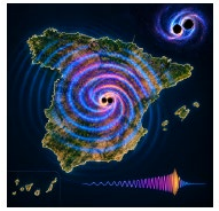
Center for Sensors, Instruments and Systems Development - UPC

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

EINSTEIN TELESCOPE



UPC prospects to join ET

2026/10/07

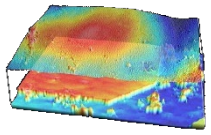
CD6: Centre de Desenvolupament de Sensors, Instrumentació i Sistemes

Optics & Photonics Engineering

- 47 people (2024)
  - 17 researchers
  - 12 R&D Engineers
  - 14 PhD students
  - 4 Management
- Income 2023 : 2,6M€
  - 69% industrial R&D
  - 8% royalties
- 8 Spin-off's + 4 Start-up's
- Photonics incubation program (3 incubated spin-off)

SENSOFAR · BEAMAGINE · Visiometrics The Human Vision Company · OBSTECH · snelloptics · microPaP easy motion

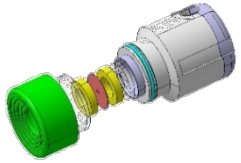
Research lines



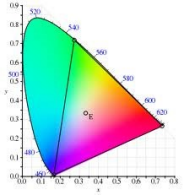
Optical metrology



Visual optics & biophotonics



Optomechanical design

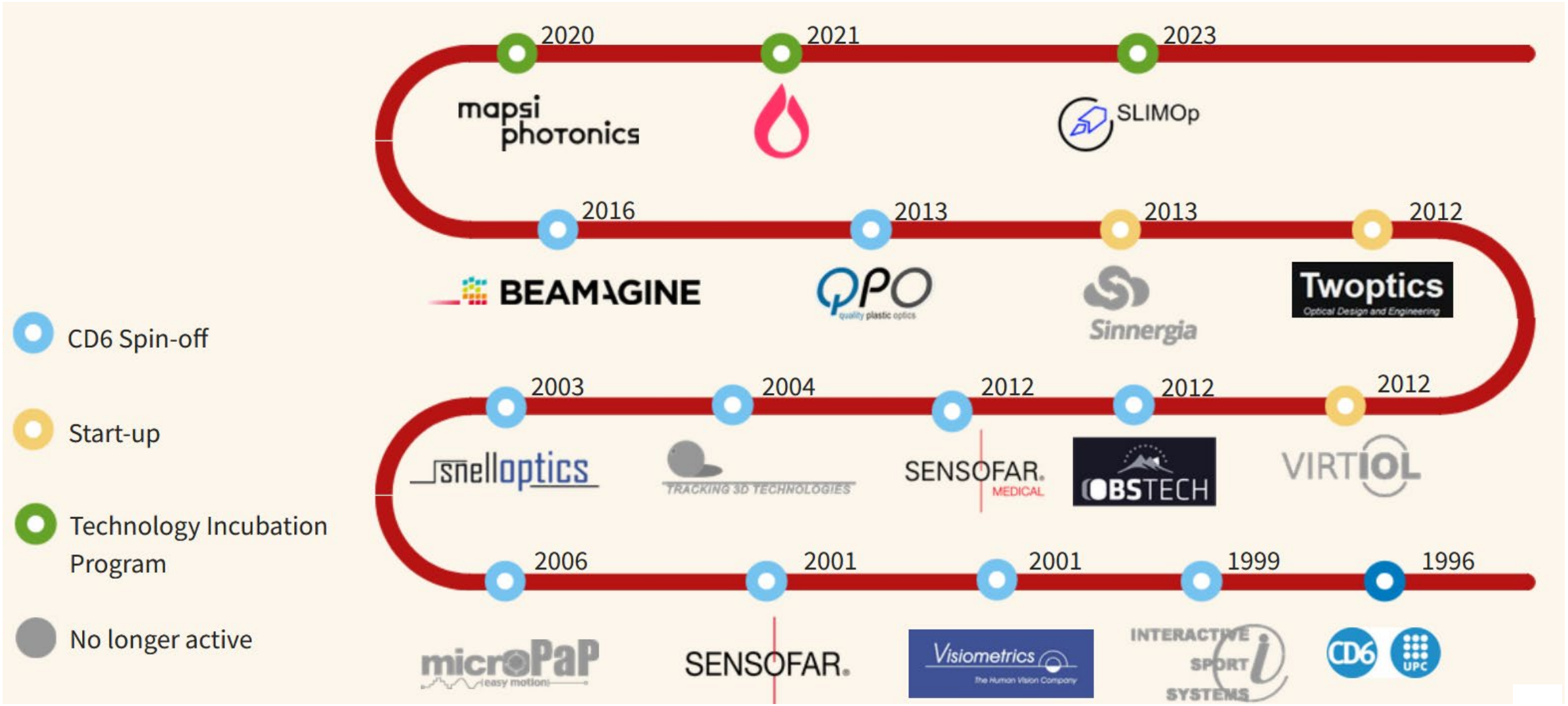


Color and multispectral technologies

Customers

ALSTOM · IDOM · SAMSUNG · GRIFOLS · idneo · FICOSA · MASSÓ · ZANINI AUTO GROUP · hp · COMEXI GROUP · Indra · Applus IDIADA · ophtec · PUIG · Autoliv · Instituto de Astrofísica de Canarias · carril instruments · essilor · SEAT · Telstar Life Science solutions · SONY · monocrom · ...

Spin-off & Start-up track





2.6 PHOTONICAT STUDENT CHAPTER

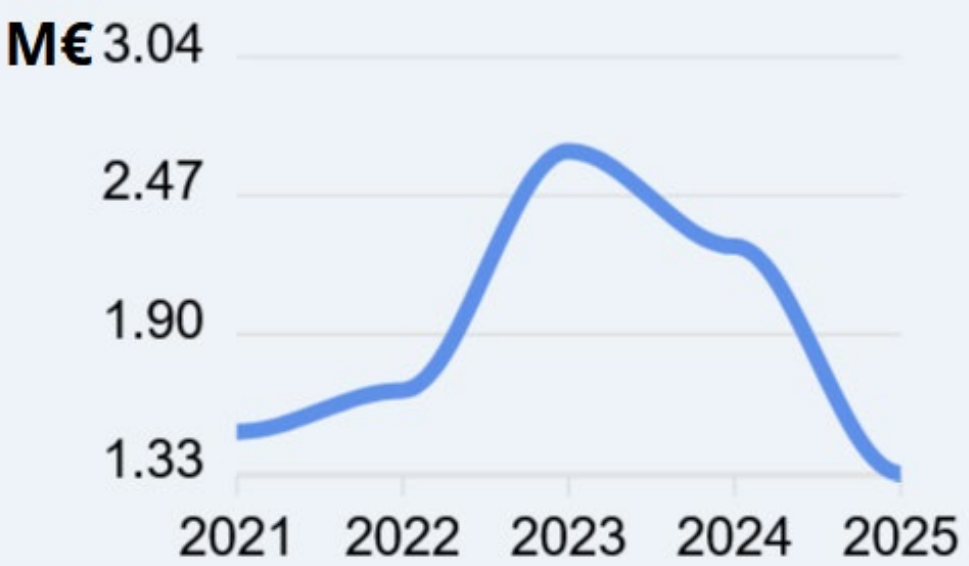
PhotoniCAT is a Student Chapter created and run by PhD students who share optics and photonics as their field of study. The aim of the Student Chapter is to foster unity and cooperation among students through various activities. The group receives funding from international photonics organizations such as OPTICA and SPIE. Currently, PhotoniCAT is made up of 17 students, of whom 75% are linked to CD6 research group.

2023 activities include a visit by Professor Maurizio Dabbicco from the University of Bari, Italy, to give a seminar on human identity in the face of technological disruptions such as artificial intelligence.

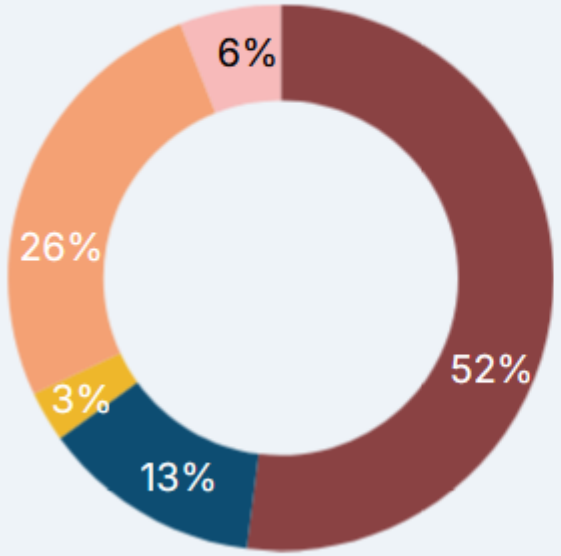
PhotoniCAT members also use Photonics Explorer Kits to promote scientific careers among the next generation, taking into account the gender perspective.

Economic results

Annual income evolution



Funding diversification

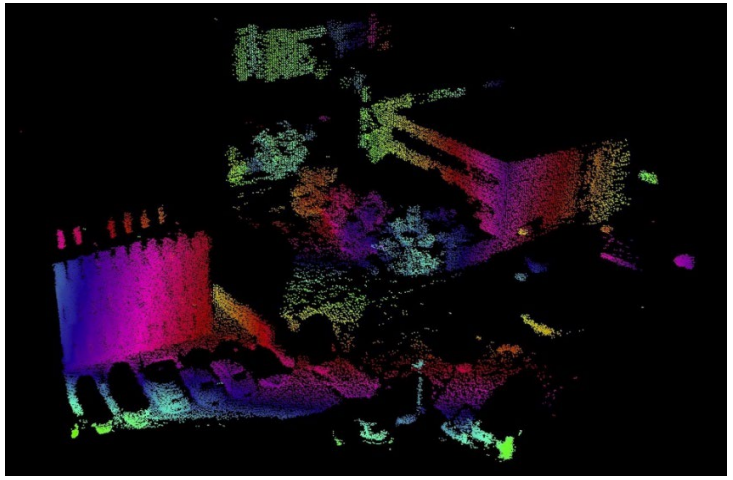


- Industry contracts
- Applied Research
- Royalties
- Collaborative R&D
- Other

2025 Income: 1,3 M€
2026 Expected income: 1,6 M€
2025 Industrial R+D Projects: 81%[1]

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Lidar imaging and data fusion for AVs





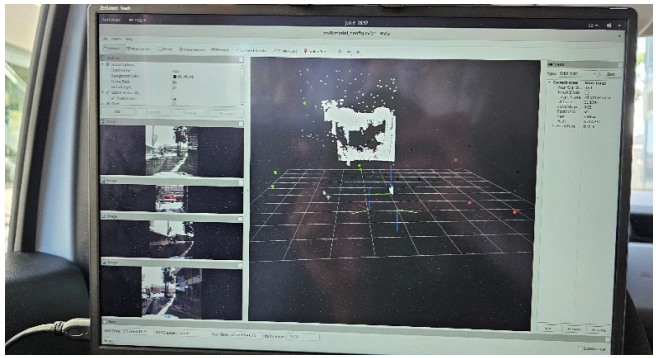


Lidar systems for 3D vision and fusion of data between cameras and radars.

Construction and integration of complex systems

Sensor configuration testing





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BARCELONATECH
Facultat d'Òptica i Optometria de Terrassa

BEAMAGINE QNAP veoneer ANELLO MAGNA

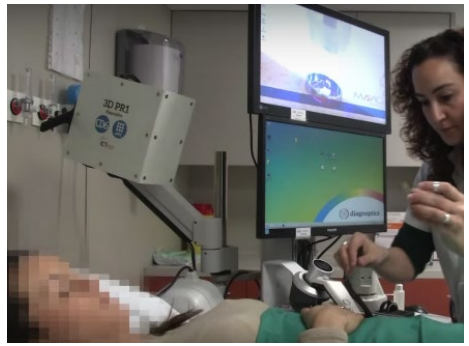
APPLICATIONS (I)

Biomedical photonics

Medical imaging and diagnosis: ophthalmology, dermatology, hematology, …

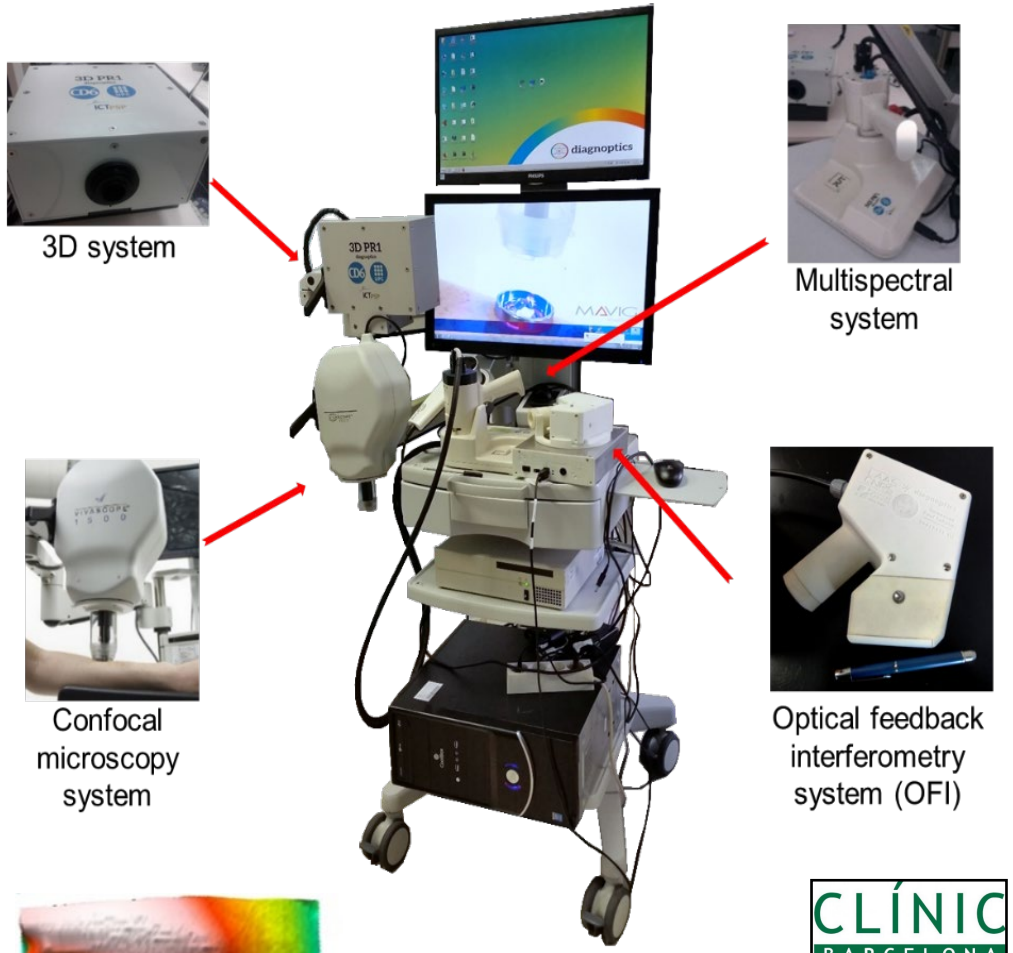
- Confocal microscopy
- Spectroscopy (UV-Visible-NIR)
- 3D

…

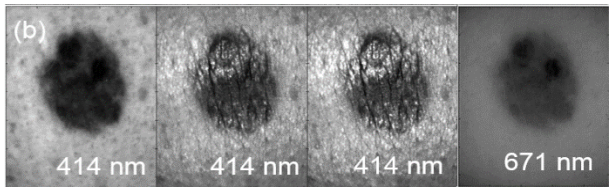


diagnoptics

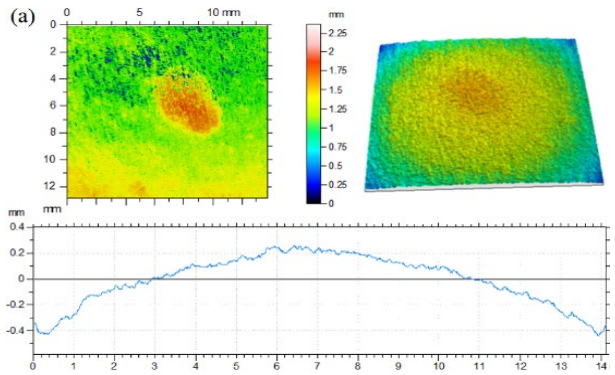
Skin cancer diagnosis

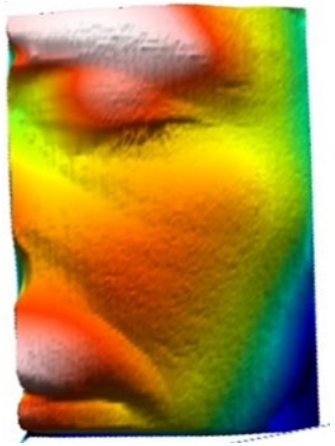


Spectral



3D





ANTONIO PUIG

Cosmetics

CLÍNIC BARCELONA Hospital Universitari

APPLICATIONS (III)

Vision (Visual Optics)

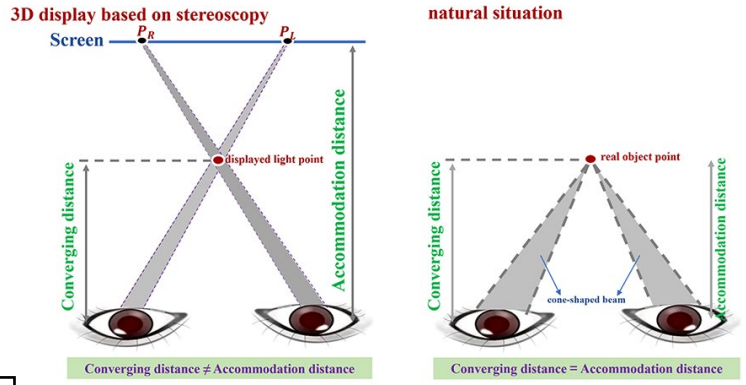
Near-Eye Displays for Augmented/Virtual Reality AR/VR



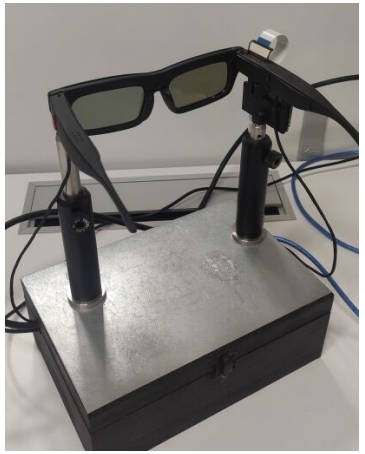




- Appealing (conventional glasses)
- Large FOV display in a compact form factor
- Mitigation of the Vergence-Accommodation Conflict (VAC)



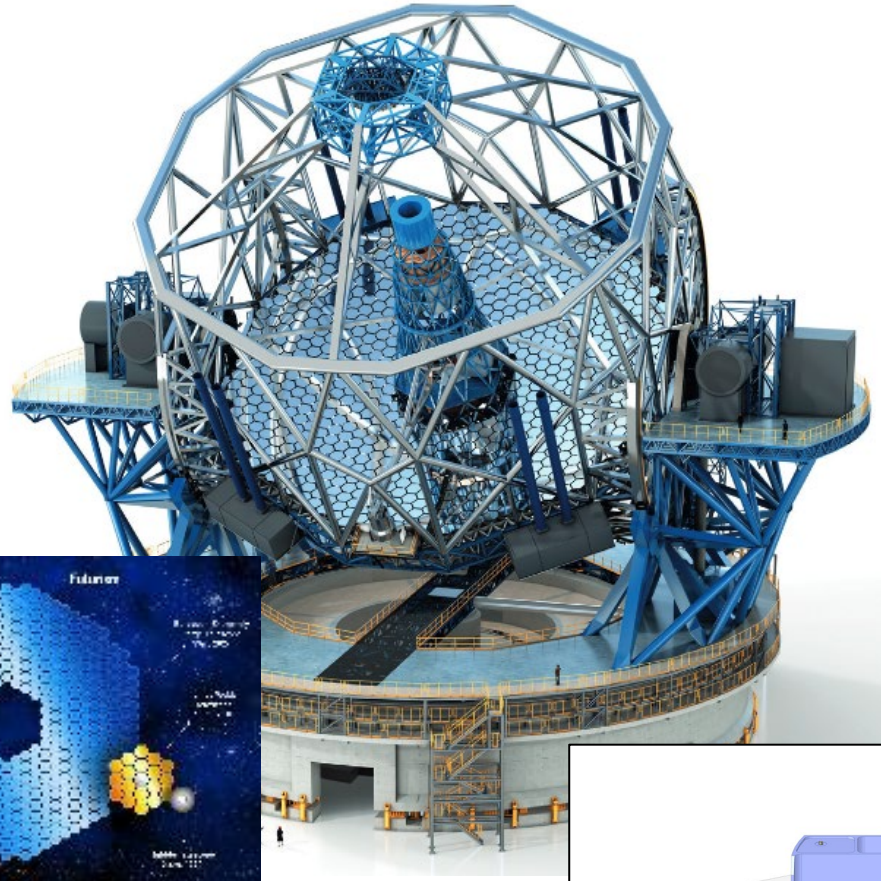




- Holographic displays, retinal projection displays, etc.
- Optical design

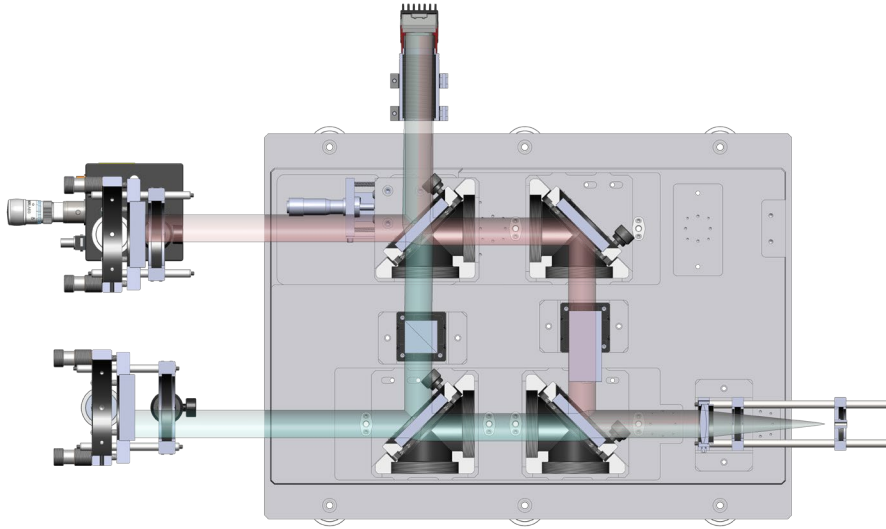
Inmersia

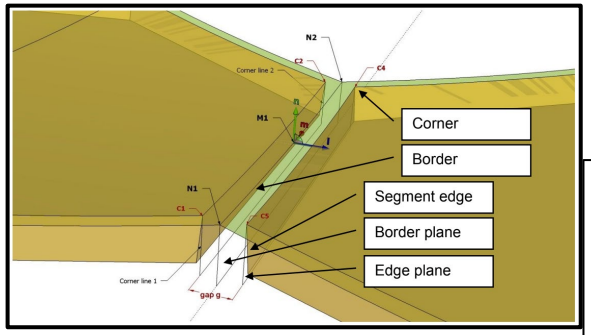
Piston, tip and tilt measurement: concept

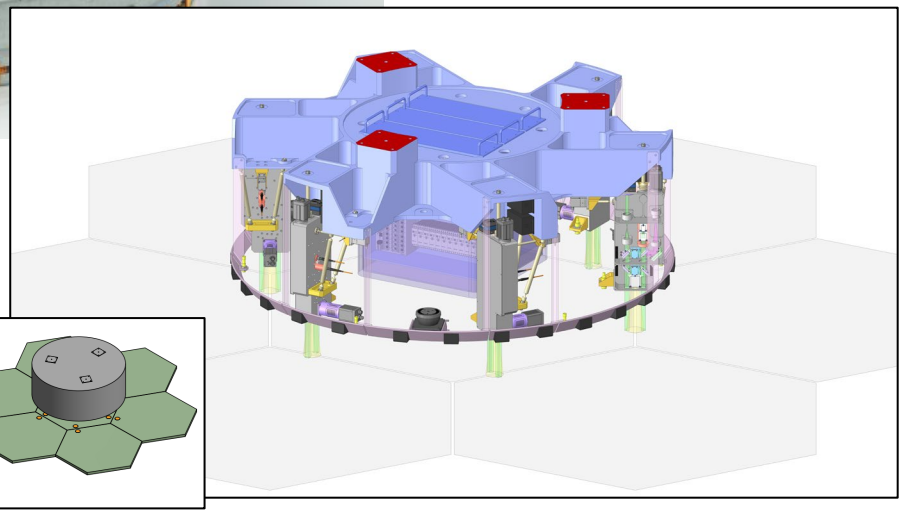


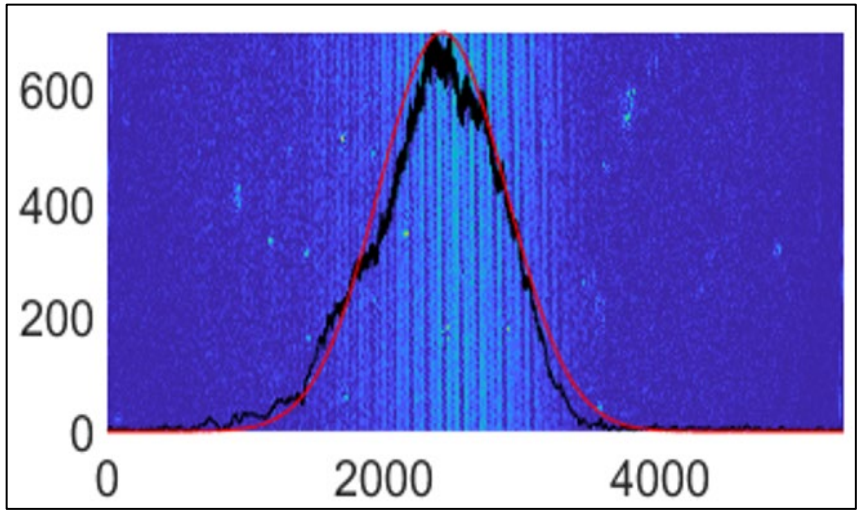
LOcal Coherencer (LOCO)
Main requirements

<0.3µm piston accuracy (2σ)
±250µm piston range
±0.3mrad relative tip range
±15deg gravity orientation
±1.4°C/h thermal gradient
1mrad of periodical drift
>2Hz measuring rate
<1ms exposure time



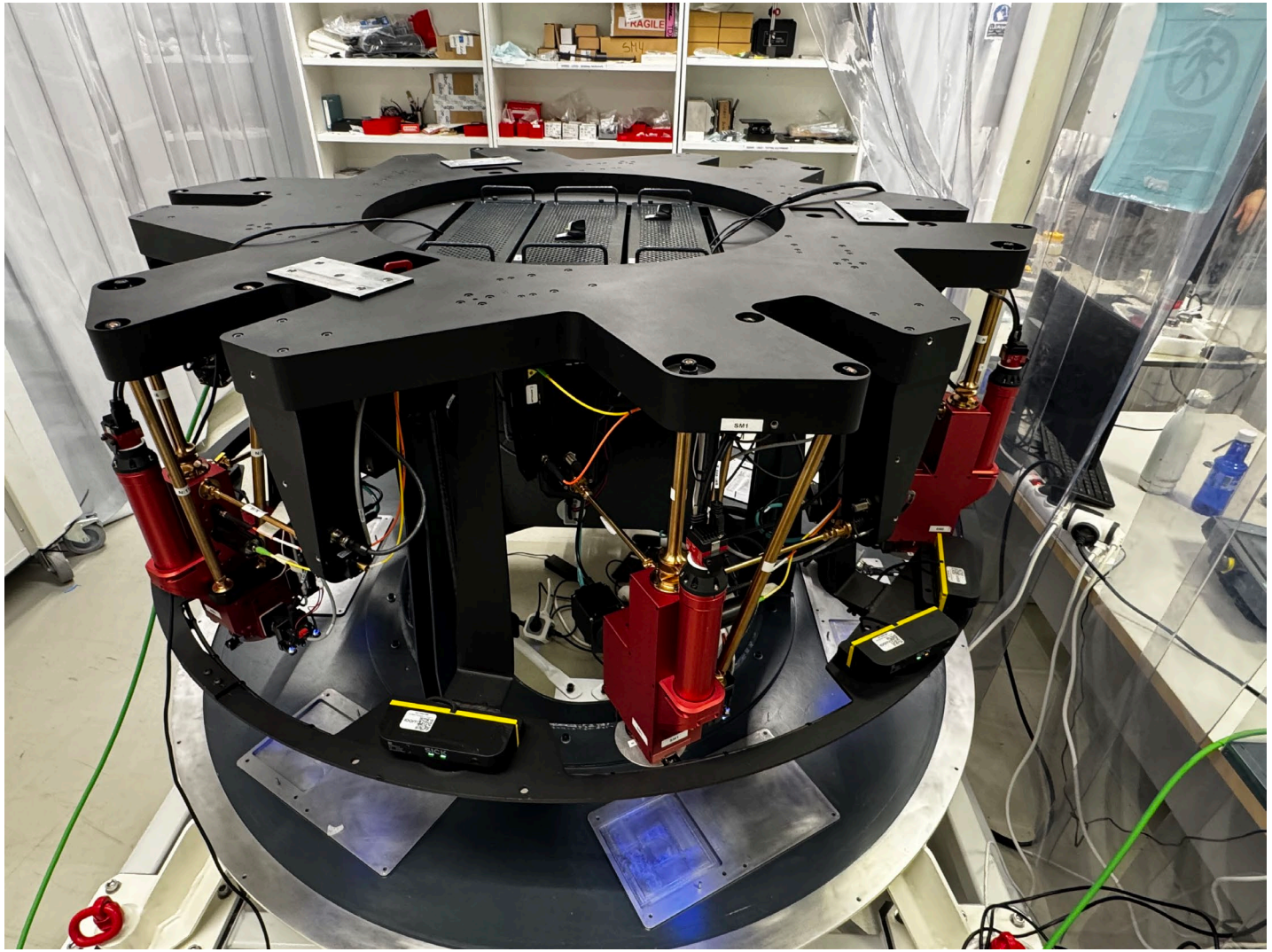


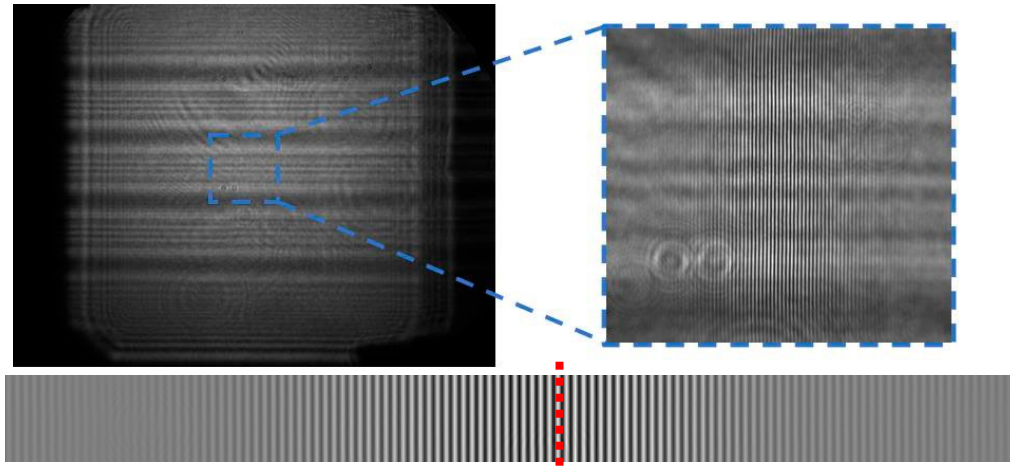


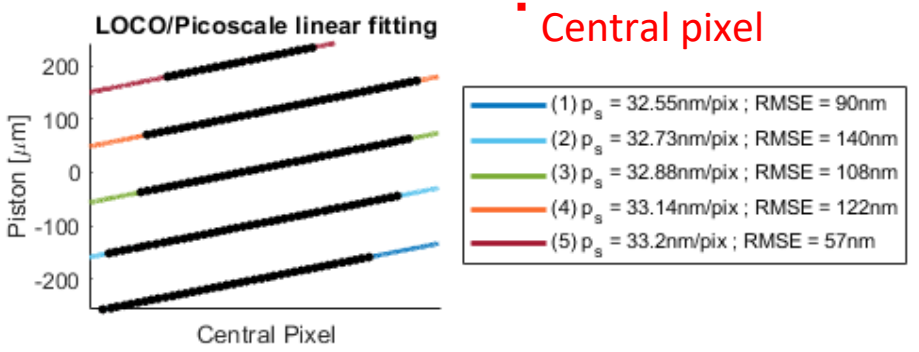


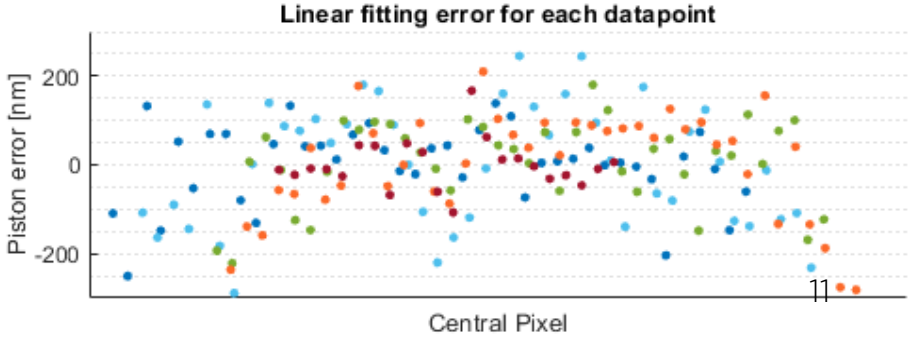
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Piston, tip and tilt measurement: performance



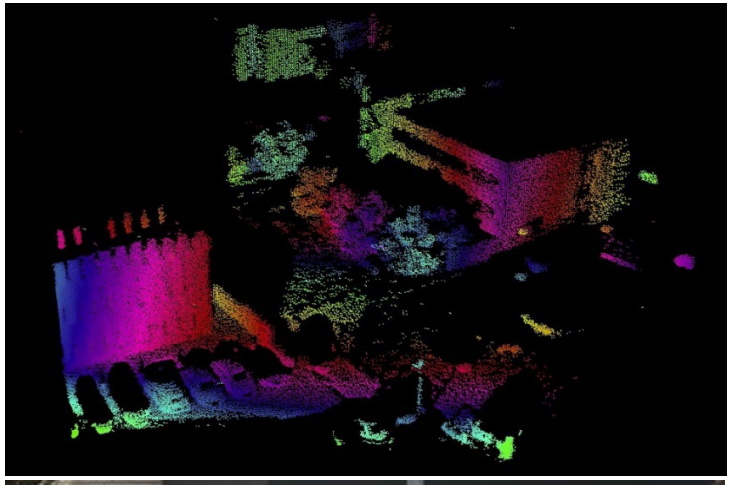




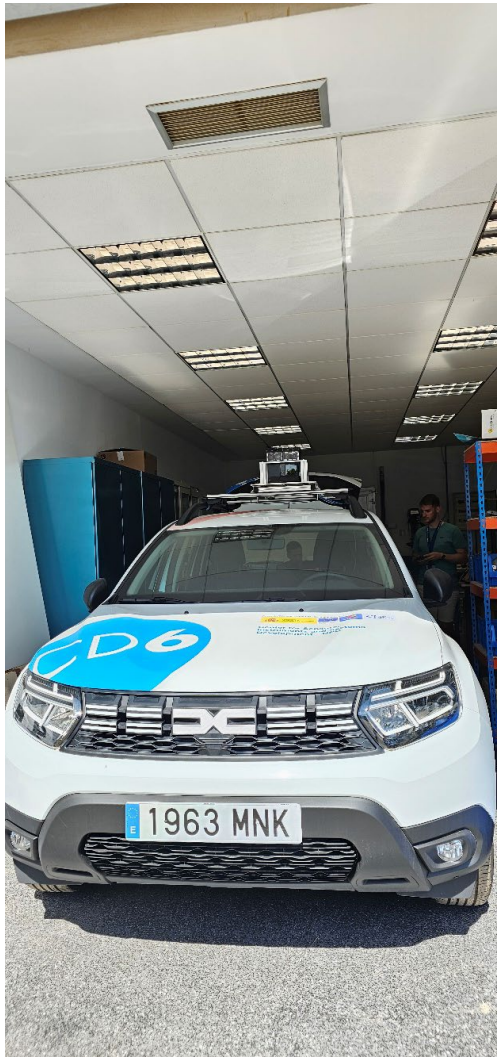


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APPLICATIONS (VI) Lidar imaging and data fusion for AVs





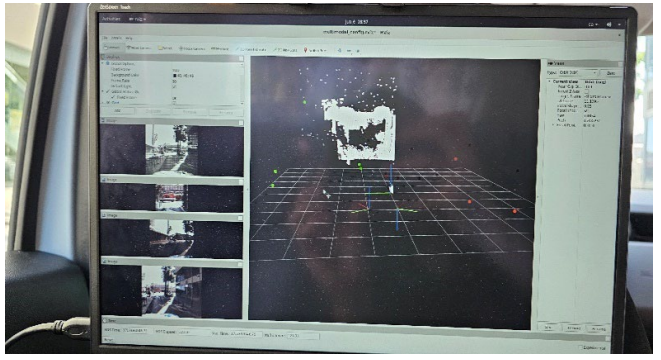


Lidar systems for 3D vision and fusion of data between cameras and radars.

Construction and integration of complex systems

Sensor configuration testing





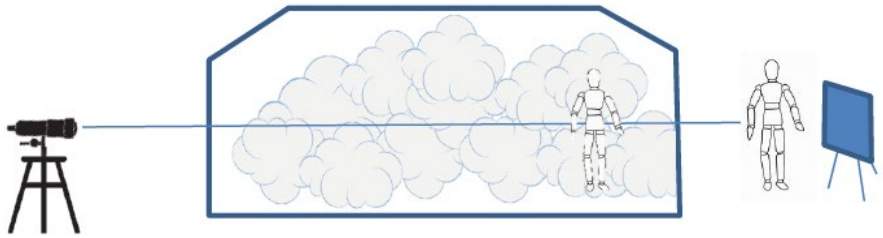
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Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH
Facultat d'Òptica i Optometria de Terrassa

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
Financiado por la Unión Europea NextGenerationEU
Plan de Recuperación, Transformación y Resiliencia
AGENCIA ESTATAL DE INVESTIGACIÓN

BEAMAGINE QNAP veoneer ANELLO MAGNA

Full waveform polarized lidar in scattering media

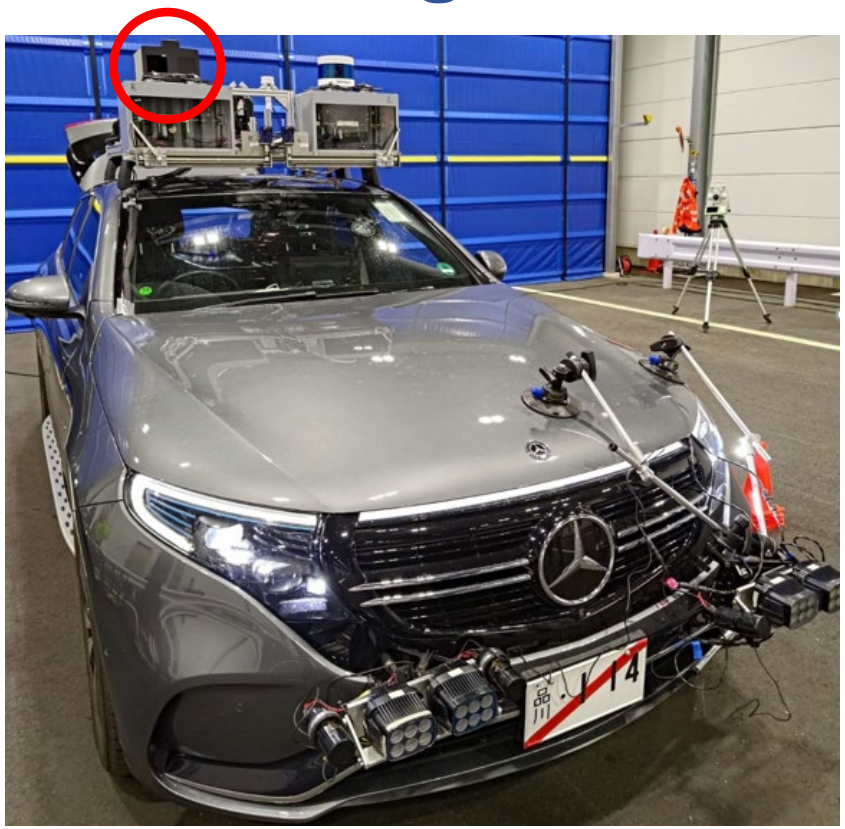




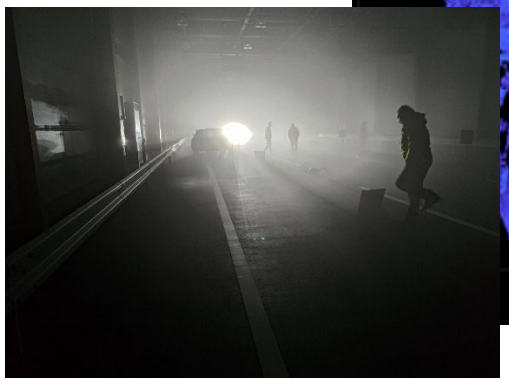


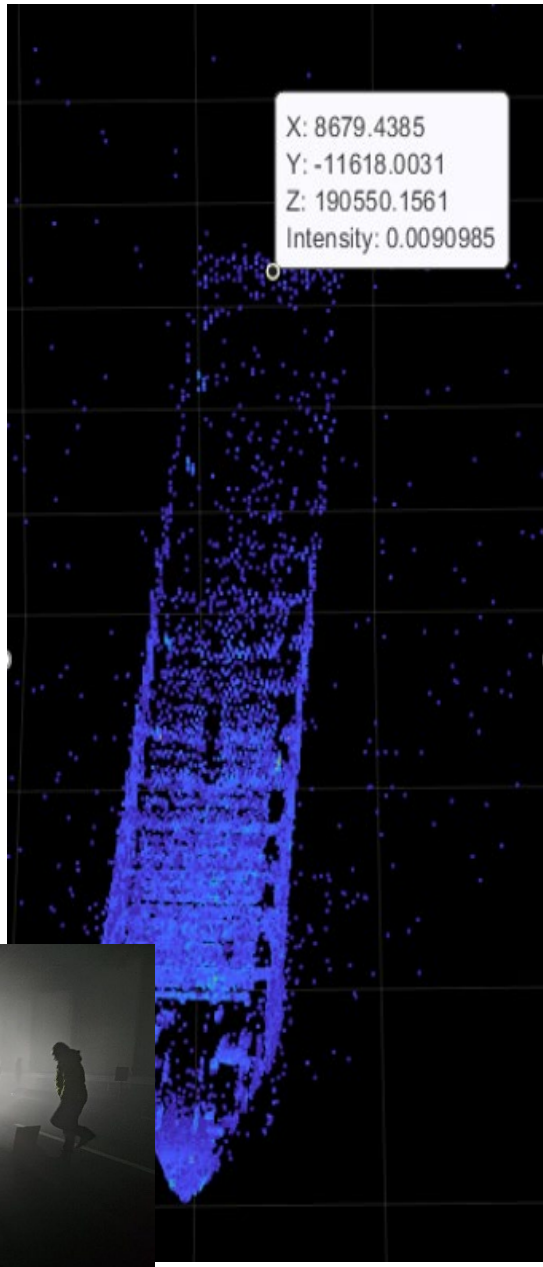






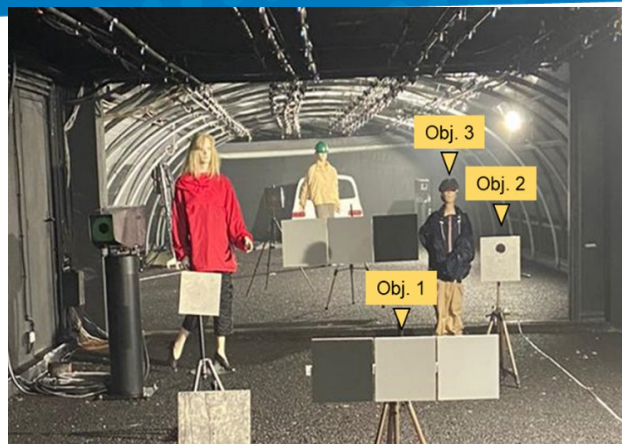




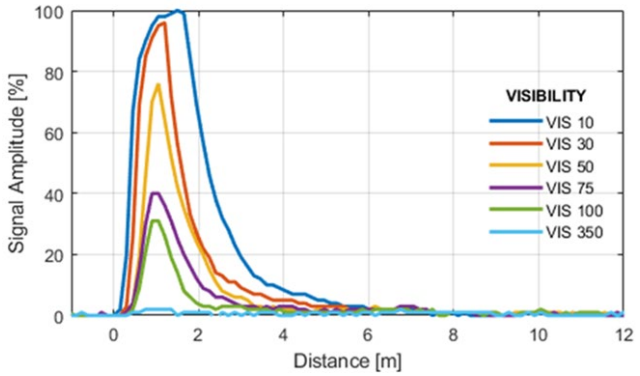


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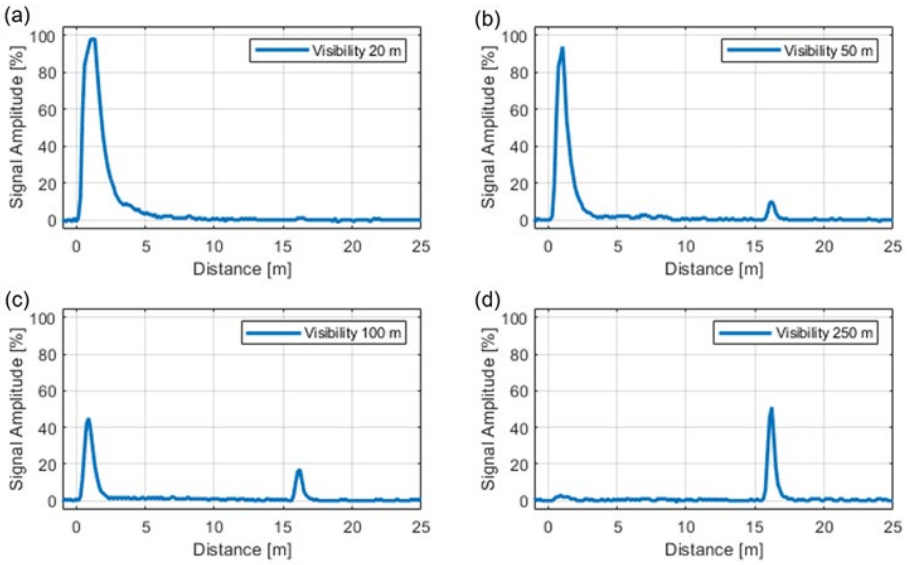
Full waveform polarized lidar in scattering media



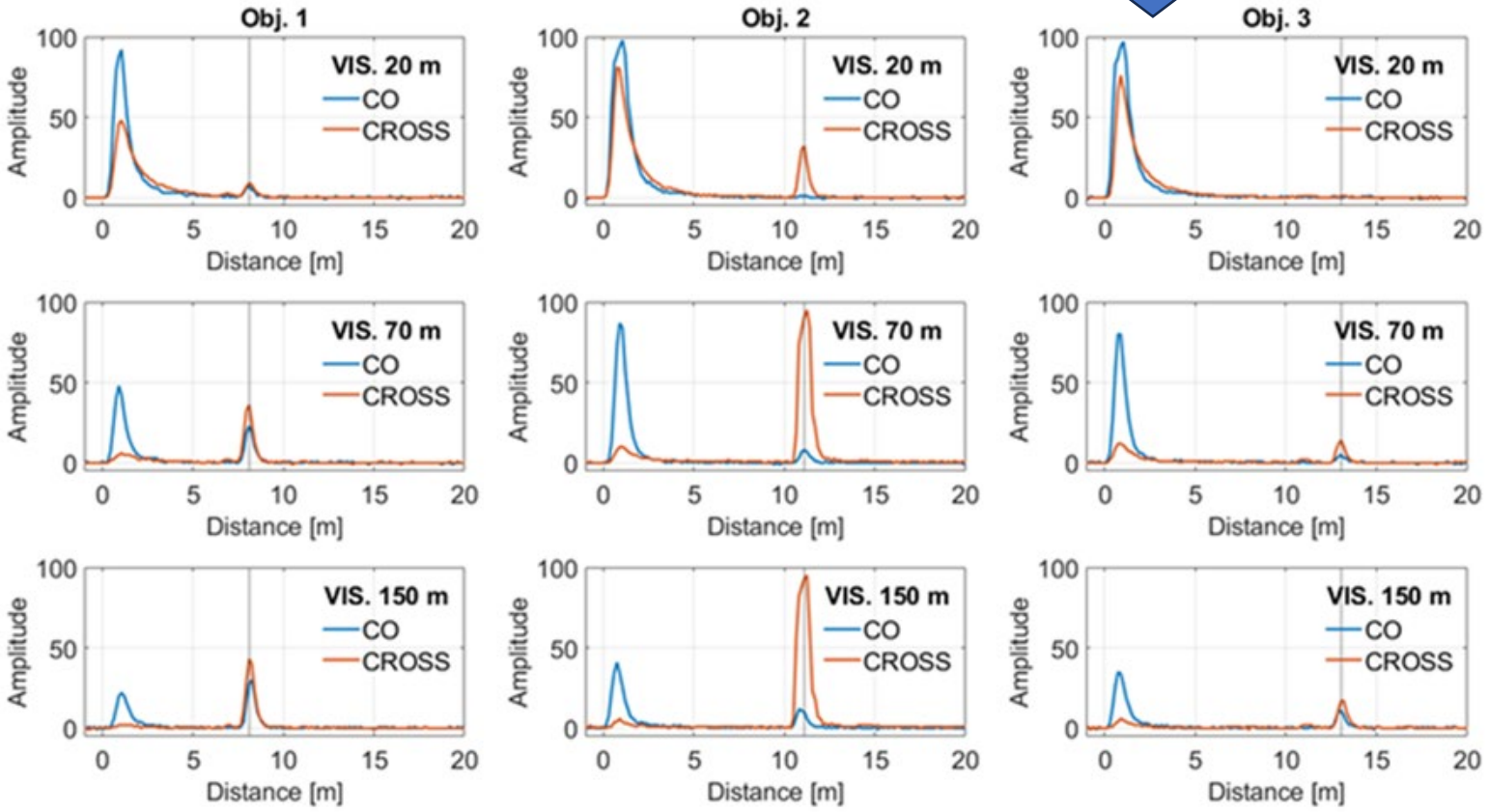
No target, no pol. (only media)



Target at 16m, no pol



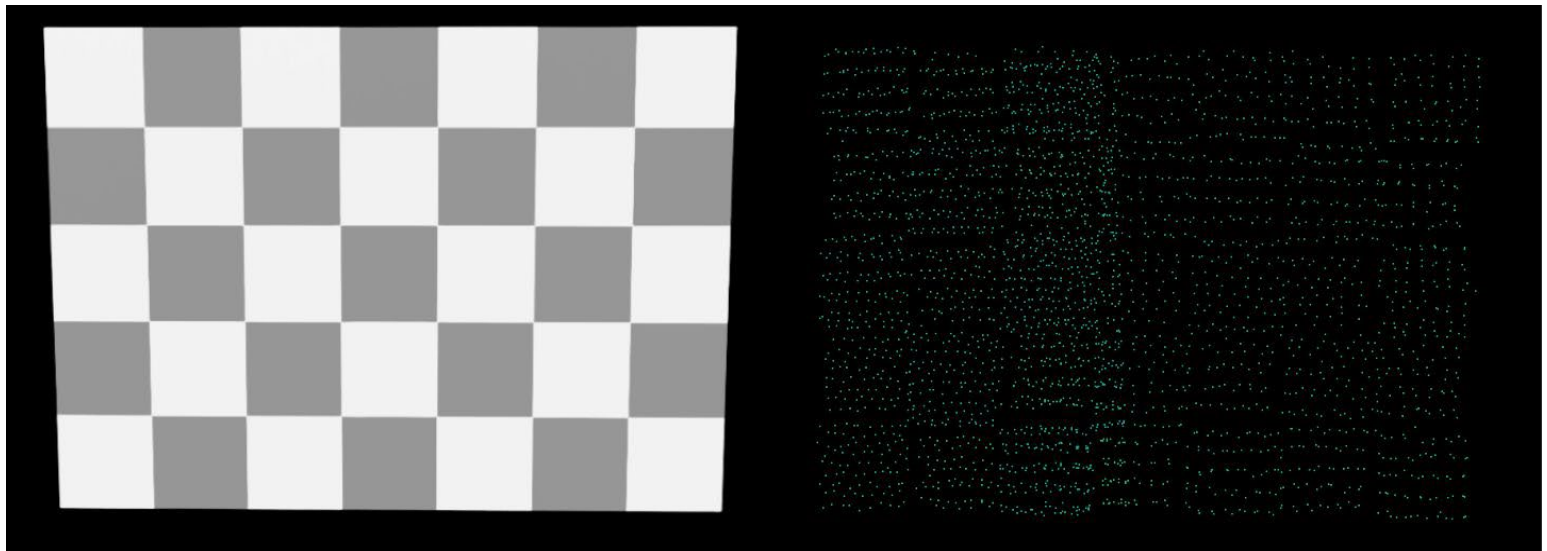
Multiple targets, circularly polarized CO/CROSS

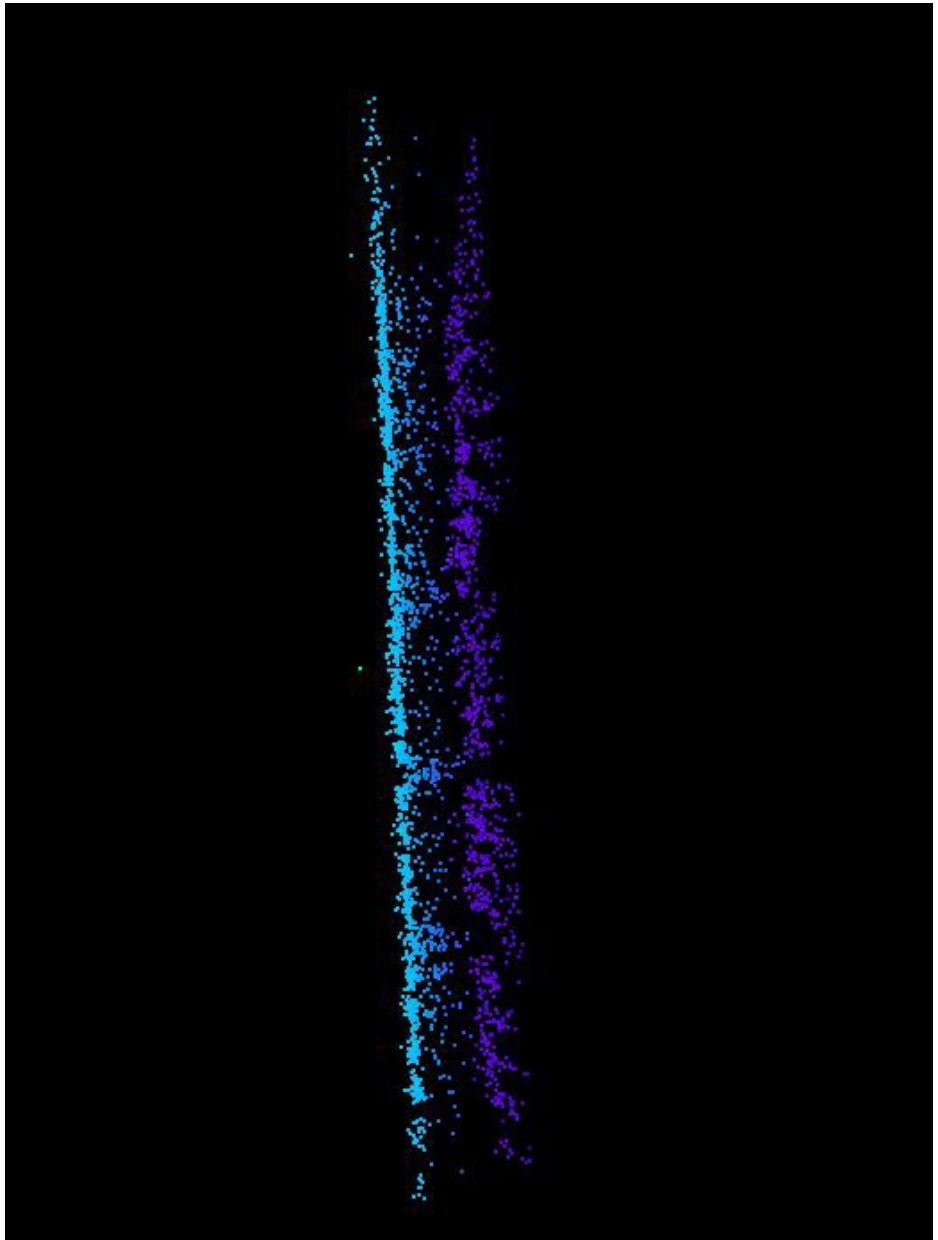


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Realistic synthetic datasets for AI-training and Digital Twins

- Lidar synthetic datasets are very needed (lack of extense datasets, multiple configuration, multiple specifications…)
- Proprietary realistic LiDAR simulation models for Omniverse, including full radiometric model, background, detectivity, edge effects, range walk…
- Includes ADC and TDC modes (full signal digitization)
- Experimentally validated,
- Enables construction of synthetic datasets (labelled) in first stages of the project to start AI training before the real datasets are obtained and annotated



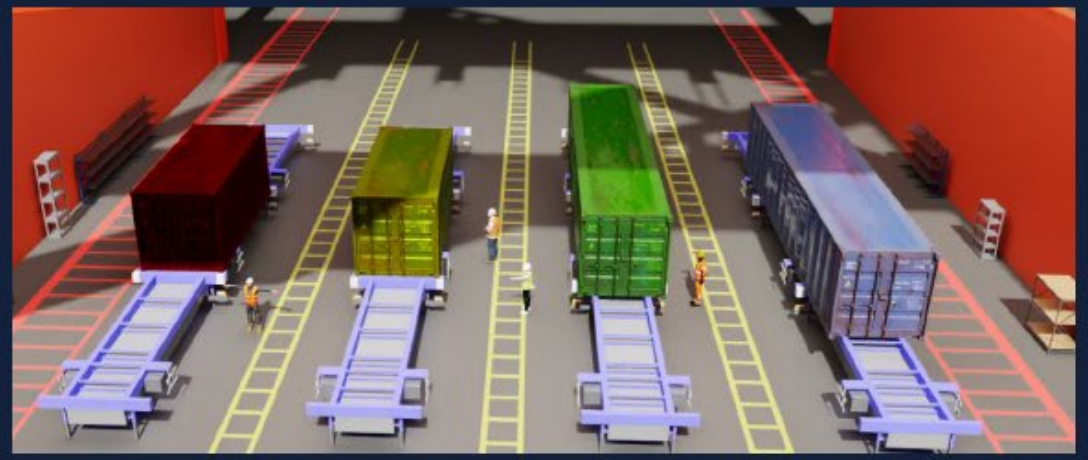


Realistic synthetic datasets for AI-training and Digital Twins

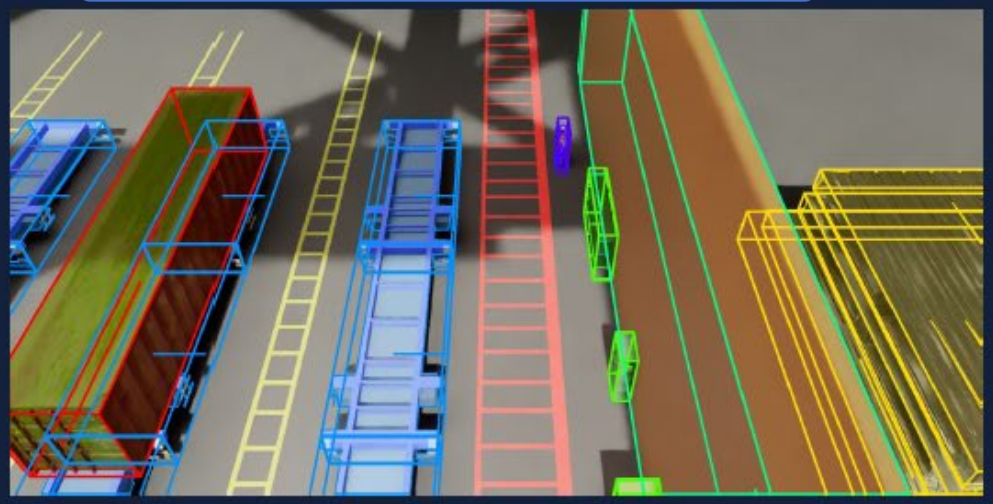
Real scene



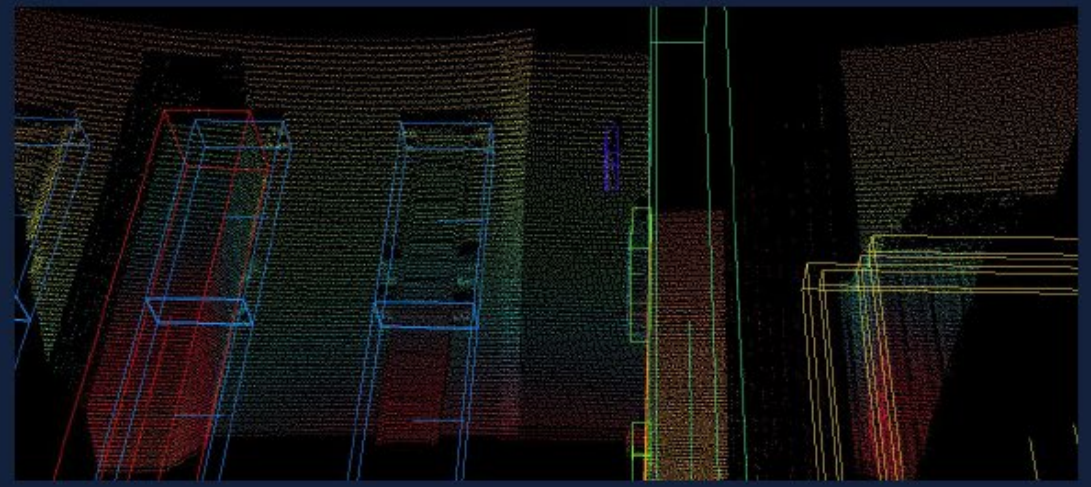
Synthetic scene



Annotated RGB scene



Annotated realistic LiDAR scene



IPs @ CD6


J. Pujol


S. Royo


M. Vilaseca


M. Aldaba


F.J. Burgos


J. L. Larriba


R. Artigas


F. Díaz


C.E. García

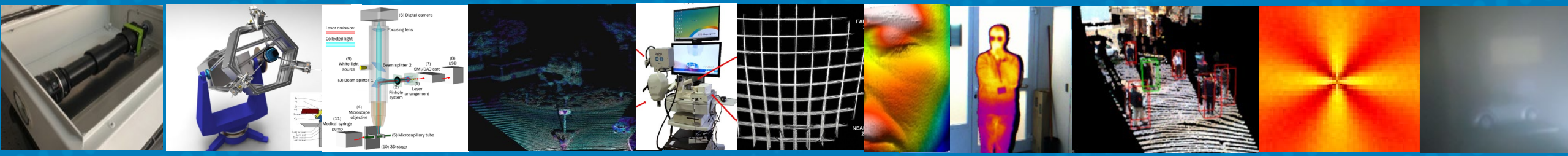

C. Pizarro

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Potential contributions to ET (examples)

- Detailed optomechnical simulations using optical deisgn software
- Advanced optomechanical design of instrumentation
- Physical AI including edge computing, PLC control, data acquisition…
- Construction, calibration and set to operation of instruments
- Generation of synthetic datasets for AI training
- AI-based data analysis, including graphs, machine learning, etc.
- Advanced radiometric models
- Lidar
- Computer Vision (Data fusion

Center for Sensors, Instruments and Systems Development - UPC



Thanks!

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