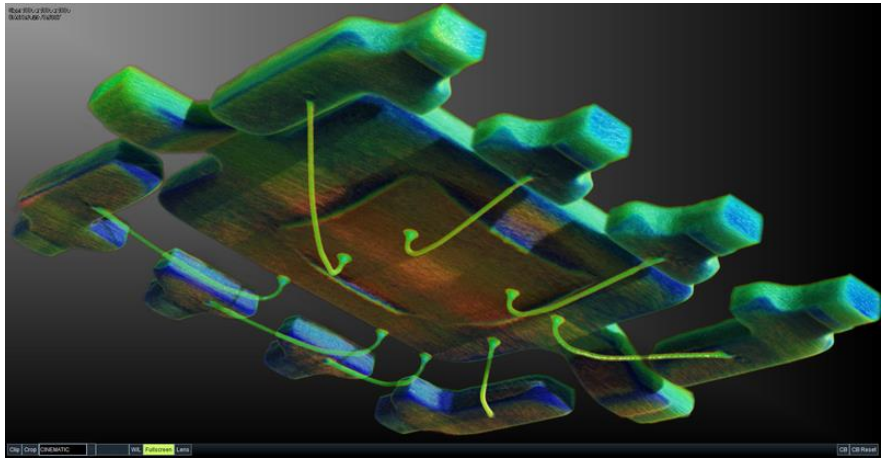
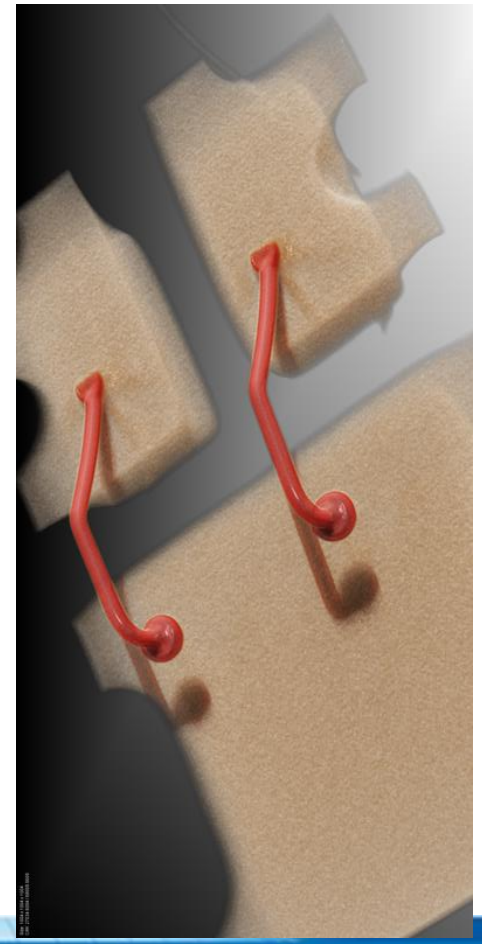
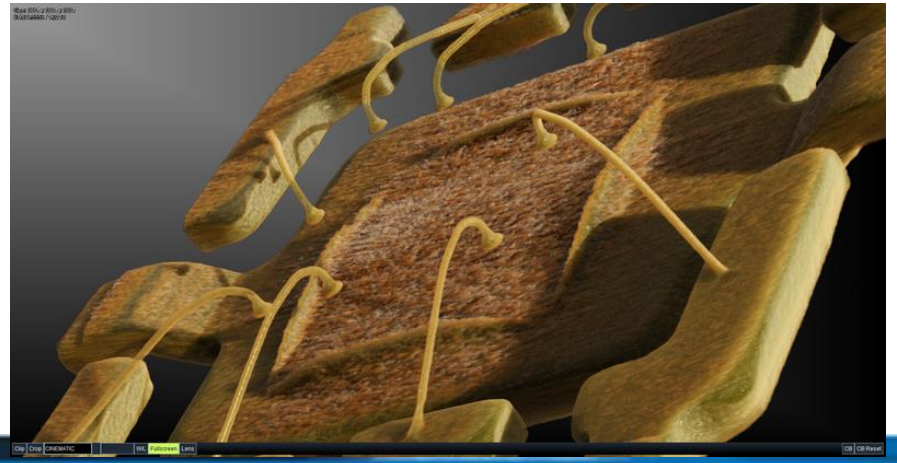
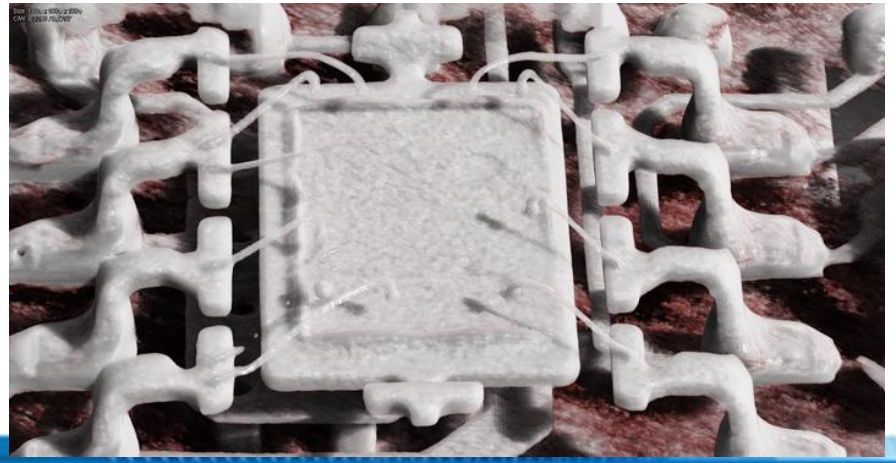
Automatic inspection for on-site applications

Generation of automatic inspection procedures by intuitive teach-in concept.

Typical applications:

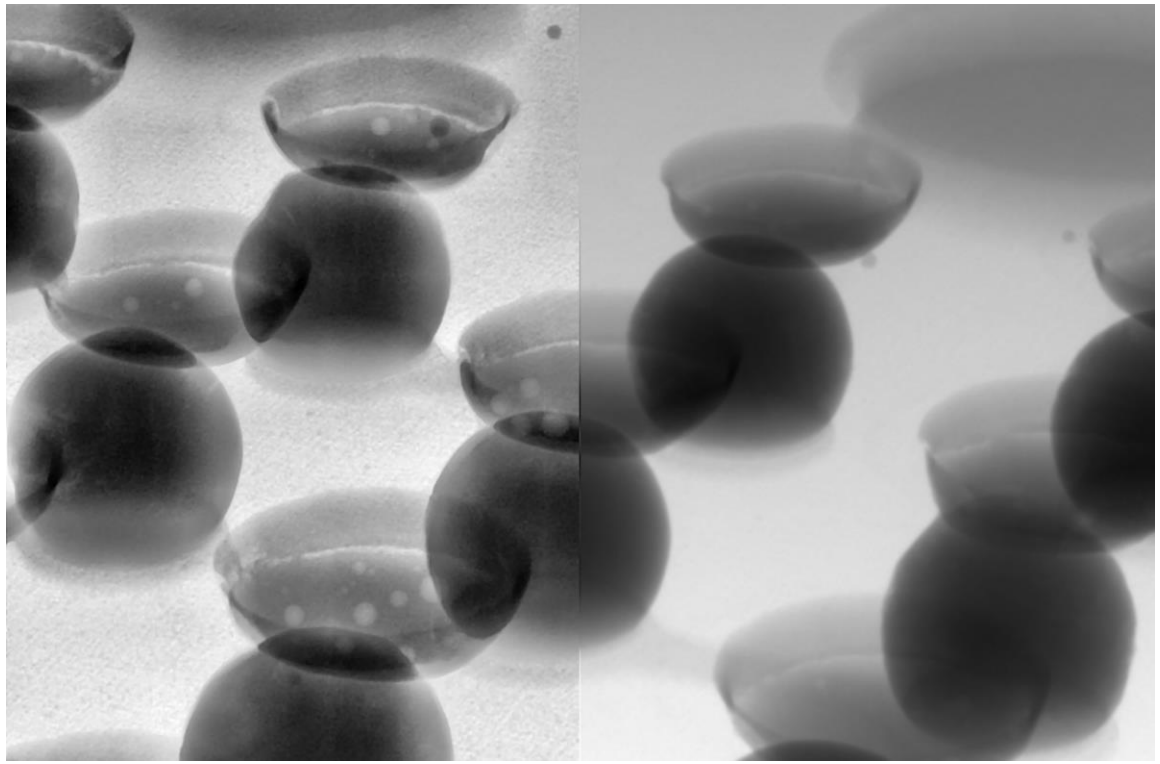
Common inspection tasks

Semiconductor
Wire Bonds
Laminography

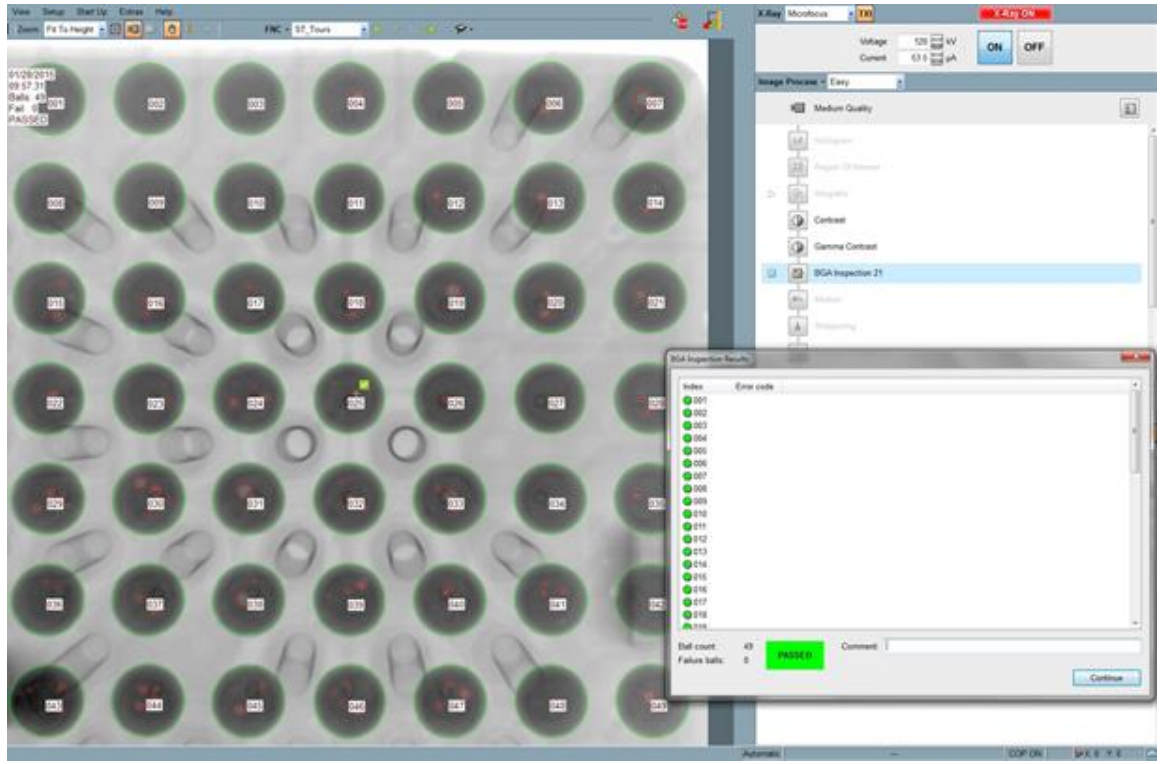






Common SMT inspection tasks

Void inspection



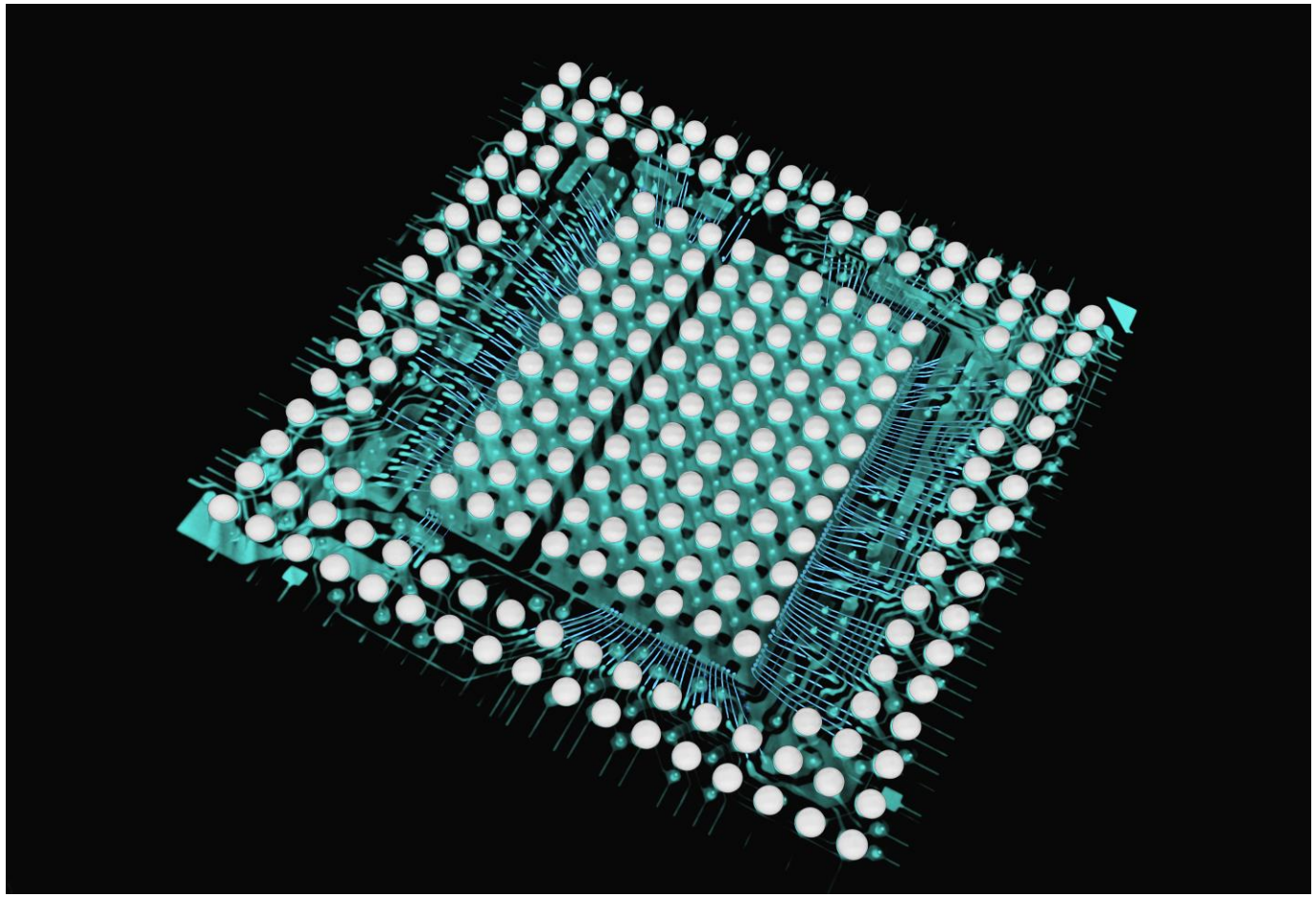
BGA

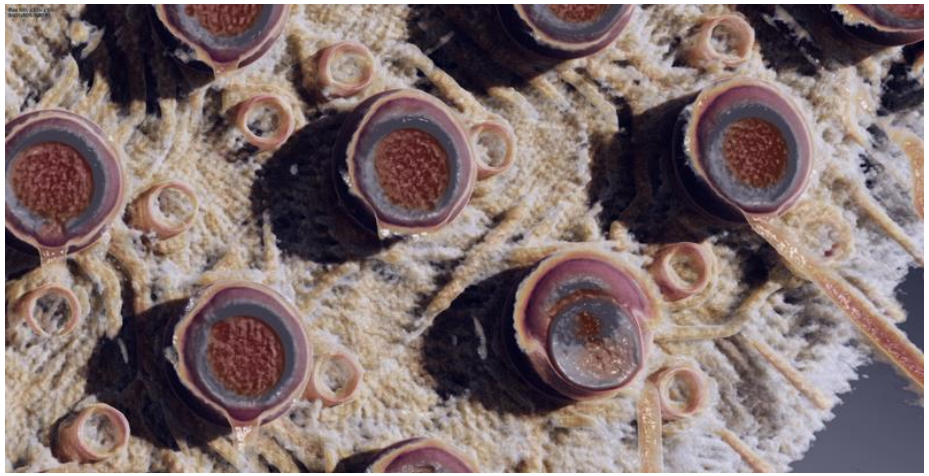


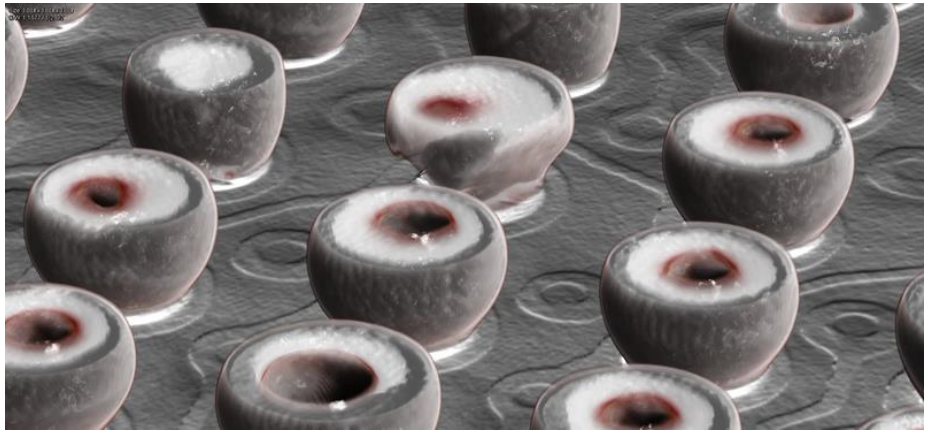
BGA

Printed Circuit Board (PCB)

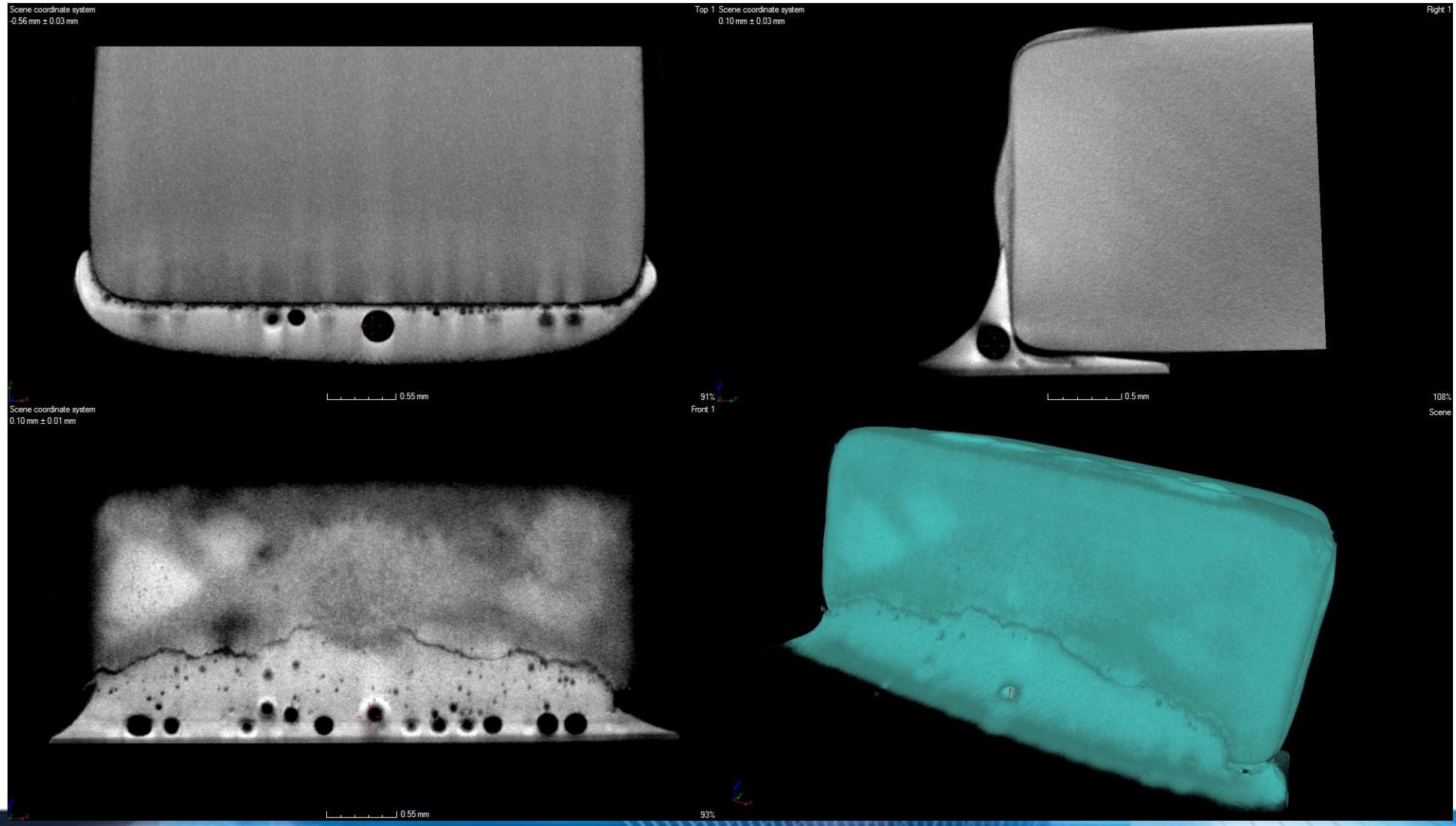
Laminography





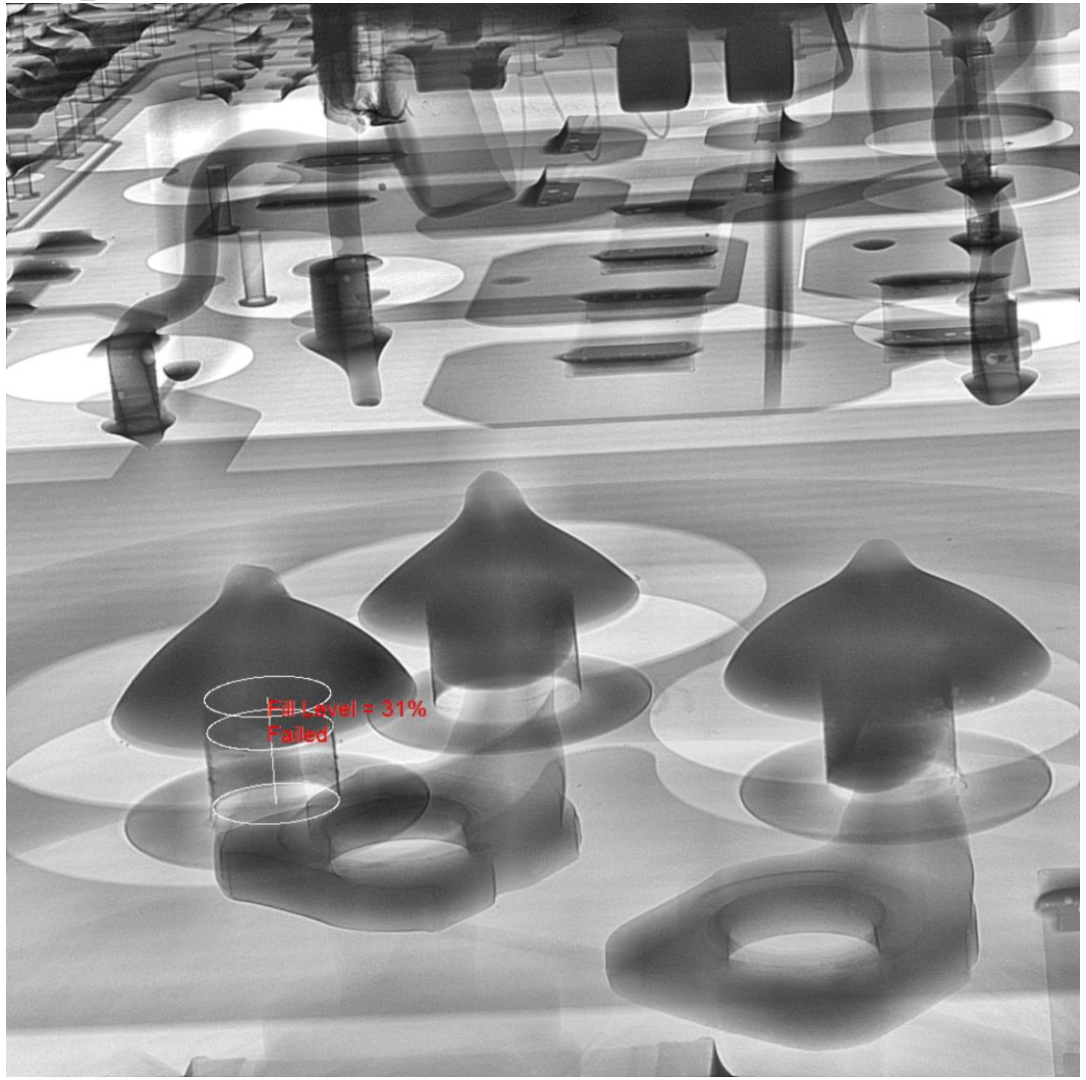


Common SMT inspection tasks



Common THT inspection tasks

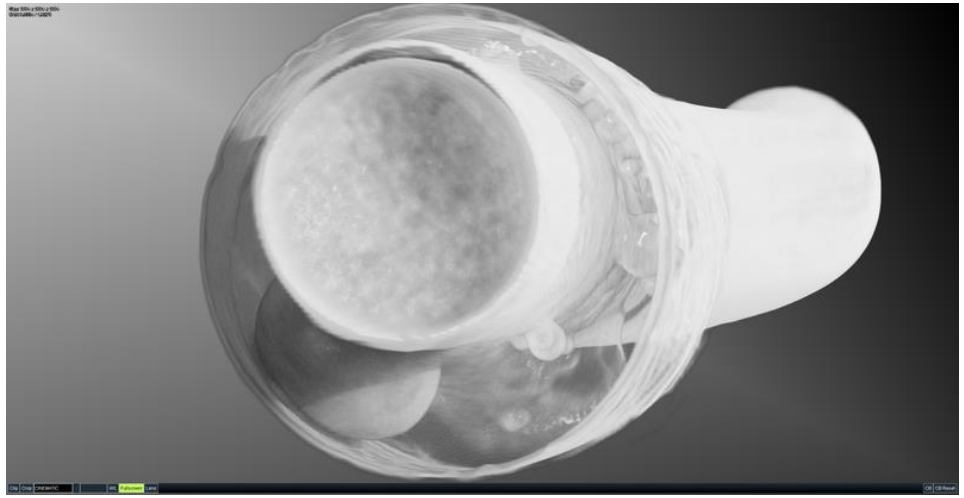
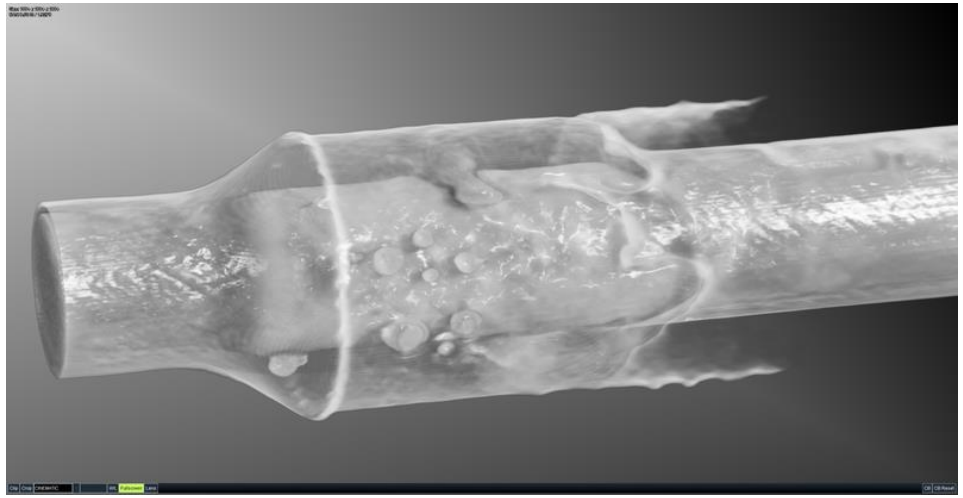
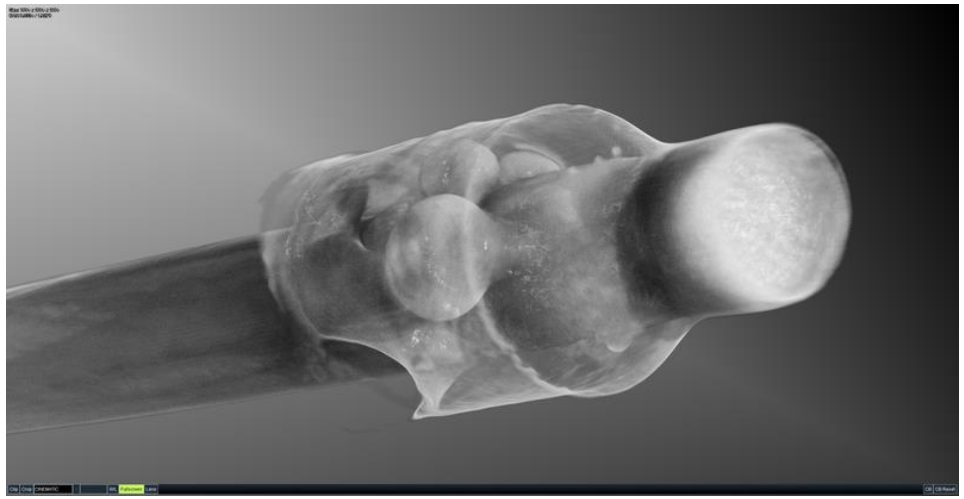
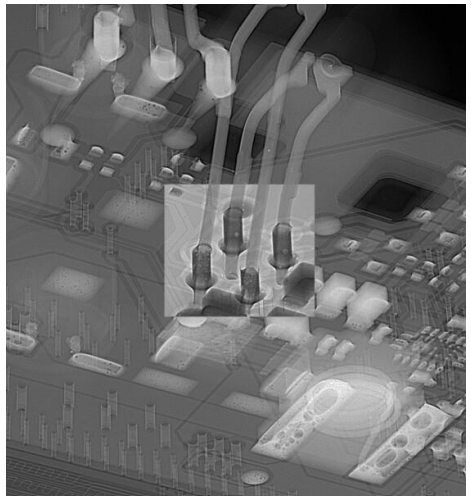
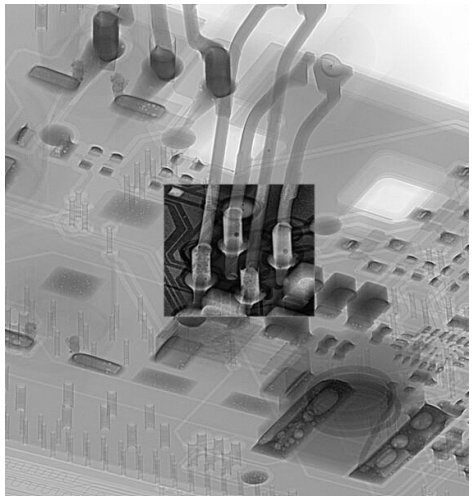
THT Inspection



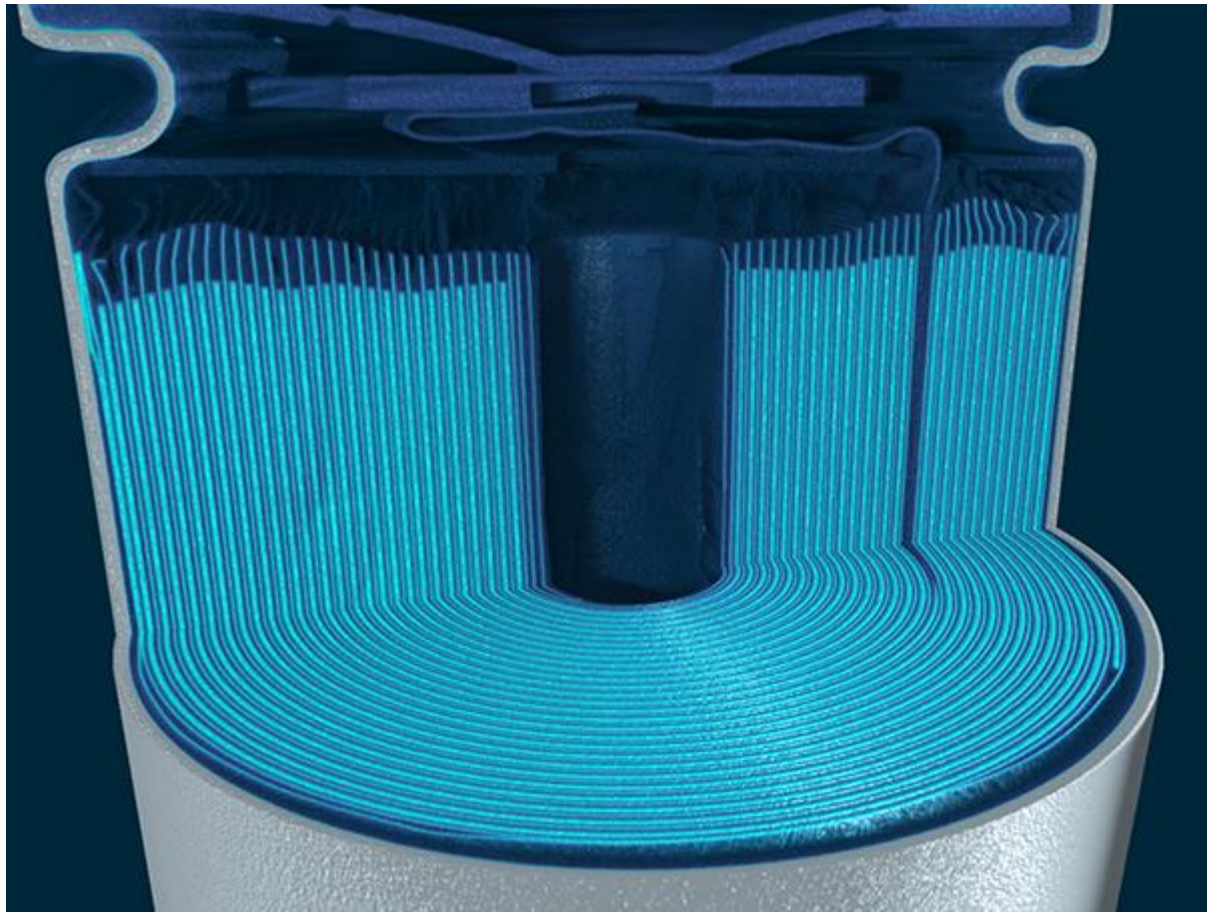
Through Hole Technology (THT)

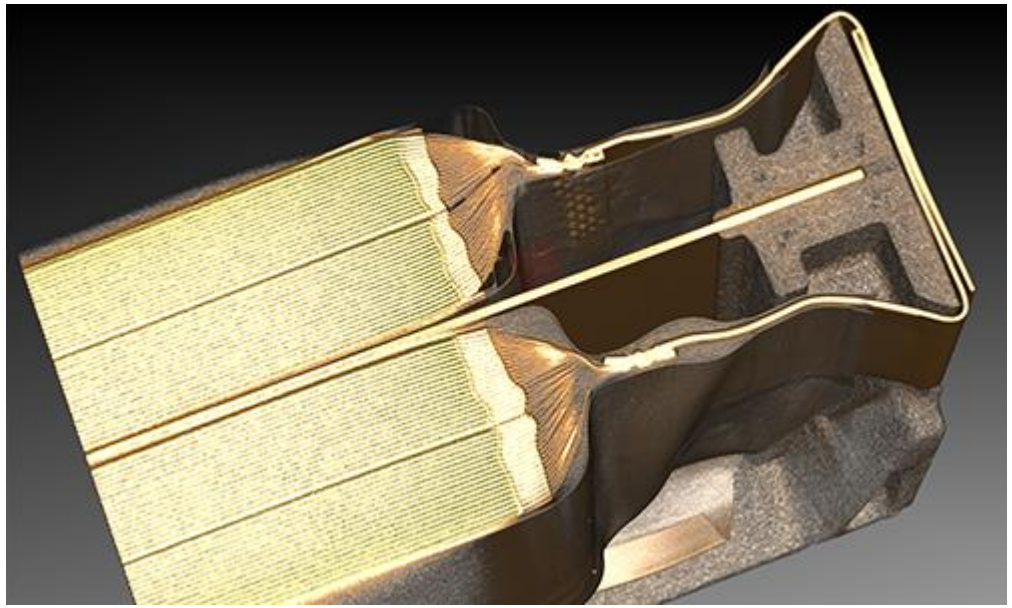
Voiding

Laminography

CT Scan of Battery Cell





Features

(Depending on the machine configuration)

comet
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Open X-ray tube with micro-/multifocus

- Open tube design
- Microfocus or Multifocus (MFT)
- Optional MFT offering 3 modes:
  - **Nanofocus** for highest resolution with target power <1 W
  - **Microfocus** for standard microfocus applications up to 3W target power
  - **High-Power** for the inspection of denser materials with up to 15 W with High-Power Target
- TXI – True X-ray intensity control
- 64 W tube power
- Detail detectability down to <350 nm

Benefits of open microfocus tubes

Unlimited lifetime

Filament & target changable

Various target materials:

- High Power
- High Magnification
- High Resolution

True X-ray Intensity (TXI)

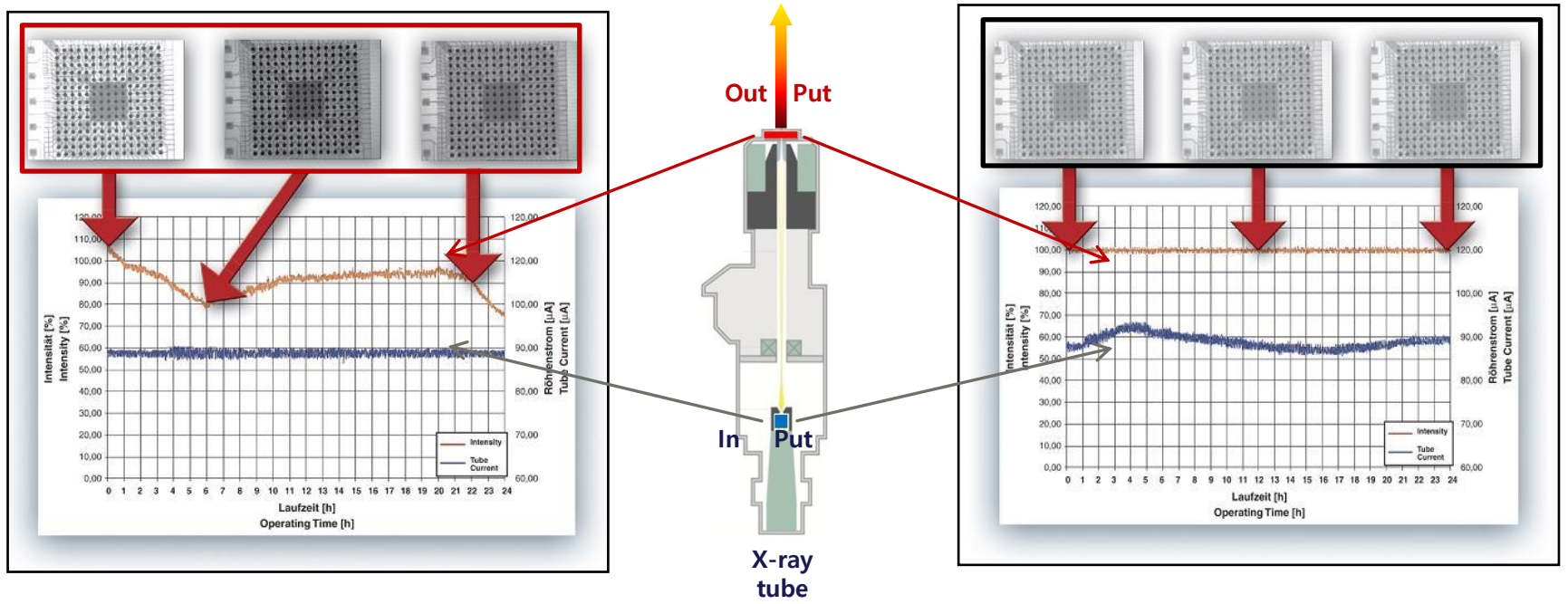


Image without TXI

Image with TXI

- True X-ray Intensity – immediate and steady X-ray stability after auto-start
- Measures the power at the target for more efficient control of focal-spot size
- Constant image qualtiy **= repeatable results**

Patented Comet Yxlon Technology

Water-cooled FXT 160.51

Permanent stabilization of the focal spot due to improved heat dissipation at the tube optics leads to improved CT results with higher spatial resolution and less image distortion. Available as upgrade.

Benefits for your testing environment

- Improved spatial resolution enhances CT capabilities of existing system configuration without changing hardware configuration

Advantages for your Cheetah / Cougar operators

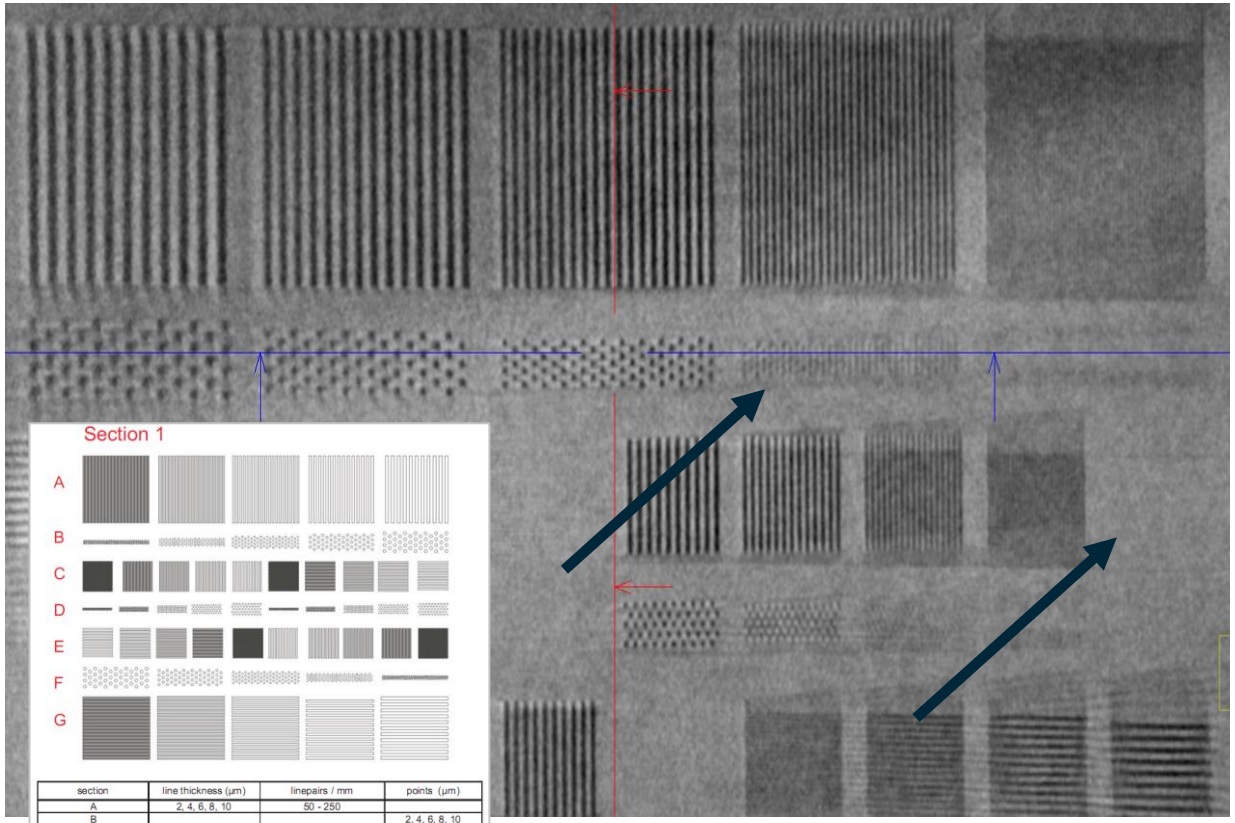
- Continuation of existing workflows without the necessity of additional training

Requirements

- Cheetah EVO with System Version v5 and FXT160.51 X-ray tube

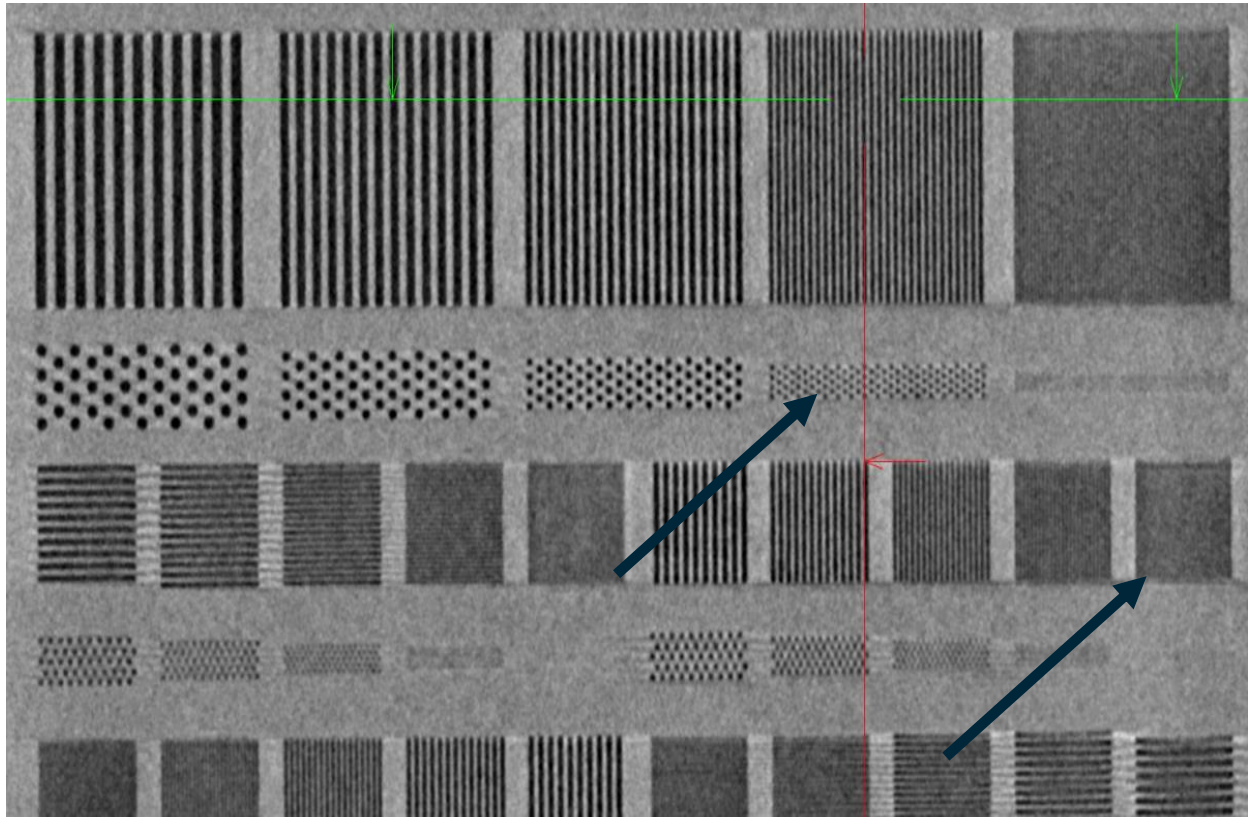
A stabilized focal spot significantly increases CT detail resolution

without cooling

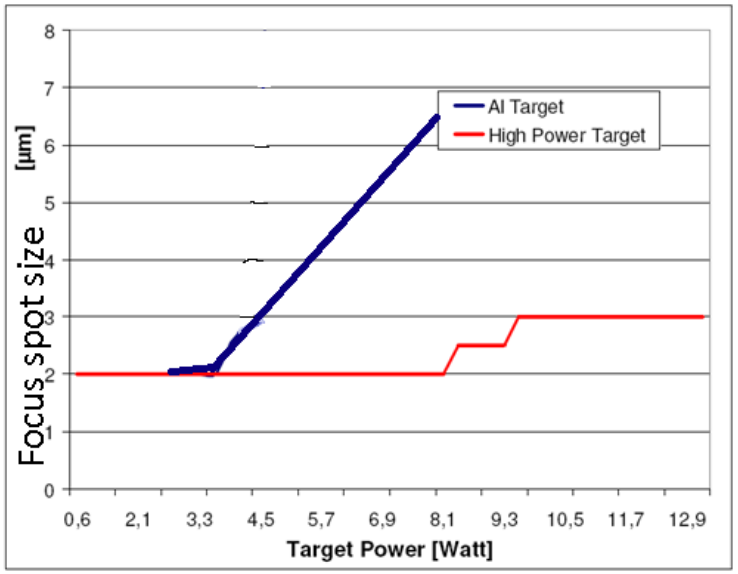


section	line thickness (µm)	linepairs / mm	points (µm)
A	2, 4, 6, 8, 10	50 - 250	
B			2, 4, 6, 8, 10
C	1, 2, 3, 4, 5	100 - 500	
D			1, 2, 3, 4, 5
E	1, 2, 3, 4, 5	100 - 500	
F			2, 4, 6, 8, 10
G	2, 4, 6, 8, 10	50 - 250	

with cooling



Tube Technology



Y.High Power Target

- 5 µm tungsten layer
- Offers a resolution at high-power factor 2-3x higher compared to standard targets
- Optimum target for applications at high target power with high resolution
- Max. target power: 15 W

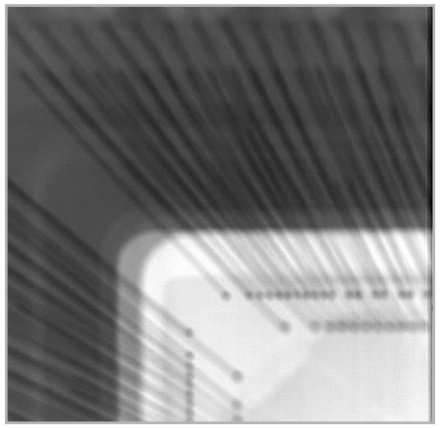
Y.High Resolution Power Target (HRP-Target)

- 1 µm tungsten layer
- Offers a resolution at nanofocus factor 2x higher compared to standard targets until 8 W
- Optimum target for applications with highest resolution
- Max. target power: 15 W

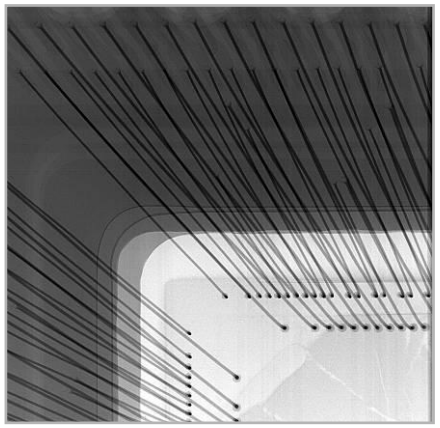
Comparision Standard vs High Power Target

Standard Target

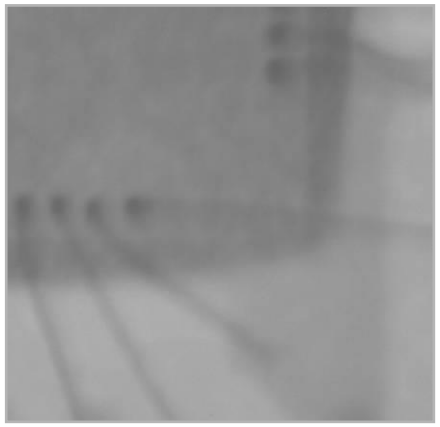
High Power Target

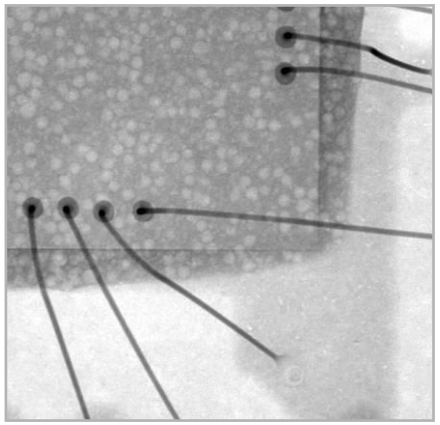


Conventional target with de-focusing



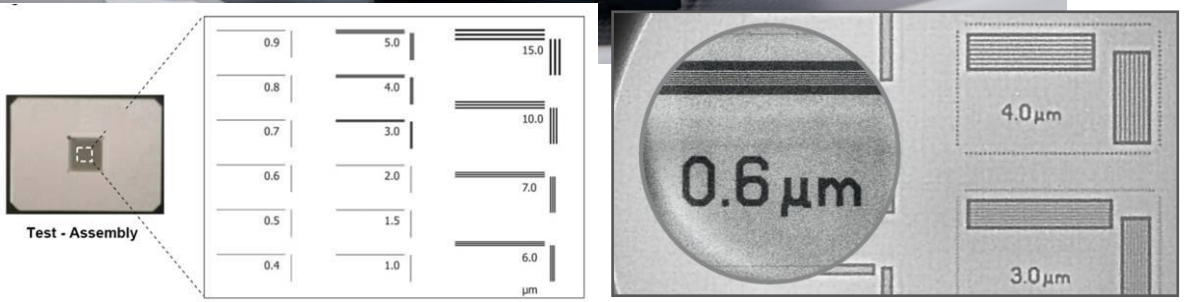
High Power Target keeping focus





At same tube and detector settings

Detector Technology

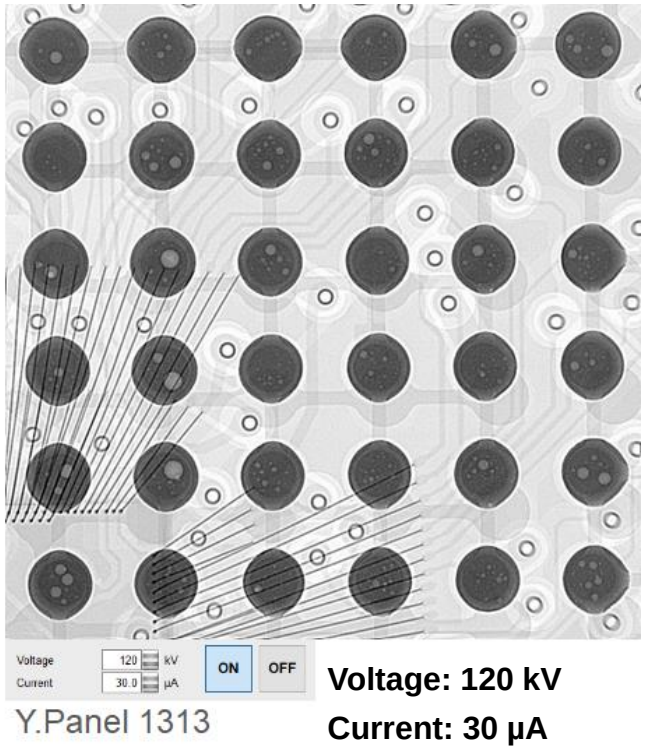


- Large flat-panel detectors 1515 or 1616.
  Better overview and shorter inspection times due to reduced steps in automated routines
- Pixel size optimized for resolution and contrast sensitivity even with limited or no image integration
- Fast real time imaging, 34 fps (1x1)
- 16 bit image processing – 65000 grey values
- Spatial resolution in combination with FXT-160.51
  Multifocus tube of 0,6µm (JIMA mask)

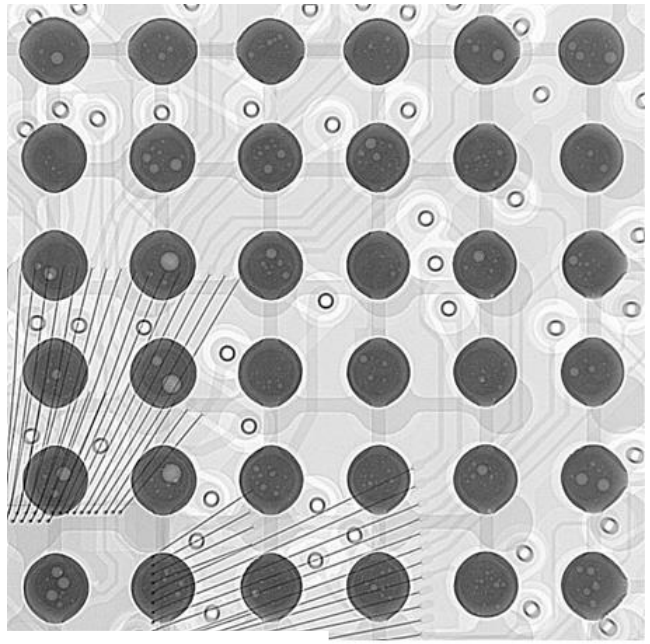
FPD: High image quality with lower dose

Benefit:

Minimized damage on sensitive components by using lower kV and power at the same image quality



Voltage: 120 kV
Current: 30 µA

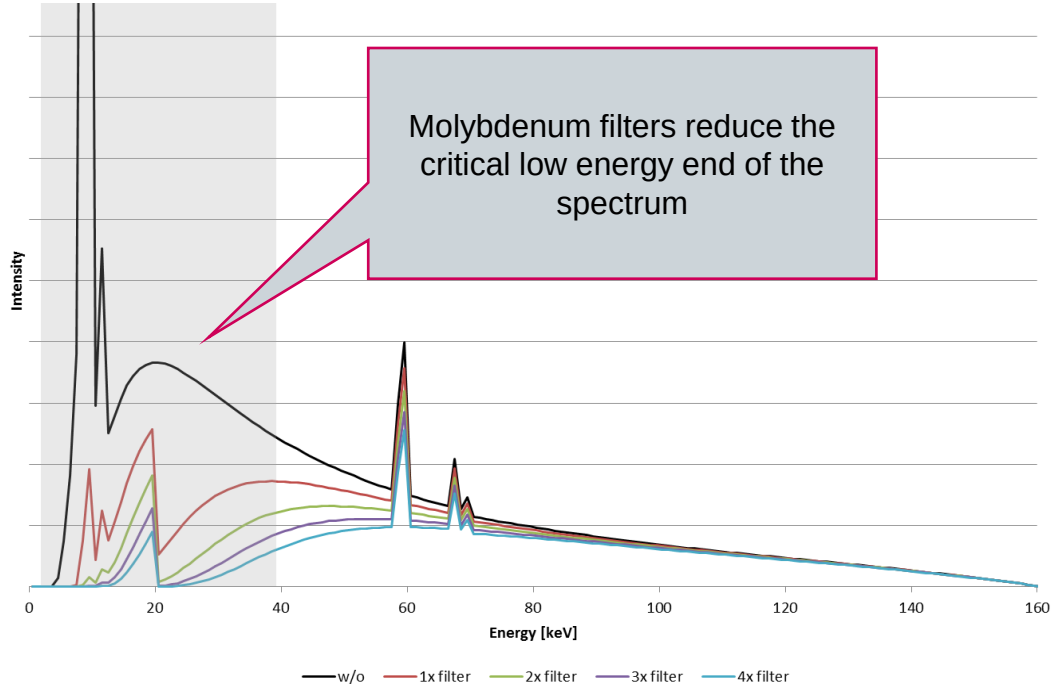


Voltage: 80 kV
Current: 20 µA

Dose reduction kit

Protect sensitive parts by reducing most damaging low-energy photons

Dose Reduction Kit



- With optional dose reduction kit the dose rate on sensitive components can be additionaly reduced.
- Combination of collimator and filters limit the effects of radiation to potentially damage silicon components while allowing allowing exact the radiation needed for imaging.

Dose Monitoring

Dose Monitoring technology for Cheetah EVO systems in order to avoid harming of electronics parts which are sensitive to X-rays. / Dose monitoring technology for Cheetah EVO systems to prevent damage of X-ray sensitive electronics

Benefits

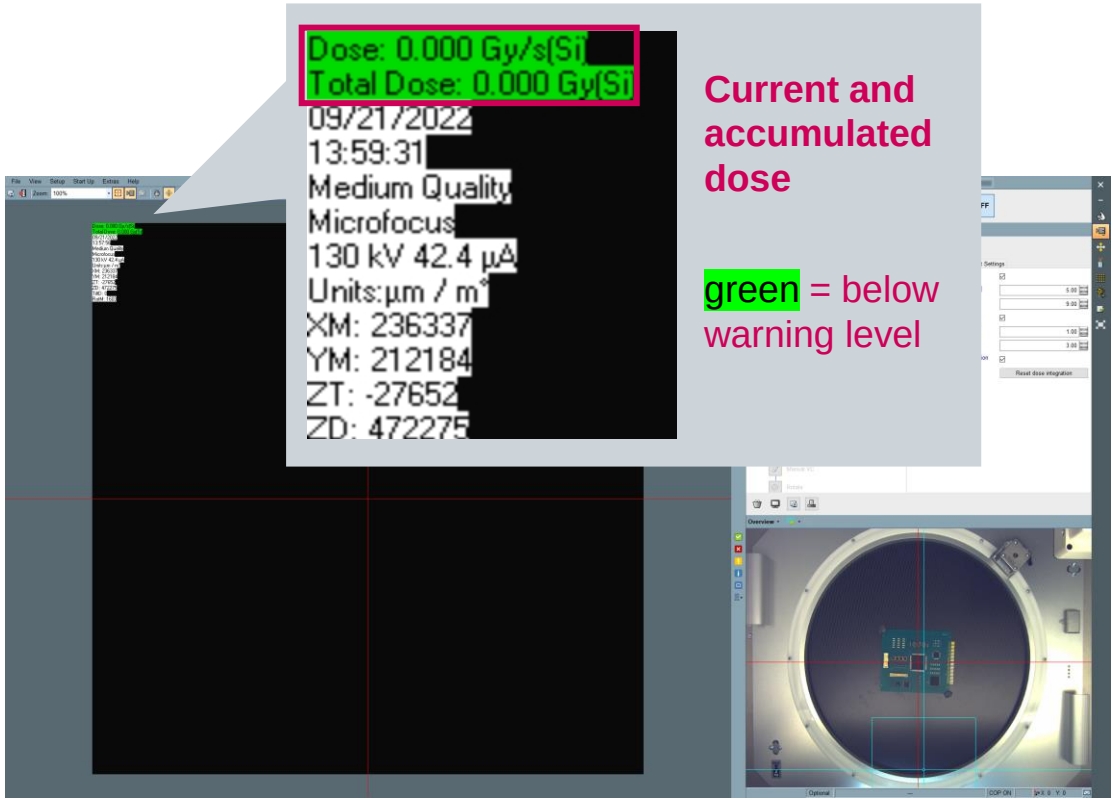
- X-ray inspection of components without destroying them if possible.
- Better inspection planning in compliance with specified dose limits is possible.
- Components that may have been destroyed or whose function has been impaired can be identified and sorted out.

Advantages

X-ray dose is automatically monitored, and the operator is informed when a critical threshold is reached, and the scan is aborted; this guarantees a non-destructive inspection of sensitive parts.

Dose Monitoring & Alarm in Cheetah

Current & accumulated dose warning levels prevent damage to sensitive parts



Current and accumulated dose

green = below warning level

yellow = warning level

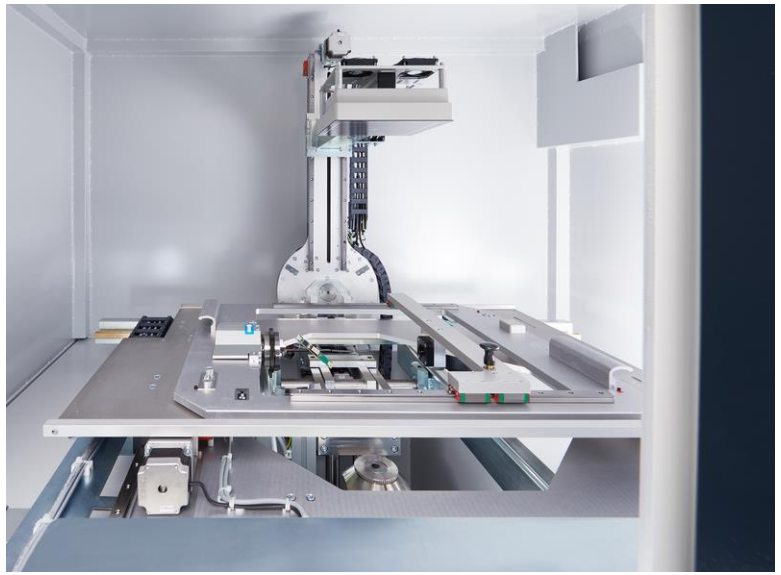
red = critical level

Advanced Manipulation
Alternative Trays

3 different exchangeable trays → **Increase of flexibility**

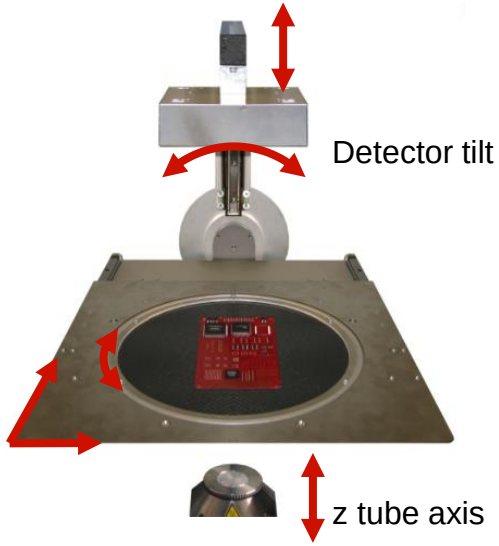
Standard tray

Rotational tray



µCT-sample tray

Collision-free concept (guard)



5-axis Manipulation System
- x/y sample tray axis
- z tube axis
- Detector 140° tilt angle
- z detector axis
- 360° rotational sample table

µCT Rotation Axis
- Reconfiguration in <1 min.
- CT-upgradable on customer site

Optional 20 kg "High Load Capacity“

Benefits:

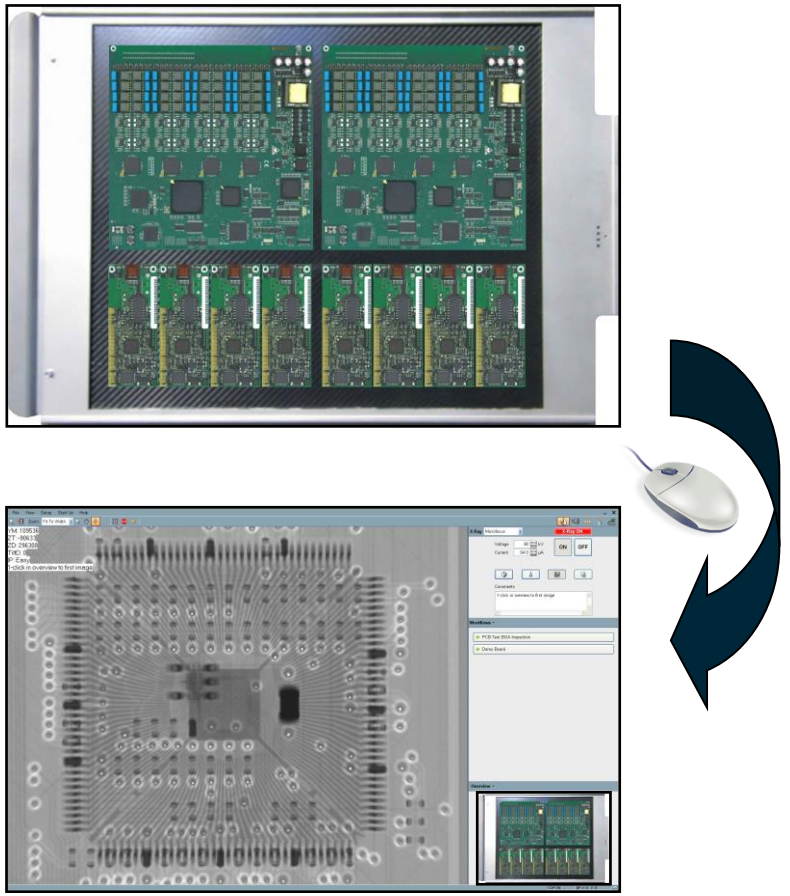
- Flexibility to inspect heavier objects such as controller box for electric vehicles.
- Durable and stable manipulator through improved tray and guides, High Load Capacity for your empowerment.
- With the optional high load capacity unit on the Comet Yxlon Cheetah EVO, we are closing a gap that greatly expands the flexibility of the microfocus X-ray and CT system.
- While common quality inspections in the manufacturing electronics industry such as SMT usually get by with a maximum loading of the inspection part carrier of 2 - 5 kg, the high loading capacity of up to 20 kg offers fundamental advantages.

Software / Image Processing

Intuitive FGUI software to control all system functions and components

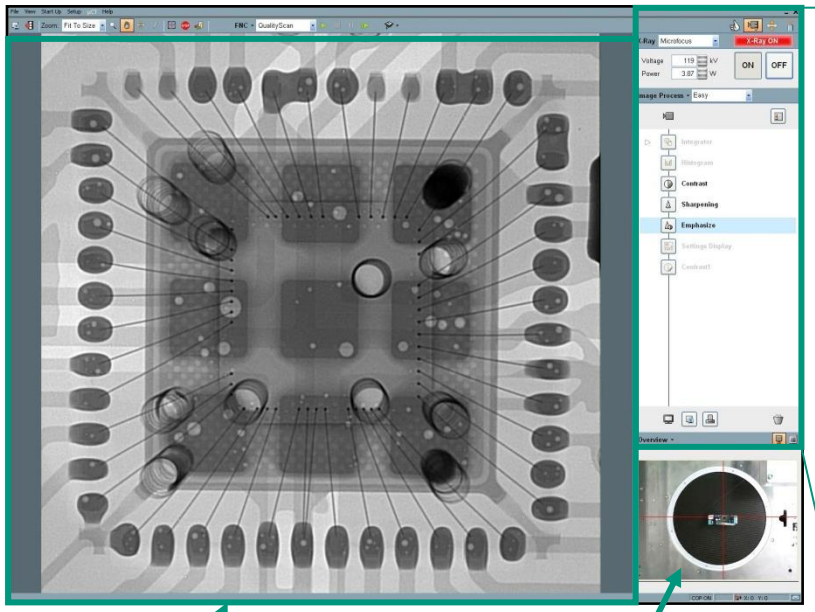
- X-ray Parameter, X-ray on/off, X-ray tube settings
- Maniplation system and axis via Mouse or joysticks
- Image-enhancement, -improvement and –processing functions, such as:
  - Contrast enhancement or auto contrast
  - Sharpening Filter
  - Averaging
  - Color Filter
  - Void Calculation
  - BGA Inspection
  - …and many more

1-click Solutions



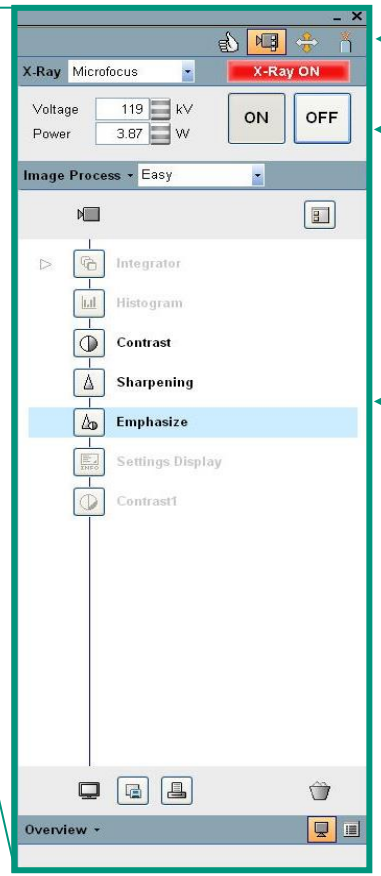
- 1-click to first image
- Click & Center
- Frame & Zoom
- Click & Fly
- 1-click access to library of automated inspection routines
- 1-click access to CL/µCT workspace with execution (option)

Y.FGUI Overview



XXL real-time image

Overview sample tabel
for easy sample positioning



Workspace
(EASY, IP, X-Ray)

X-ray settings
(kV, µA, X-ray ON/OFF)

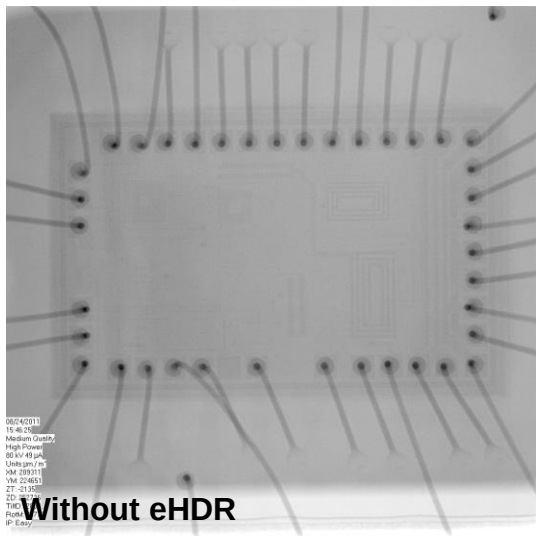
Image Processing:

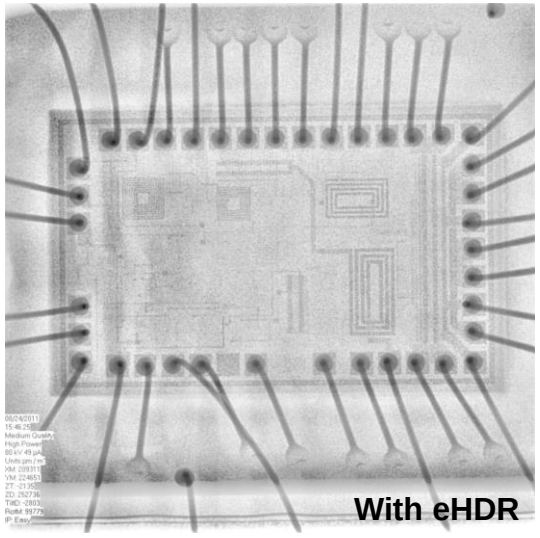
- Image Analysis
  - Enhancements
  - Filter
    - Histogram
    - Gamma
    - etc
- OSD: On Screen Display
  - Drawing
  - Measuring
  - …

eHDR – Filter

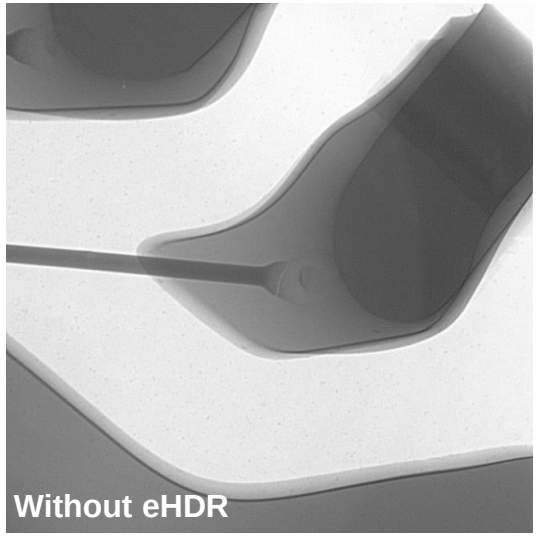
1-click operation – electronic High-Dynamic Radioscopy (eHDR)

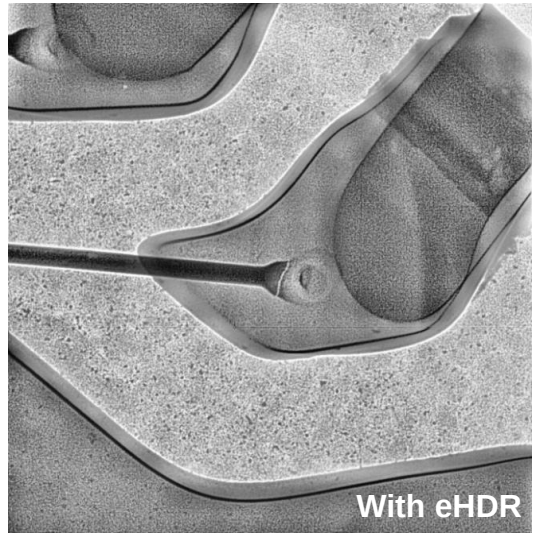
Real-time imaging with outstanding effects





Memory device



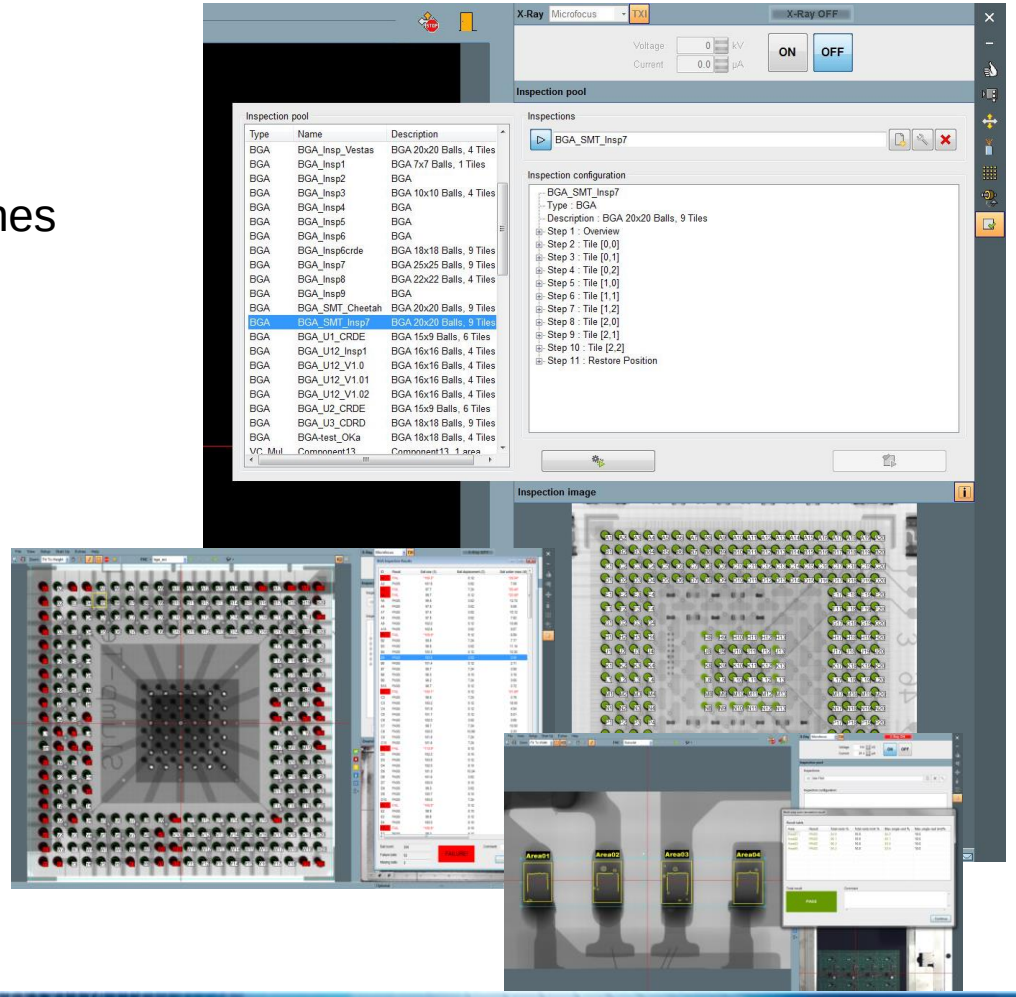


Crack in wedge bond

Easy automation and automatic defect recognition

Customer benefits:

- Teach-in with FNC programming based on easy visual basics
- Fully automated functionality without needing CAD Input or programming skills
- Simple to make and modify, accurate automated inspection routines
- Automated component fault analysis
- Easy-to-apply, powerful suite of image enhancements
- Automated reports



Comet Yxlon Inspection pool:

- Collection of inspections
- Easily re-useable
- Includes machine settings
- Works with BGA and Multi Area Void calculations
- Can be integrated into automated inspection plan

FGUI Automatic BGA Inspection

Wizard leads user through inspection workflow

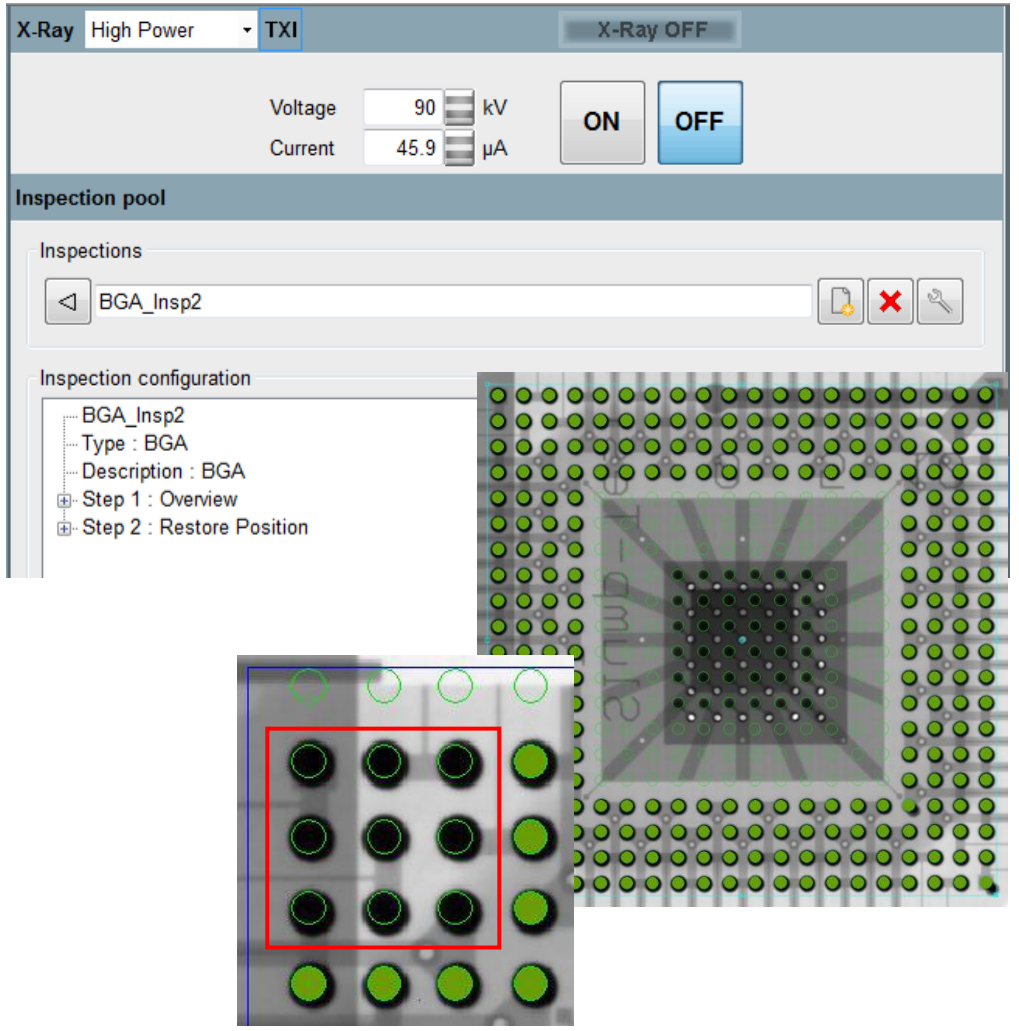
Automatic grid detection

Solder balls can be deselected / selected manually

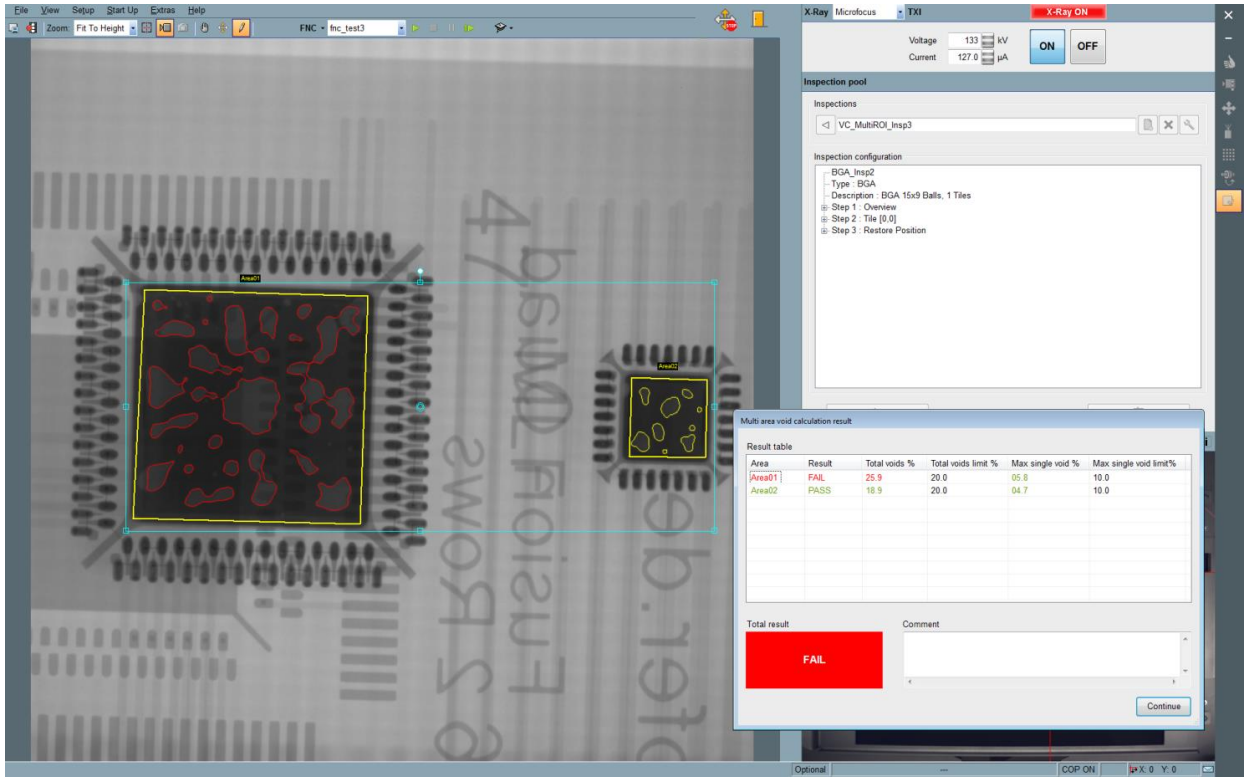
- Either by clicking on the respective ball
- Or by drawinig a rectangle around respective balls

Balls will be indexed automatically for clear identification

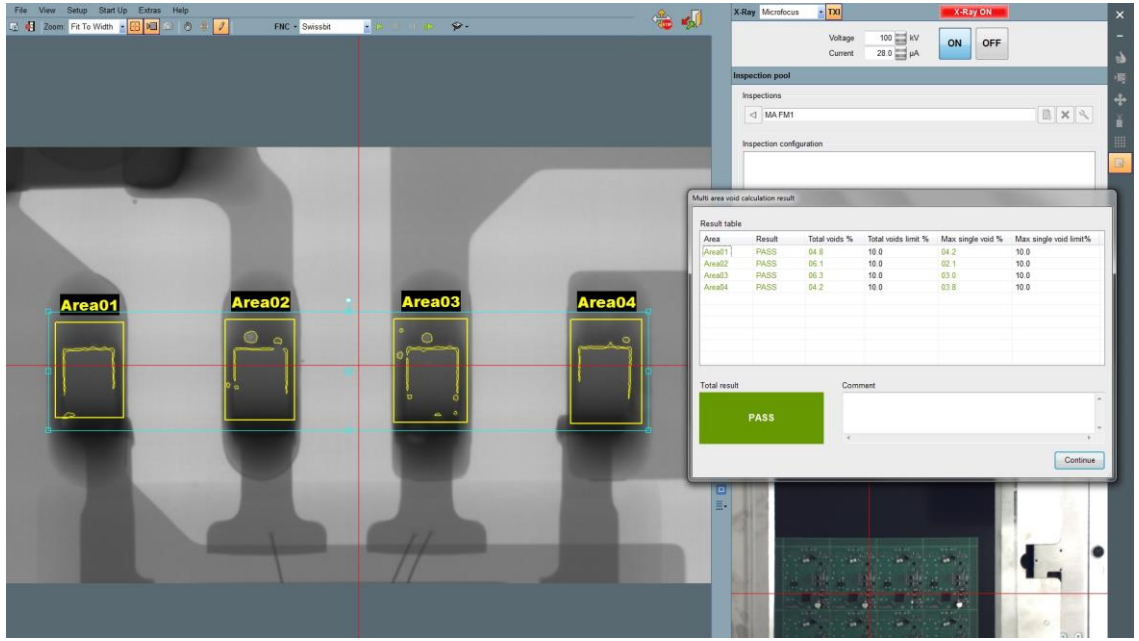
Automatic detail examination in high magnification



FGUI Automatic Analysis MAVC



- Automatic Analysis of Multi Void Areas
- Each area can be calculated independently
- Each area can have own defect criteria



Traceability

Establish a one-to-one correspondence between

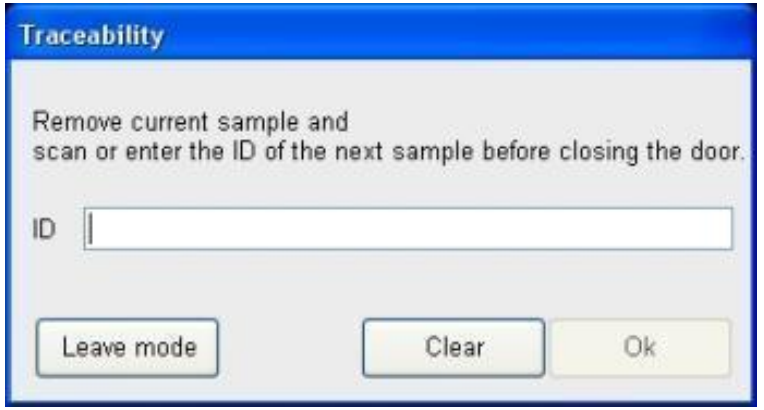
- Samples and
- Inspection Reports / Inspection Maps

Barcodereader & holder

- 1D and 2D codes

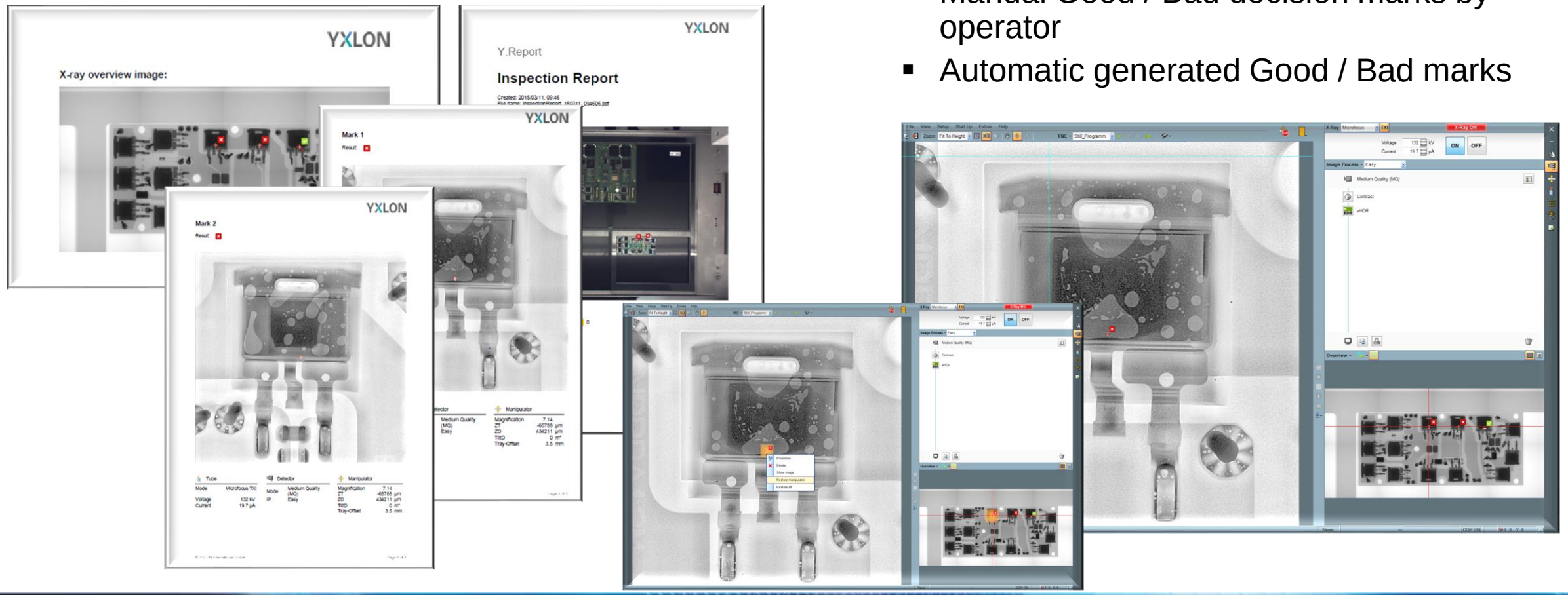
Y.FGUI plugin

- 3 user guidance modes:
  - Always / Before Inspection:
    - Mandatory report generation
    - Forces user to enter ID
  - Optional / After Inspection:
    - E.g. Report generation for failed samples only
  - Never:
    - No traceability



FGUI 1- Click Inspection Report

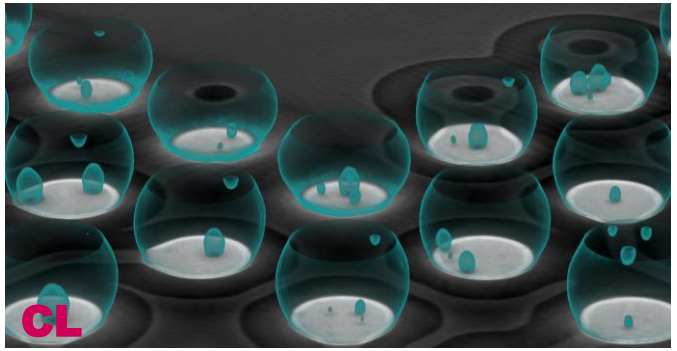
- Automatic manipulation to ROIs
- Manual Good / Bad decision marks by operator
- Automatic generated Good / Bad marks

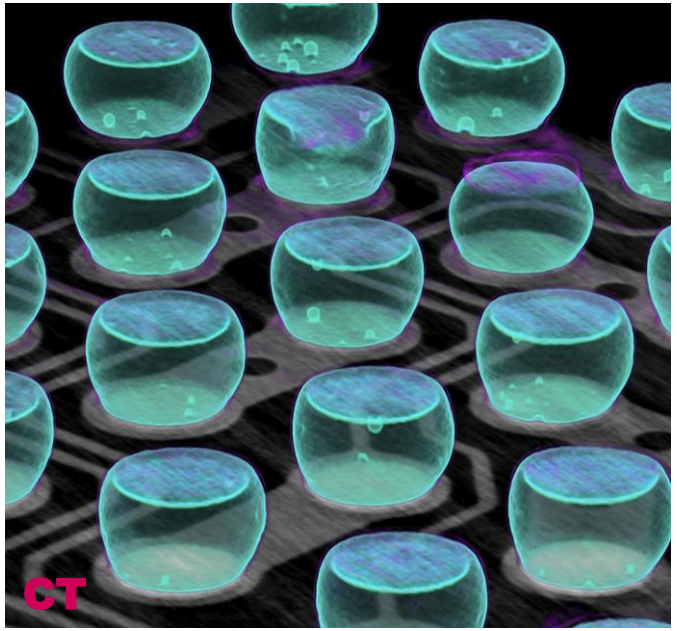


High-performance/fast Computed Tomography and Laminography inspection

Benefits:

- µCT results in few minutes including image acquisition and CT reconstruction
- Easy and intuitive wizard for CT and CL
- Various algorithms to enhance the reconstruction including jitter correction
- Slice-by-slice image analysis
- Superior CL and µCT results





Laminography: Combining the benefits of 2D and 3D inspection

Computed laminography (micro3D Slice):

- “2.5D inspection”
- Technological intermediate between 2D X-ray radioscopy and 3D computed tomography (CT).

Laminography addresses the specific challenges of inspecting flat components, such as printed circuit boards (PCB), microchips (IC), entire cell phones, tablets, laptops, or even scripts on papyrus.

While a 2D X-ray inspection provides high resolution but does not give spatial information, 3D CT supplies good spatial information but can lack resolution.

A case for laminography: It adds depth information to high-resolution 2D images, so defects can be reliably detected and spatially located in a plane object.

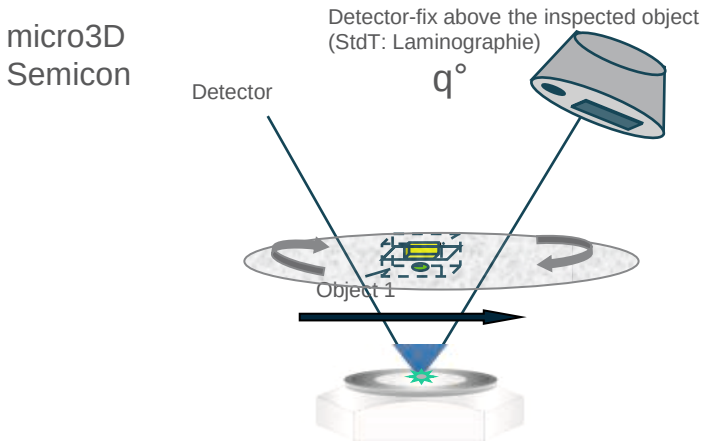
micro3D slice

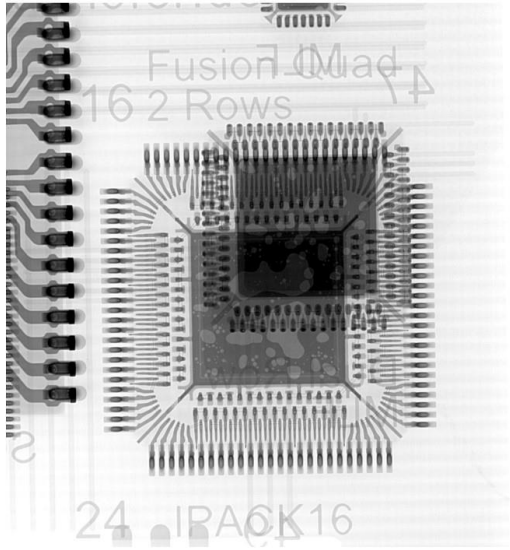
Reconstruction of projections (DR X-ray images) obtaining a incomplete set of data by rotating the object on sample tray (360°).
Precondition is the penetration capability of the inspected object from reduced angles (< 60°).

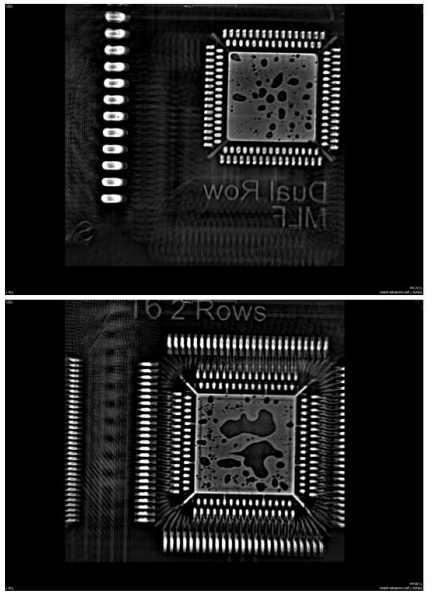
Used for flat components or larger size objects to obtain higher magnification images and CT Slices

Allows to inspect single 3D slices

Software add-on for Cheetah and Cougar.
No need for specific hardware.







Analysis Software

(Depending on the machine configuration)

comet
yxlon

Image Software Solutions

For visualization and image analysis, Cougar and Cheetah offer:

- **2D X-ray image inspection:** Comet Yxlon FGUI
- **CT reconstruction and visualization:** Comet Yxlon FF CT software (powered by Siemens CERA Xplorer)
- **3D volume visualization and analysis:** Dragonfly
- **CT data processing, analysis, and visualization:** Volume Graphics VGSTUDIO

Software solutions for automated inspection

- Multi Area Void Calculation MAVC
- Automatic positioning and re-positioning of inspection parts based on their unique structures
- Automated inspection processes for identical parts after an initial manual set-up by an operator
- Easy reporting and software-supported evaluation
- **VoidInspect CL for void analysis in computed laminography images**

Facts & Figures

comet
yxlon

Cheetah EVO

X-ray inspection system

Dimensions (w x d x h)	1,650 x 1,400 x 2,050 mm
Weight	2,200 kg
Mains connections	230 V ± 10% AC, 50/60 Hz, 1 Phase, neutral and ground conductor
Fuse protection	16 A
Max. power consumption	2.5 kVA
Max. dose rate*	< 1µSv/h

* at 100 mm distance to the cabinet surface

Inspection parts

Max. part size	800 x 500 mm (31" x 19")
Max. radiographic area	460 x 410 mm (18" x 16")
Max. part weight (standard)	5 kg
Max. part weight rotation	2 kg
Max. part weight (high load capacity)	20 kg

Manipulation

Manipulation control	via mouse or joystick
Manipulation axes	X, Y, Z(D)*
Oblique viewing	+/-70° (140°)

* Manipulation options for horizontal and vertical rotation available

General Product Features

Time to first image (typ.)	~ 10 s
Reconfiguration time (typ.)	< 60 s
Acquisition time (Quick Scan) for 2000 projections	~ 3.15 min
Reconstruction time (Quick Scan) for 2000 projections	~ 1.55 min
Acquisition time (micro3Dslice Semicon) for 120 projections	~ 1.45 min
Reconstruction time (micro3Dslice Semicon) for 120 projections	~ 0.30 min
Access for sample loading	large automated door (690 x 650 mm)
Cabinet window	520 x 370 mm
Monitor	27" Ultrasharp, wide viewing angles
Zoom+	yes
PowerDrive	yes
Image stabilization	air suspension

X-ray source

	FXT-160.50 Microfocus	FXT-160.51 Multifocus
Target	transmission	
Voltage range	20 – 160 kV	
Current range	0.001 – 1.0 mA	
Tube power	max. 64 W	
Target power	max. 15 W	
Target material	Tungsten	
Detail detectability	0.75 µm	< 0.3 µm
X-ray intensity control	TXI	
Optional		Water-cooling
Optional	Dose Reduction Kit with collimator and filters for sensitive test parts	

Image Chain

Geometric magnification	~ 3,000 x	
Total magnification	~ 384,000 x	
Spatial Resolution	1.5 µm	0.6 µm

Flat-panel detector

	1308	1313	1515	1616
Max. resolution Pixel	1004 x 620	1004 x 1004	1280 x 1280	1276 x 1276
Pixel size	127 µm	127 µm	119 µm	127 µm
Pixel Area	128 mm x 79 mm	128 mm x 128 mm	152 mm x 152 mm	162 mm x 162 mm
A/D transformer	16 bit			

Please note that not all components and features described in this brochure belong to the standard configurations but are part of an optional selection.

Cougar EVO

X-ray inspection system

Dimensions (w x d x h)	1,000 x 1,050 x 2,200 mm
Weight	1,450 kg
Mains connections	230 V ± 10% AC, 50/60 Hz, 1 Phase, neutral and ground conductor
Fuse protection	16 A
Max. power consumption	2.5 kVA
Max. dose rate*	< 1µSv/h

* at 100 mm distance to the cabinet surface

Inspection parts

Max. part size	440 mm x 550 mm (17"x 21")
Max. radiographic area	310 mm x 310 mm (12"x 12")
Max. part weight (standard)	5 kg
Max. part weight rotation and tilt	2 kg

Manipulation

Manipulation control	via mouse or joystick
Manipulation axes	X, Y, Z(D)*
Oblique viewing	+/-70° (140°)

* Manipulation options for horizontal and vertical rotation and tilting available

General Product Features

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Reconstruction time (Quick Scan) for 2000 projections	~ 1.55 min
Acquisition time (micro3Dslice Semicon) for 120 projections	~ 1.45 min
Reconstruction time (micro3Dslice Semicon) for 120 projections	~ 0.30 min
Access for sample loading	manual
Cabinet window	380 mm x 200 mm
Monitor	27" Ultrasharp, wide viewing angles
Zoom+	yes
PowerDrive	yes

X-ray source	FXT-160.50 Microfocus	FXT-160.51 Multifocus
Target	transmission	
Voltage range	20 – 160 kV	
Current range	0.001 – 1.0 mA	
Tube power	max. 64 W	
Target power	max. 15 W	
Target material	Tungsten	
Detail detectability	0.75 µm	< 0.3 µm
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Please note that not all components and features described in this brochure belong to the standard configurations but are part of an optional selection.

Life Cycle Service

Supporting you every step of the way

Getting you started

Accelonix Installation Services

ON-Site Service
- Installation & Commissioning

Academy
- Basic Module:
  Knowing your system
- Expert Modules:
  Understanding the technology & in-deth experience of using this knowledge
- Application Modules:
  Transfering know-how into daily business

Running things smoothly

Accelonix After Sales Services

Remote-Service
- Remote Control
- VisualAssist

Field Service
- Preventive Maintenance
- Calibration & Certification
- Repair & Exchange

Service Level Agreements
- Sampling Inspection
- At-line Inspection
- In-line Inspection
- Warranty Extension

Service Parts
- Smart Service Parts
- Smart Service Cases

Enhancing performance

Lifetime and Application Support

Upgrades
- System Releases
- Components (e.g. Detectors)
- Operating Software

Software-License-Management
- Software Features

Academy
- Expert Modules:
  Understanding the technology & in-deth experience of using this knowledge
- Application Modules:
  Transfering know-how into daily business

Thank you for your attention

Contact

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Accelonix delivers innovative solutions to electronics organisations around the world
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