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IRIDIAN
SPECTRAL TECHNOLOGIES

EPIC – Online Technology Meeting on Earth Observation

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Who we are at Iridian

Canadian supplier of custom optical filter solutions

- ~180 staff providing extensive expertise in all optical filter design and manufacturing
- Privately owned Canadian company, established in 1998
- All manufacturing done in Ottawa, Ontario, Canada
  - Achieved ISO9001:2015 certification in May 2016
  - Registered in Canadian Controlled Goods Program
- *Officially opened 45,000 sq. ft. custom-built facility Nov 2012*

Iridian designs and manufactures thin-film dielectric optical filters and filter arrays

Capabilities:

- WL range: 300nm to 15um
- Customized solutions
- Single/Multi-band; Multi-zone
- <1mm^2 to >150mm dia.

Technologies:

- Energetic sputtering and evaporation (25 chambers)
- Custom design/control software
- In-house patterning by photolithography

Why Earth Observation (EO)?

"Measurement is the first step that leads to control and eventually to improvement.

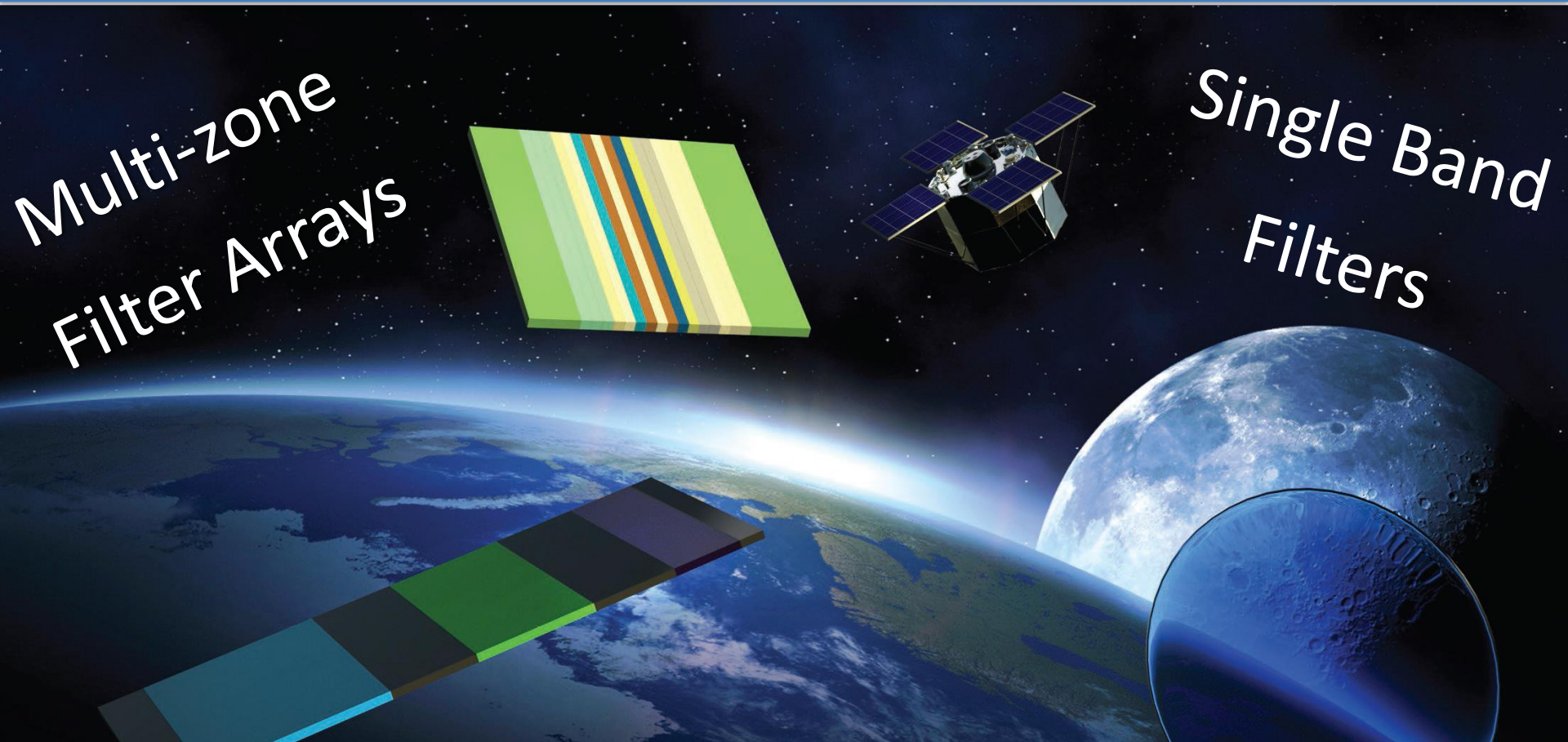
If you can't measure something, you can't understand it.

If you can't understand it, you can't control it.

If you can't control it, you can't improve it."

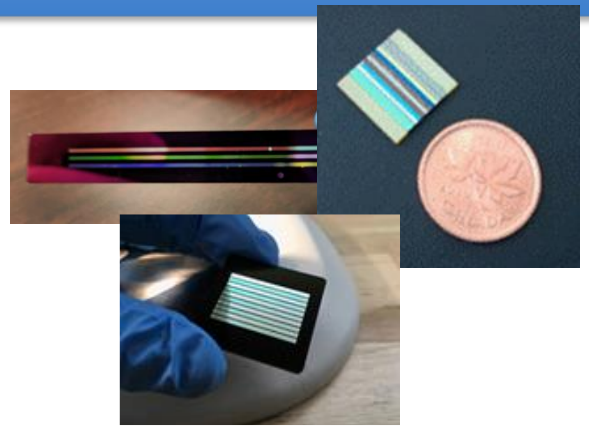
H. James Harrington

Optical Filters for Earth Observation



EO Filters – Example MZF

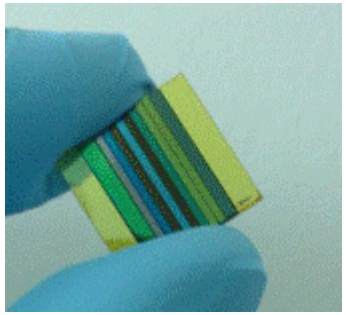
- Function: provide wavelength selectivity to different bands of pixels → multi-spectral imaging
  - High Tx in signal bands
  - Steep edges with deep blocking of other spectral bands
- Filter challenges:
  - Signal to noise:
    - Wavelength selectivity
    - Stray Light
  - Band to band coplanarity
  - Minimize pixel loss:
    - Surface quality – defects
    - Physical dead-band between zones

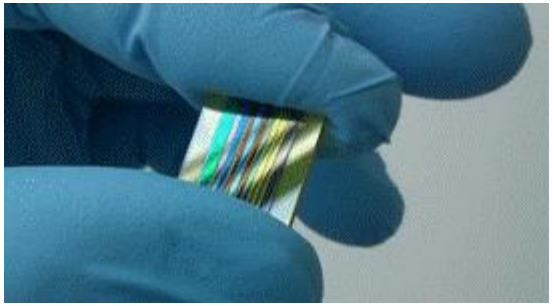


Demonstrated capabilities for:

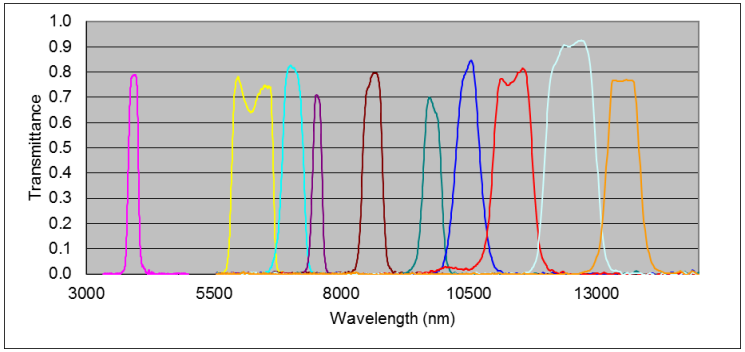
- **butcher block** style build of multi-zone filter assemblies
- **photo-lithographically patterned** monolithic multi-zone arrays
- **hybrid builds** using patterned monolithic elements assembled together as a butcher block

EO Filters – Example MultiZoneFilter

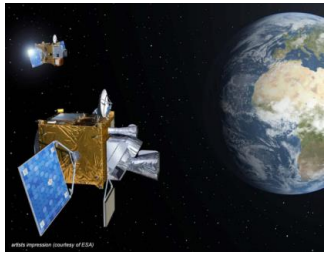




These images show a MZF with ten band pass filters between 3 µm and 13 µm developed under a subcontract from ABB Canada for the Space Technology Development Program of the Canadian Space Agency.



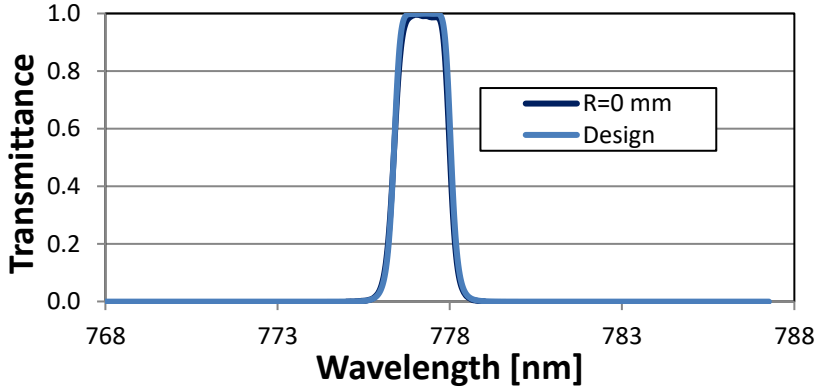
EO Example: Lightning Imager

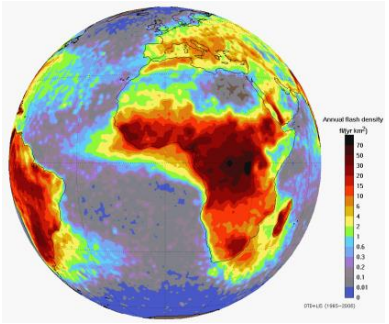


- Iridian has successfully produced an environmentally stable narrow band-pass filter
  - CWL centered to within ±10pm of target
- This filter demonstrates Iridian's ability to produce state-of-the-art performance large NBPF to a uniformity variation of <0.02%.
  - CWL maintained to within ±100pm over clear aperture of 125 mm dia.

777.4 nm oxygen triplet line for lightning detection from space

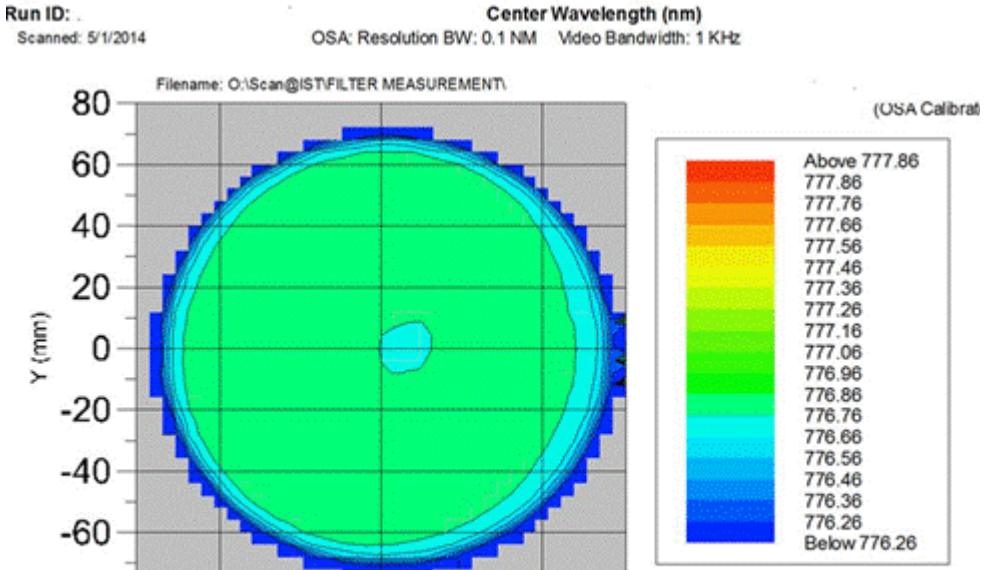
- Requires narrow BPF (~1.72 nm FWHM)
- Large clear aperture (125mm)

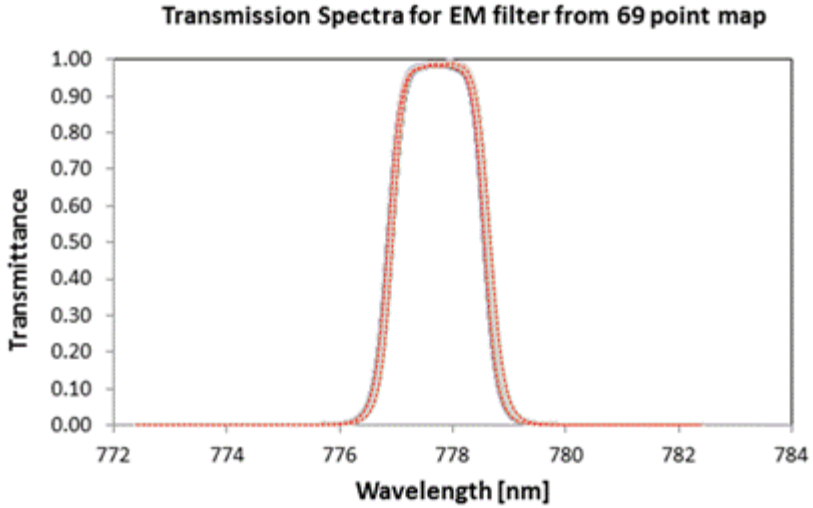




The above mentioned NBPF has been developed under a contract with Leonardo S.p.a for the Lightning Imager Instrument, in the frame of the ESA program Meteosat Third Generation (MTG), with Thales Alenia Space France as prime contractor.

777.4 nm 4-Cavity Filter- 125mm dia.





Change in CWL (uniformity)	0.094nm	Δ ≤ 0.013%
Change in Bandwidth (FWHM)	1.705nm – 1.735nm	Δ ≤ 1.8%
CWL targeting	±10 pm	Δ ≤ 0.003%
Change in peak Transmittance	98.70% – 99.52%	Δ ≤ 0.82%

Proven Space Heritage

- Iridian has produced individual filters and multi-spectral arrays that have been tested and qualified to meet space usage requirements and used by our customers in space!

- Examples of testing and qualification that our filters have passed include:
  - **Radiation exposure (gamma rays, protons, combined solar UV and electrons)**
  - **Thermal cycling/shock/survivability including liquid N_2 to boiling ethanol dips**
  - **Vibration testing**
  - **Laser damage testing in excess of 1 MW/cm^2**
  - **Thermal vacuum cycling testing from 50K to 450K**
  - **Outgassing testing as per ASTM-E595**
  - **Reliability as per MIL-C-48497A**

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ISO9001:2015 certified

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