



3D METROLOGY CONFERENCE

3D CAMERAS FOR LASER TRIANGULATION: SELECTING WAVELENGTHS FROM UV TO NIR

Thomas Wimmer | 17.11.2022

WELCOME

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AGENDA

01

Photonfocus AG

02

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Laser Triangulation

03

Why different
wavelengths?

04

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Available Hardware

1.

PHOTONFOCUS AG



ABOUT PHOTONFOCUS



Photonfocus is part of ISRA VISION in AtlasCopco's Machine Vision Solutions Division



- 20+ years vision system competence
- Pioneer of high-performance imaging
- Award winning imaging specialist
- CMOS sensor manufacturer since 2001
- Extreme flexibility in camera design
- Swiss quality assurance



- 1200+ employees in MVS division
- More than 30 years experience in machine vision
- One of the world-leading machine vision innovators
- 10,000+ installations worldwide

Source: isravision.com



- Swedish multinational industrial group
- Founded in 1873 (1920 stock-listed)
- 43,000+ employees (2022)
- Customer service centers in over 70 countries
- Customers in 180+ countries
- Revenues: 11 Billion € (2021)

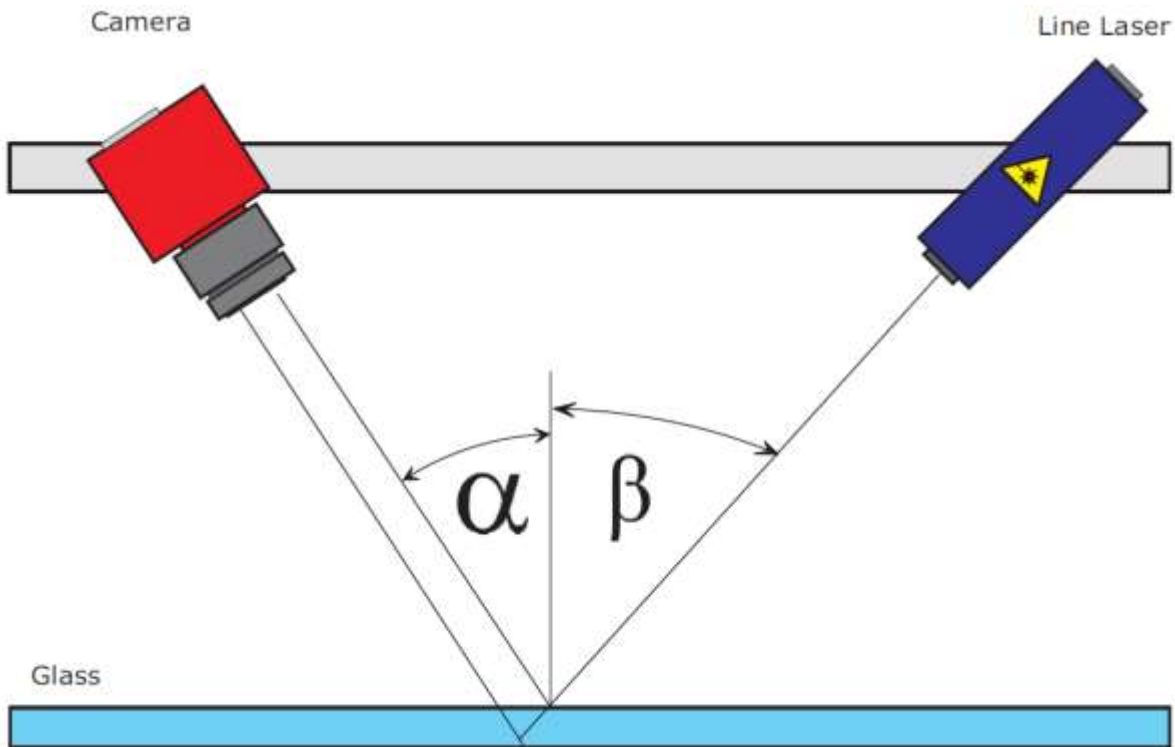
Source: atlascopcogroup.com

2.

REQUIREMENTS FOR 3D LASER TRIANGULATION



CAMERA BASED 3D METHODS



- **3D Laser Triangulation**
- Pattern Projection
- Time-Of-Flight
- Stereoscopy
- Interferometry

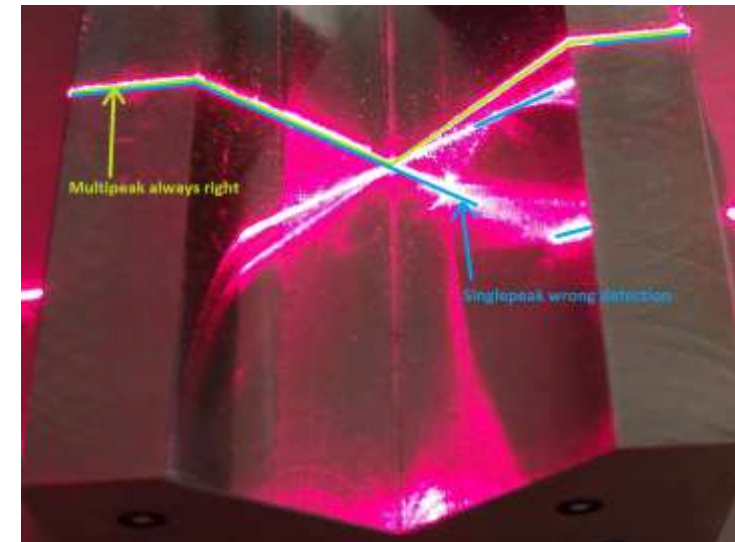
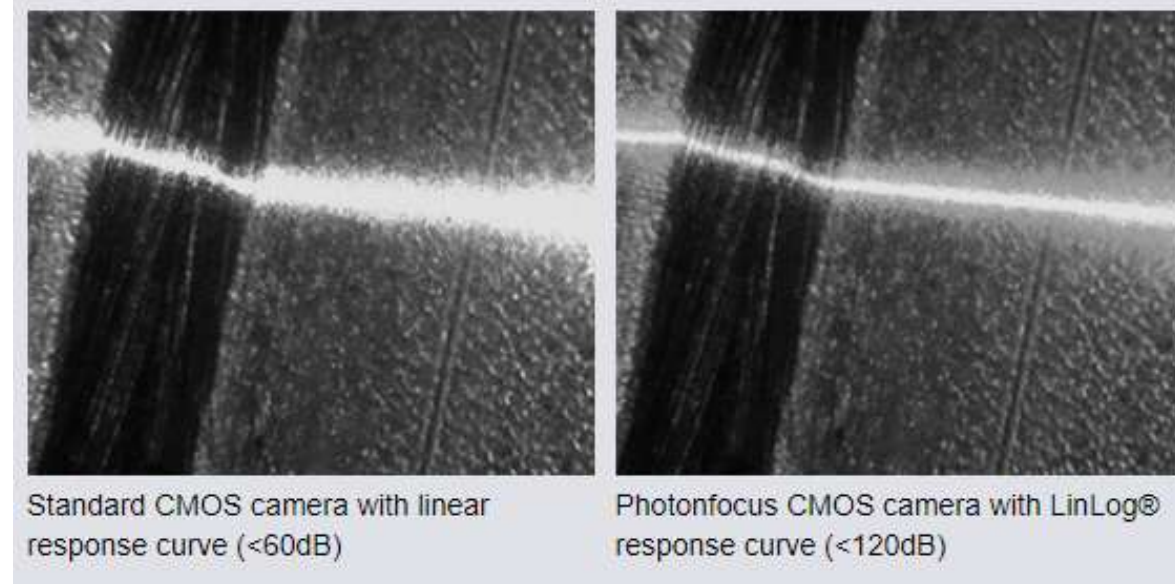
3D LASER TRIANGULATION ALGORITHM AND SYSTEM REQUIREMENTS



What is needed in a 3D laser triangulation system to achieve reliable results?

Best possible optical imaging in terms of:

- High sharpness
- Good reflection & low transmission
- Low diffusion
- High Signal-to-Noise Ratio / low ambient light



3.

WHY DIFFERENT WAVELENGTHS?



WAVELENGTH LIMITS RESOLUTION



Optical system must accommodate diffraction limit.

The smaller the object resolution, the more the influence of diffraction can be seen.

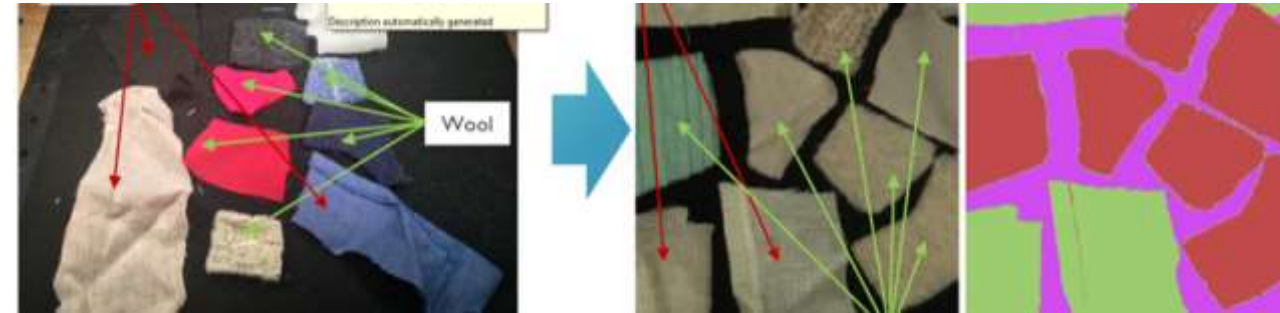
The shorter the wavelength, the smaller the object resolution can be.

Also be aware of the lens' diffraction limit!

LIGHT / MATERIAL INTERACTION



Each material interacts in its own, unique way to different wavelengths.

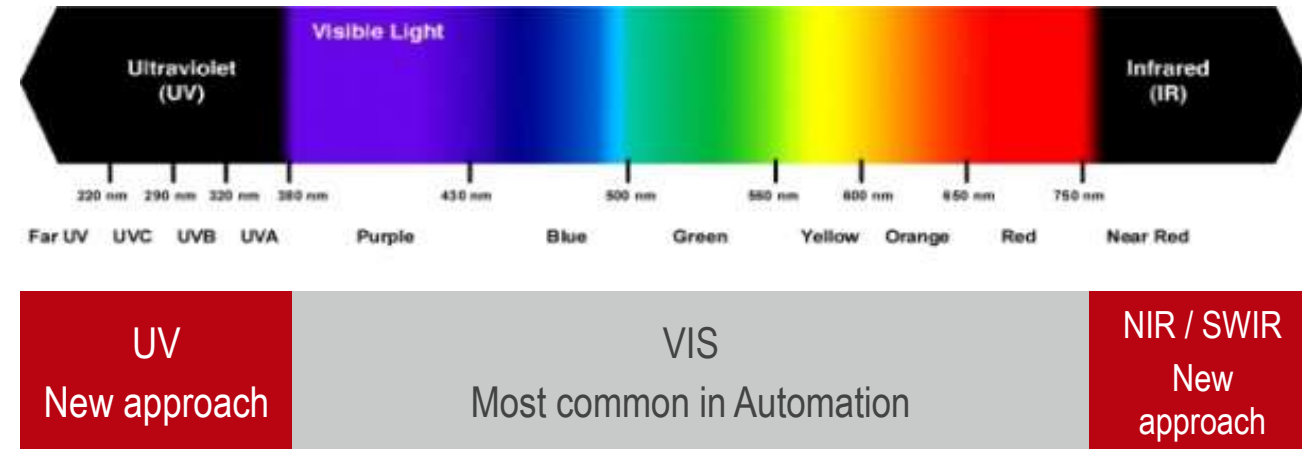


CURRENTLY USEFUL SPECTRUM



New sensor technologies allow new wavelengths for 3D laser triangulation.

- New UV sensor: down to 175 nm
- Usual VIS sensor: 380 nm to 680 nm
- New NIR / SWIR sensors: from VIS up to 1700 nm

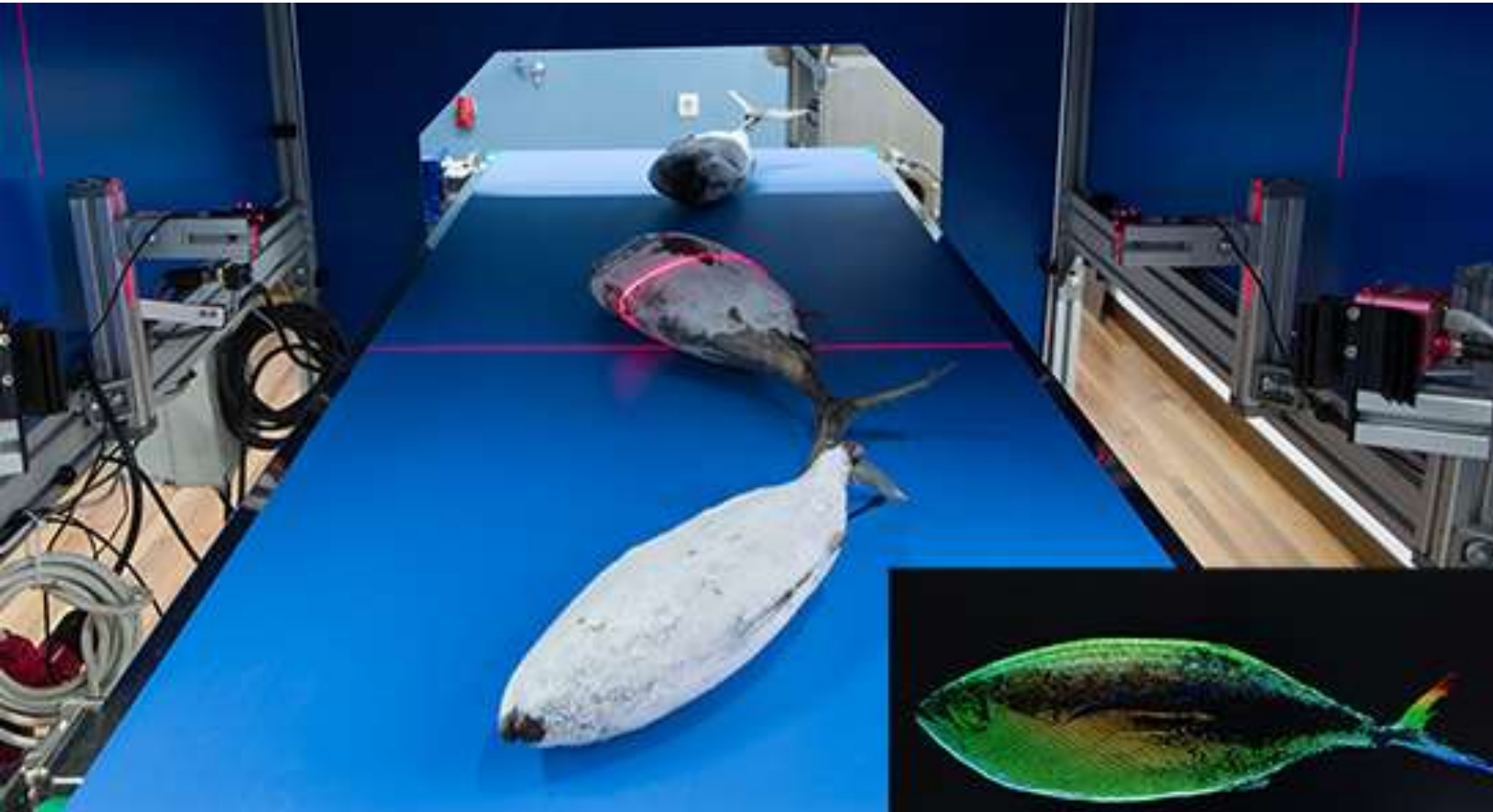


4.

APPLICATION EXAMPLES



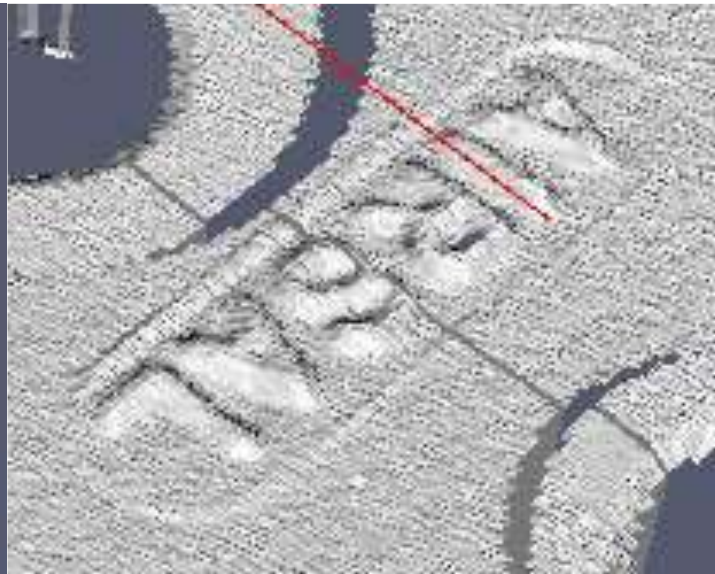
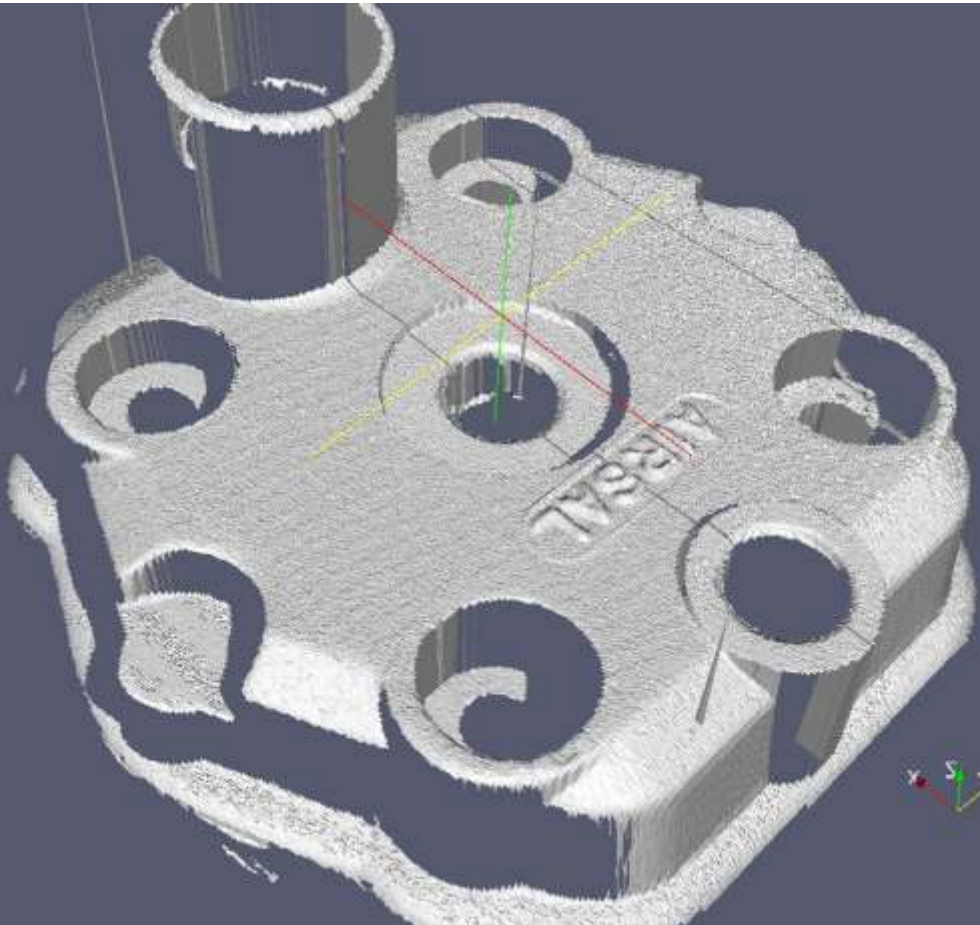
EXAMPLE FOR SWIR



Food / Fish cutting

- Combination of SWIR and VIS
- Outline with 3D Laser Triangulation in VIS
- Finding parts of cut of with SWIR

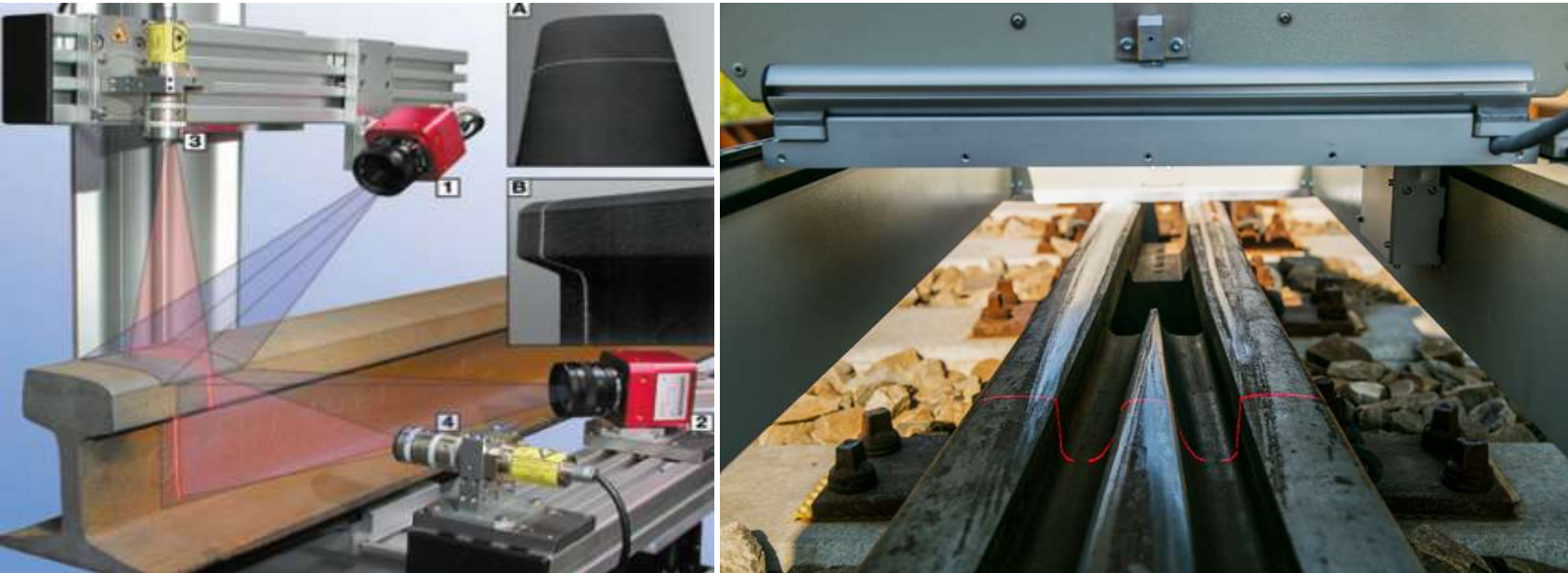
EXAMPLE FOR NIR



Metal production

- NIR laser with NIR filter on lens / camera
- Anodized surface gets translucent in NIR
- 3D Laser Triangulation of surface below anodized layer

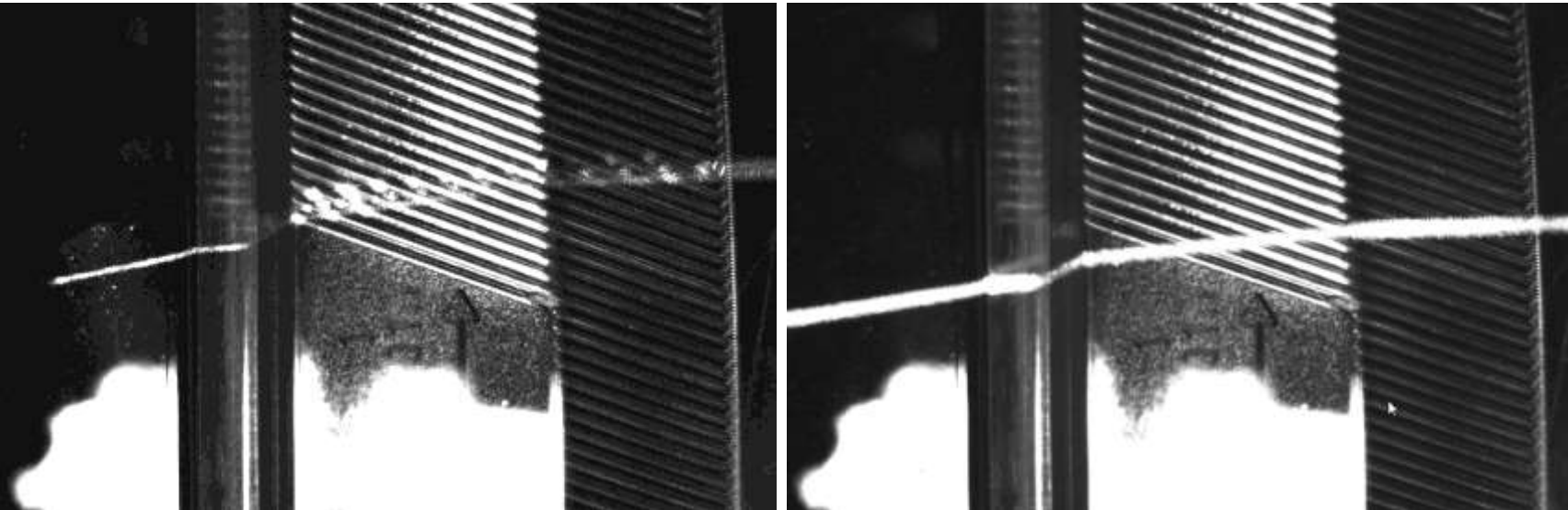
EXAMPLE FOR VIS



Railway safety

- Robust laser modules and cameras at 610 nm
- Track inspection
- Profile measurement

EXAMPLE FOR UV



VIS

UV

Glass / Acrylic production

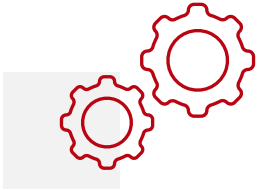
- UV Line Laser and UV camera with UV notch filter
- Quality insurance
- Surface inspection of material, which is transparent in VIS

5.

AVAILABLE CAMERAS

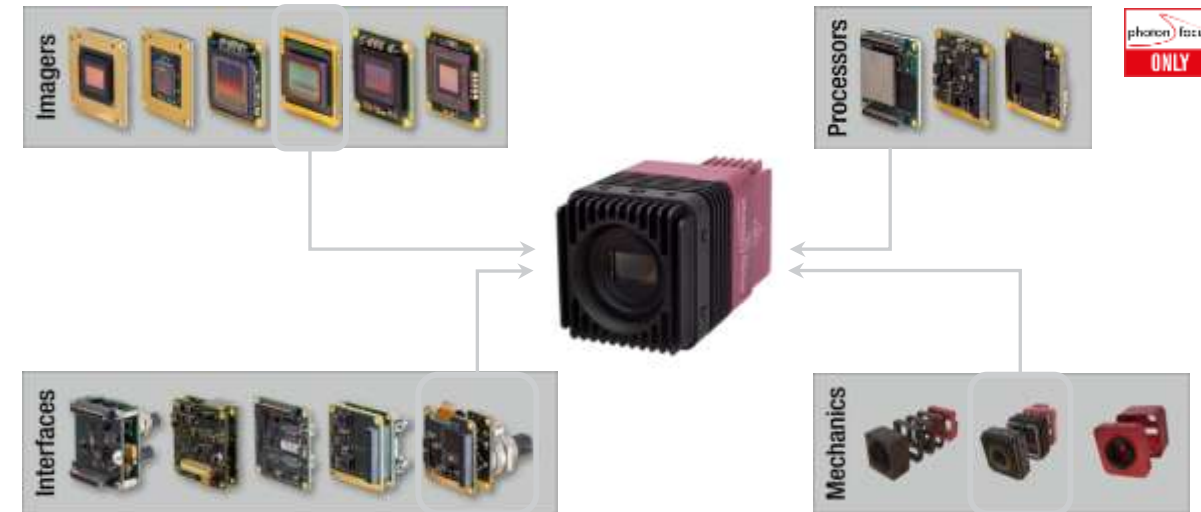


MODULAR CAMERA BASIS



Modular concept enables adaption to different needs:

- Imager palette: from UV (175 nm) to SWIR (1700 nm)
- Processors: FPGA with IP-Cores for 3D algorithm and more
- Data Interfaces: from 1GigE to 10 GigE (copper / fiber)
- One software Interface: GenICam / GigEVision
- OEM versions: without housing, SLVDS interface, IP cores, etc.

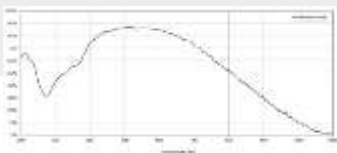


photonCLASSIC	photonCOMPACT	photonSPECTRAL	photonHISPEED	photonHIRES	photon3D
Standard platform, proven performance for 2D	Compact, powerful platform for system integration	Super-fast Hyper-spectral and SWIR and UV platform	Maximum performance platform	Modular high-resolution Platform	Super fast 3D Triangulation platform

CAMERA BASIS EXAMPLES FOR 3D LASER TRIANGULATION

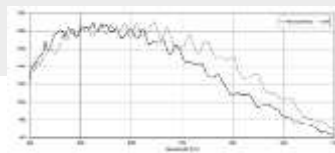
UV

- **MV4-D1280U-H01-GT**
- 175 nm to 900 nm
- Sensor: Photonfocus AG
- 10 GigE data interface
- < 140 fps
- Full encoder support



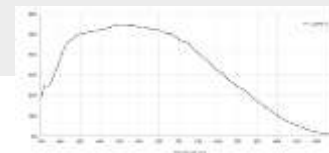
VIS COMMON

- **MV2-D2048x1088-C01-G1**
- 330 nm to 930 nm
- Sensor: AMS
- 1 GigE data interface
- < 18540 fps
- Basic encoder support



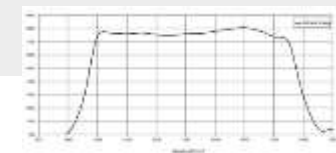
VIS HIGH SPEED

- **MV4-D2048-L01-3D06-GT**
- 350 nm to 950 nm
- Sensor: Luxima
- 10 GigE data interface
- > 80000 fps
- Full encoder support



SWIR

- **MV3-D640-M01-G2**
- up to 1700 nm
- Sensor: Lynred
- 1 GigE data interface
- < 344 fps
- Full encoder support



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**Thank you
for your attention!**