



imec

On-chip Spectral Imaging
for Earth Observation

EPIC Online Technology Meeting on Photonics for Earth Observation and
Monitoring

04/03/2024, Bavo Delauré – bavo.delaure@imec.be

IMEC (founded in 1984)

- World-leading R&D in nano-technology & high-tech applications
- **>5500** international R&D top talents, >90 nationalities
- Unique **€ 3B leading-edge semiconductor fabs**
- Delivering industry relevant technology solutions serving semiconductor, ICT, IoT, healthcare and energy markets
- **2022: € 800M revenues: 70% industry, 20% regional gov't, 10 % EU & regional programs**
- Collaborating with 600+ industrial partners
- Created **118 spin-off** companies and incubated **200+ start ups**
- **8 sites worldwide**



World-class infrastructure

- 1 200mm pilot line
- 2 300mm pilot line
- 3 Nano bio labs
- 4 NERF labs
- 5 Silicon solar cell line
- 6 Organic solar cell line

Earth observation: exciting times

The background of the slide is a composite image. It features a view of Earth from space, showing the Eastern Hemisphere with Africa, Europe, and Asia. The Earth's surface is detailed with green landmasses, blue oceans, and white clouds. Above the Earth, the background is a deep space scene filled with numerous stars of varying brightness. A prominent, bright star with a visible diffraction pattern is located in the upper center. A vibrant, ethereal nebula with shades of blue and green is visible in the upper right quadrant.

Ever increasing user expectations

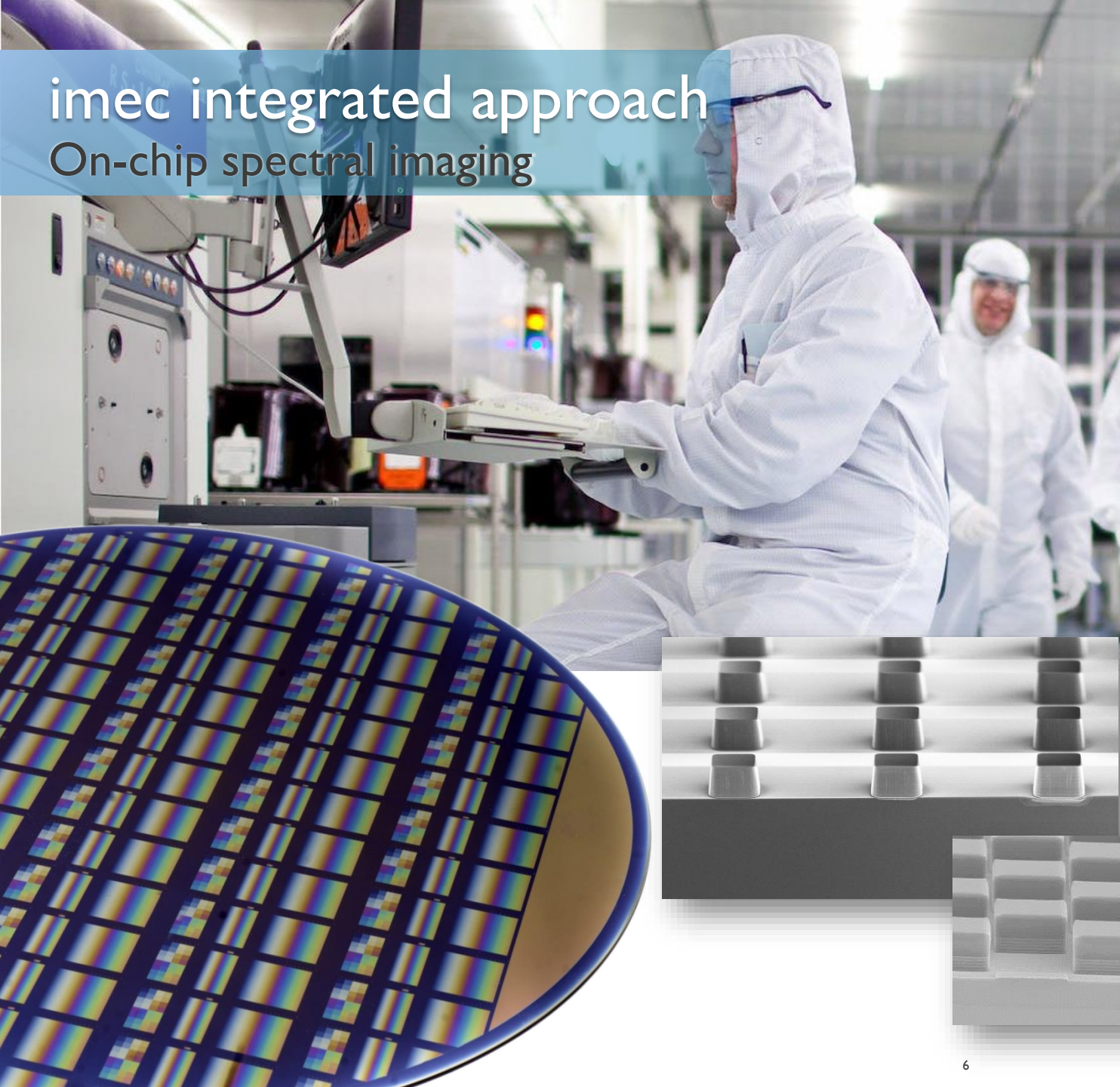
- High spatial resolution
- High temporal resolution
- Digitized world
- Demonstrated EO added value
- Global observations

Technological advancements

- Performant small satellites
- Disruptive change in access to space
- Instrument miniaturization
- Industry driven

imec integrated approach

On-chip spectral imaging



Leveraging imec's class I cleanroom

- Wafer level processing
- Thin film filter deposition
- Lithographic patterning
- Dry and wet etching

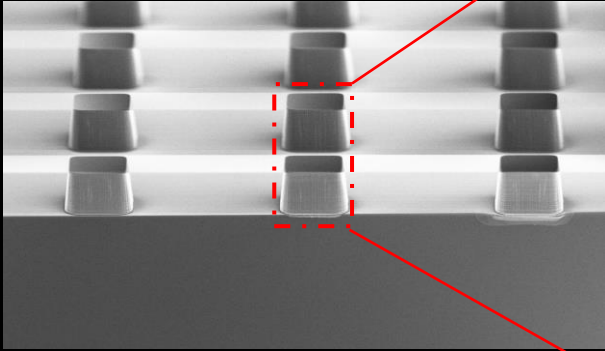
World unique **optical filters on chip**:

- Robust
- Compact
- Scalable
- Precise
- Extremely clean

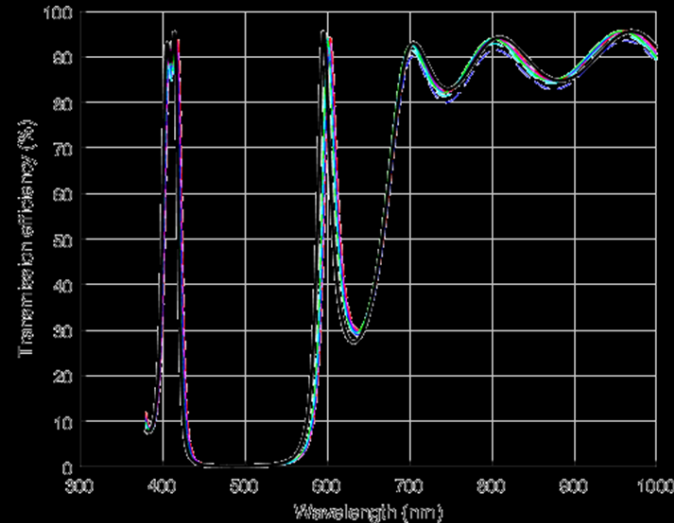
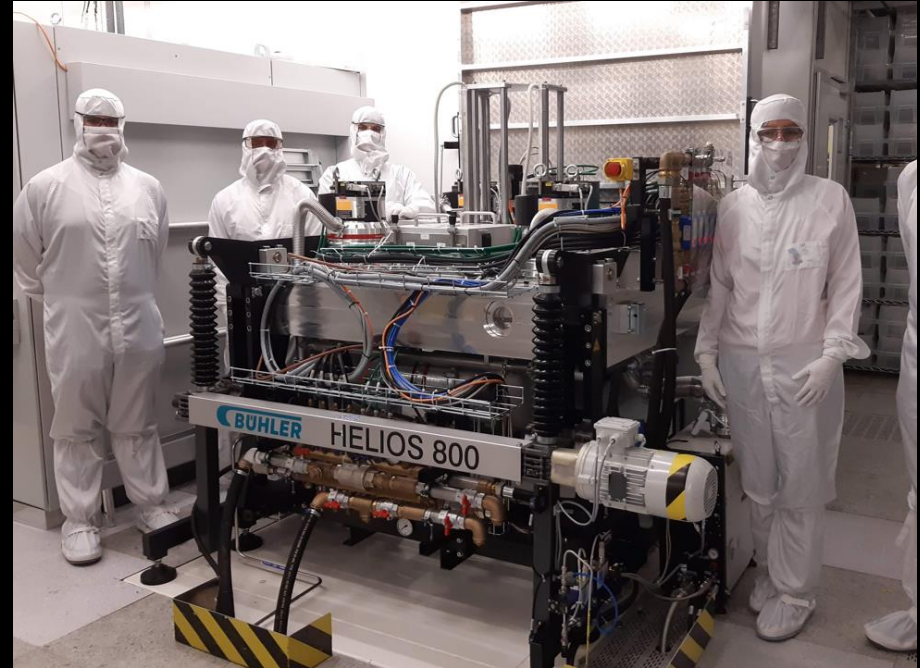
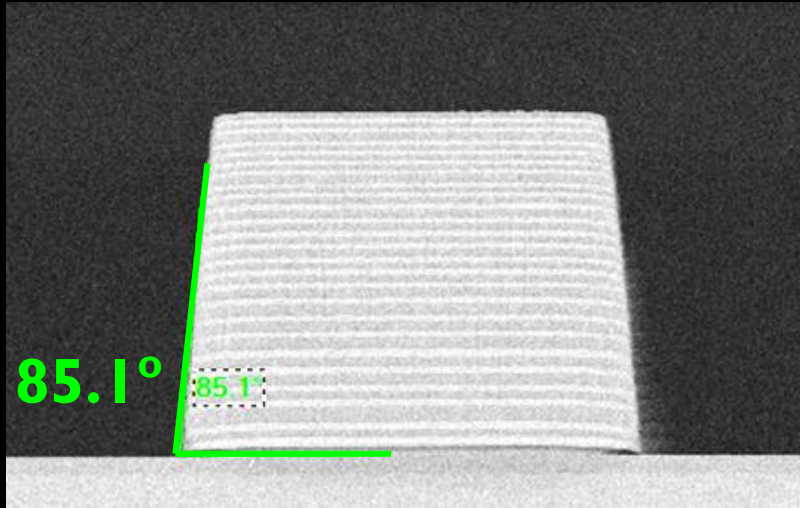
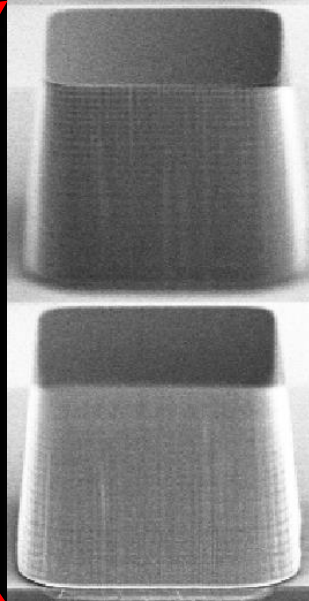


New developments, new capabilities

New tools allow more complex filters with reduced process complexity



OD6 filters etched
on small pixels (2-10 μm)



Optical tools, CMOS fab qualified

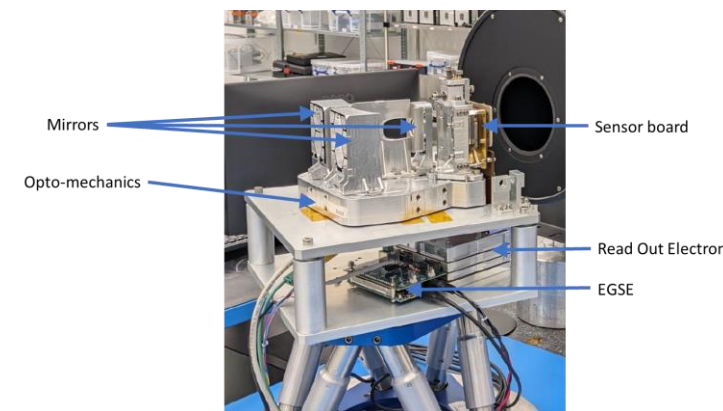
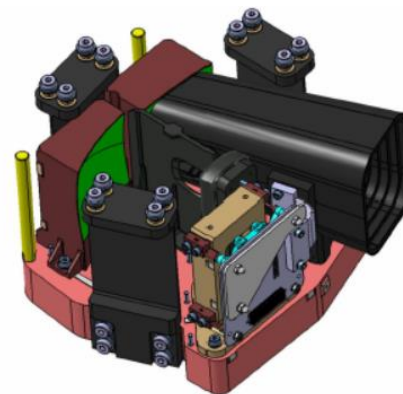
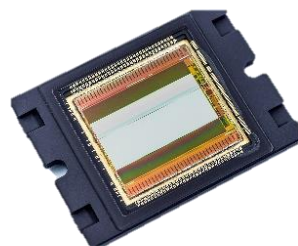
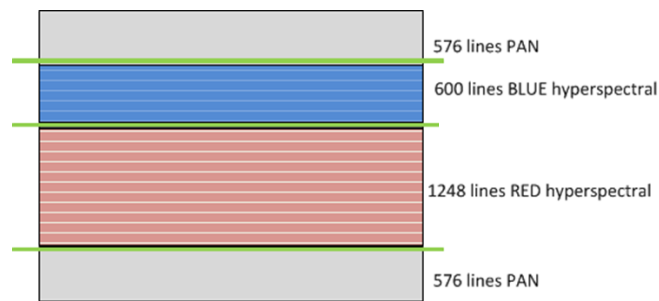
Controlled material deposition
and enhanced patterning

Accurate and repeatable process



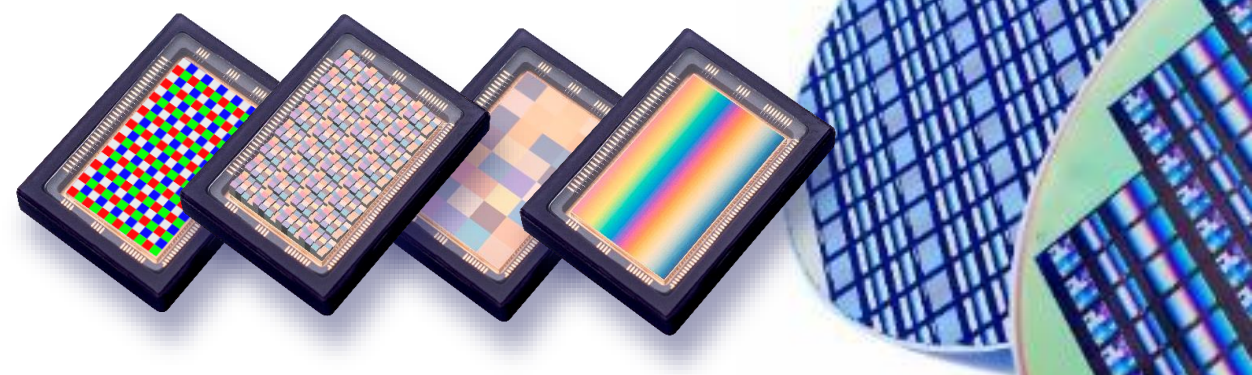
Efficient use of the focal plane for enhanced performance

First light images



- 154 spectral bands
- 12 TDI lines per band for enhanced SNR
- Panchromatic zone for high resolution reference image

imec on-chip spectral imaging



- Our unique filter deposition technology opens new opportunities for imaging from space
 - Integration on chip for **decreased complexity**
 - Efficient use of the focal plane for **enhanced performance**
 - **Extreme design flexibility**: lines, mosaic, ...
 - Optimised filter designs for **computational imaging**
- Eager to discuss how to support your **exciting space endeavours**



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mec

embracing a better life