

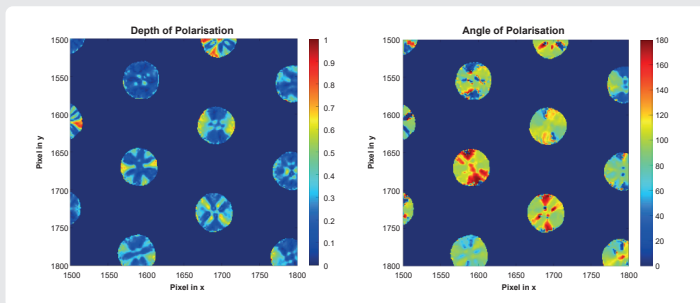
# VCSEL Characterization – Advance to the next level!

## Challenges of VCSEL testing

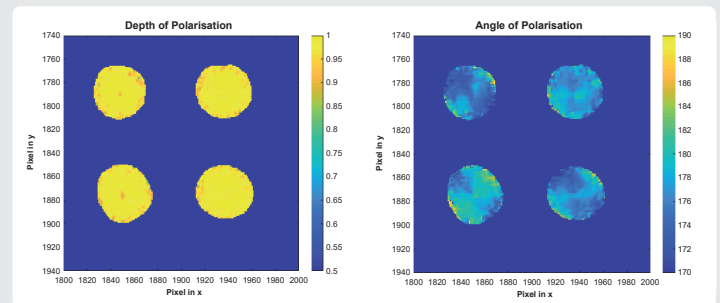
- ▲ Novel high power VCSEL arrays need spatial testing of the whole ensemble as well as of the single emitters.
- ▲ Time-of-flight applications require the testing of VCSELs with pulse durations shorter than 10 ns.
- ▲ Optical measurements must be calibrated and traceable to determine error budgets for eye safety evaluation.



## Visualisation of VCSEL polarization characteristics



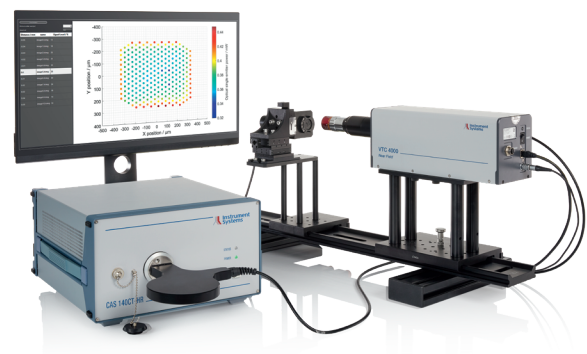
Polarization-unstable VCSELs



Polarization-stable VCSELs

## Fast Single Emitter Characterization on a VCSEL Array

- » Single shot evaluation of radiant power across array and each emitter
- » 2D defect emitter detection
- » Determine position, waist, numerical aperture and  $M^2$  of each emitter
- » Measurement of spectra for all emitters on array
- » One-Shot spatially resolved evaluation of linear polarization with pixel-resolution
- » PTB traceable, absolute radiometric and spectral calibration



## Calibrated Spatial Emission Inspection in the Far Field

- » Measure radiant intensity or irradiance in one shot
- » Measure angular distribution of the whole packaged or unpackaged array
- » Automatic identification of highest intensity “Hot-Spots” for laser eye safety relevant power calculation
- » Uniformity control of radiation pattern
- » PTB traceable radiometric calibration

