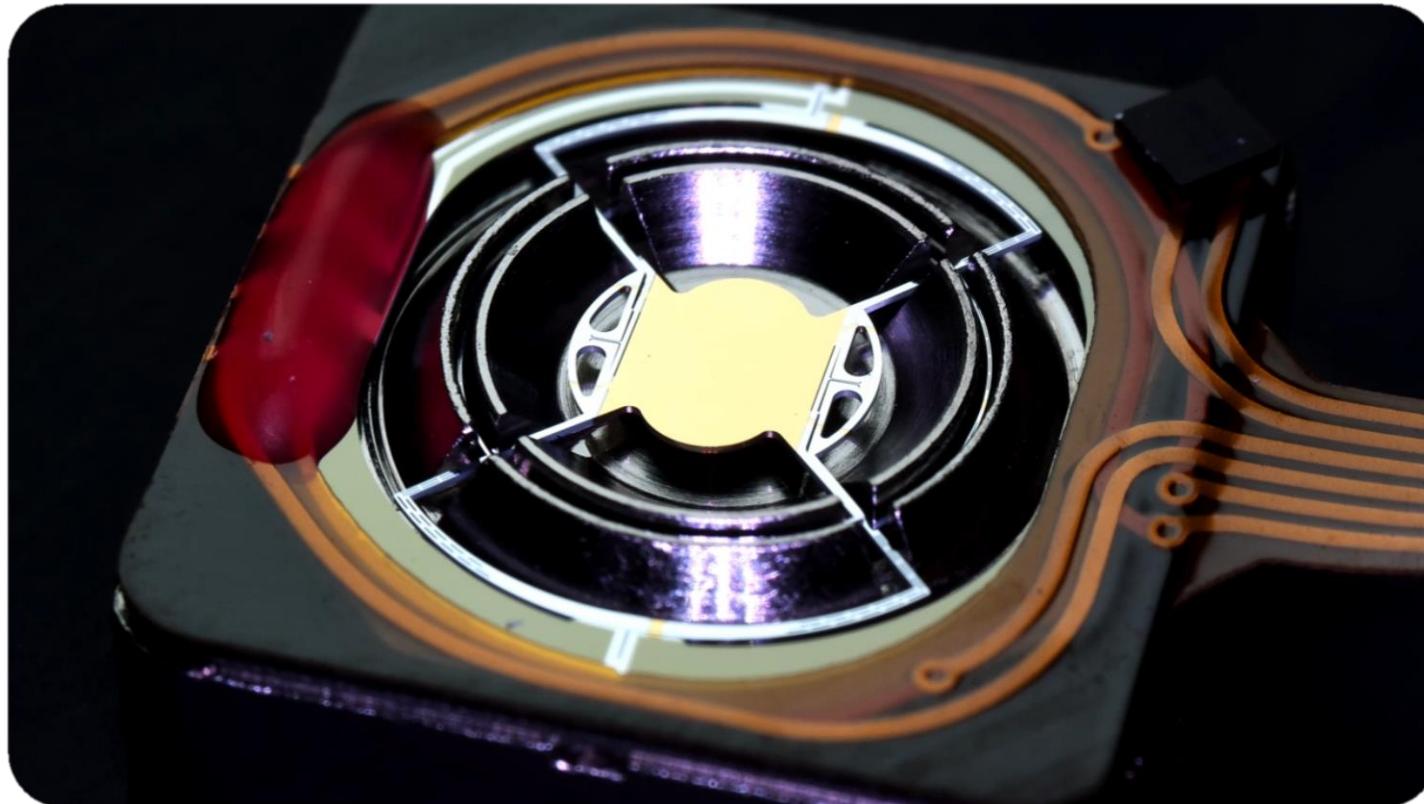


# Fiber optical MEMS

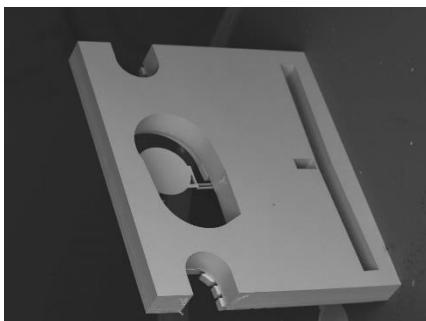
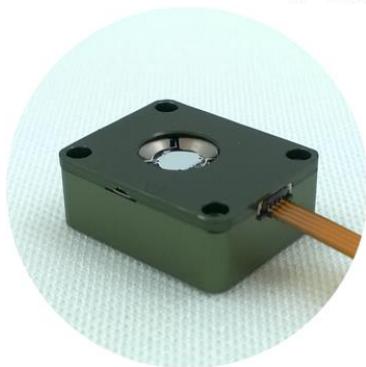
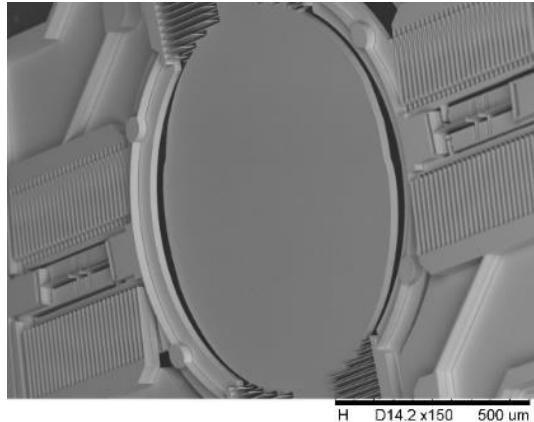
We produce highly reliable components  
for the Fiber optic industry

**sercalo**  
*microtechnology ltd*

- Swiss Made MEMS Technology -



*THE BEST OPTICAL MEMS*  
[sercalo.com](http://sercalo.com)



## ELECTROSTATIC: TELECOM COMPONENTS

- Well suited for DC pointing (switches and VOAs)
- stability < 0.005° over time and temperature
- Telcordia 1221 qualification standards
- latching and non-latching switches, VOAs, tunable filters

## MAGNETIC ACTUATORS: 2 D scanner

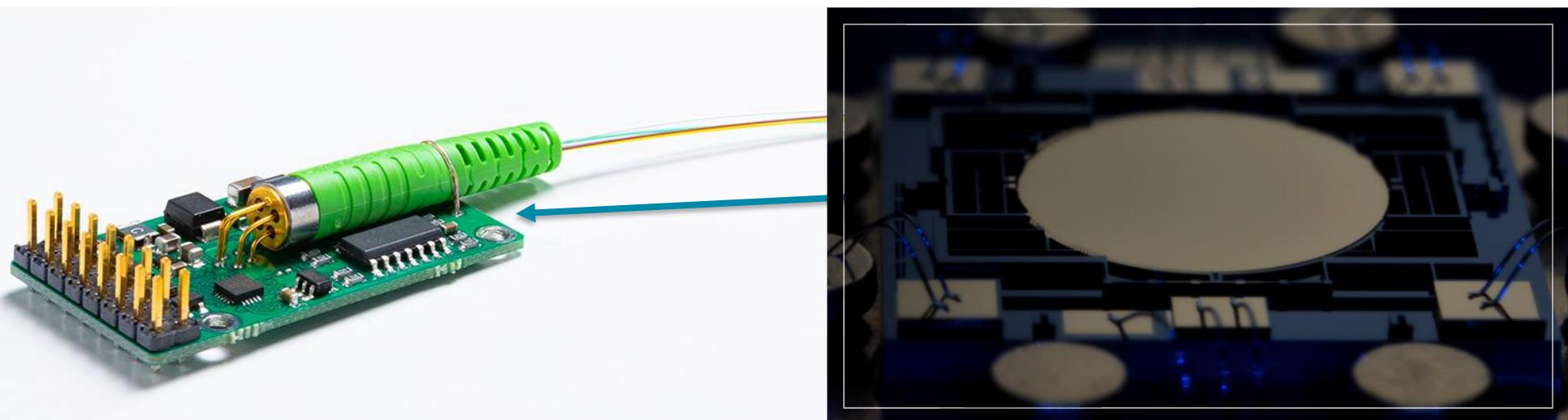
- 2-D scanning (1<sup>st</sup> axis resonant, 2<sup>nd</sup> axis static)
- Automotive LIDAR
- Reliable thanks to “Solid State Design” (flexible hinges)

## THERMAL ACTUATORS: foundry services

- Shutters in Telecom Lasers: solid state design
- IR components

## Sercalo brings together a unique expertise in MEMS:

- **Design and Manufacture** of optical MEMS components
- **Electrostatic, Thermal or Magnetic MEMS**
- Deep **Reactive Ion Etching** brought to perfection
- Packaging based on **Laser Welding**



## SERCALO OPTICAL MEMS

### COMPANY OVERVIEW

- Founded 1999, 40 FTE
- Private and Self financed
- ISO 9001:2015 Certified
- Turn Over 2024: >8 M USD

### COMPANY STRUCTURE

- Engineering (11 FTE)
- Production (25 FTE)
- Administration (4 FTE)

### DESIGN HOUSE, MEMS-FAB, ASSEMBLY

Sercalo skills span the entire production process, from in-house MEMS chip design and qualification to manufacturing and assembly.

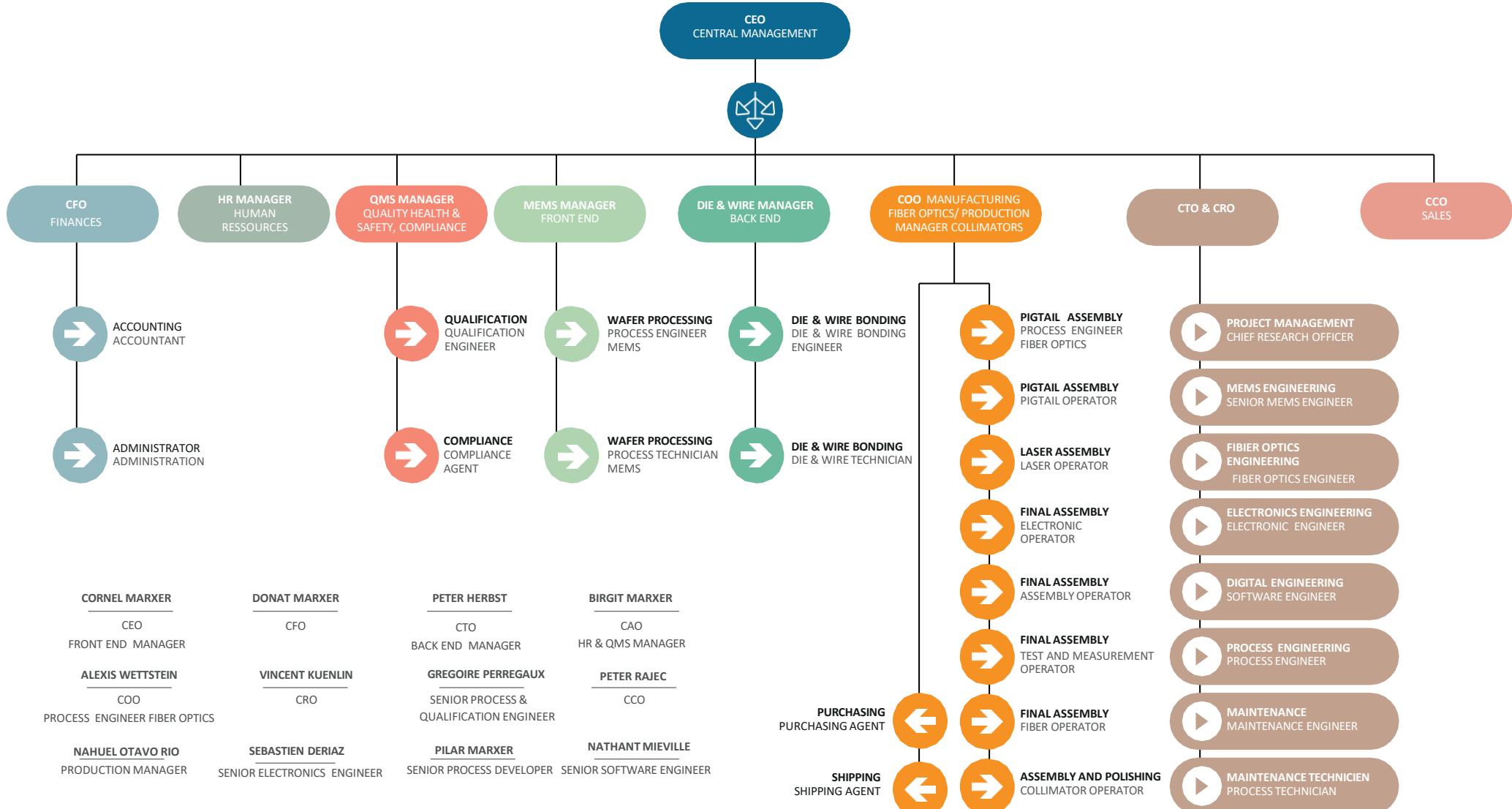


ISO 9001:2015 Certified

# 03 · ORGANIZATIONAL CHART

## SERCALO STRUCTURE

The highly skilled Team of professionals and experts has more than 20 years of experience in MEMS and Fiber Optical Components. Sercalo designs are leading the market because of their reliability, long-term stability, and high performance over lifetime. Sercalo fiber optic components are qualified according to the Telcordia 1221 standard. Sercalo's Quality Management System is certified ISO9001:2015.



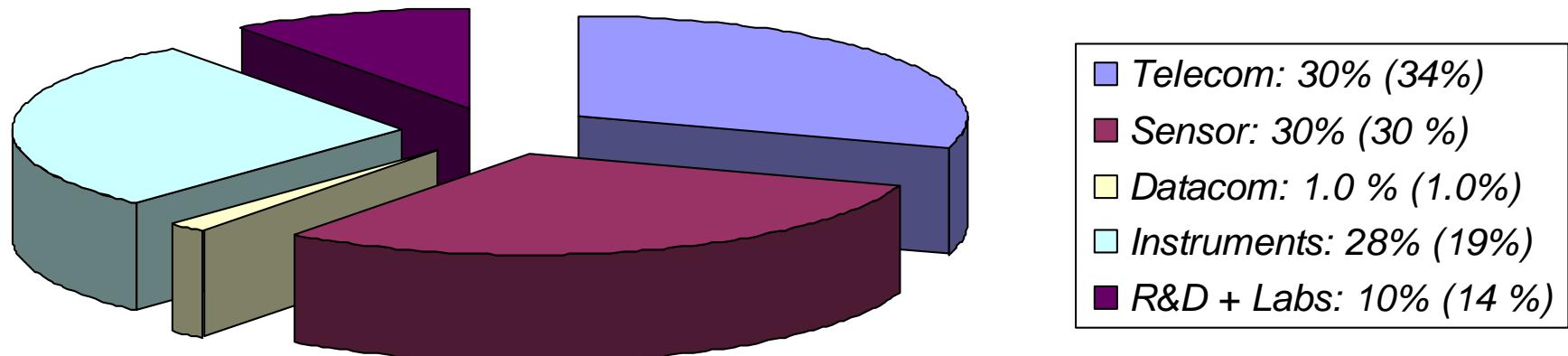
### Sercalo products are used in highly demanding markets such as:

- Telecom (Linecards, Subsystem)
- Sensor Networks (Oil & Gas Industry, Infrastructure monitoring)
- Instrumentation (Test and Measurement)
- MEMS Foundry Services (Watchmaking, Coherent Transceiver, MEMS Microphone)

- Over 100 Active Customers
- First 5 customers: ~50 % of Turn Over

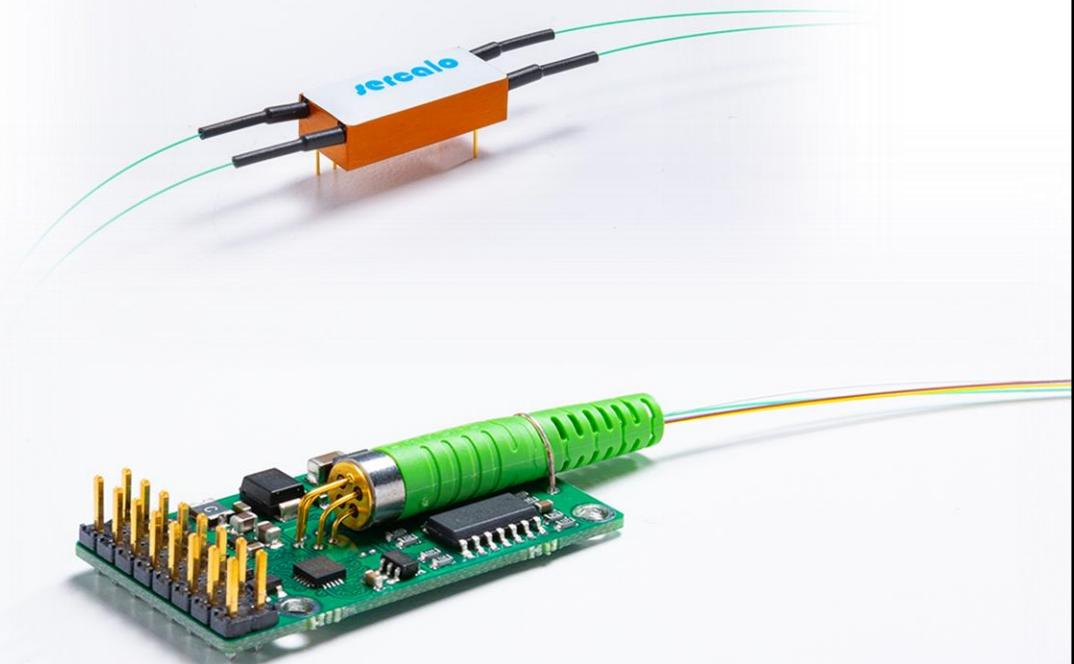
### **2024 Revenue ~8 M USD**

- Telecom Market recovery and Space will bring back growth in 2025.



## FIBER OPTICAL SWITCHES

- Standard and Specialty Wavelengths: 400 nm up to 2.0 um.
- Highest Repeatability
- Long Term Stability and Reliability thanks to LASER WELDED PACKAGING
- Low Insertion Loss and Low Power Consumption
- 1x2, 2x2,
- 1xN,
- 8x8 up to 16x16 Matrix

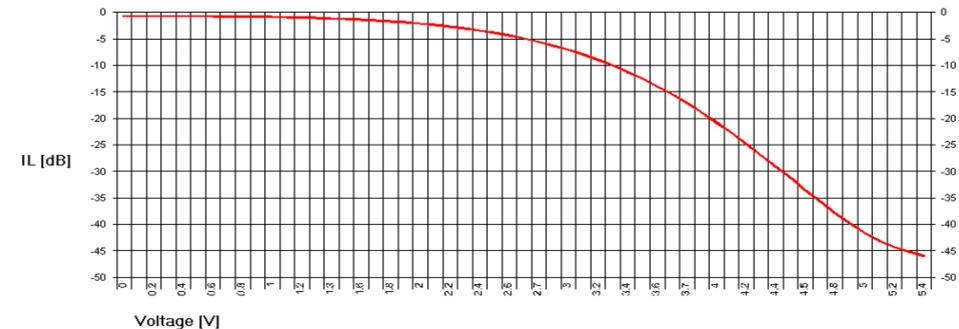


## VARIABLE OPTICAL ATTENUATORS

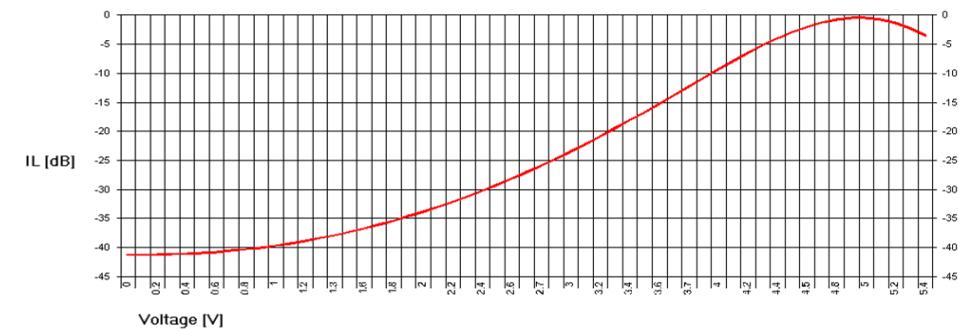
- Power Management in Optical Networks
- Fiber Amplifiers, Power Equalizers, Transceiver Cards
- Smaller Size and Robustness for Free Space Attenuators



TYPICAL RESPONSE OF BRIGHT VARIANT:

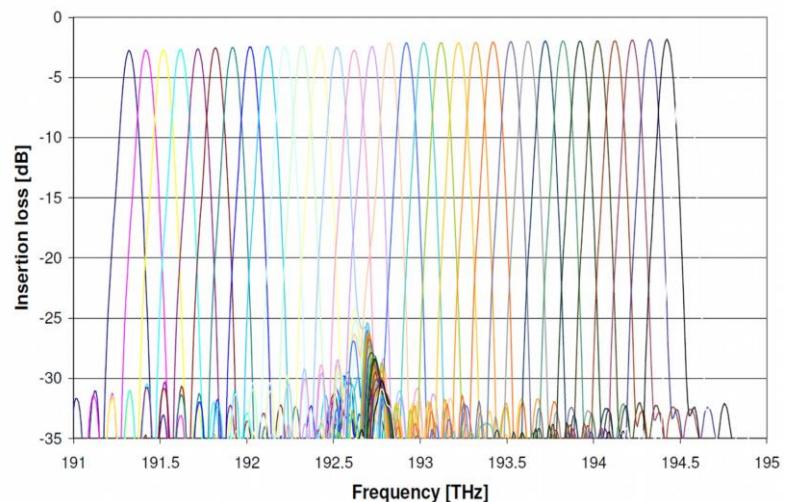
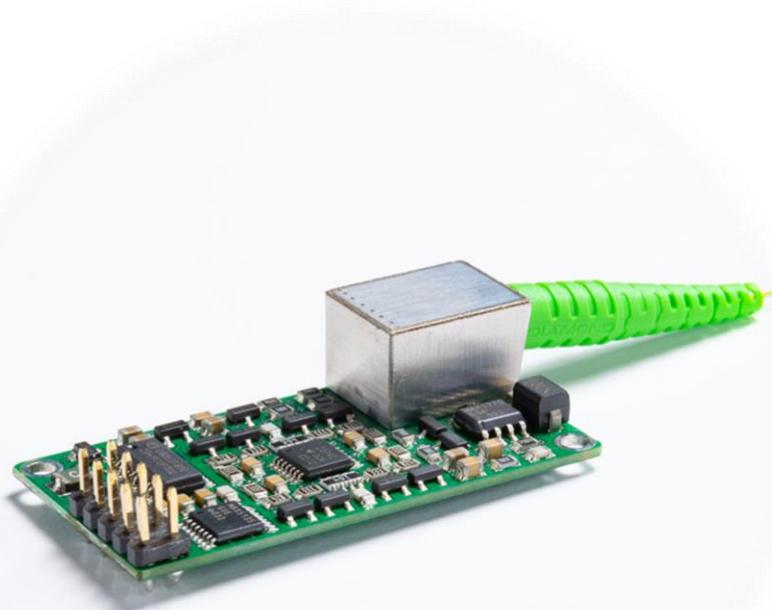


TYPICAL RESPONSE OF DARK VARIANT:



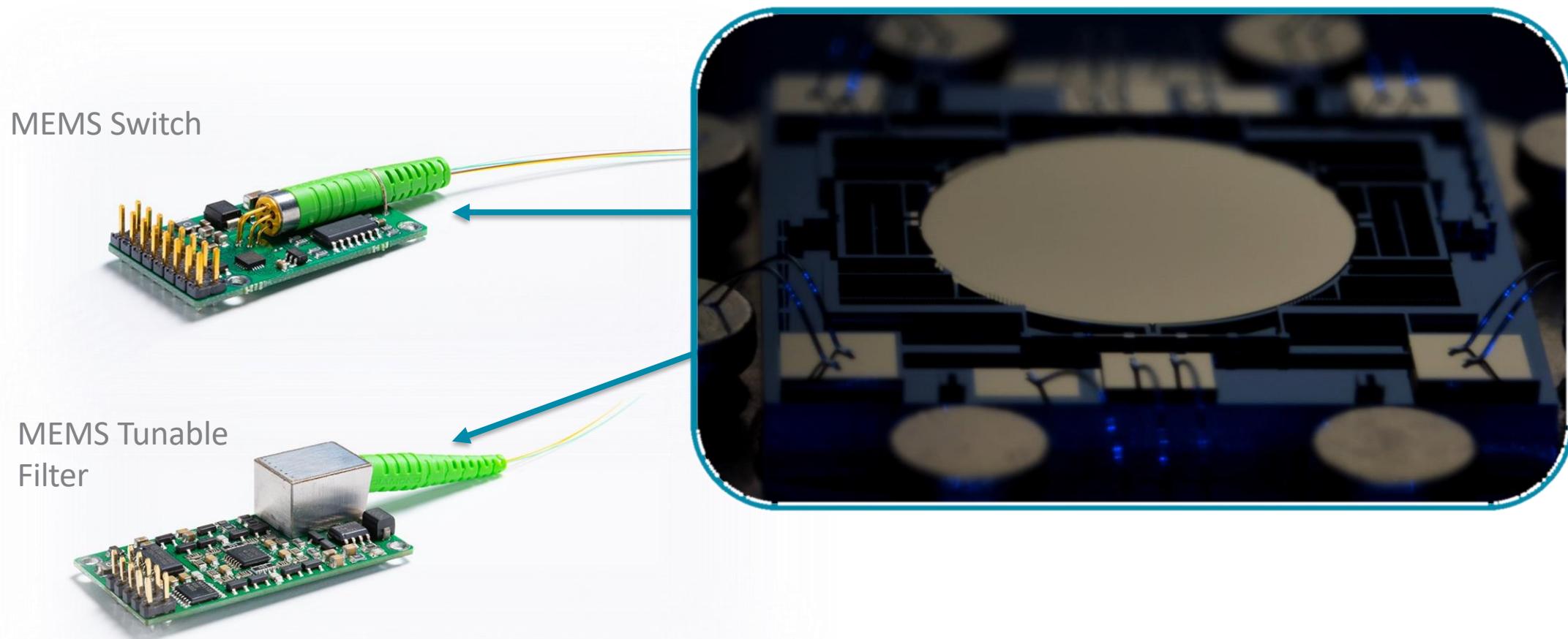
## MEMS TUNABLE FILTER

- Wavelength Filtering in Networks and Instruments
- Reconfiguration Add Drop Multiplexers
- Miniature Spectrum Analyser



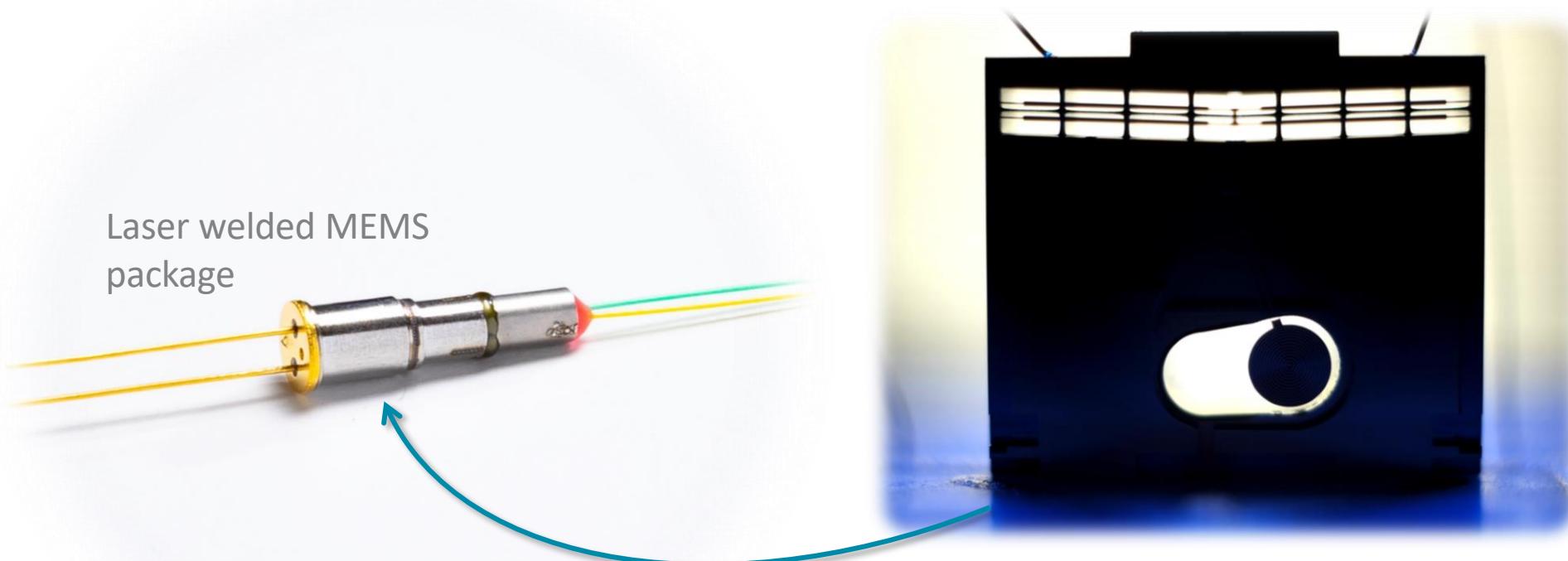
## ELECTROSTATIC MEMS for TELECOM COMPONENTS

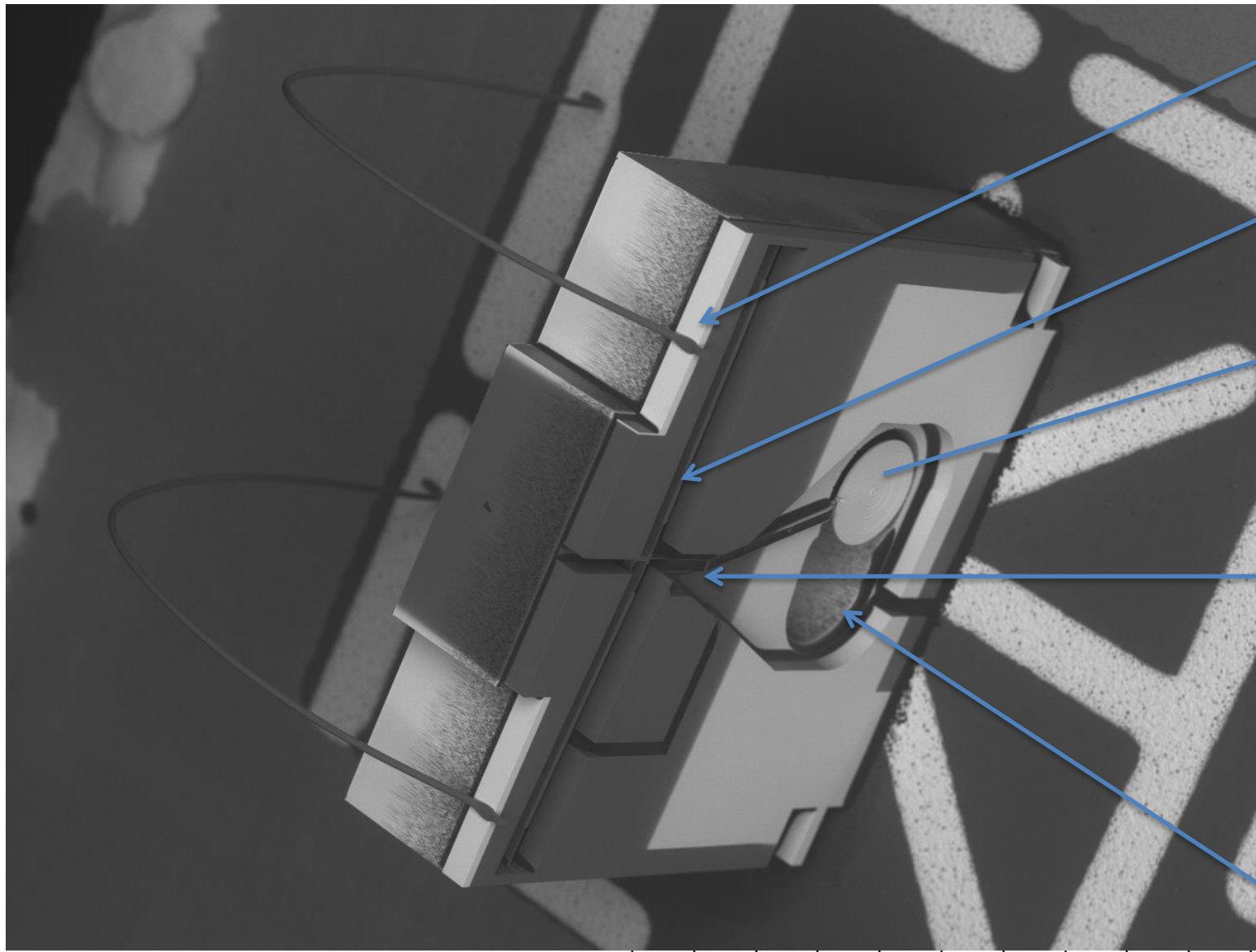
- Well suited for DC Pointing with excellent Stability ( $< 0.005^\circ$ )
- Telcordia 1221 qualification standards
- Switches, Attenuators, Tunable filters



### Thermal MEMS for TELECOM COMPONENTS

- Thermal VOAs chips (with low power) for coherent transceivers
- > 2.0 kHz Resonance Frequency
- Telcordia 1221 qualification standards





**Integrated Bond Pad  
(100 x 600  $\mu$ m)**

**Thermal Actuator  
(height = 30  $\mu$ m)**

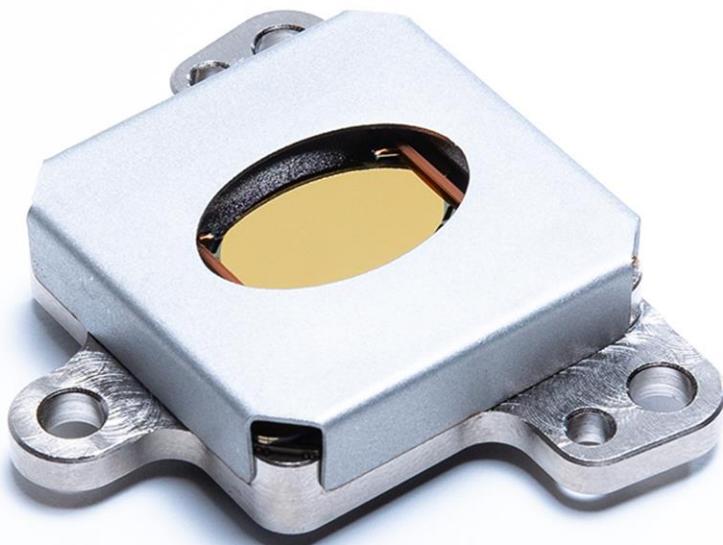
**Thinned Shutter  
(height = 5-10  $\mu$ m)**

**Amplifier Hinge**

**Optical Aperture**

### 2D MEMS MIRRORS FOR SCANNING AND TRACKING

- Well suited for Dynamic Scanning and Tracking (Space Laser Comm)
- 2.5 x 3.6 mm 2-D MEMS up to 300 Hz, +/- 5° mechanical
- 16 x 11 mm 2-D MEMS up to 300 Hz, +/- 1 ° mechanical



## OPTICAL MEMS MIRRORS OVERVIEW



	TM10	TM2520	MM2536-2	MM160110-2-15
NUMBER OF AXIS	2	2	2	2
MIRRORS SIZE [mm]	Ø 1.0 X 1.0	Ø 2.5 X 2.0	Ø 2.5 X 3.6	Ø 16.0 X 11.0
DIMENSION [mm]	5.6	9.1	14.0 X 14.0 X 5.0 (MAX. 5,7)	46.20 X 31.00 X 11.10
TIlt ANGLE	X : ±3.5 / Y : ±3.5	X : ±4.5 / Y : ±2.5	±4.0°	±1.5°
RESONANT FREQUENCY	X : 800 Hz Y : 740 Hz	X : 200 Hz Y : 240 Hz	X : 390 Hz Y : 240 Hz	X : 350 Hz Y : 200 Hz

## From Wafer to MEMS chip

### 150 mm MEMS Front End

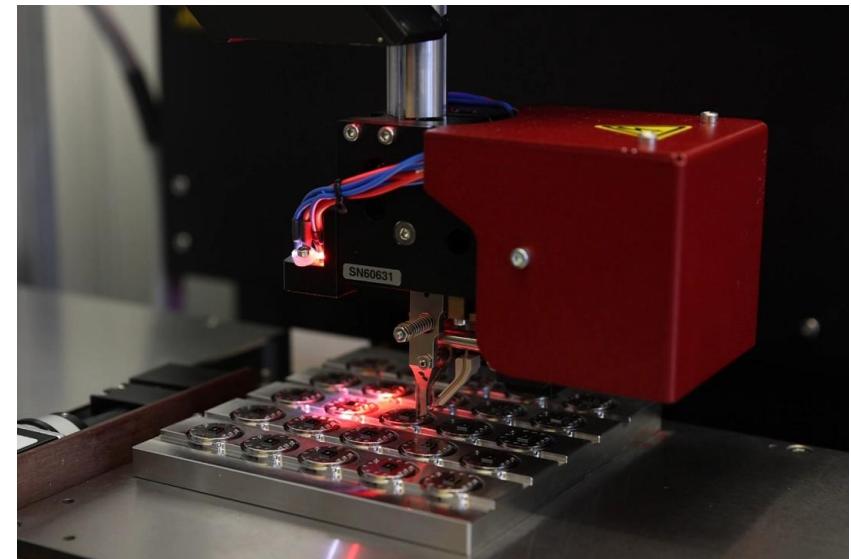
- Photolithography
- DRIE Etching (1 manual and 1 cluster tool)
- MicroOptics: Silicon and Fused Silica
- Dry and Wet Oxidation
- HF Vapor Release
- Metal Evaporation
- AR Dielectric Coating



## From Chip to Assemblies

### Semi-automated Back End

- Automatic Prober Testing
- Automatic Die Bonding
- Automatic Wire Bonding (Alu)
- Pigtail Assembly and Polishing
- UV and Epoxy Assembly
- Hermetic Package Welding
- Seam Sealing
- Laser Welding



## Test & Qualification

- Burn-in
- 100% Final Inspection
- Measurement Setup with SQL Database
- Electronic Data Transfer (EDT)
- Reliability testing and analysis lab in house (vibration, thermal shock, humidity, dry storage)

✓ Qualification according to Telcordia GR1221

✓ Quality improvement through ISO9001:2015 QMS





# Optical MEMS for Space

Swiss made optical components

