



EPIC Meeting on
Micro and Nano-satellites in the New Space

Laser RADAR for Space Applications

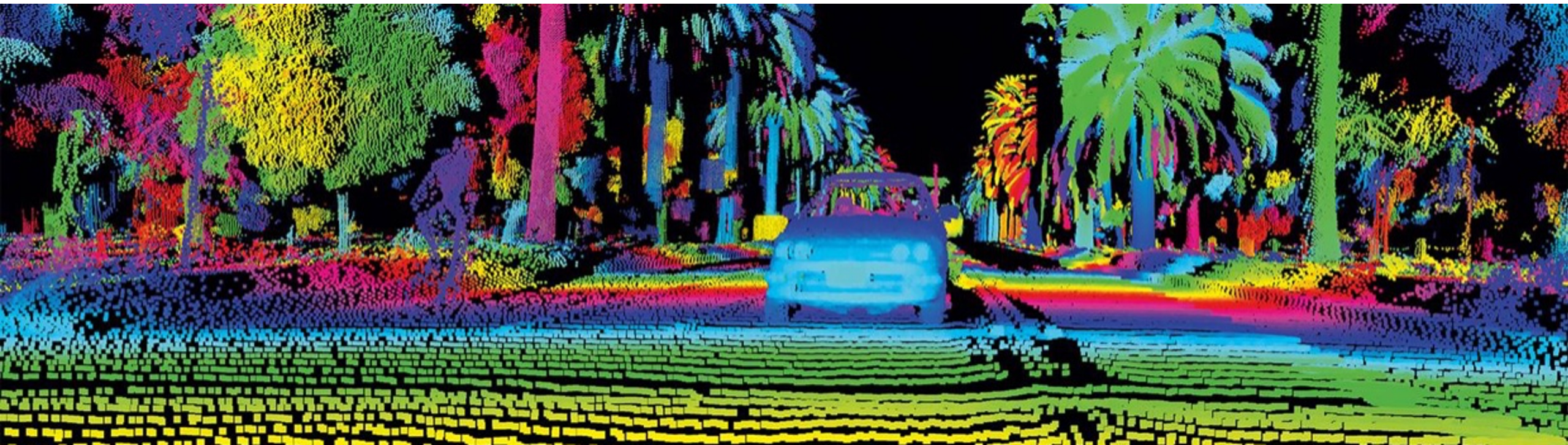
Ommatidia LiDAR

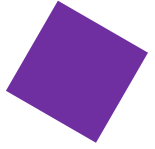


Eduardo Margallo – 16 Mayo 2022

What is LIDAR/LADAR/LASER RADAR?²

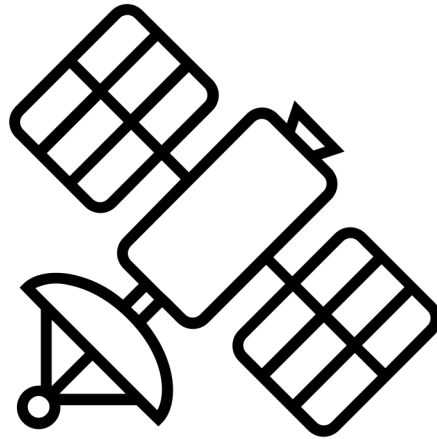
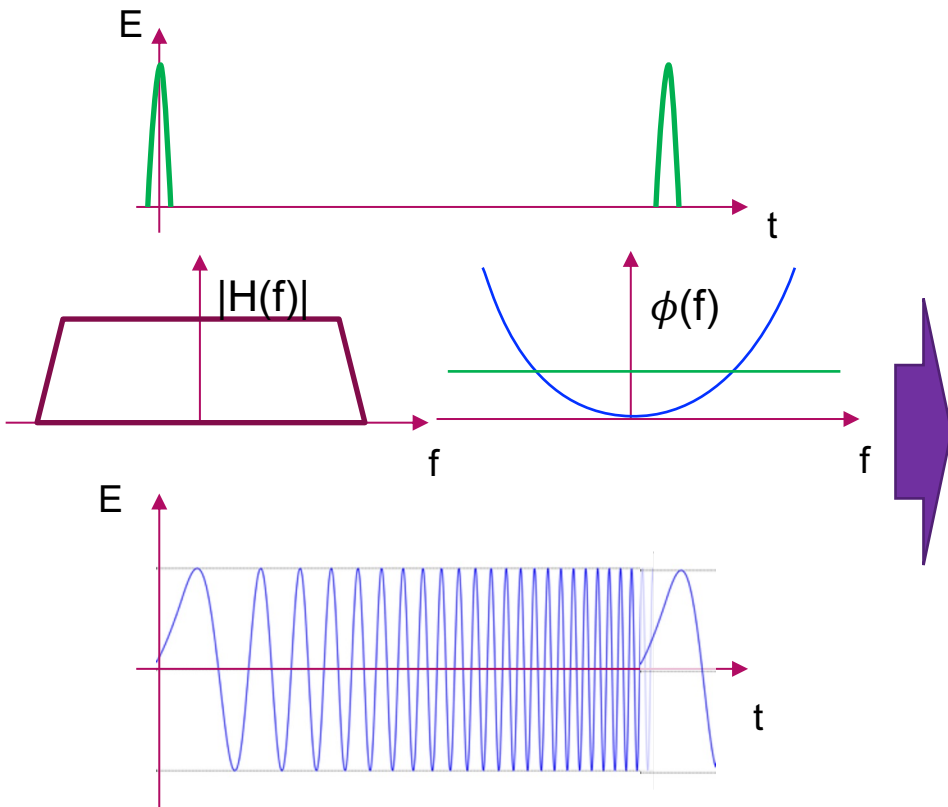
- *Light-based Detection And Ranging*
- Active Illumination
- Matched Receiver



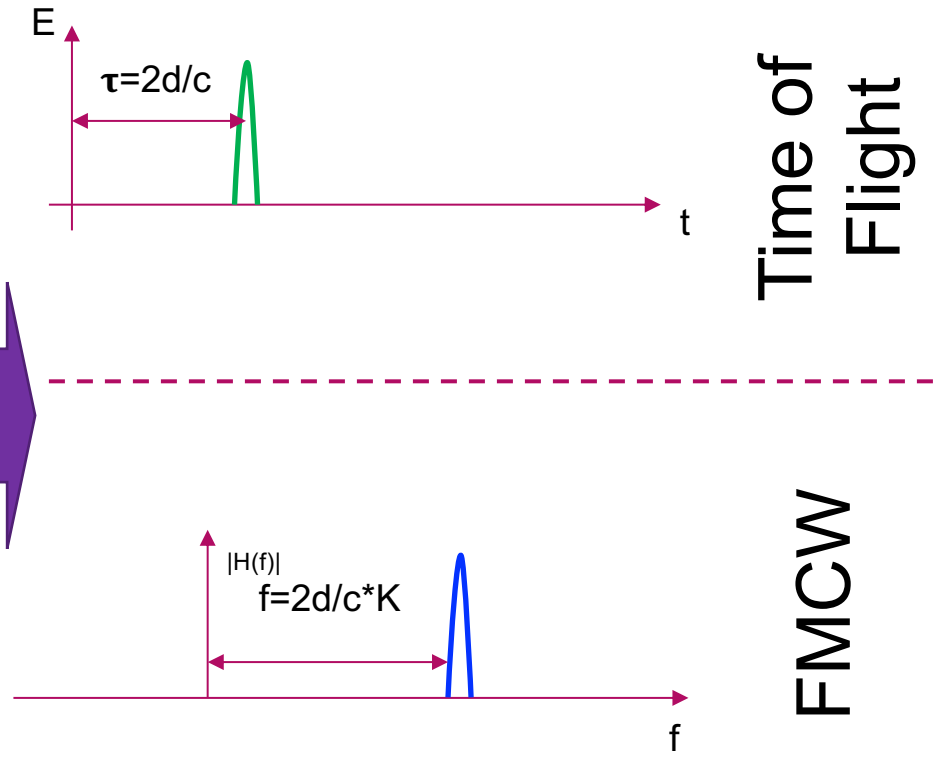


ToF vs. FMCW

Input Waveforms



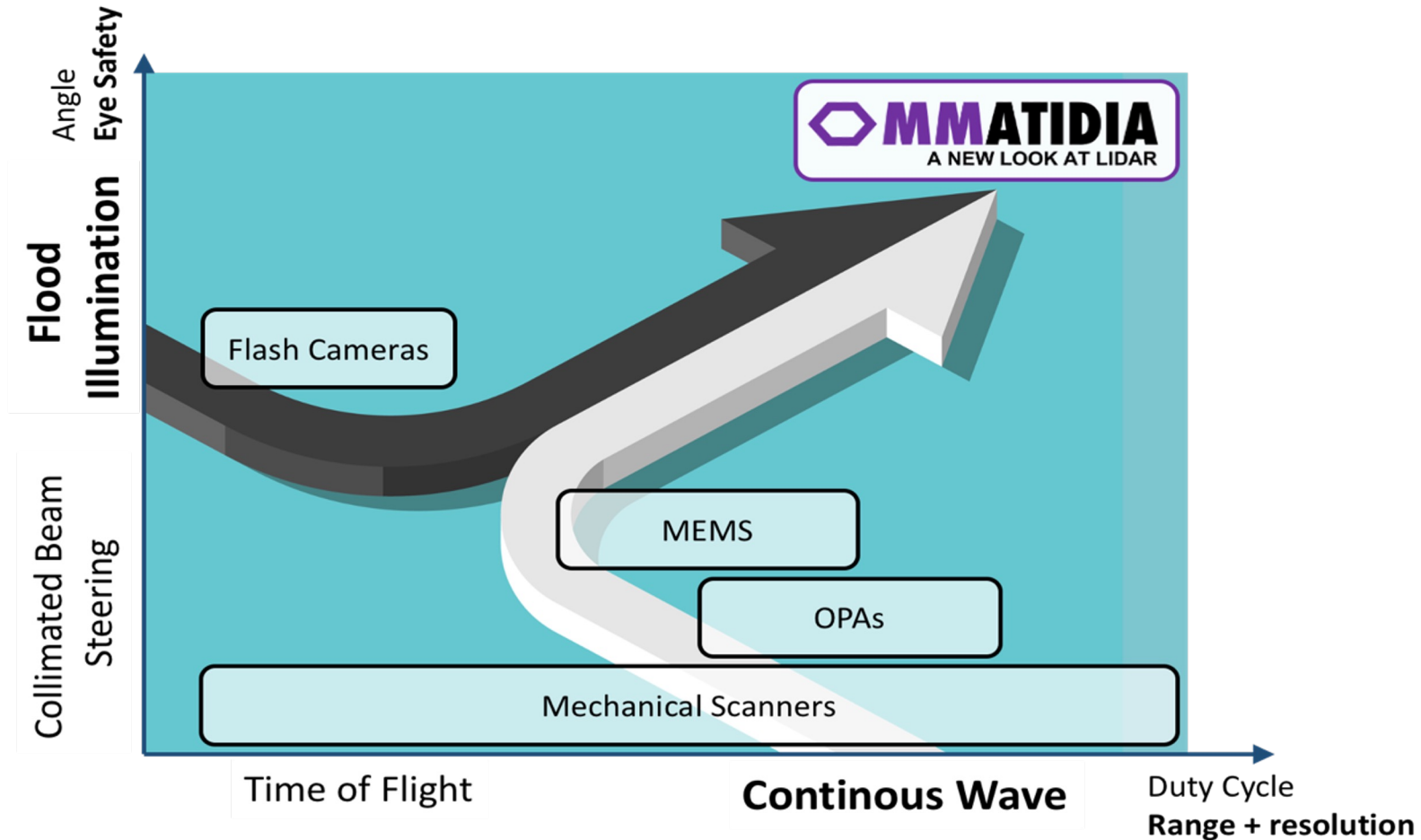
Output Waveforms



Time of Flight

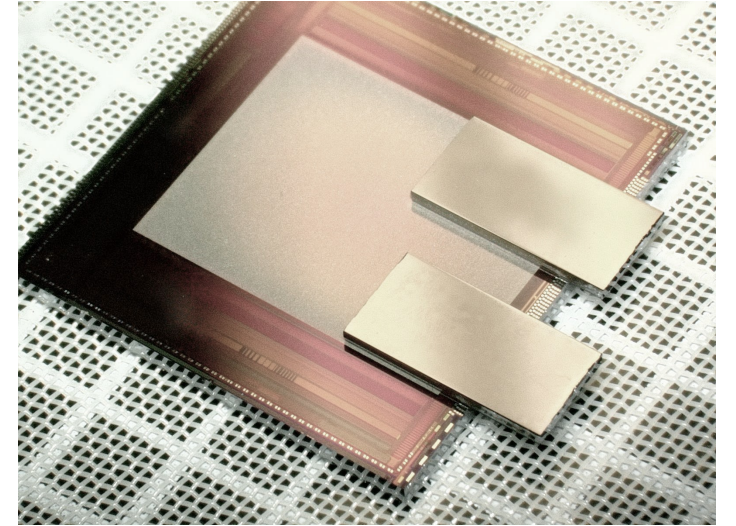
FMCW

◆ Ommatidia's LightField Sensor



Learning from Nature

- ▶ Fly: $700 \times 6 = 4\text{k}$ elements
- ▶ Bee: $5\text{k} \times 8 = 40\text{k}$ elements
- ▶ Dragonfly: $40\text{k} \times 8 = 320\text{k}$ elements
- ▶ Ommatidia 1st Gen: 512 elements – 2D
- ▶ Ommatidia 2nd Gen: 48k elements– 3D
- ▶ Ommatidia 3rd Gen: 480k elements– 3D
- ▶ Video High Resolution & Long Range
 - ▶ 1-10Mpix – 10-200Mpts/s
 - ▶ > 300m

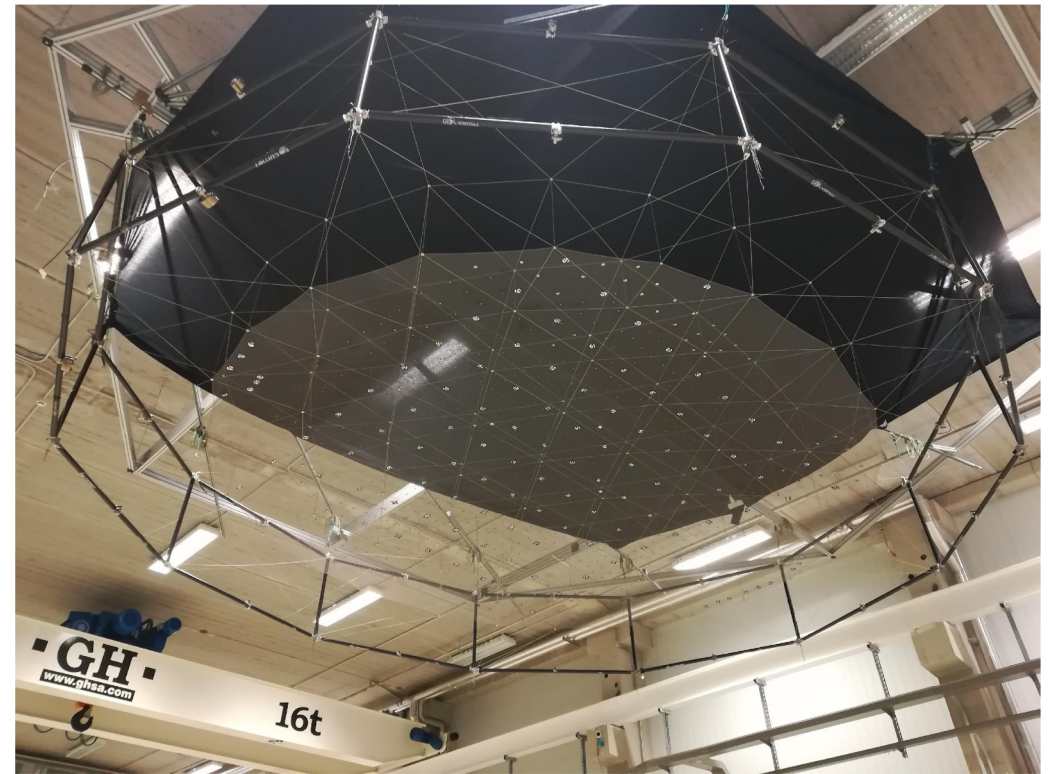
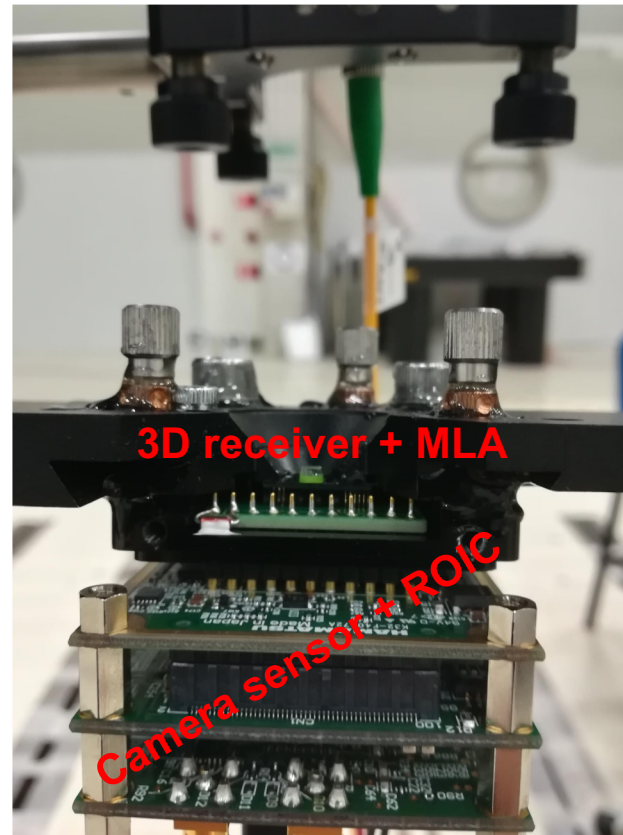
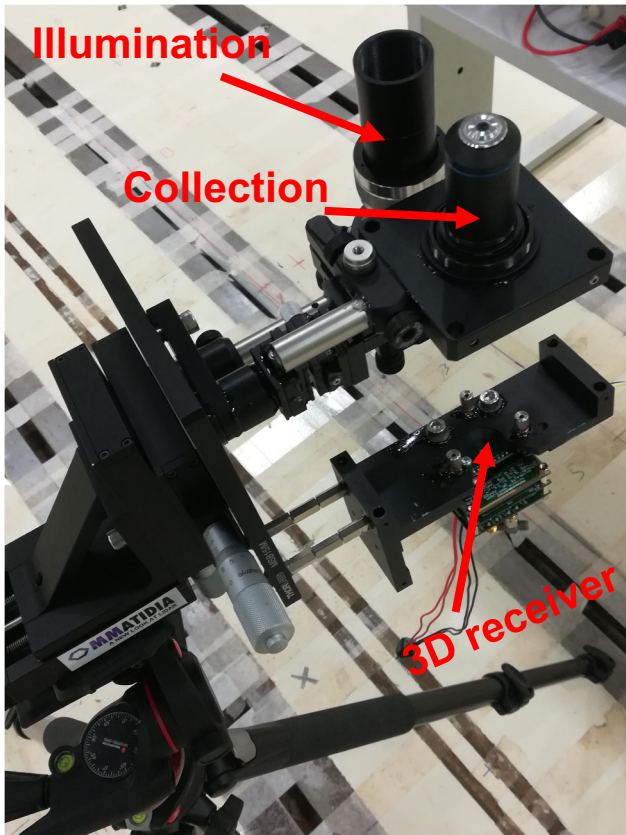


Biomimetic parallel sensors with 48k channels



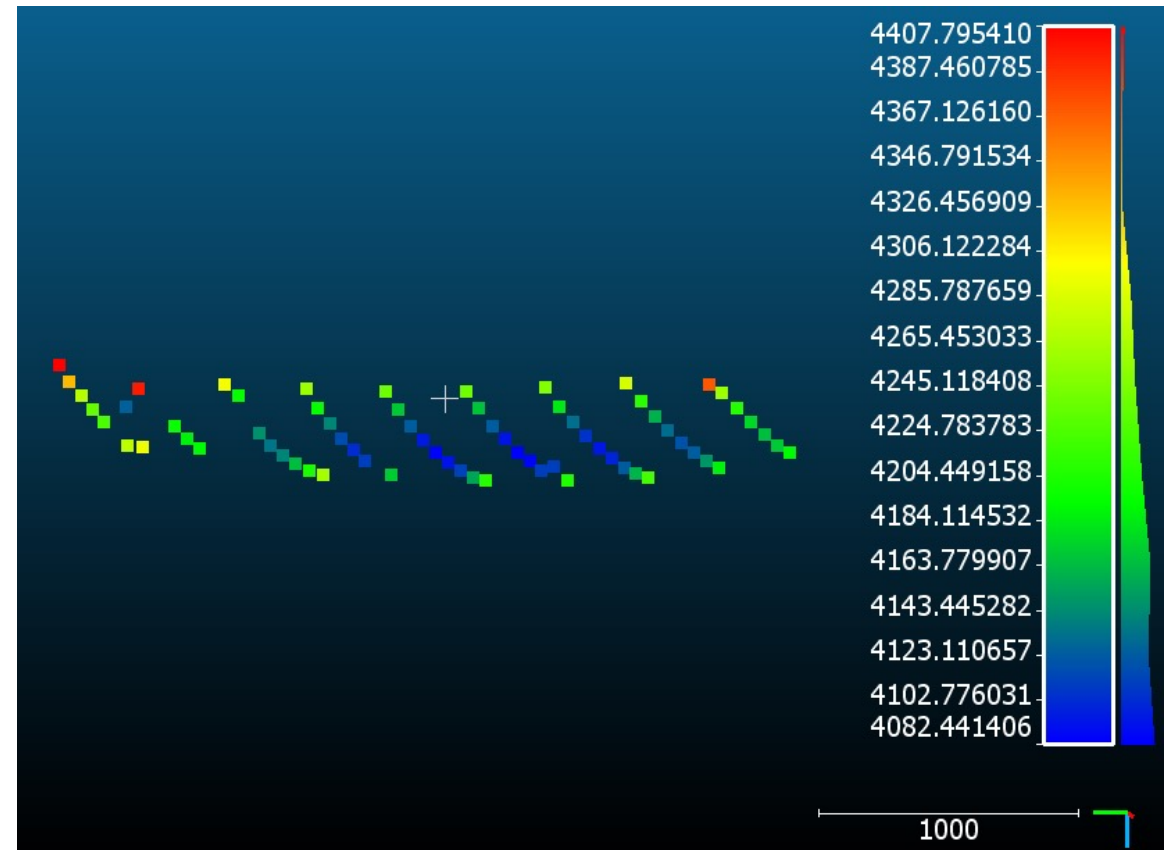
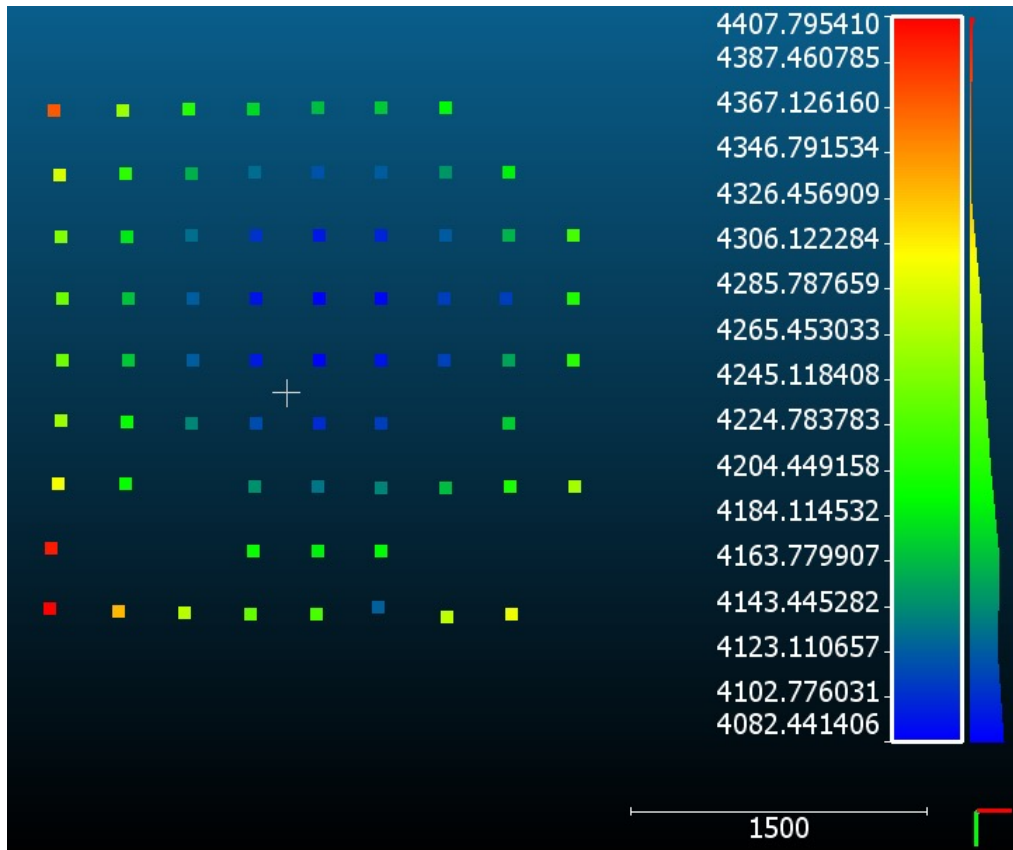
Compound eyes of robber flies

Application to in-orbit Metrology



Work done under ESA contract
In collaboration with COMET Ingeniería

Application to In-orbit Metrology





Ground Metrology

Ommatidia Q1

- 128 Channels
- Interferometric absolute measurement
- 20.000 points/s
- 6 μ m/m

Aerospace

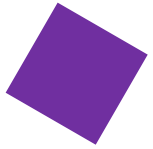
- Antenna measurements
- Composite structures

Production

- Automotive manufacturing
- Naval engineering

Civil Engineering

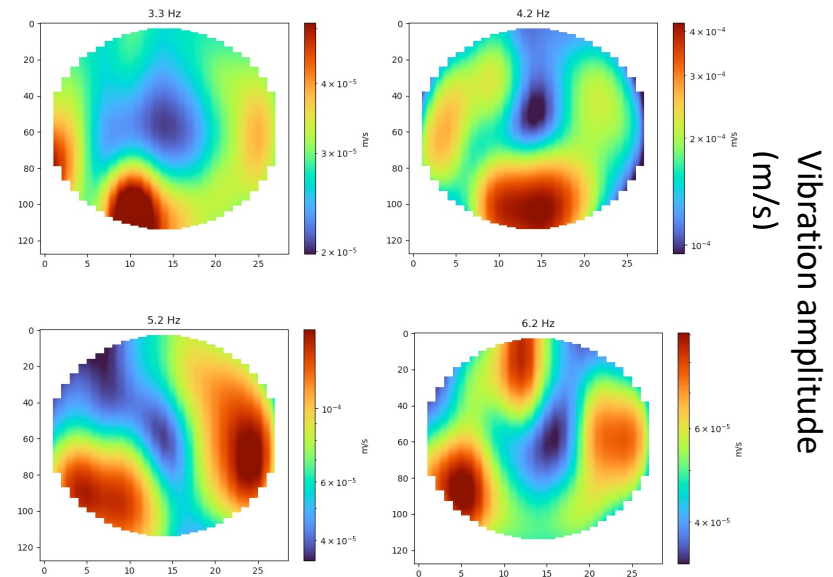
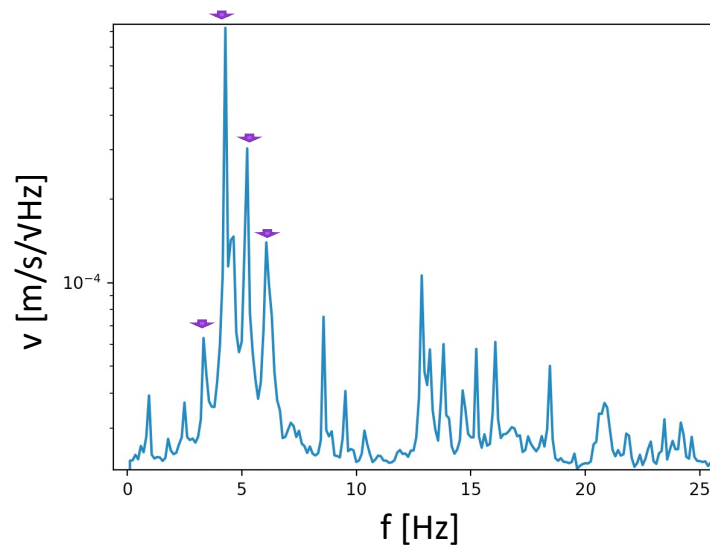
- Imaging vibrometry for structural analysis



Imaging Vibrometry of Next Generation Reflectors



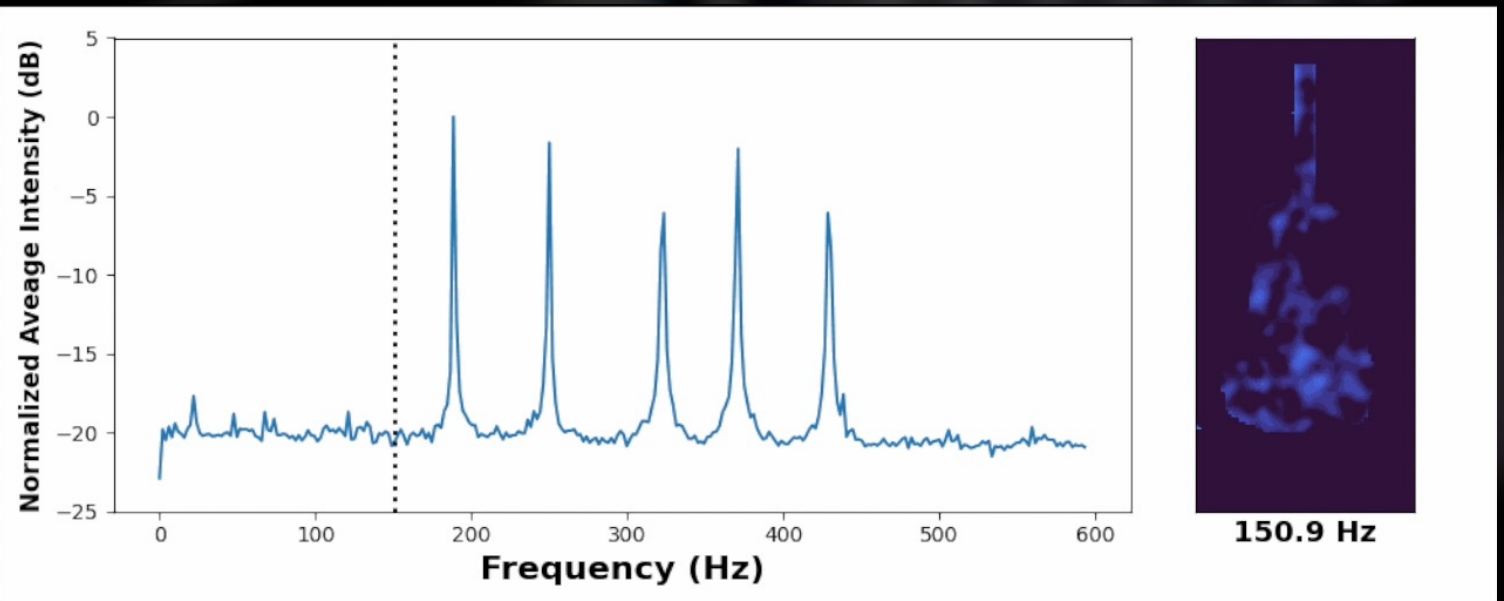
Hassle-free structural analysis with Ommatidia's Q1 Multi-channel Laser Radar



Spatial Modal Analysis of a Guitar

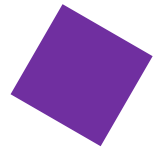
Imaging capabilities

- Mode spatial profile revealed
- 128 Simultaneous Points
- Up to 50m range

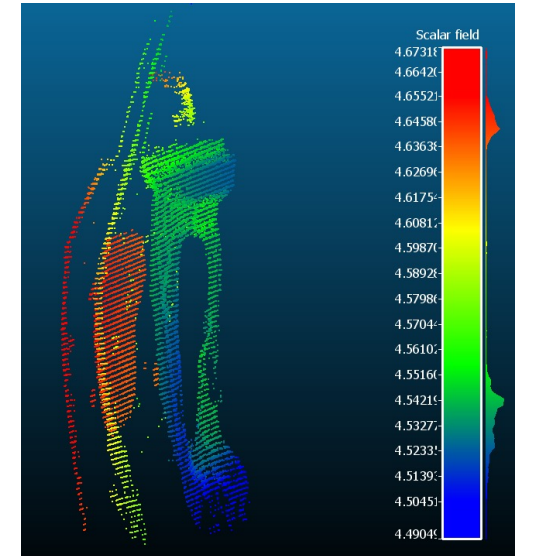
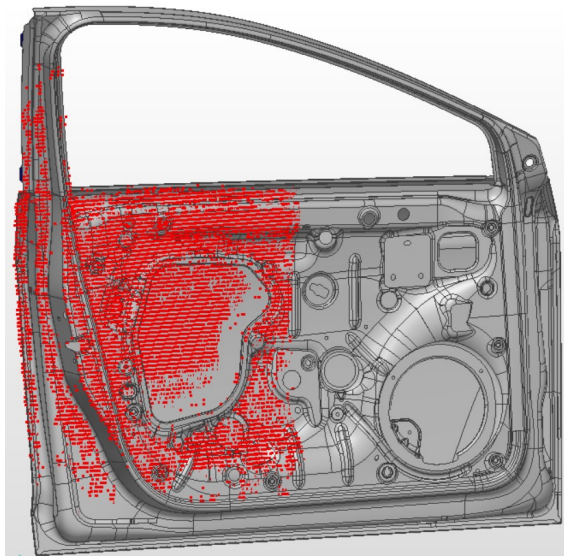
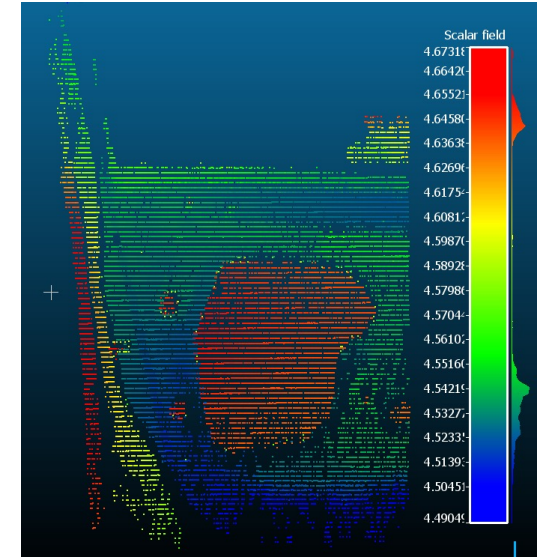
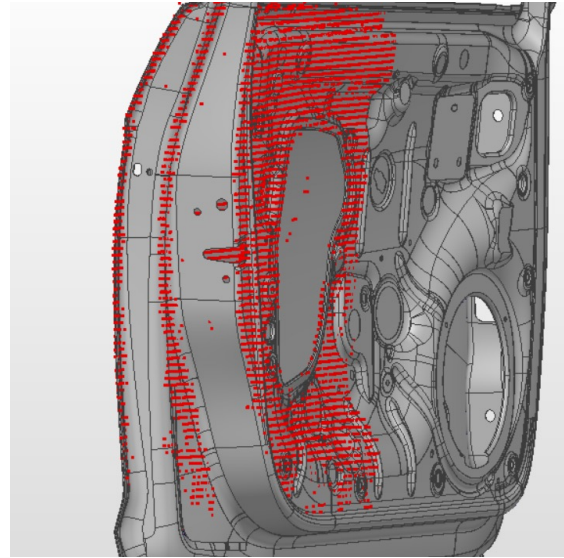
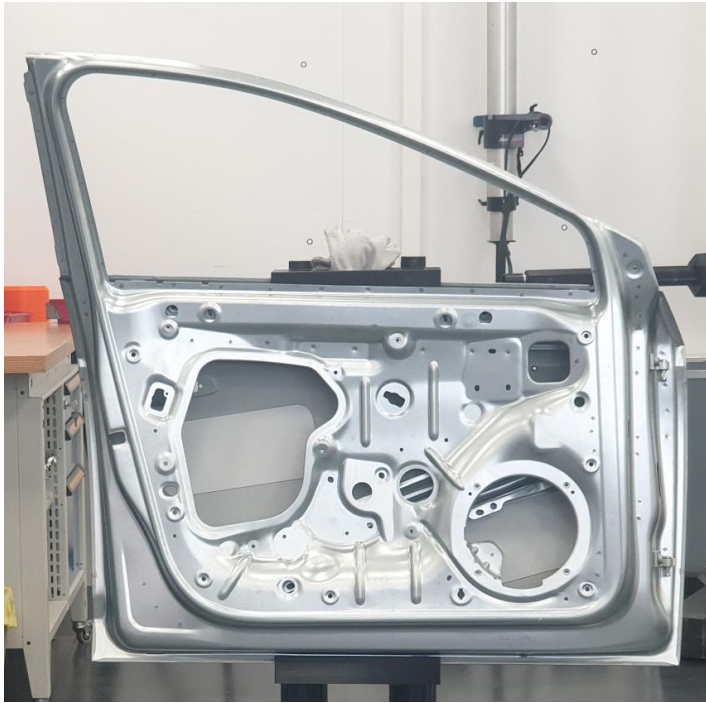


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Ground & In-Orbit Automated Metrology





Questions?

