

# xposure - more than just the world's fastest multi-line scan camera

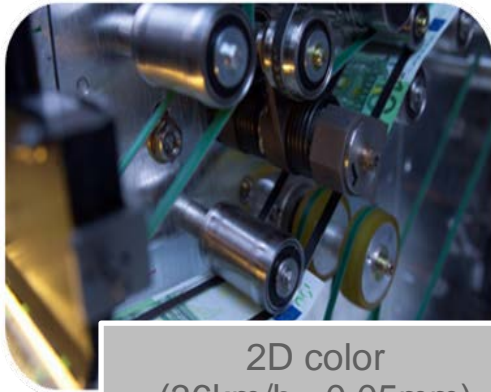
AIT Austrian Institute of Technology

Scientific Vision Days, Stuttgart, 9.+10.11.2016

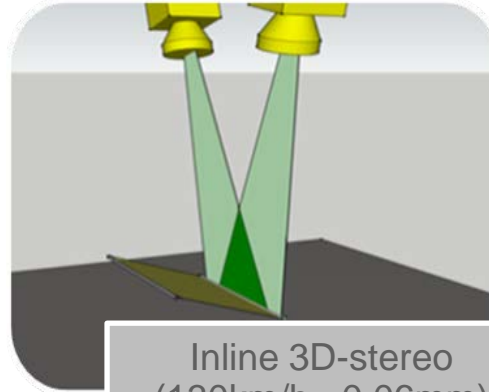
Ernst Bodenstorfer



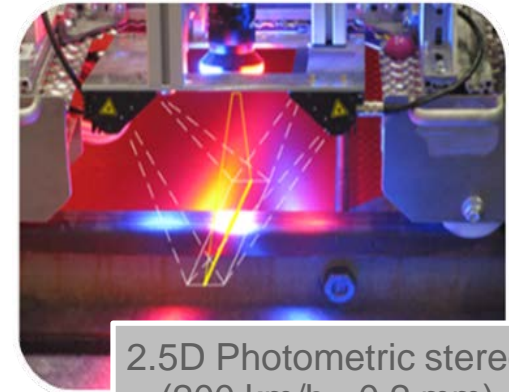
# The versatile xposure - enables applications in industry, infrastructure and medicine



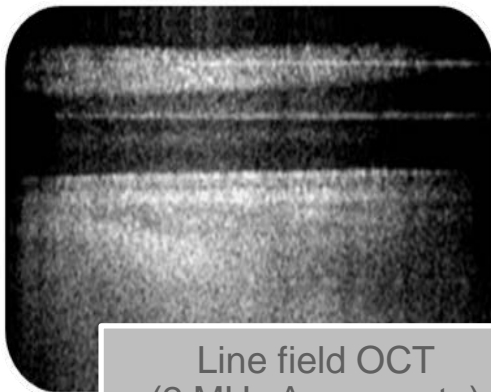
2D color  
(36km/h - 0.05mm)



Inline 3D-stereo  
(130km/h - 0.06mm)



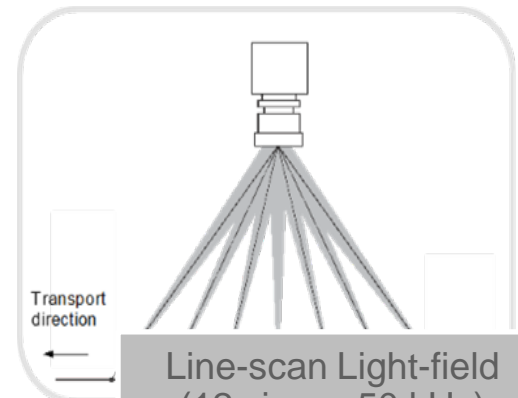
2.5D Photometric stereo  
(200 km/h - 0.2 mm)



Line field OCT  
(2 MHz A-scan rate)



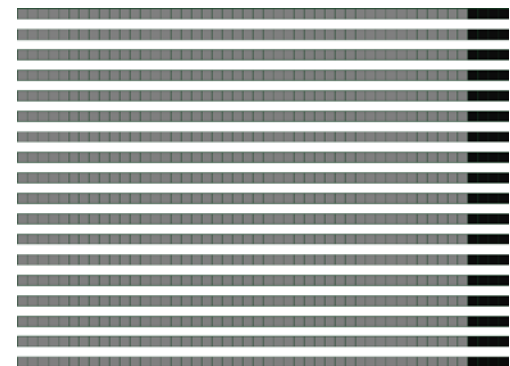
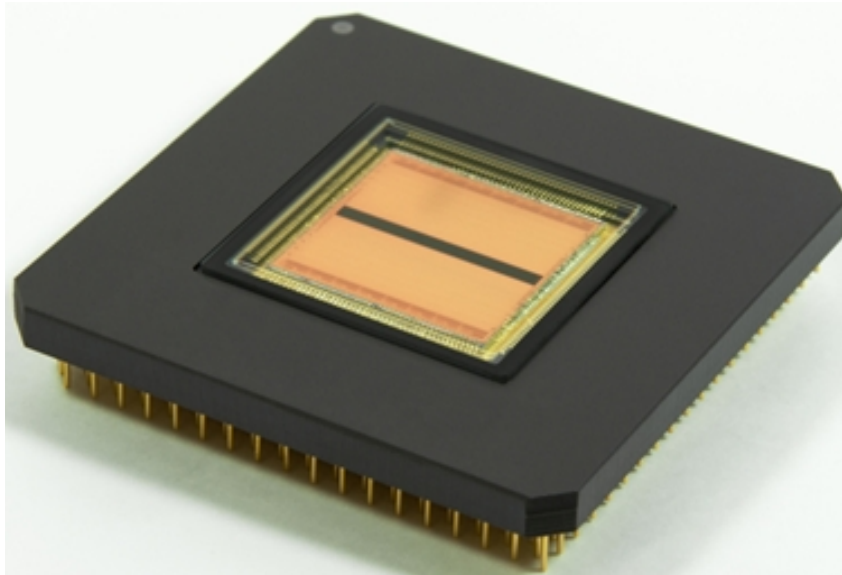
Hyperspectral Imaging  
(60 channels: 10 kHz)



Line-scan Light-field  
(12 views: 50 kHz)

# Multi-line-scan sensor technology

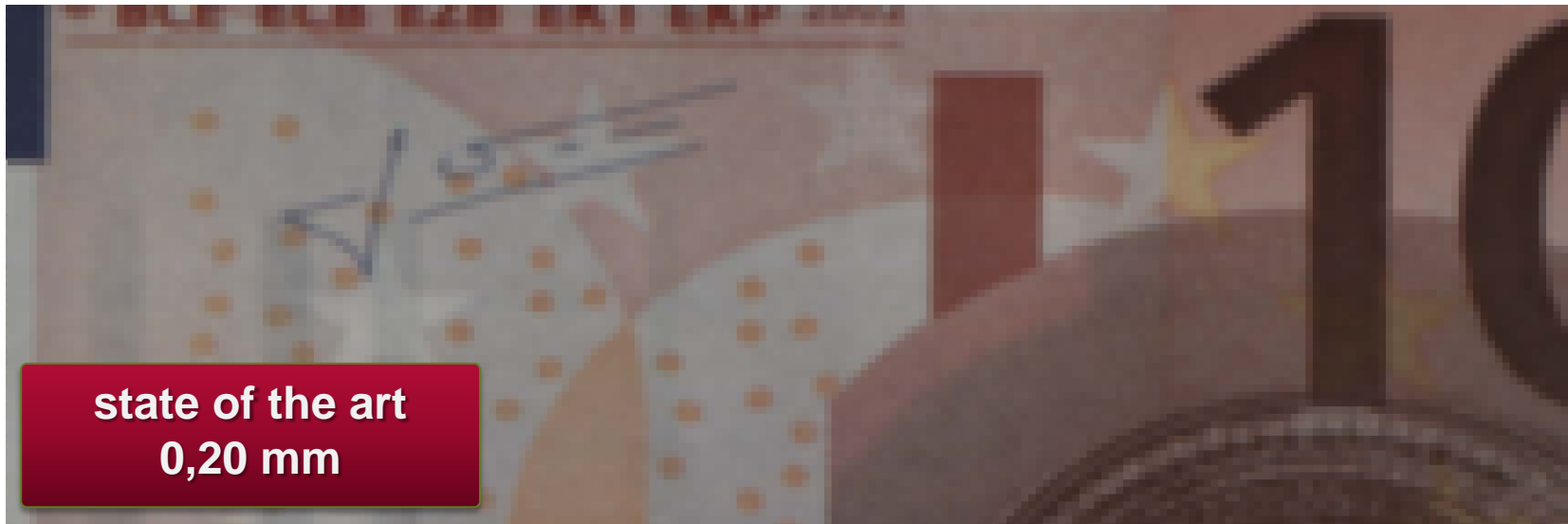
- 60 lines
  - 2016 pixels
  - 600.000 lines per second
- Current variants:  
color and monochrome



## xposure as base for various application technologies

- 2D high-speed and high-resolution (colour) at the same time
- 2.5D Photometric stereo
- Fine 2.5D inspection of challenging materials
- Inline 3D inspection
- Depth-sensitive image restoration for inspection of non-flat objects
- Line field OCT ( > 2 MHz A-scan rate)
- Multi-spectral imaging with up to 60 spectral bands
- Multi-line-scan light-field imaging for versatile inline inspection tasks
- Super-resolution by multi-line-scanning

## 2D color print inspection @ 10 m/s – boost resolution



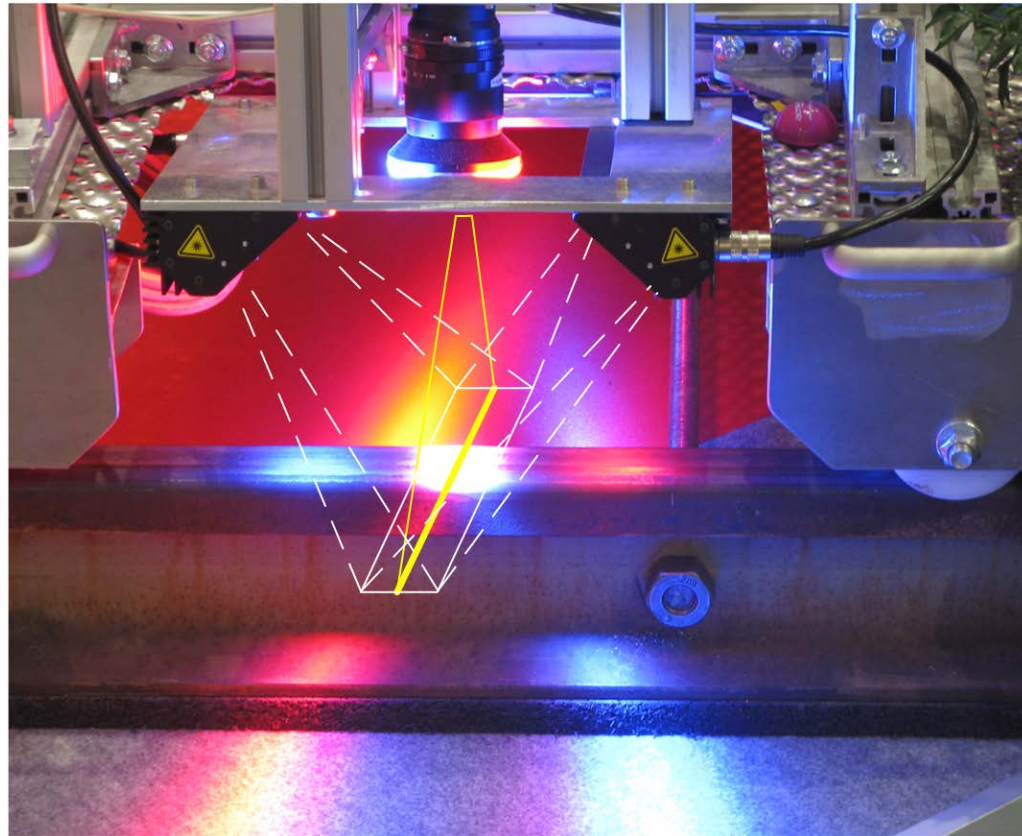
**state of the art**  
**0,20 mm**



**xposure**  
**0,05 mm**

## 2.5D Rail Inspection with photometric stereo

- Resolution 0,2 mm – 2 color channels
- scanning speed: 200 km/h
- → 300 kHz line rate (RB)



## 3D road surface inspection

- 2 xposure cameras 3D stereo
- 60  $\mu\text{m}$  resolution
- 130 km/h for highways



## Metal Surface Inspection – finding a needle in a hay stack

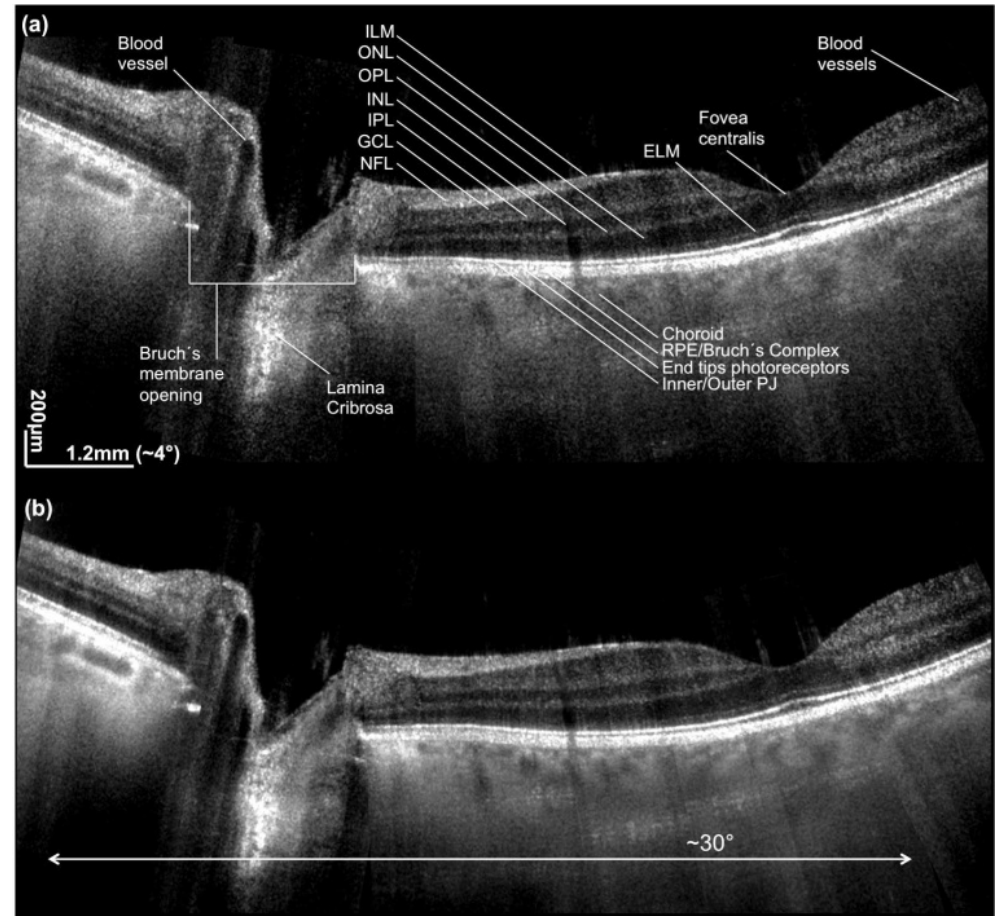
- Defects in micrometer range
- Hundreds of square meters





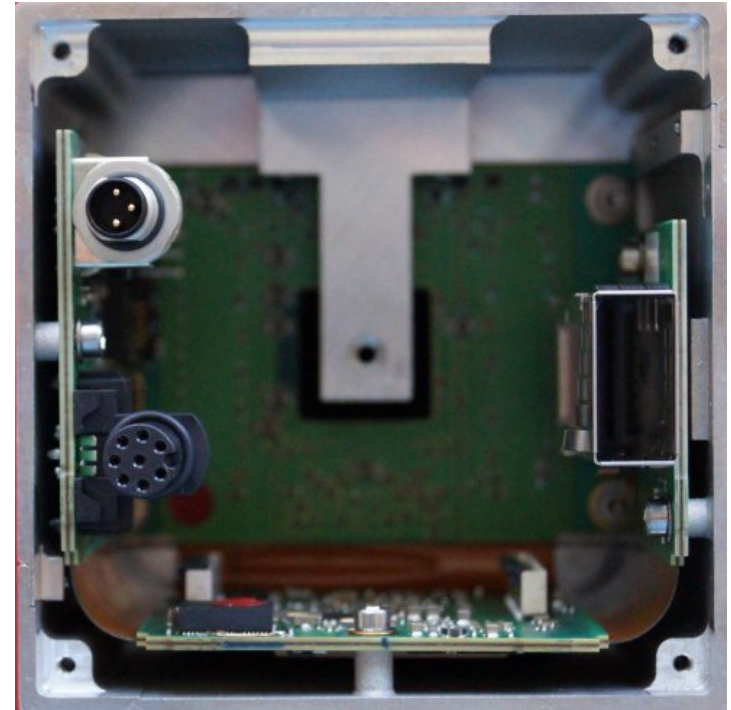
# 3D volume scan with Optical Coherence Tomography

- Swept-source line-field OCT
- Medical (eye, skin)
- > 2 MHz A-scan rate



# The technology scout xposure - technology highlights

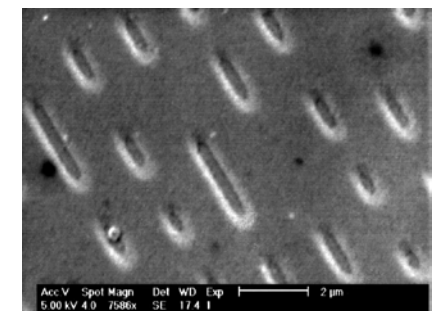
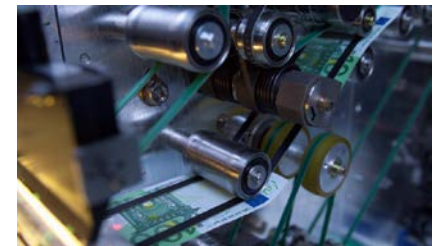
- High-speed multi-line-scan sensor
  - 600.000 lines per second
- Altera Arria 10 SoC FPGA with
  - Dual Core ARM Cortex A9 MPCore™ processor
  - Linux based software development
  - Fast image processing in FPGA
- QSFP interface
  - 4\*10 GigE Vision compatible
  - Standard network components
  - Fiber optic data transmission >100 m
  - Scalable network of cameras & processors
- Flex-Print technology
  - High reliability interconnects



# The fast xposure: inspiring speed and resolution



Example	m/s	km/h	Resolution dpi	@ 600kHz mm
Earth observation satellite	7200	25920	2	12,0
Moon around earth / bullet	900	3240	17	1,5
Aircraft	300	1080	50	0,5
ICE train	90	324	170	0,15
Print inspection	11	40	1400	0,018
Metal surface inspection	1,2	4,32	12700	0,002



enabling a new dimension of  
high speed image processing applications

## The fast xposure

- Flexible multi-line technology
- 600.000 lines per second / 200 kHz color RGB
- 2016 pixels per line
- High sensitivity



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