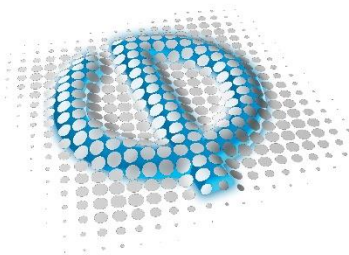


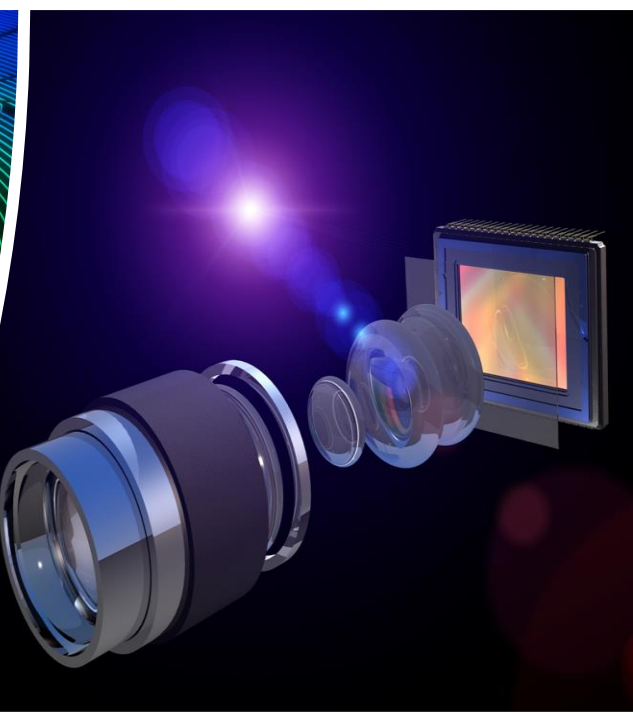
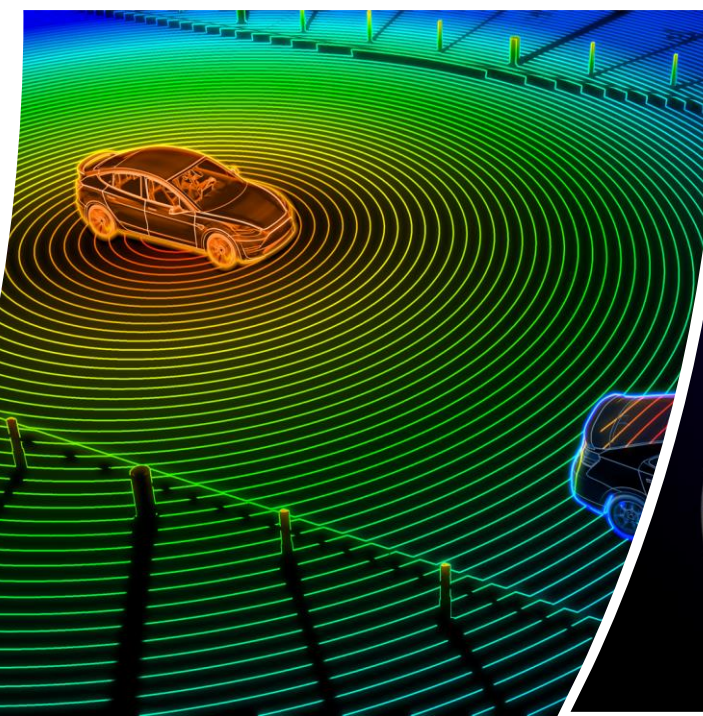
WAVEFRONT SENSORS APPLIED TO METROLOGY FOR ADAS

EPIC ONLINE TECHNOLOGY MEETING ON ADAS AND AUTONOMOUS DRIVING
7/15/2020

YOANN PRIOL— SALES MANAGER | PHASICS CORP (USA)



PHASICS
the phase control company



Phasics at a glance

➤ Core competencies

Wavefront measurements

Wavefront sensors and test stations

➤ Patented technology

Quadri-Wave Lateral Shearing Interferometry

Spin-off from French laboratories

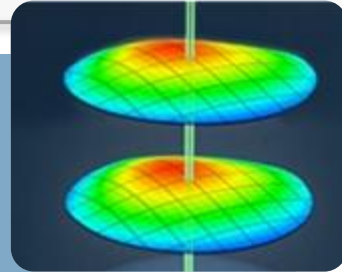
LULI (CNRS) and ONERA

➤ Well established

Created in 2003

ISO 9001 certified

40 Employees



HQ south of Paris | US Branch in San Francisco CA

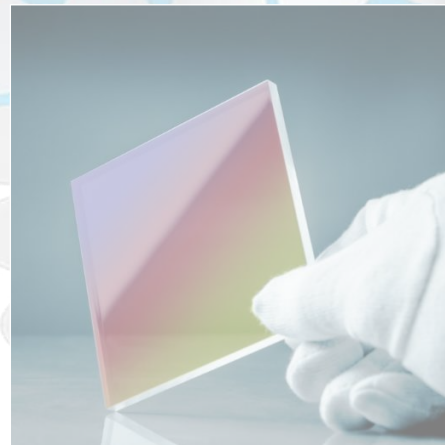
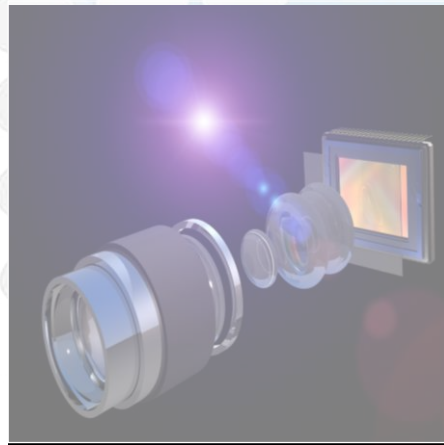
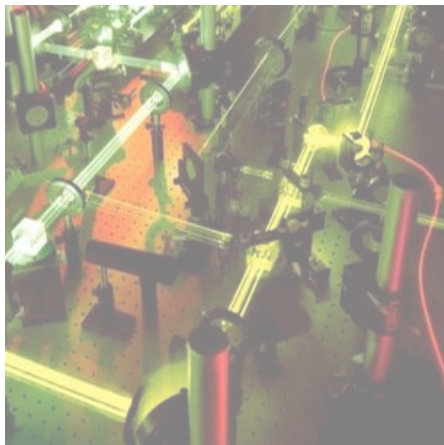
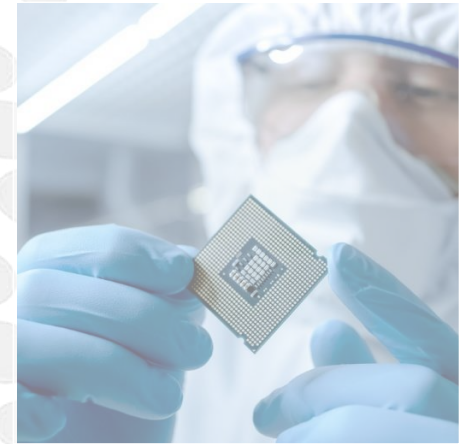
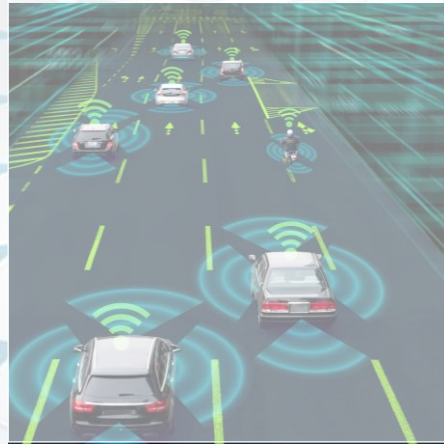
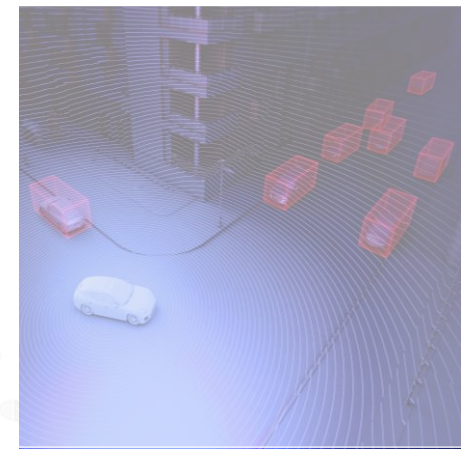
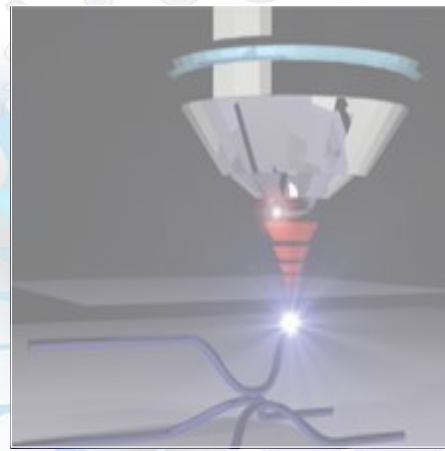
Strong distributors network



Clients worldwide
(academics & industrials)



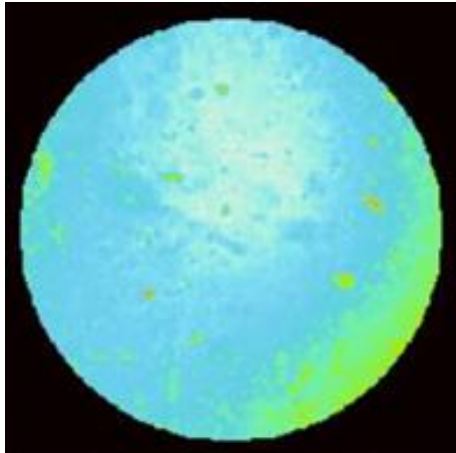
Large Range of Applications



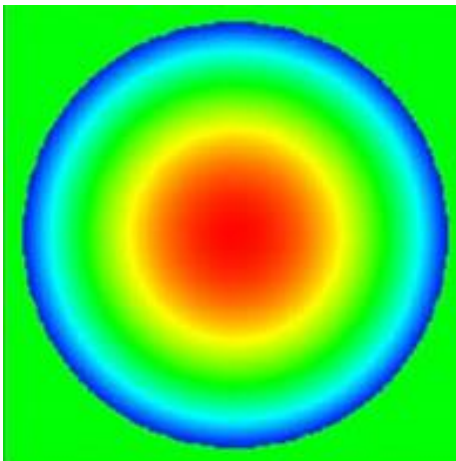
Way more than a beam profiler to qualify LIDAR beams!

1. MEASUREMENT

Intensity (I)



Phase (Φ)



2. COMPUTATION

Light propagation equation

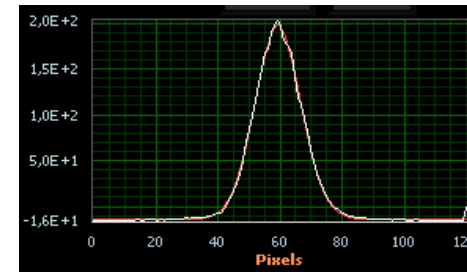
$$E = \sqrt{I}e^{i\phi}$$

At any plane

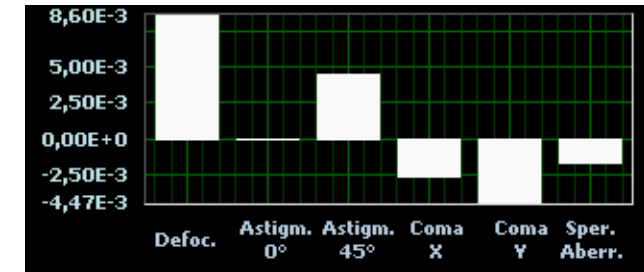
Beam Parameters

- Radius of Curvature
- M^2
- Divergence
- Waist size and position
- Tilts

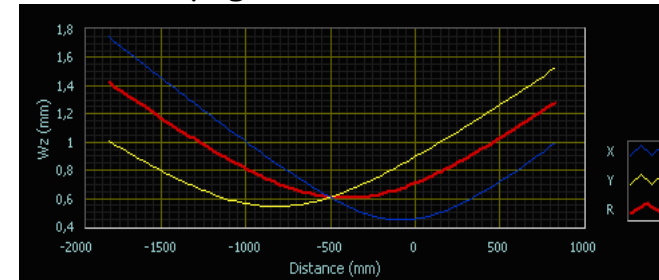
Intensity Profiles



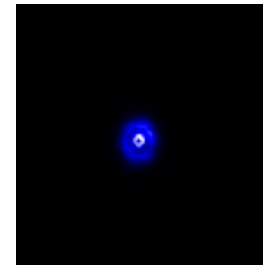
Wavefront Abberations



Beam Propagation



Point Spread function



- Single shot (no scanning required)
- Complete qualification
- Live monitoring for alignment feedback
- UV, VIS, NIR, SWIR, MWIR, LWIR
- Compact



Optical Metrology from components to systems

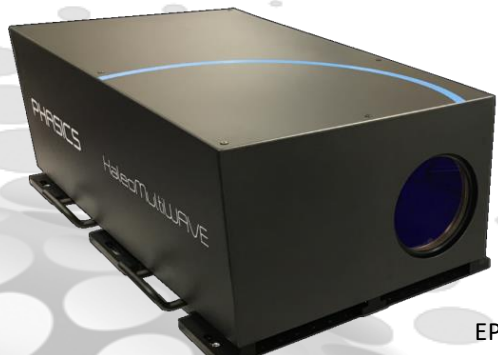
1. Test of optical filters for LIDAR at their working wavelength

Kaleo MultiWAVE SWIR 940 nm & 1550 nm
TWE and RWE



2. Homogeneity and optical quality of windshield & car headlight

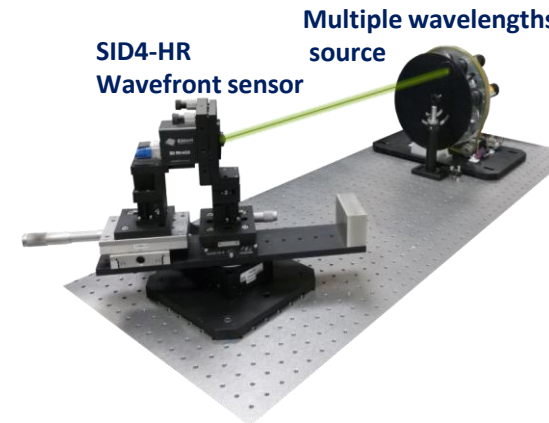
Kaleo MultiWAVE visible
TWE RWE
150 microns dynamic range



3. Accurate qualification of large FOV objectives

ADAS Objectives are complex and challenging to measure
Classical metrology tools are not sufficient anymore

- Large FOV (180 degrees)
- Large CRA (> 30 degrees)
- Small BFL
- Wide wavelength range



Kaleo MTF Capabilities

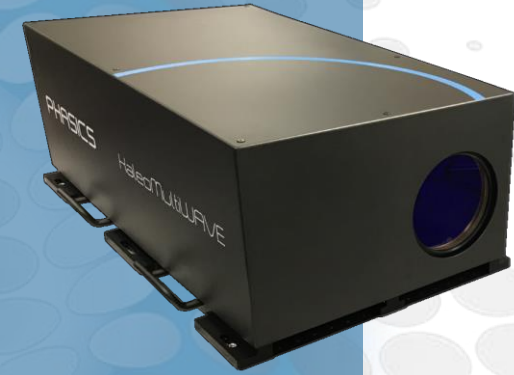
- WFE in the exit pupil
- On & off-axis MTF
- Photometry, distortion
- At various wavelengths
- Automated workflow (alignment, measurements)

4. Single component, subassembly, assembly, system



➤ **What can PHASICS do for EPIC's members in ADAS:**

- Offer metrology solution for every part of the supply chain (Tier 2, Tier 1, OEM)
 - Laser, and beam delivery
 - Components filters, lens, metalenses, waveguides
 - Subassemblies, final assemblies
- From standalone wavefront sensor to fully integrated test station
- Bench marking in R&D, Alignment in production, Quality Control



➤ **What can EPIC's members do for PHASICS:**

- PHASICS has the chance to collaborate with top academic laboratories and industrial leaders working on breakthrough technologies and applications: why not with you !
- Bring new ideas ! We are always eager to test new samples and see how far we can go together !

