photon focus

Hyperspectral Imaging

modular camera experts

Welcome

Your Presenter

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Field Application Engineer

Content

- Photonfocus modular camera concept
- Wavelengths of light and material interaction
- Photonfocus solutions
- Sensor techniques and data processing
- Use cases in agriculture

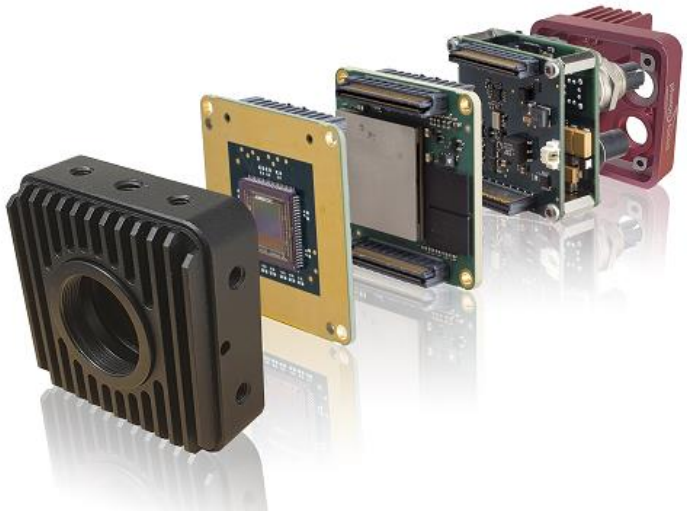
About Photonfocus

Main Product Lines

- Cameras for 2D applications (VIS, UV, SWIR, Hyperspectral)
- Cameras for 3D applications (VIS, UV)
- Modular embedded systems
- CMOS sensors

What Are We Known For?

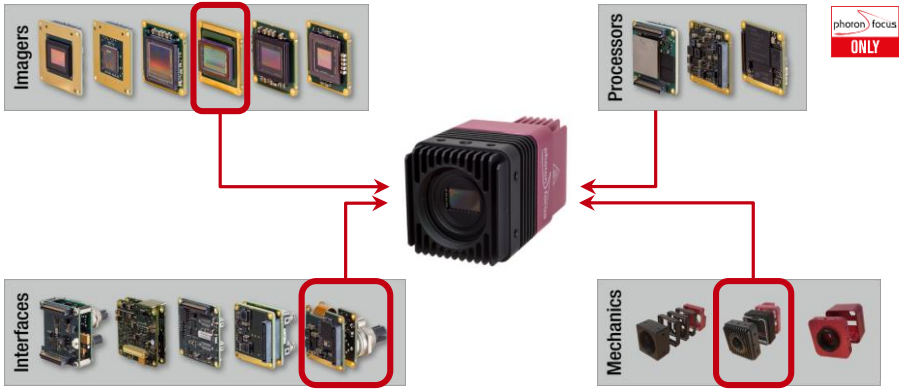
- One of the first in the market for CMOS (fast cameras)
- Designing our own sensors with large full well capacity (@100 ke-) vs Sony IMX174 (@32 ke-)
- Being the leader in high dynamic range imaging with our LinLog® technology



Modular Camera Concept

Modular Camera Set-Up

➡ Thanks to our modular camera concept, we can quickly and easily adapt to meet your requirements.



Standard Camera Models

➡ Choose from a wide range of standard cameras.

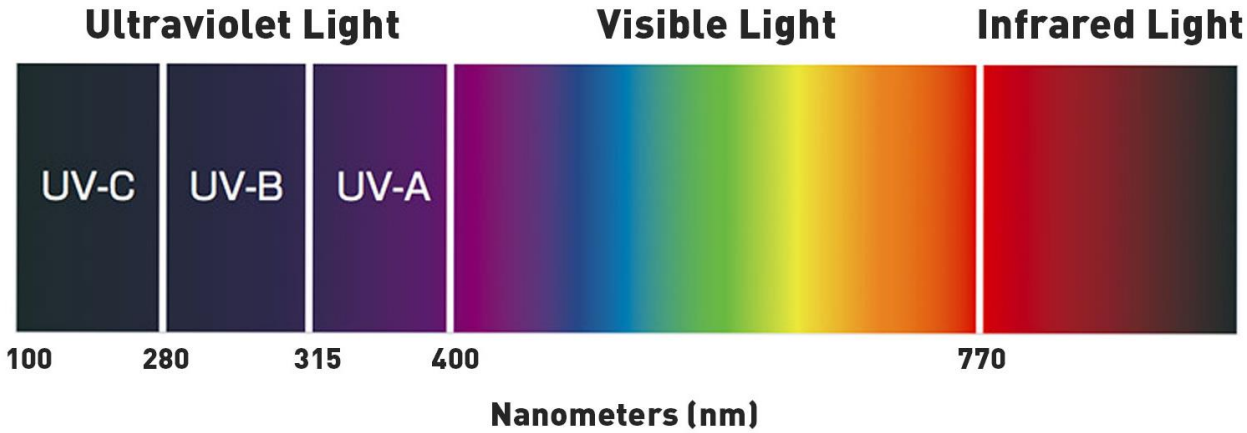
Custom Design

➡ With 20 years of experience in camera and sensor development, we are ready to discuss your projects!

Wavelengths of Light

Spectrum of Light

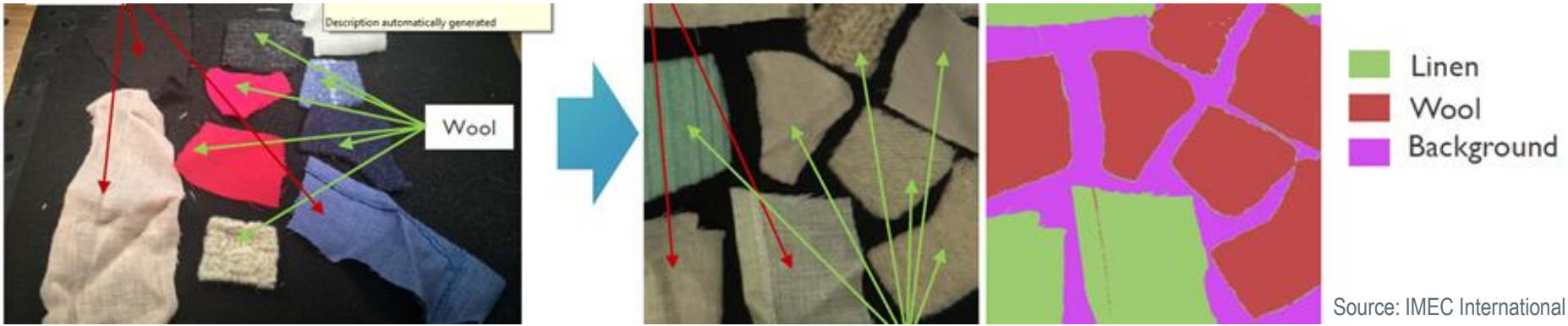
- VIS: standard for optical inspection with CMOS sensors
- NIR (near infrared): selected CMOS sensors
- SWIR (short wave infrared): InGaAs sensors
- UV: specific designed CMOS sensors



Material Interaction

Each Material Interacts Differently with Wavelengths

- Total reflection
- Diffusion
- Absorption
- Fluorescence

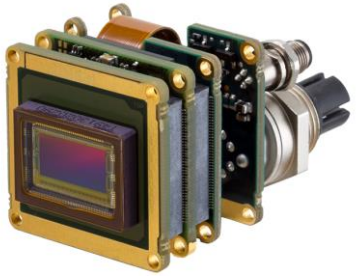


Source: IMEC International

Solutions from Photonfocus

photonSPECTRAL Platform

- Many optical spectrums: VIS, UV, SWIR, multispectral / hyperspectral
- Different platforms: MV0, MV3, MV4
- Board level and housing
- Different interfaces: 1 GigE®, 10 GigE®, CameraLink®
- Sensors from different manufacturers: Photonfocus, IMEC®, Chunghwa®, Lynred®



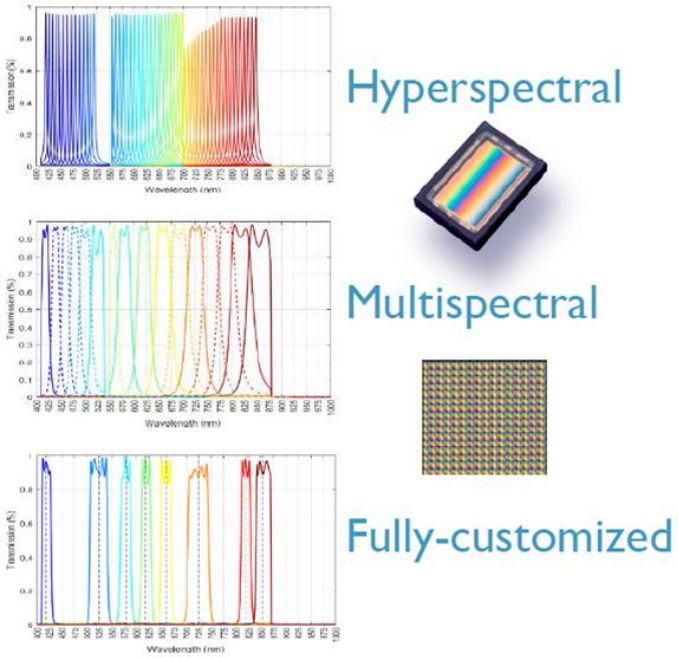
Available Sensors for Multi and Hyperspectral Imaging

Multispectral vs. Hyperspectral

- Multispectral: less spectral bands, like Bayer Mosaic
- Hyperspectral: many spectral bands

Sensors of IMEC® International

- Snapshot and line scanning systems available
- Different number of bands available
  - HS03: 16 spectral bands from 470 – 630 nm (VIS)
  - HS02: 25 spectral bands from 665 – 975 nm (red – NIR)
  - HS01: 100 spectral bands from 600 – 975 nm (red – NIR)
  - HS05: 150 spectral bands from 470 – 900 nm (VIS – NIR)
  - Customized bands possible

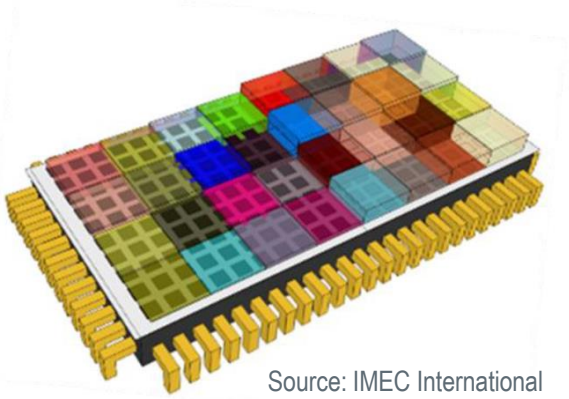


Source: IMEC International

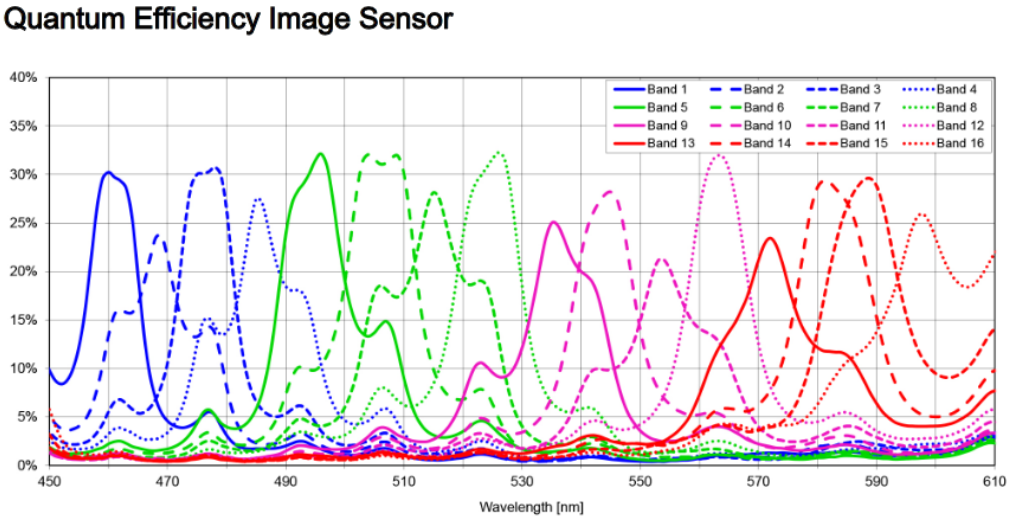
Bands of Wavelengths and Filters

How Does Multi and Hyperspectral Imaging Work?

- Mosaic array of filters on sensor
- Combine all pixels of one band to one image
- Combine all images to one hypercube



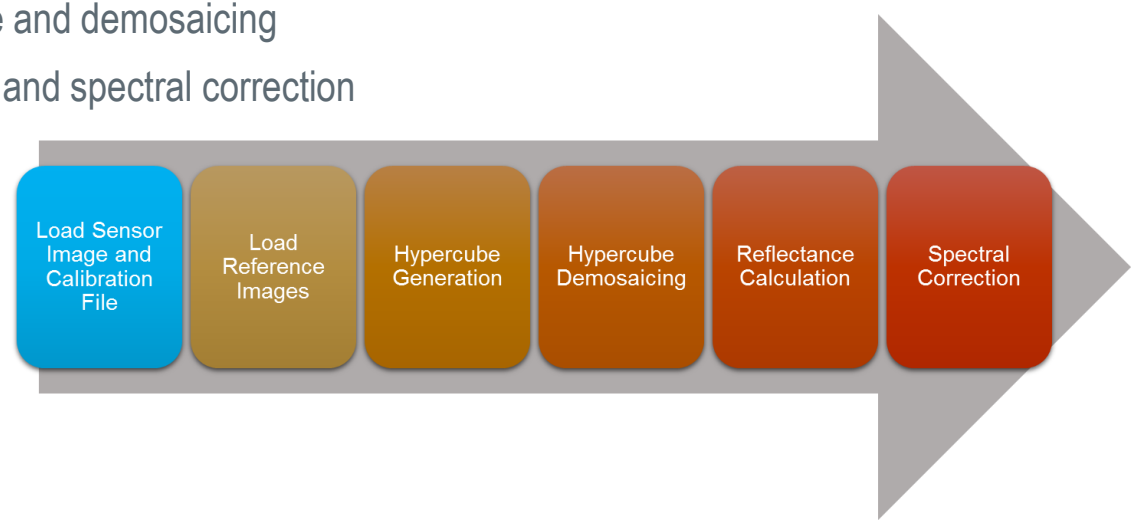
Source: IMEC International



Data Processing of Hyperspectral imaging

Steps to Do for Hyperspectral Analysis

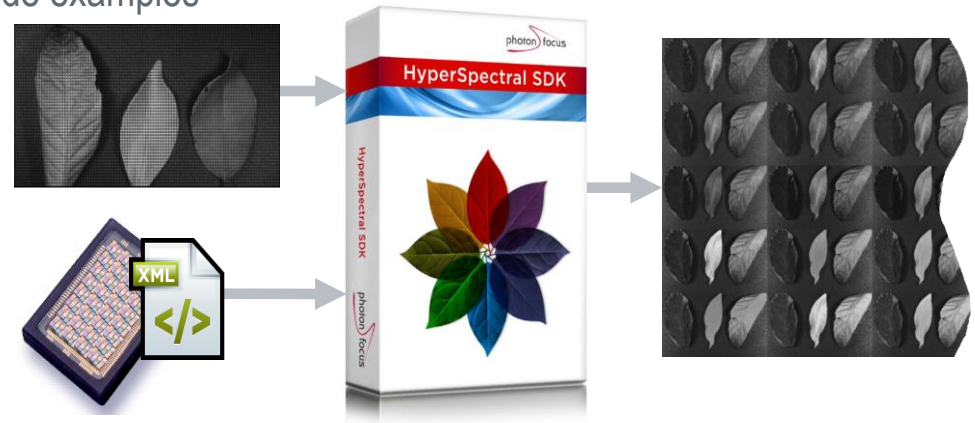
- Image acquisition
- Image calibration along calibration data for each sensor
- Reference image for error correction
- Generate hypercube and demosaicing
- Process reflectance and spectral correction



Tools from Photonfocus

PF HyperSpectral SDK

- Cropping and demosaicing of the mosaic sensor's hyperspectral images
- Obtain the image reflectance
- Deal with the sensor calibration
- Apply spectral correction
- SDK includes a wizard and code examples

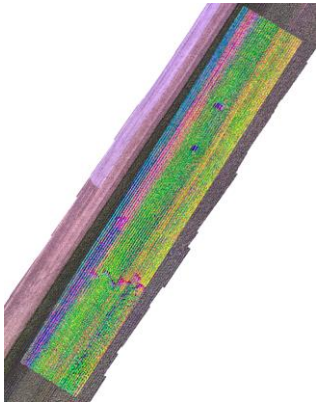


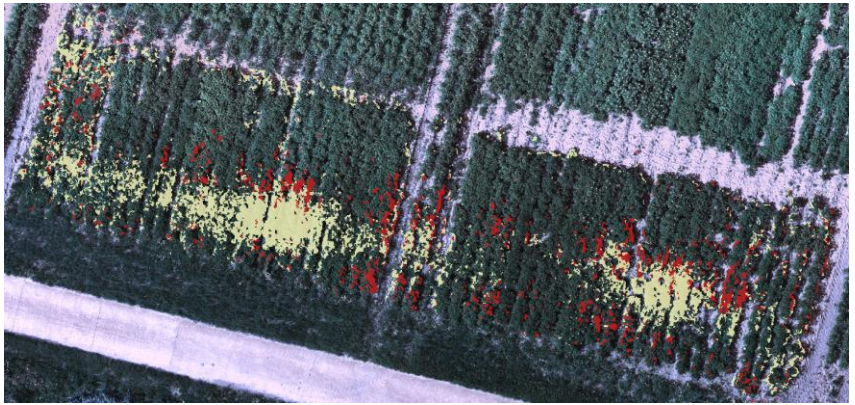
Hyperspectral for Agriculture

Benefits of Hyperspectral Imaging in Agriculture

Based on a database you can:

- Identify plant species
- Detect plant condition for optimizing soil irrigation or fertilization
- Database as a service





Source: AgriCircle

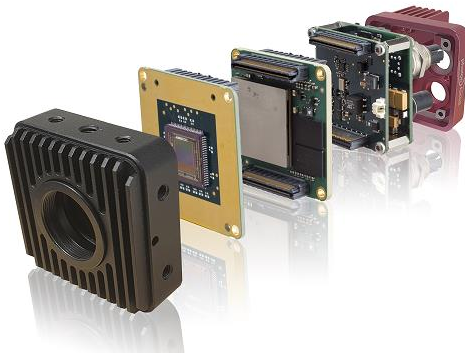
Use Case – Agriculture with Drones

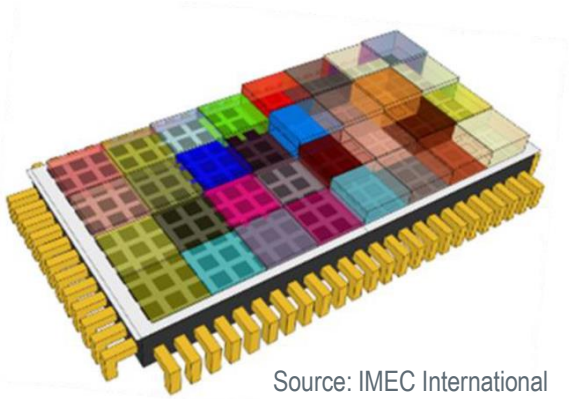
Cameras Mounted Below Drone

- 2 hyperspectral cameras
- 41 bands (470 – 975 nm)
- Local image storage
- GPS geo tracking
- Identify plant species

Summary

- Hyperspectral imaging returns more data for new object recognition applications.
- Modular concept of Photofocus is ideal base for customized challenges.
- Service of Photonfocus assists customer in finding solutions and in development.





Source: IMEC International

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Thank You Very Much For Your Attention!

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