Inline Computational Imaging:
Single Sensor Technology for Simultaneous 2D/3D High Definition Inline Inspection

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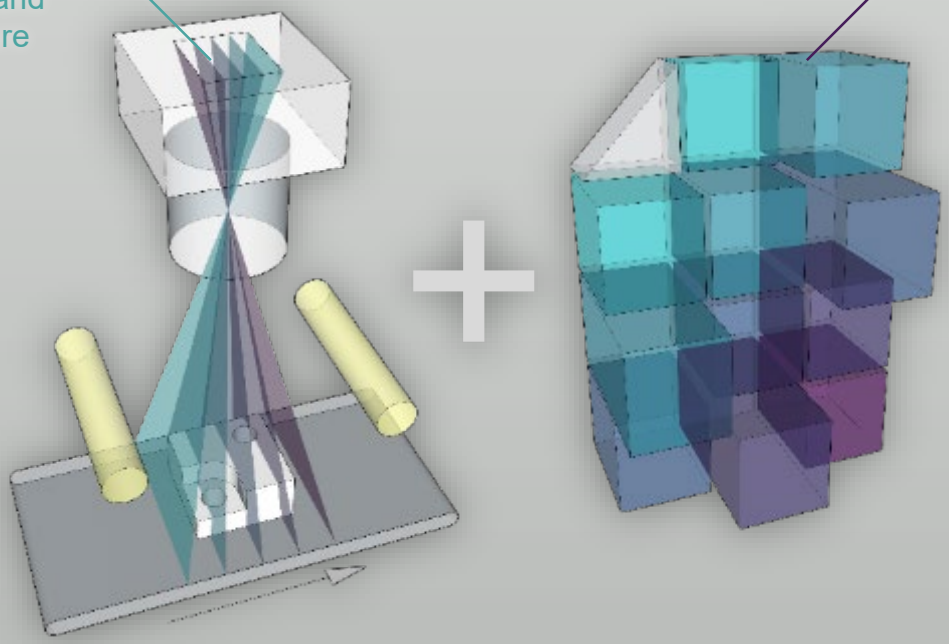
AIT Inline Computational Imaging:
Single Sensor Technology for Simultaneous 2D/3D Inline Inspection

ICI Sensor System

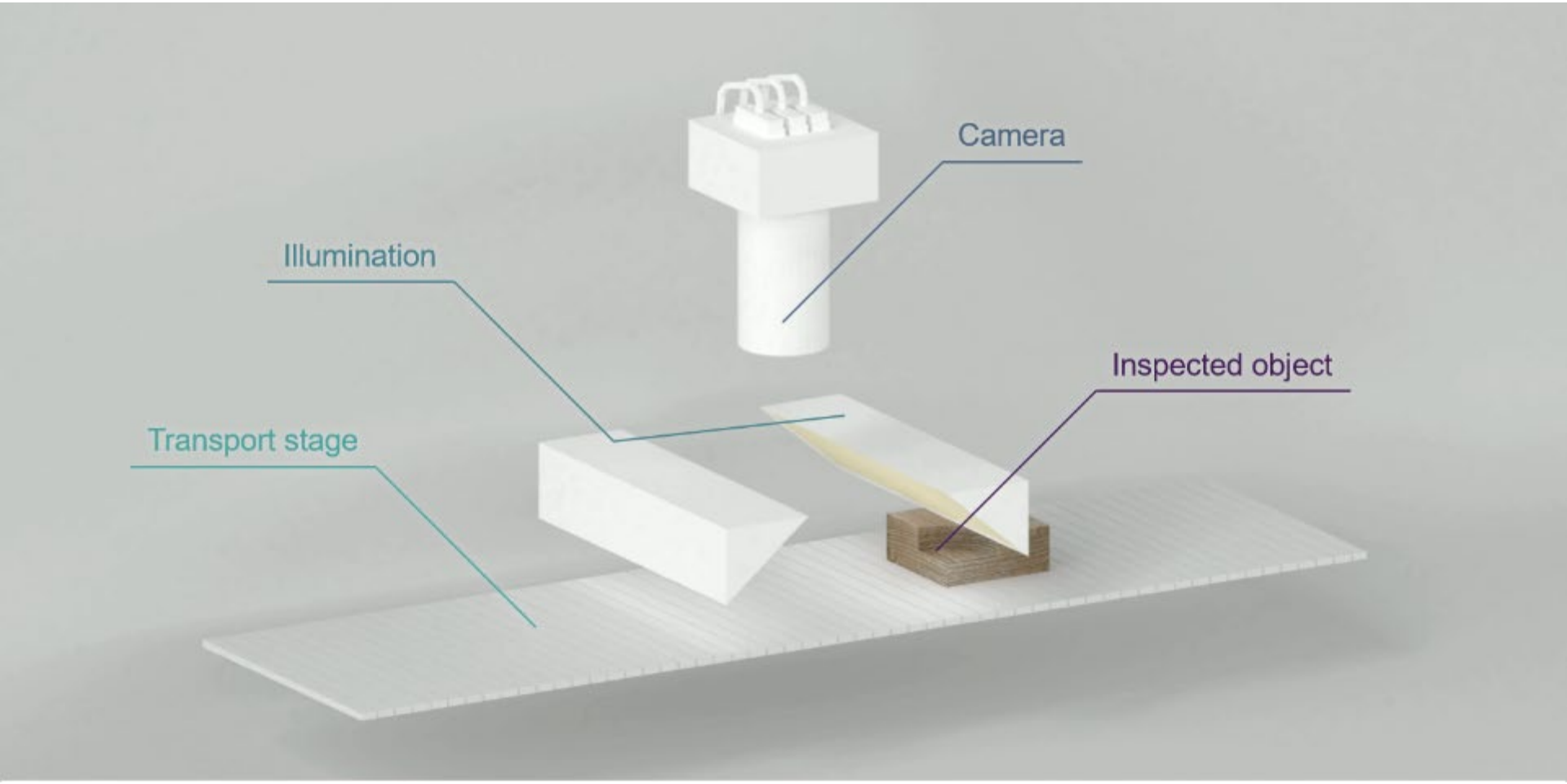
Single Sensor Technology for Simultaneous Light Field and Photometric Stereo Capture

ICI Software Modules

Generic Computational Imaging Library for 2D/3D Tasks



AIT Inline Computational Imaging: Working Principle



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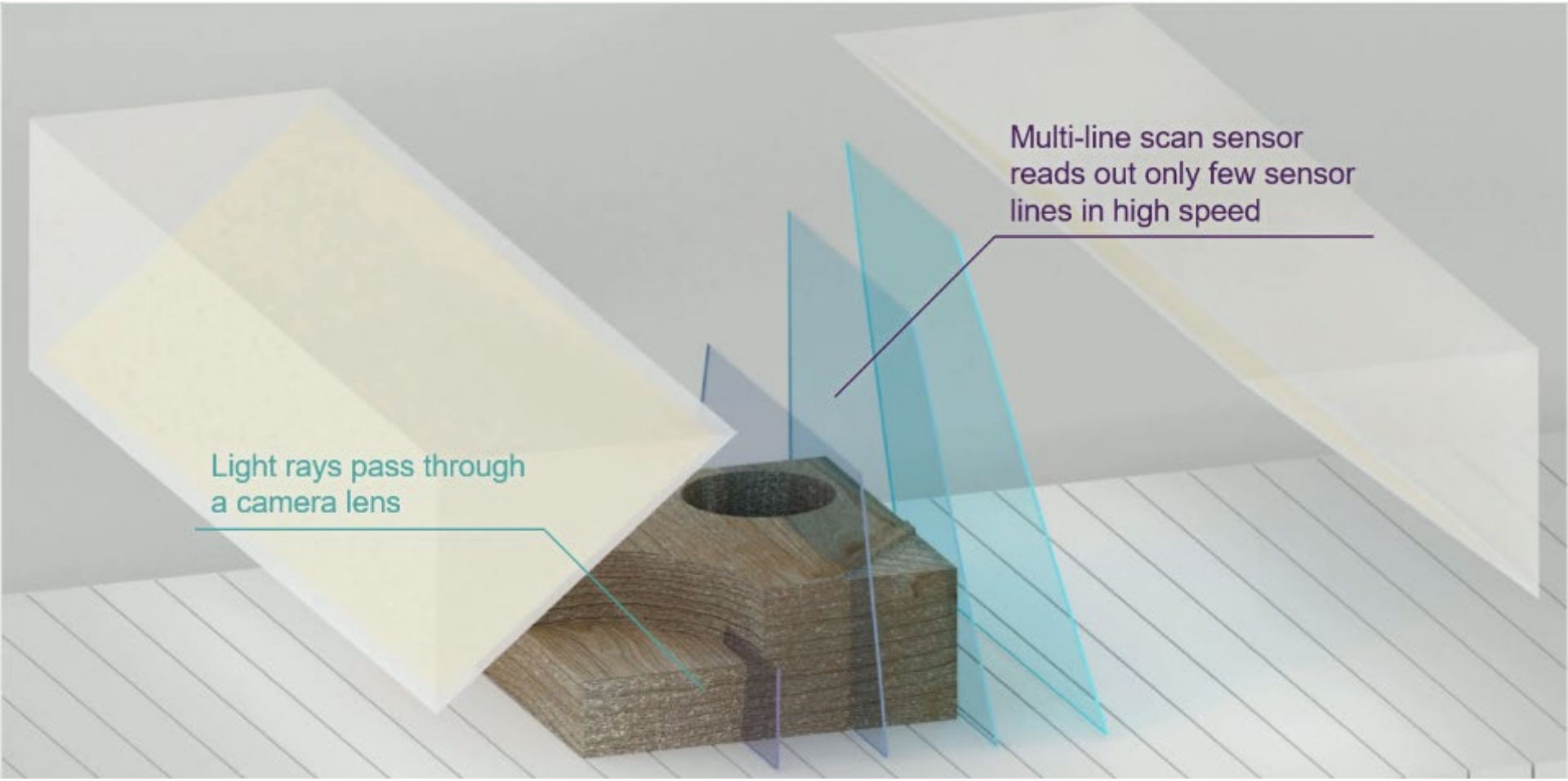

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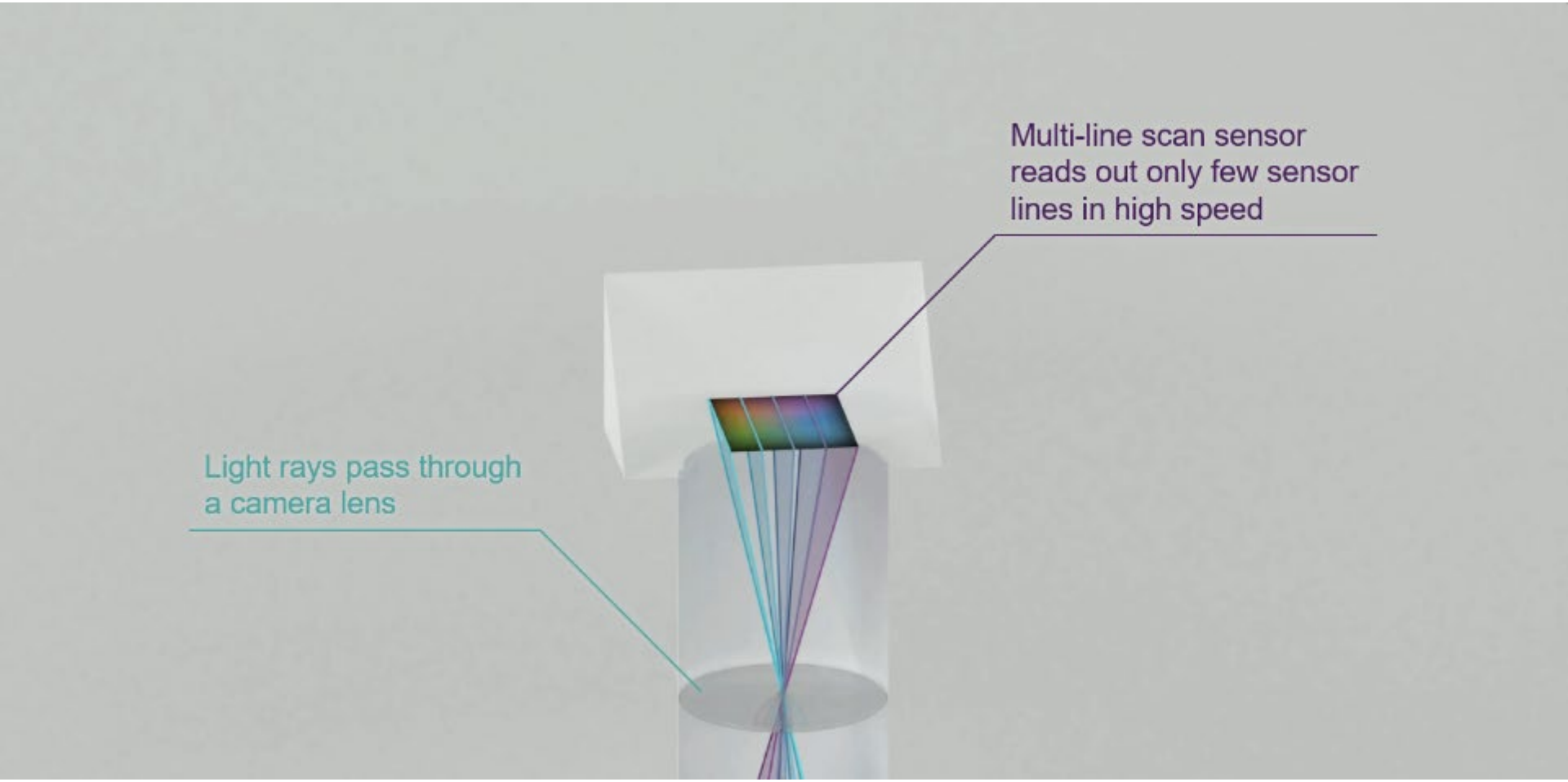

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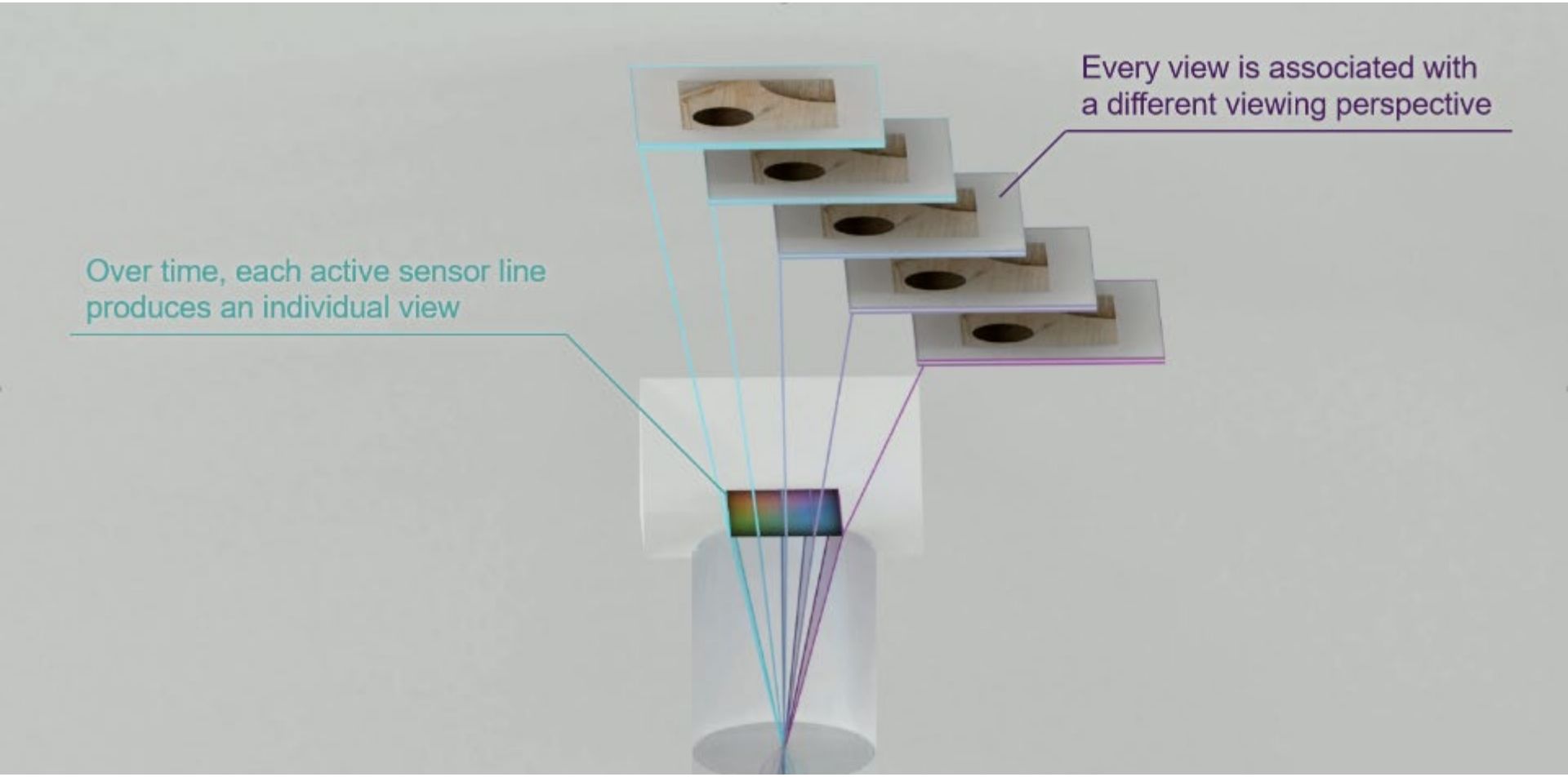

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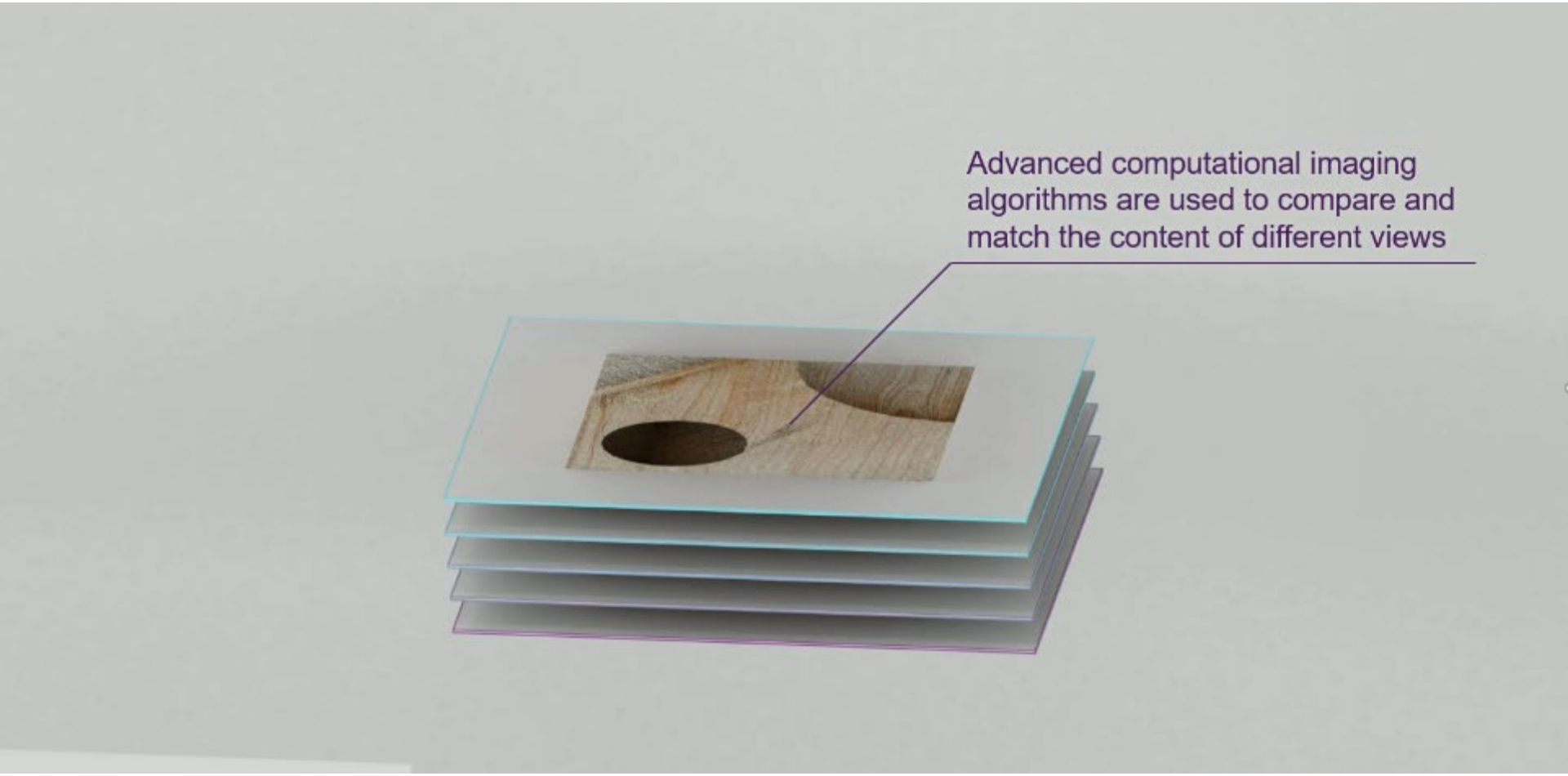

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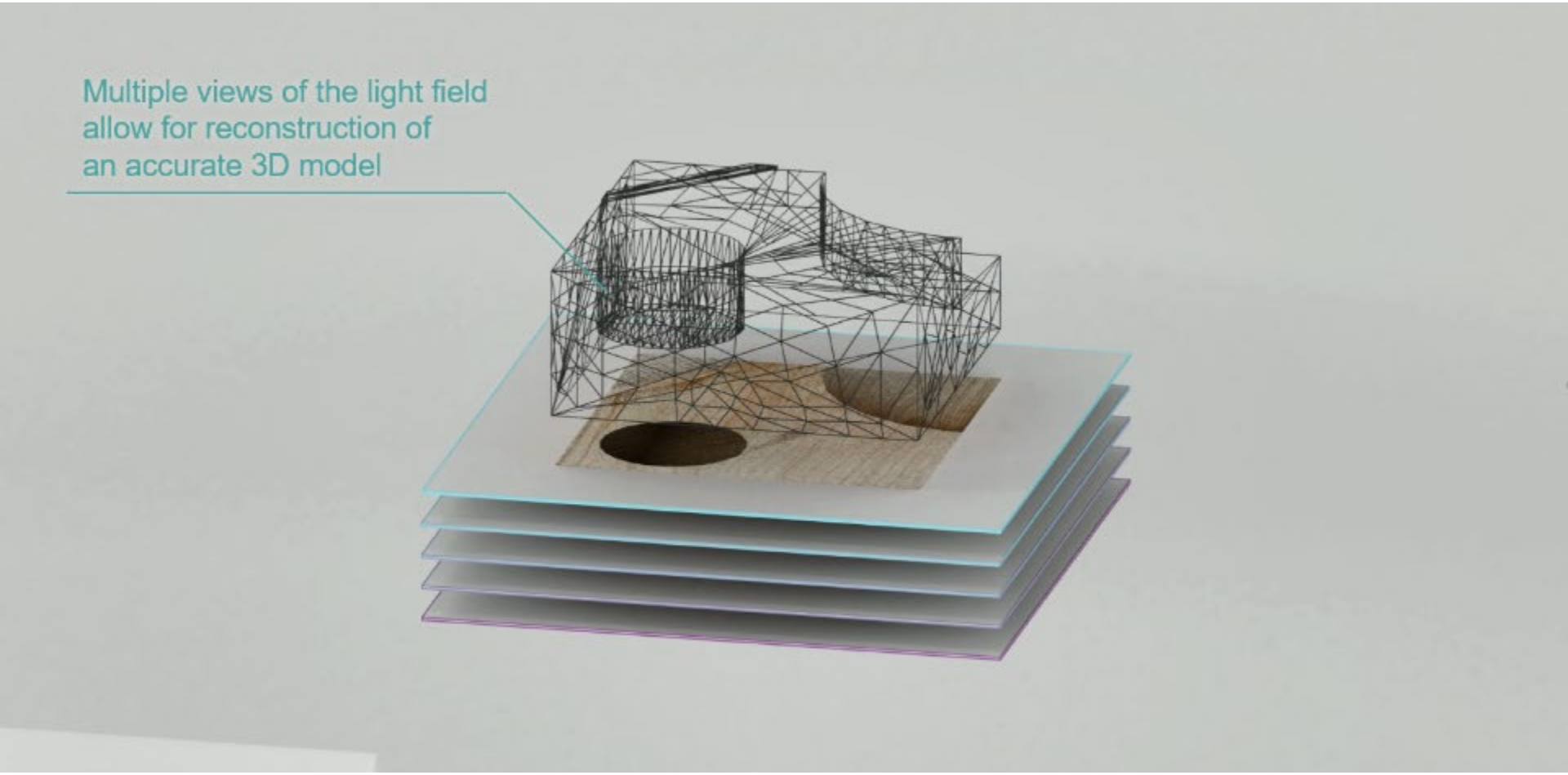

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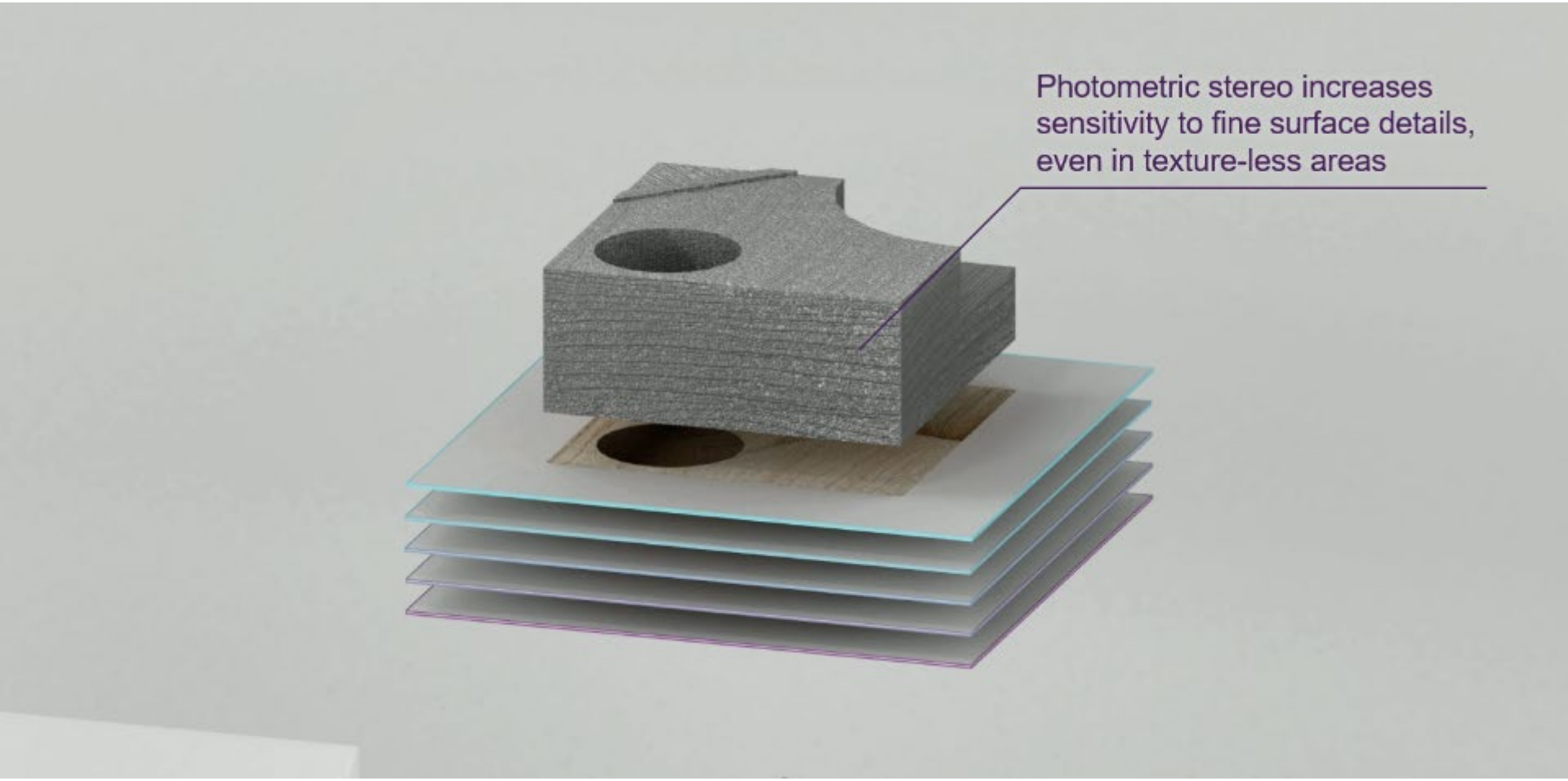

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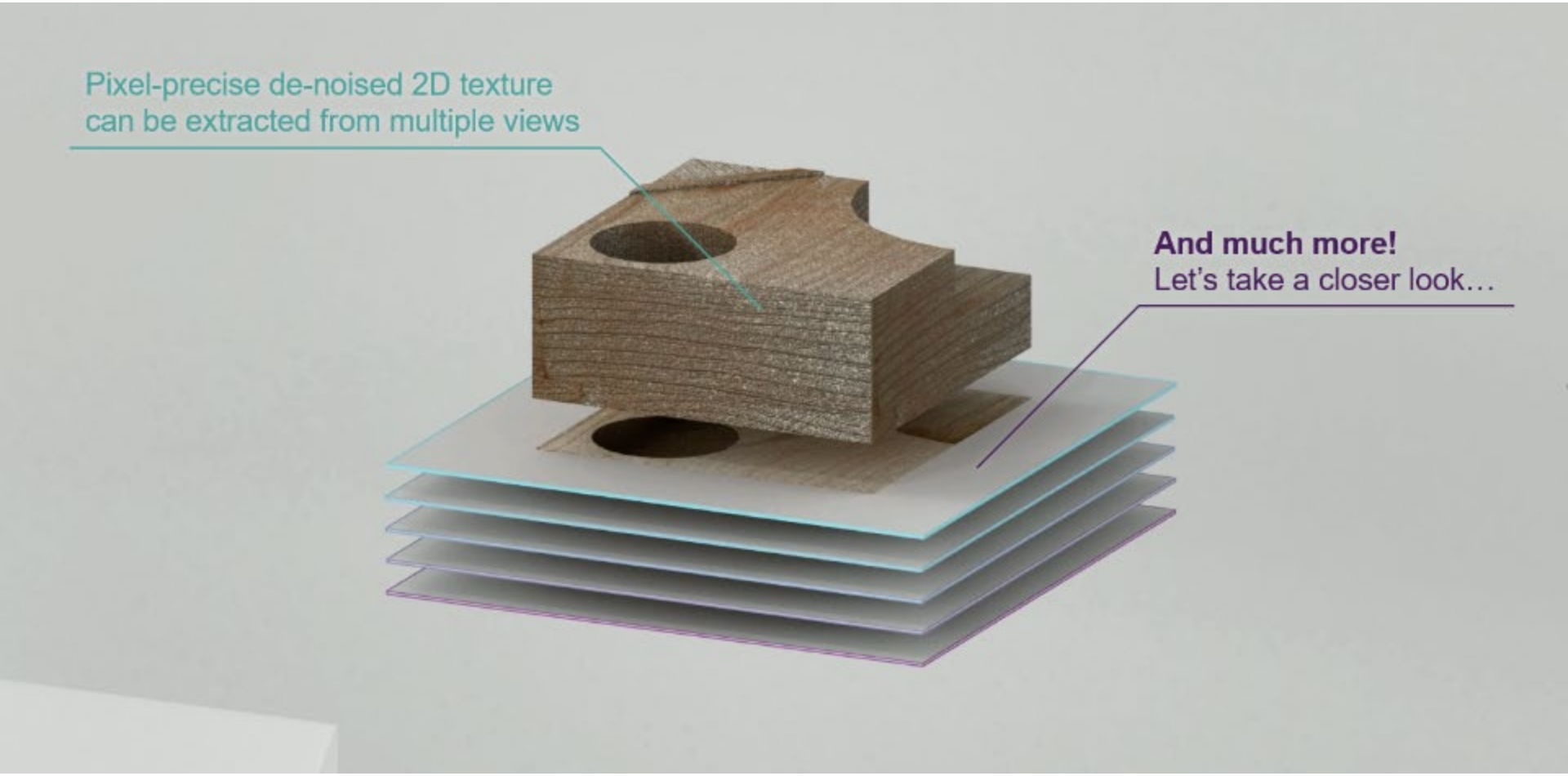
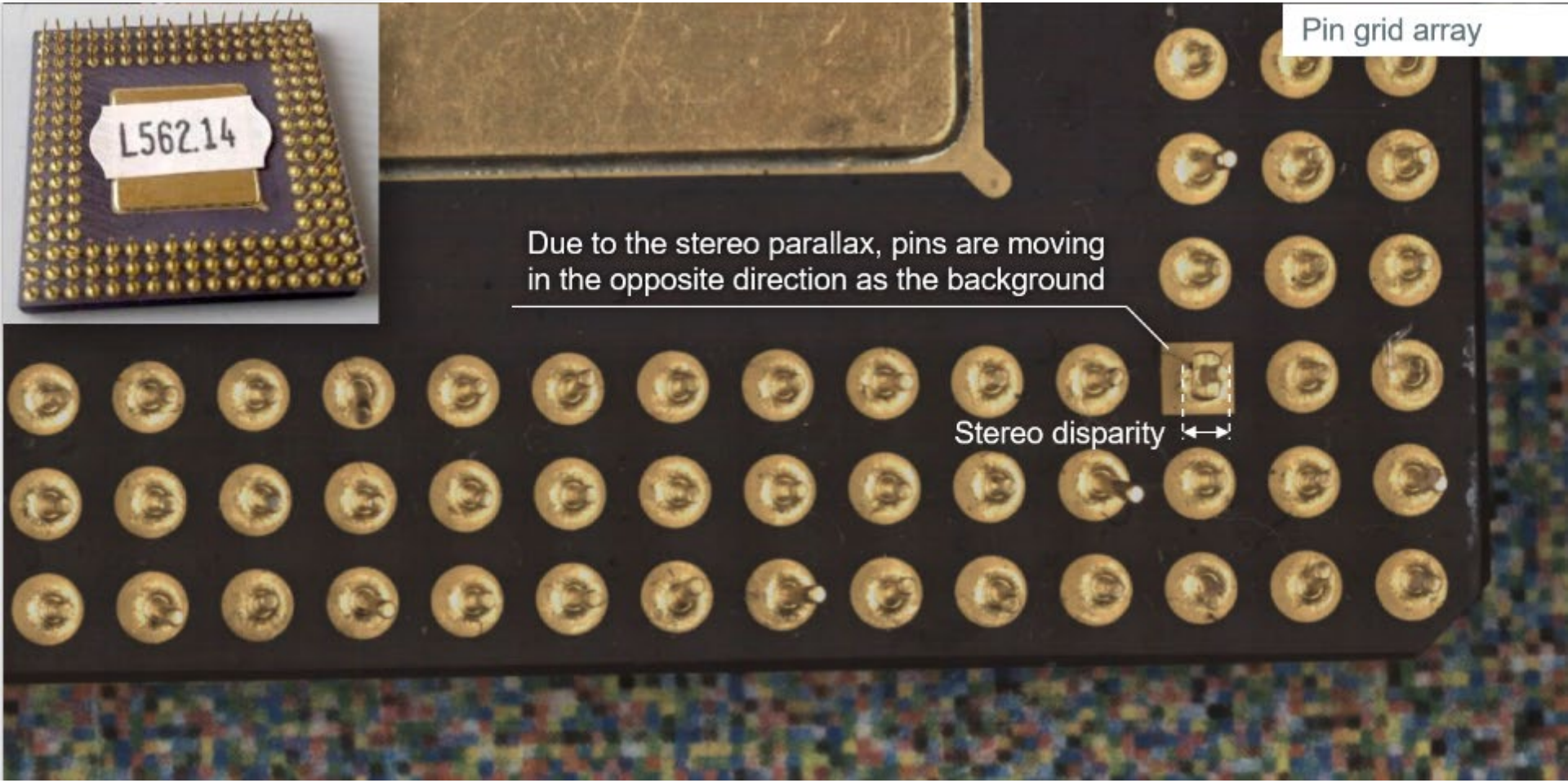
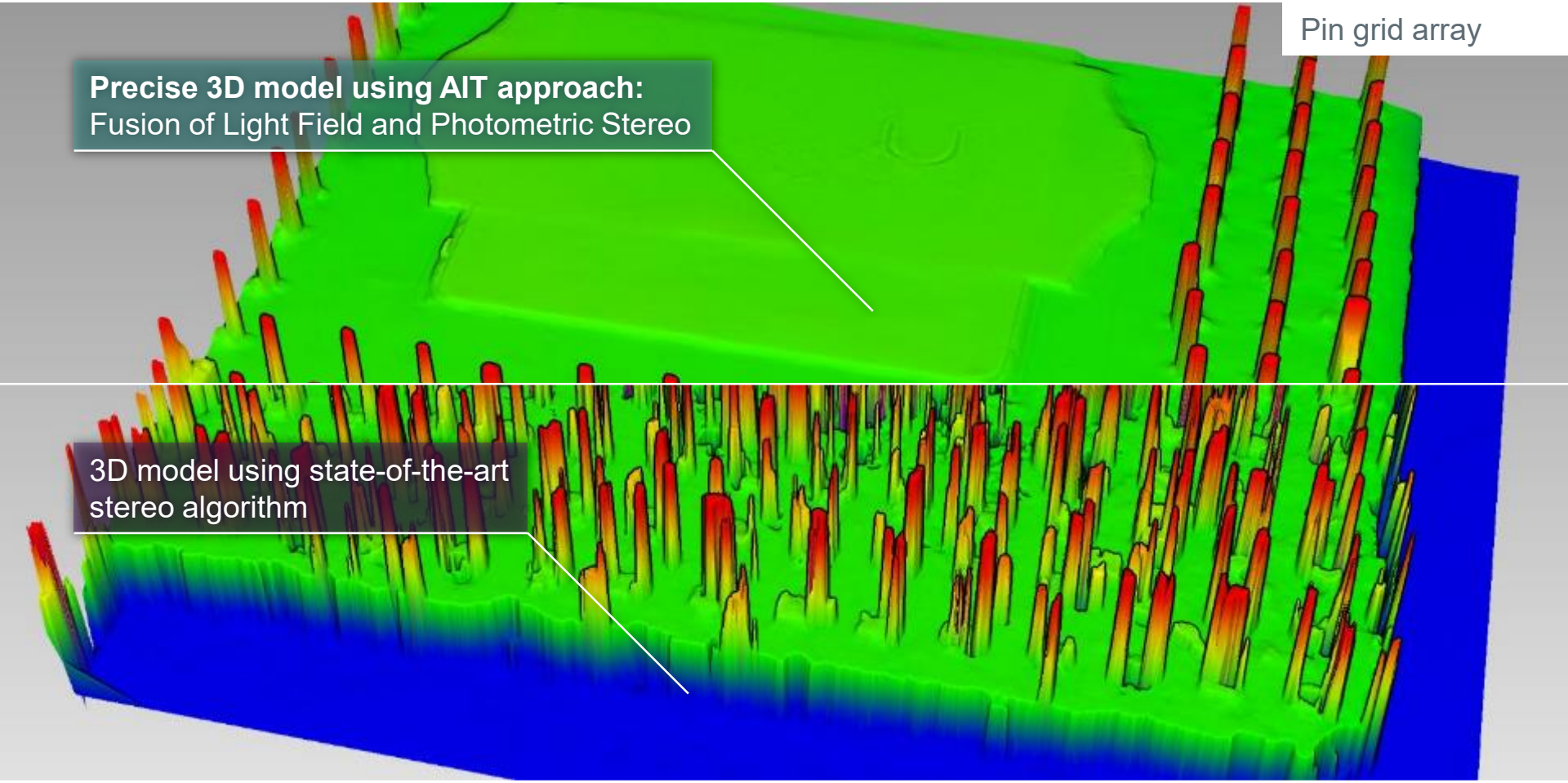


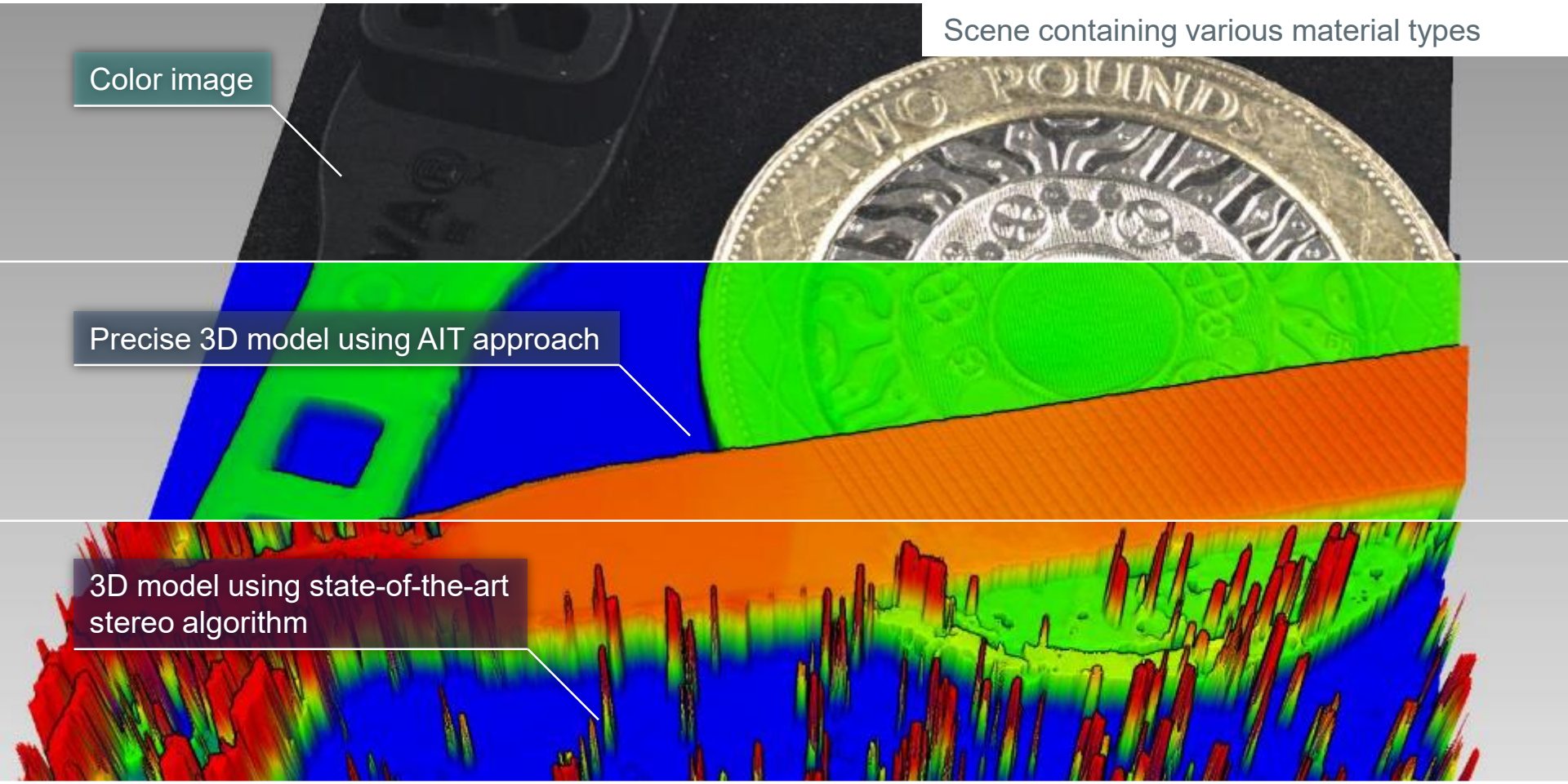
AIT Inline Computational Imaging:
Simultaneous Capture of Multiple Viewing Perspectives



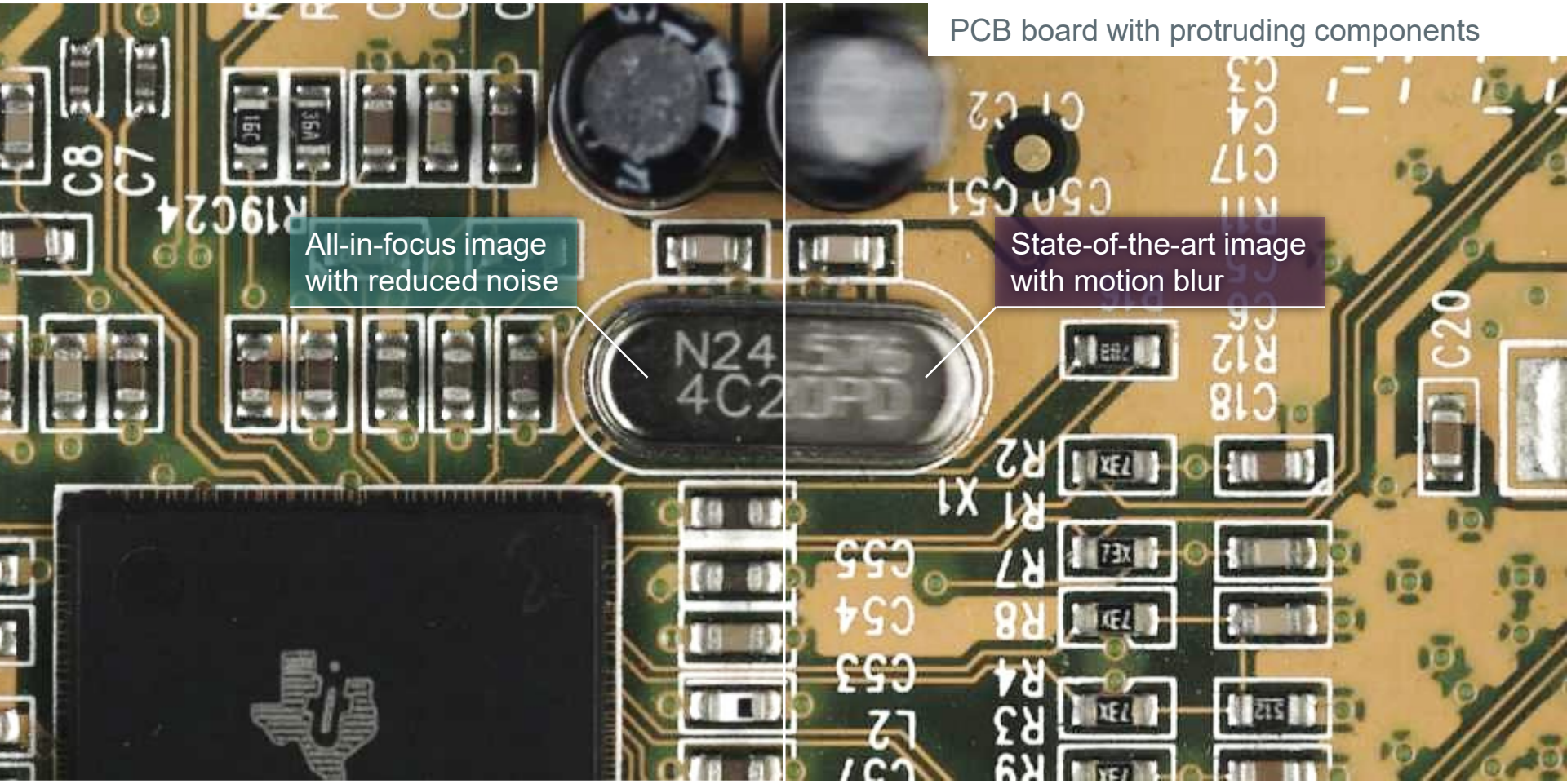
AIT Inline Computational Imaging: 3D Sensing



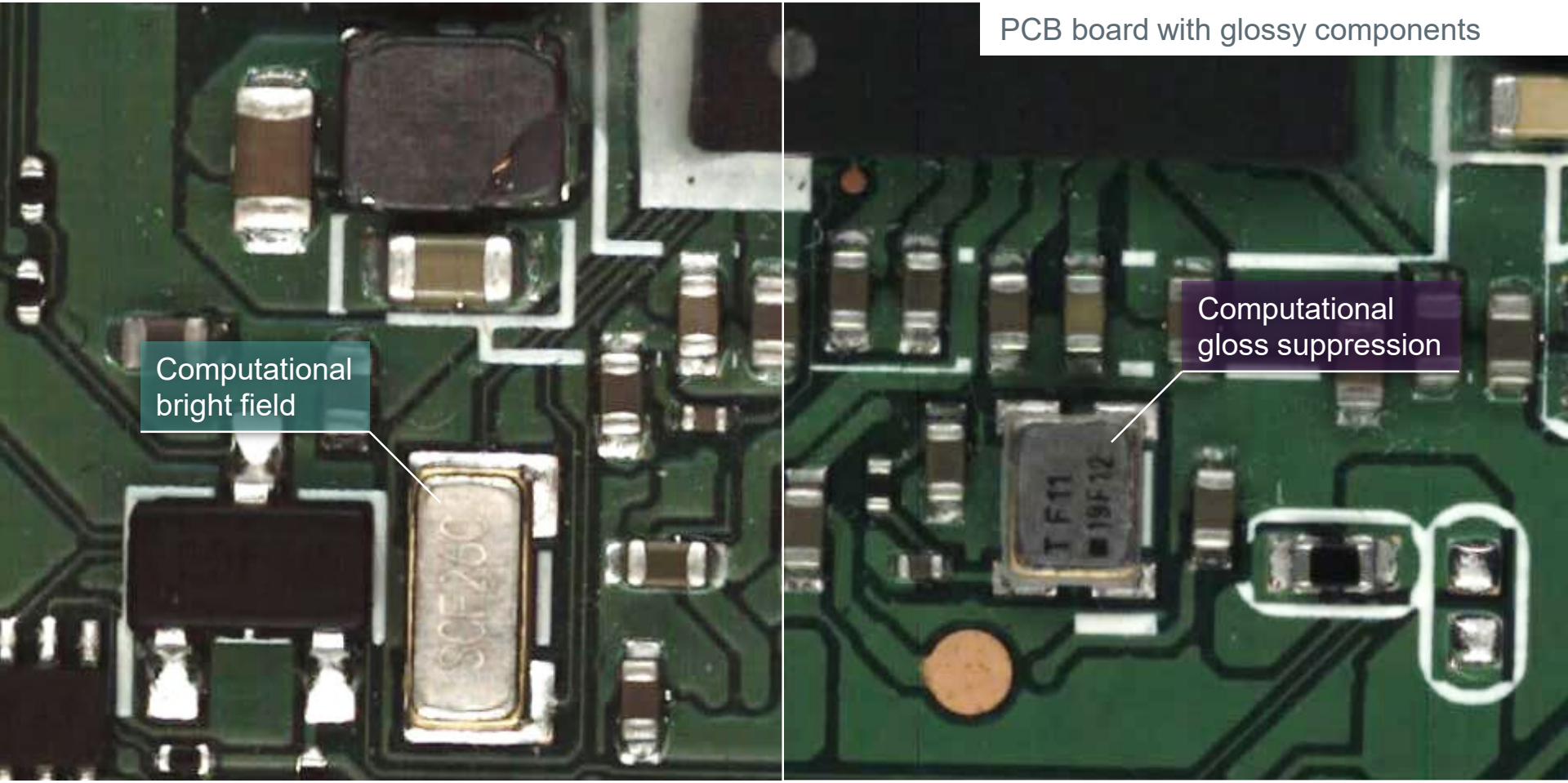
AIT Inline Computational Imaging:
Robust to Material Reflectance Properties



AIT Inline Computational Imaging:
Sharper Images with All-in-Focus / 3D-TDI



AIT Inline Computational Imaging:
Computational Bright Field and Gloss Suppression



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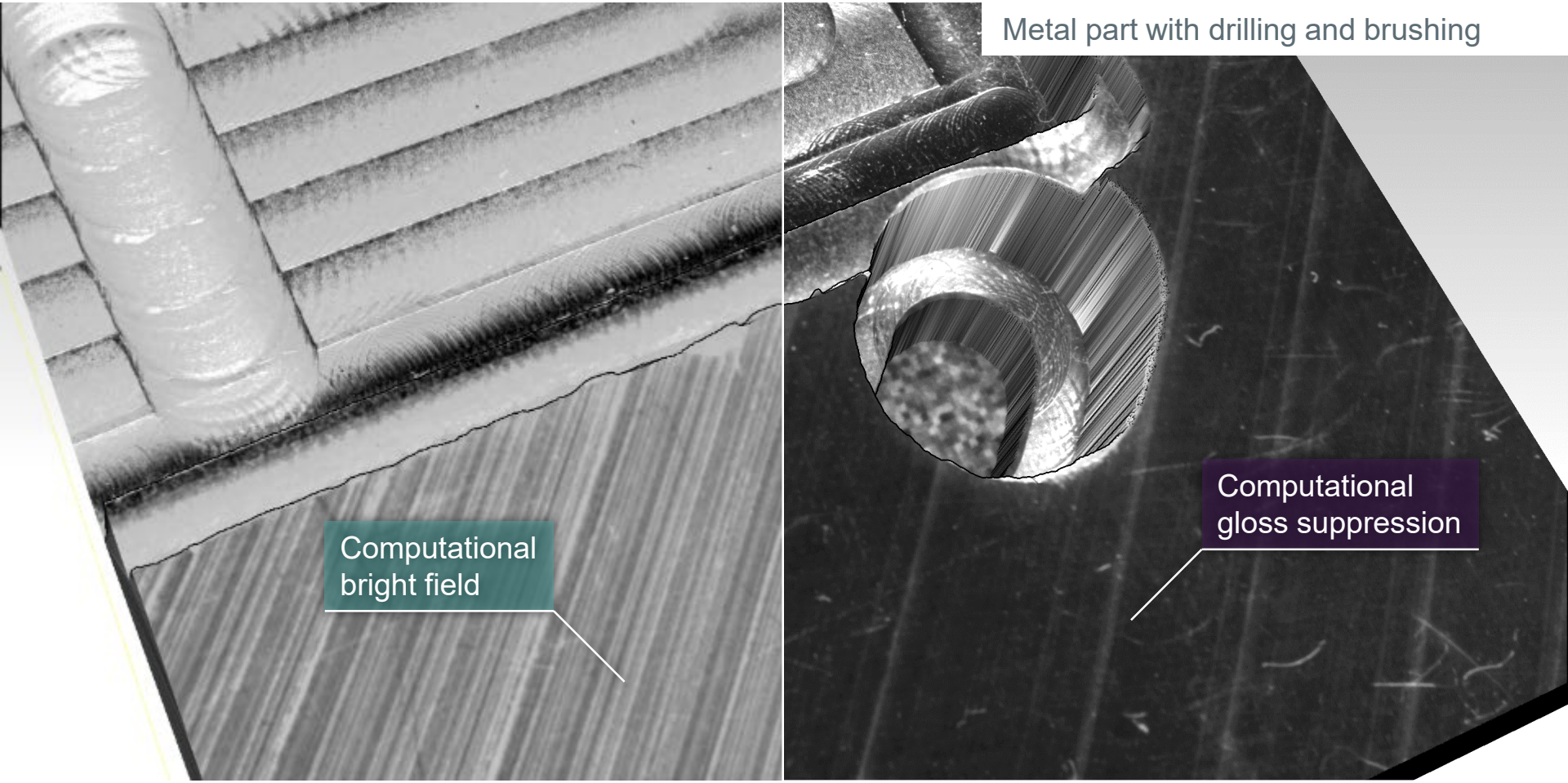
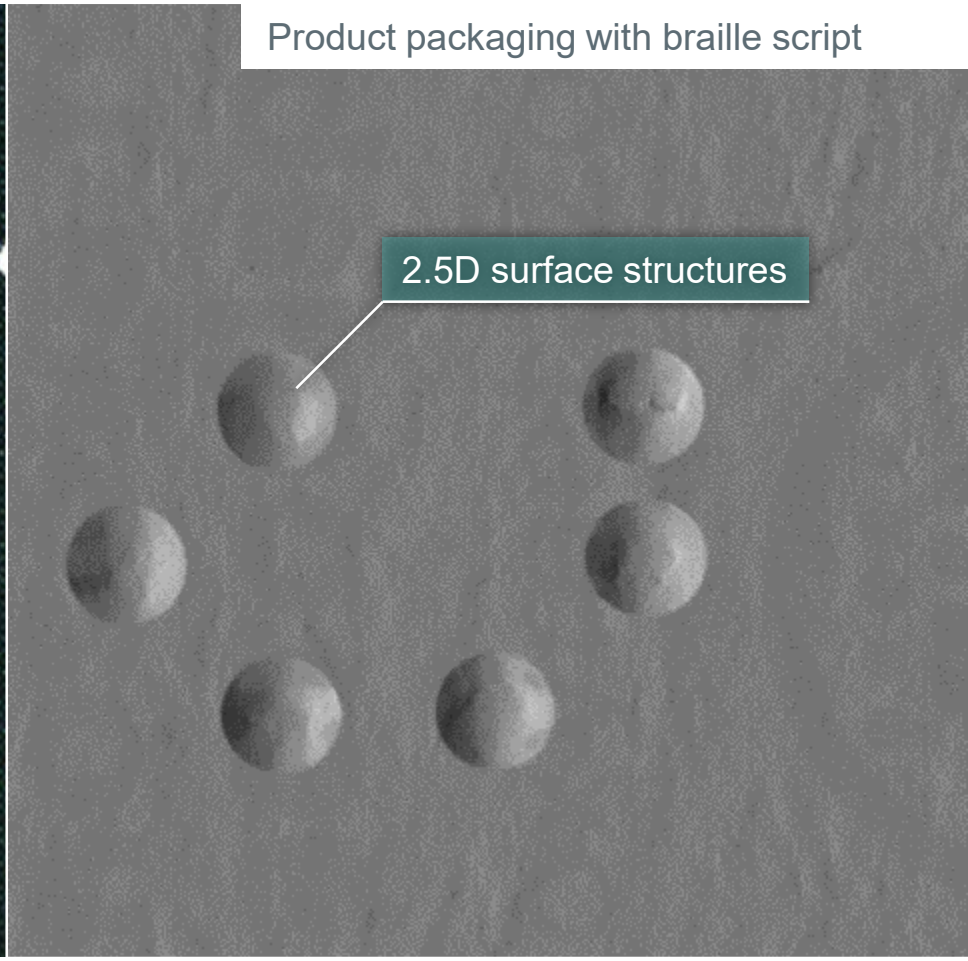


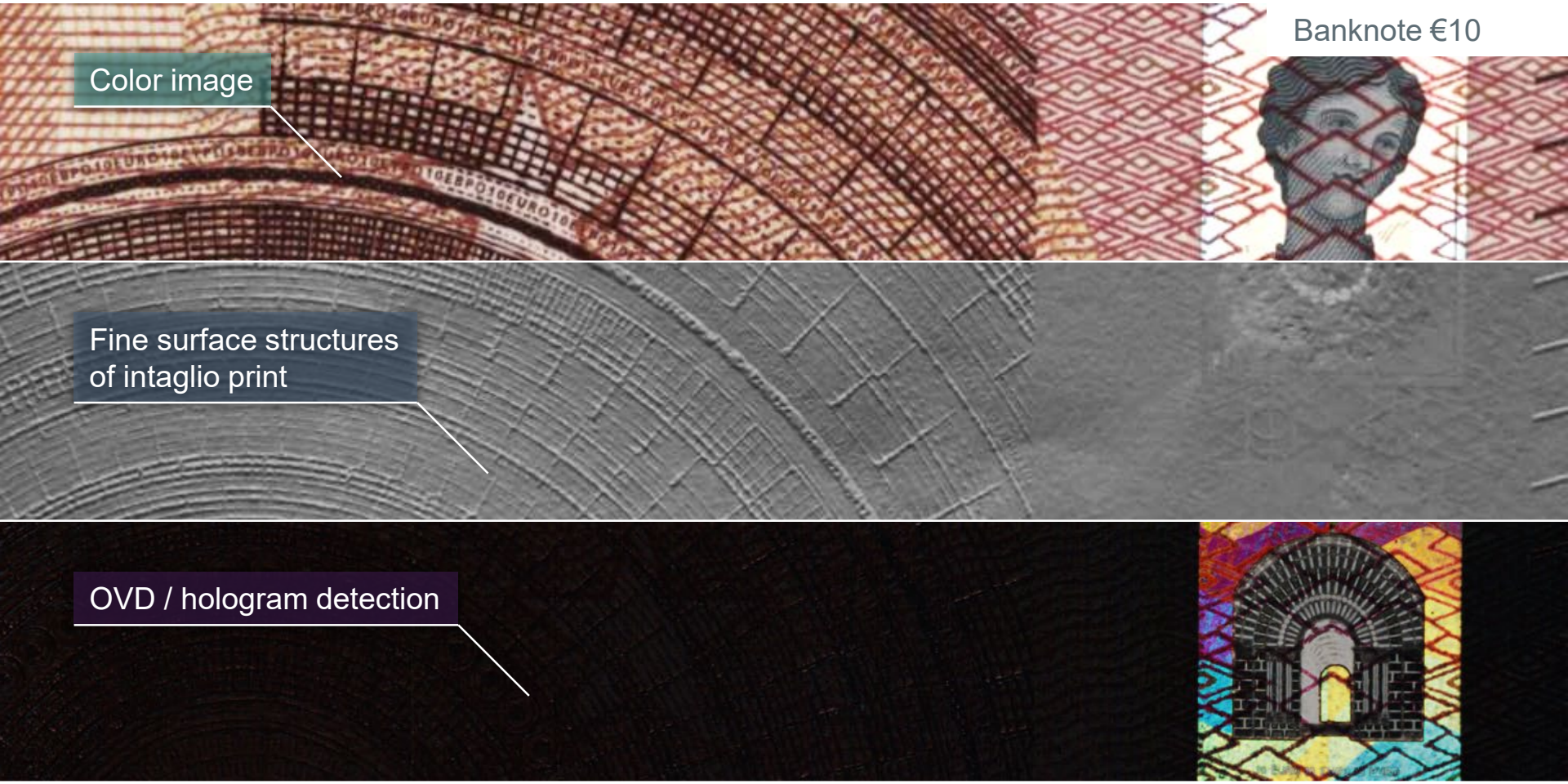
AIT Inline Computational Imaging:
Computational Bright Field and Gloss Suppression

AIT Inline Computational Imaging:
Fine Surface Structures via Photometric Stereo

AIT Inline Computational Imaging:
Fine Surface Structures via Photometric Stereo



AIT Inline Computational Imaging:
Security Print and Optical Variable Devices

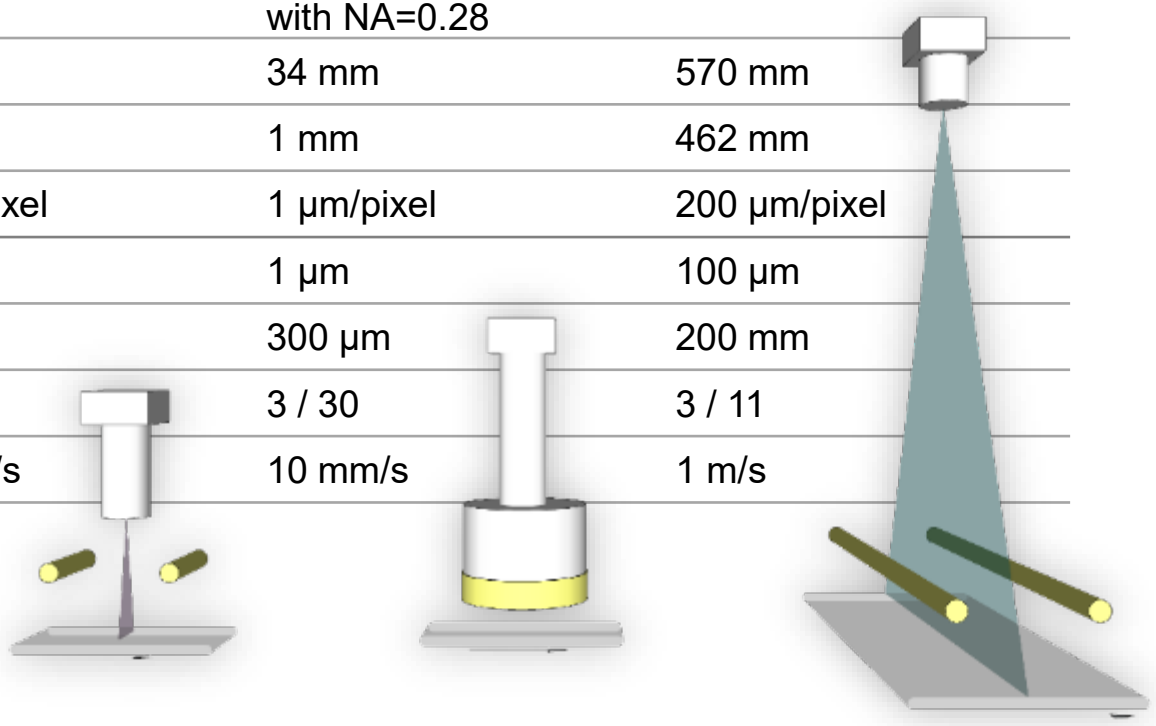


ICI Sensor System:
Scalable Optical Configurations

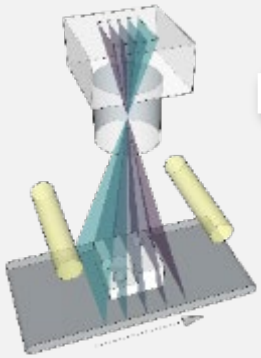
Configuration Examples

	Standard Scale	Micro Scale	Large Scale
Optics	45mm f/4	Modified 10x industrial inspection microscope with NA=0.28	20mm f/2.8
Working distance	128 mm	34 mm	570 mm
Field of view	46 mm	1 mm	462 mm
Lateral resolution	20 µm/pixel	1 µm/pixel	200 µm/pixel
Depth resolution *)	20 µm	1 µm	100 µm
Depth range	10 mm	300 µm	200 mm
Min. / typ. viewing angles	3 / 11	3 / 30	3 / 11
Typical acquisition speed	100 mm/s	10 mm/s	1 m/s

*) using Light Field and Photometric Stereo



ICI Software Modules:
Generic Computational Imaging Library for 2D/3D Tasks



ICI Sensor System
- Camera
- Illumination
- Transport stage

Acquisition
- Light field data acquisition
- Camera, illumination, and transport control

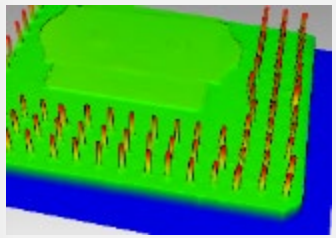
Stereo matching
- High speed multi-view / light field stereo matching

Depth refinement
- Fast discrete and continuous depth regularization
- Fusion with additional depth cues

Rectification
- Camera lens rectification
- Shading correction
- Image processing

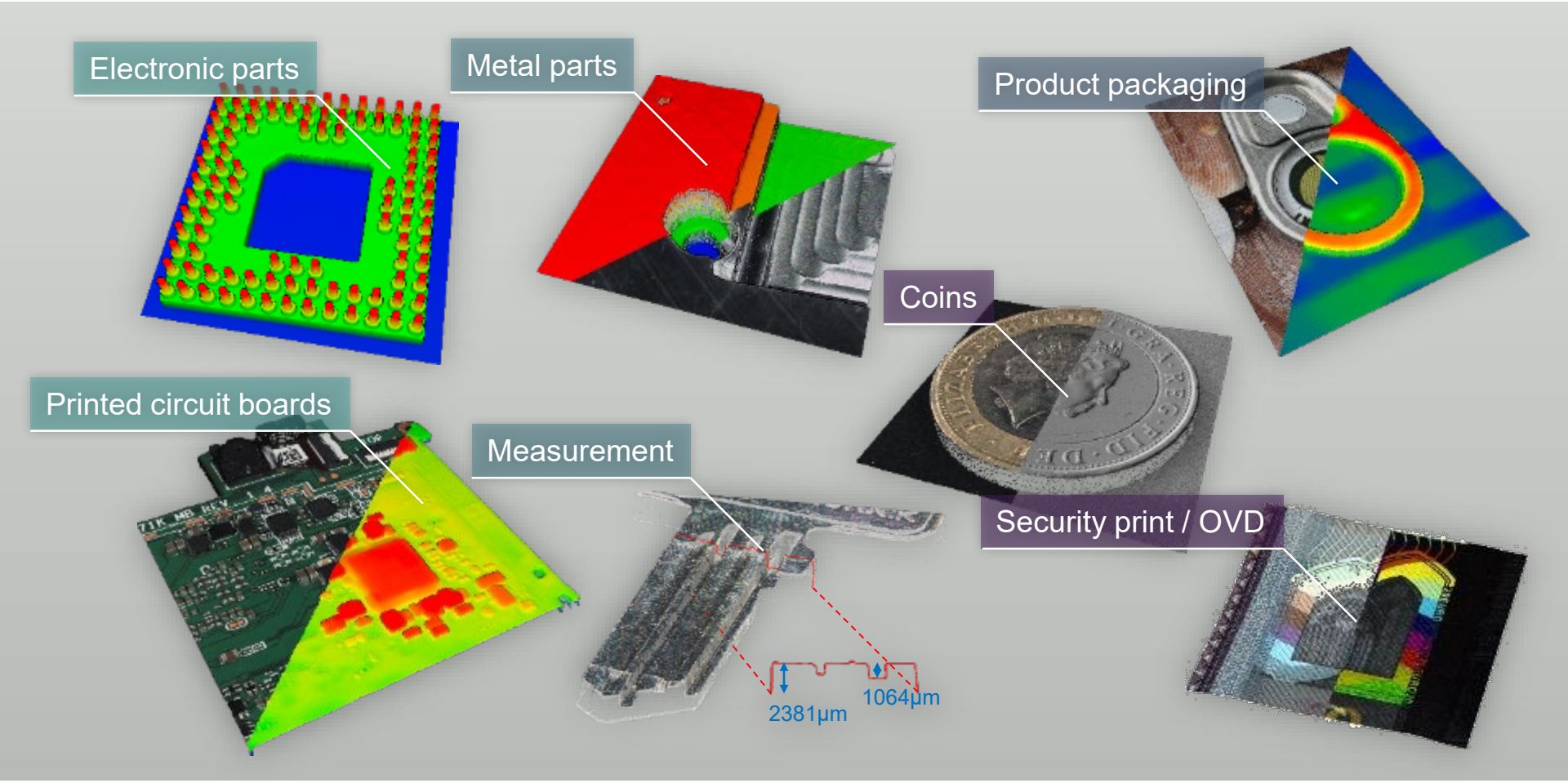
Feature extraction
- Extraction of robust image features
- Extraction of local surface features

Texture enhance
- All-in-focus image generation
- Computational bright field and dark field images
- OVD detection

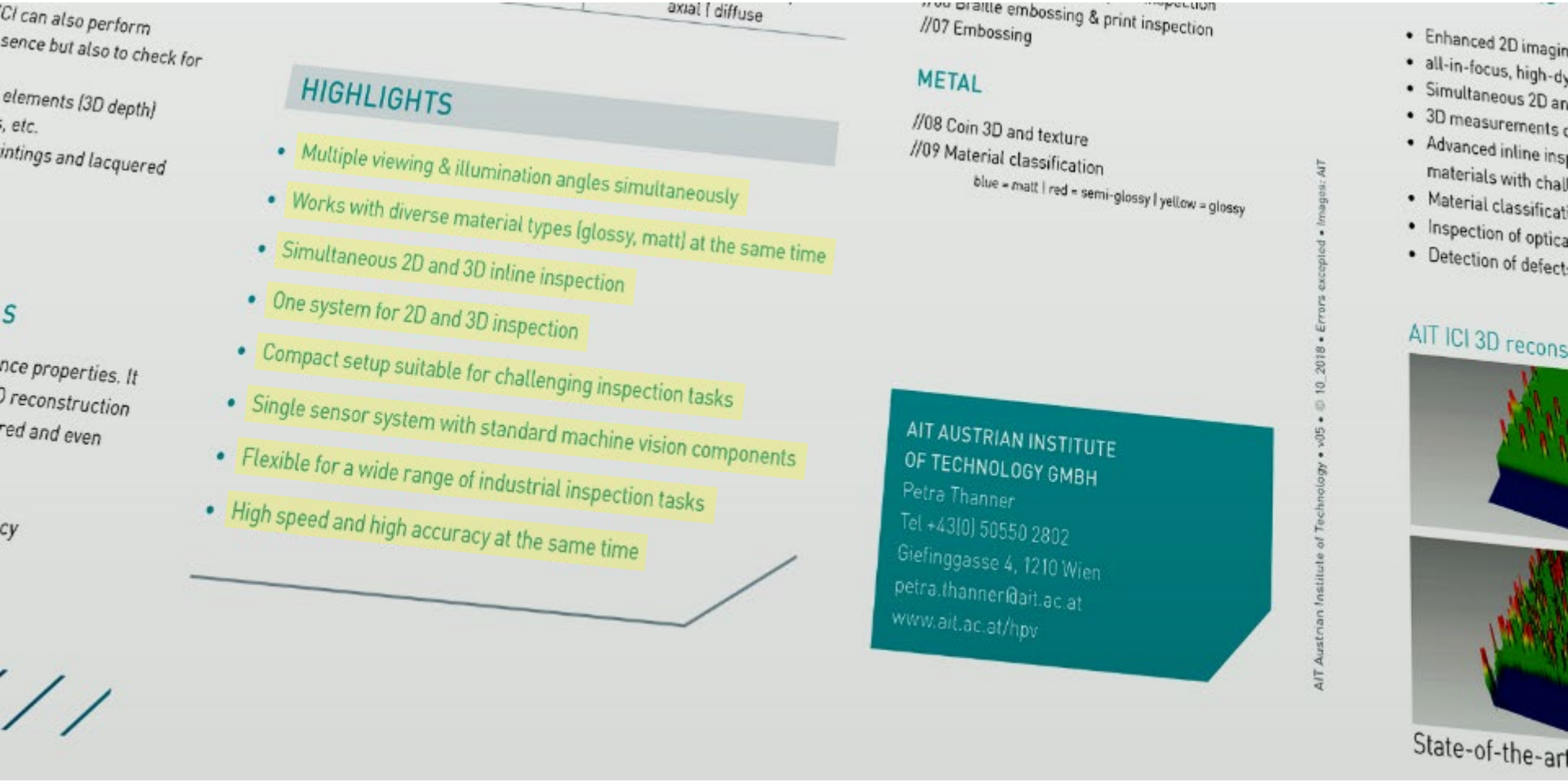


Detailed 2D/3D data
- Refined 3D depth model (depth map, point cloud)
- Depth measurement confidence
- Enhanced 2D texture images (all-in-focus, bright field / gloss suppression, OVD detection)
- Fine 2.5D surface map

AIT Inline Computational Imaging: Industrial Use Cases



AIT Inline Computational Imaging: Conclusions



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TOMORROW TODAY

Thank you!

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