

# TeraXion

An indie Semiconductor Company



# Compact Narrowband Tunable Optical Filter

2024 EPIC Members New Product Release December

Patrice Dionne

Product Line Manager, Optical Sensing



# TeraXion & EXALOS – indie Semiconductor Companies



## TeraXion

An indie Semiconductor Company

### Founded in 2000

- Quebec City, Canada
- Design & manufacture of innovative photonic components and lasers
  - **Fiber Bragg Gratings**
  - Lasers for Optical Sensing
  - Ultrafast Lasers & Components
- 182 employees
  - 55 Engineers/Specialists
  - 15 PhDs
  - 40 Masters/MBA

## EXALOS

An indie Semiconductor Company

### Founded in 2003

- Zurich & Ecublans, Switzerland
- Design & manufacture of high-performance SLED light sources and modules
  - Super Luminescent Diodes
  - Broadband light sources
  - Packaged Laser Diodes
- 35 employees
  - 10 Engineers
  - 12 PhDs
  - 6 Masters/MBA

# Proven Supplier to Photonics Industry

+1 MILLION OF  
COMPONENTS SOLD

115,000+  
Dispersion  
Compensators

60,000+  
Ultrafast Laser  
Components

3,000+  
Narrow  
Linewidth  
Lasers

210,000+  
High-Power  
Reflectors

800,000+  
SLEDs into  
Gyros & OCT



# TeraXion - Technological Expertise

20+ years of Canadian expertise



Design



Integration



Testing



Production

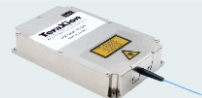
Fiber Bragg Gratings

State-of-the-art tailored fiber Bragg gratings



Semiconductor Lasers

Narrow linewidth DFB semiconductor lasers



Electronics

Low noise drive and locking electronics



Packaging

Best-in-class thermal management



Silicon Photonics

Silicon photonics optical functions



Ultrafast Fiber Laser

Unique combination of very short pulse duration (50 fs typical) and high peak power approaching 1 MW



# FBG Filters: Benefits and Applications



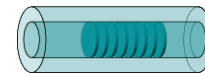
## Benefits:

- High performance filters that can be tailored for specific needs
  - Any wavelength between 700 nm and 2100 nm
  - Custom bandwidth starting at 2 GHz for narrow model and down to 35 MHz for ultra-narrow model
  - Optimized profile for steep isolation

## Example of Functions & Applications:

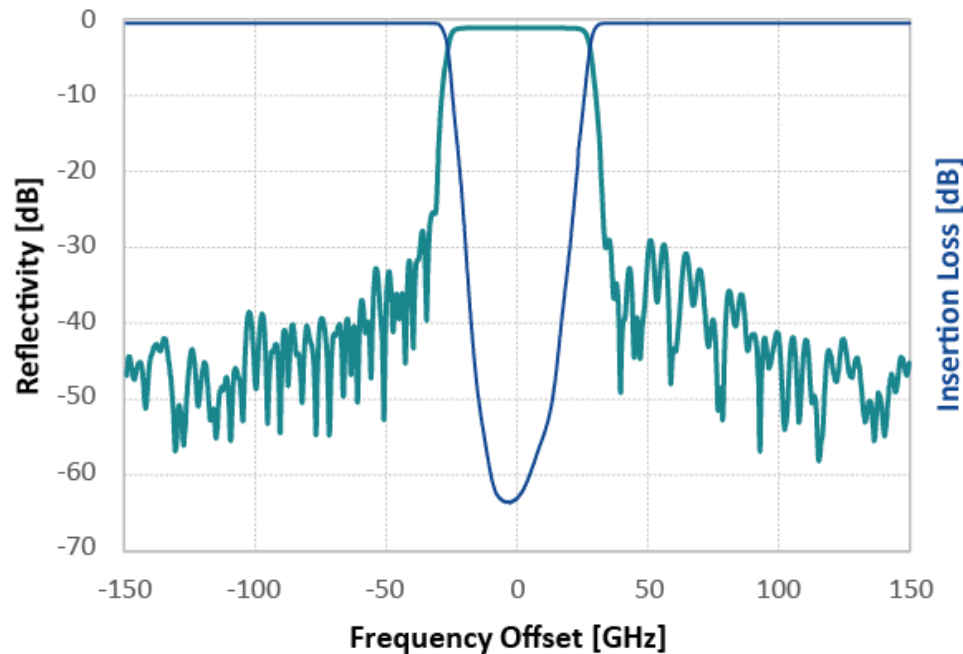
- Carrier suppression/side-band isolation in **microwave photonics / RFoF**
- Wavelength selection in **frequency combs**
- Carrier suppression, signal isolation and ASE filtering in **Brillouin sensing**
- Signal isolation in **quantum key distribution (QKD)**
- ...

# Types of FBG Profiles and Examples

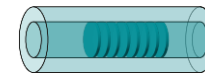


## *Narrow filters with steep edge, flat top and high isolation*

- Single –narrow– reflective band
- Typically designed with steep-edges and flat-top

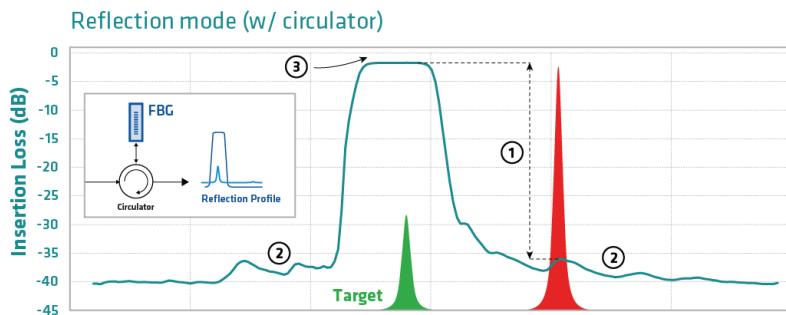


# Types of FBG Profiles and Examples

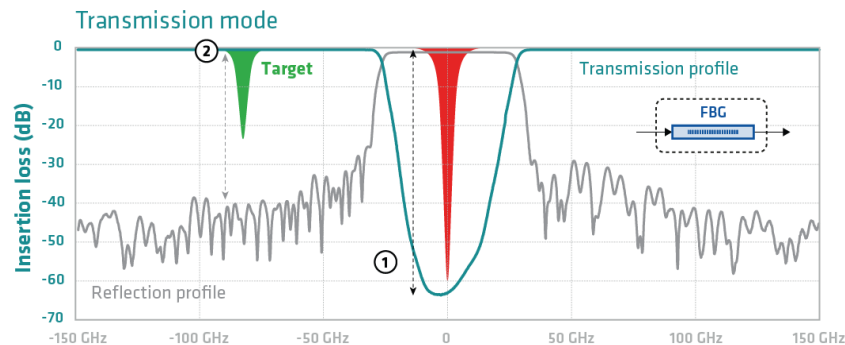


## Narrow filters with steep edge, flat top and high isolation

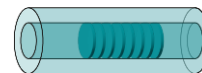
Focus on signal isolation:  
reflecting the signal



Focus on carrier suppression:  
reflecting the carrier

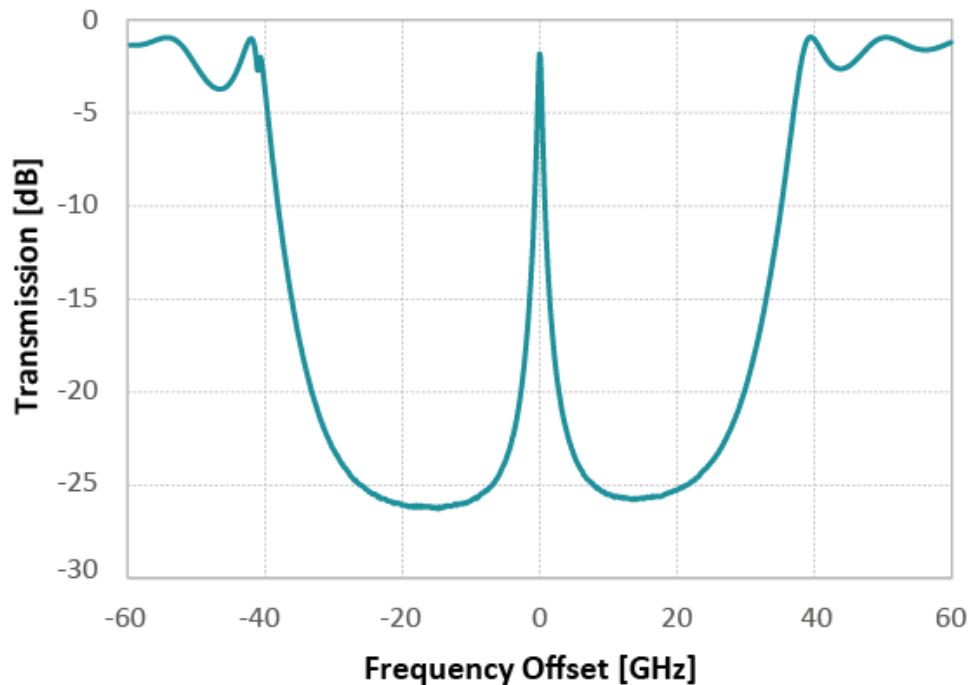


# Types of FBG Profiles and Examples



## Ultra-narrow Bandpass Filter

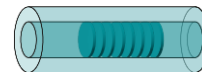
- [phase-shift FBG]
- Ultra-narrow transmissive band sided with 10's of GHz reflective bands
- Lorentzian band with BW@ -3dB between 35 and 500 MHz
- >50% transmission
- Often packaged into the tunable platform



TeraXion's 2010 article - DOI: [10.1117/12.847174](https://doi.org/10.1117/12.847174)

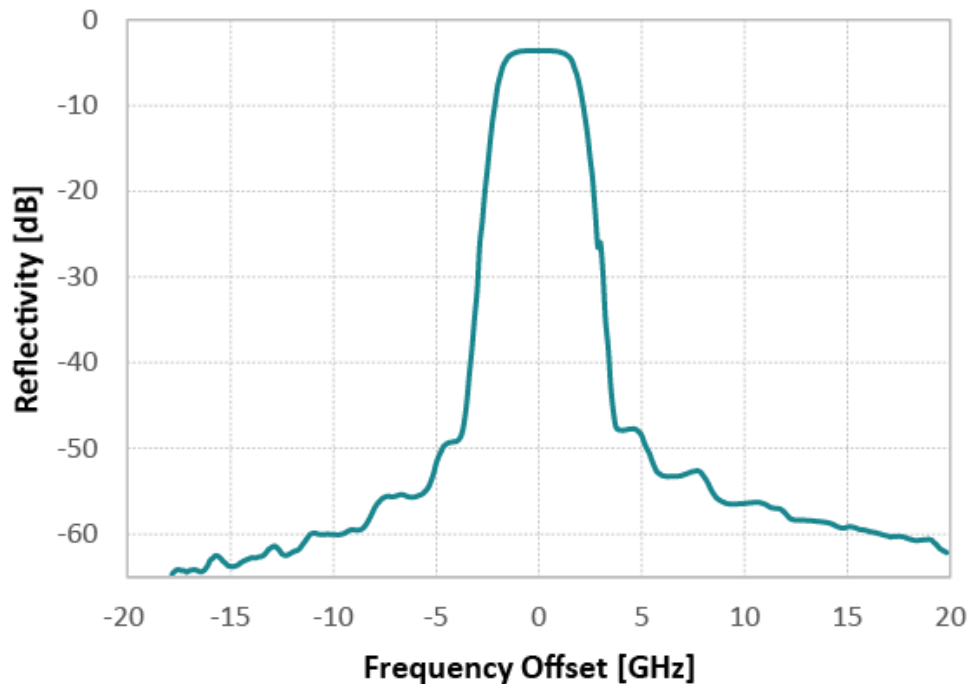


# Types of FBG Profiles and Examples

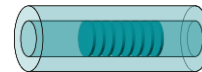


## High-isolation narrow filters: dual FBG

- Dual FBG package to increase isolation
- Specified, packaged and characterized as a single object

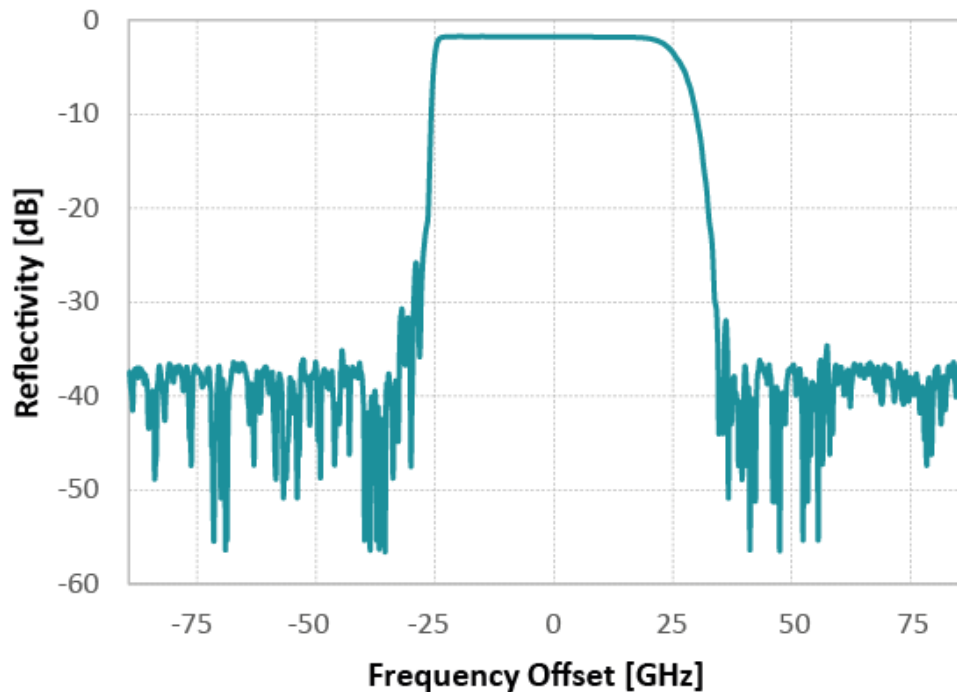


# Types of FBG Profiles and Examples

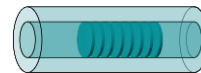


## Asymmetric Filters

- Bandwidth typically >10 GHz
- Optimized for **steepest edge profile** (left or right)
- Maximum reflectivity.

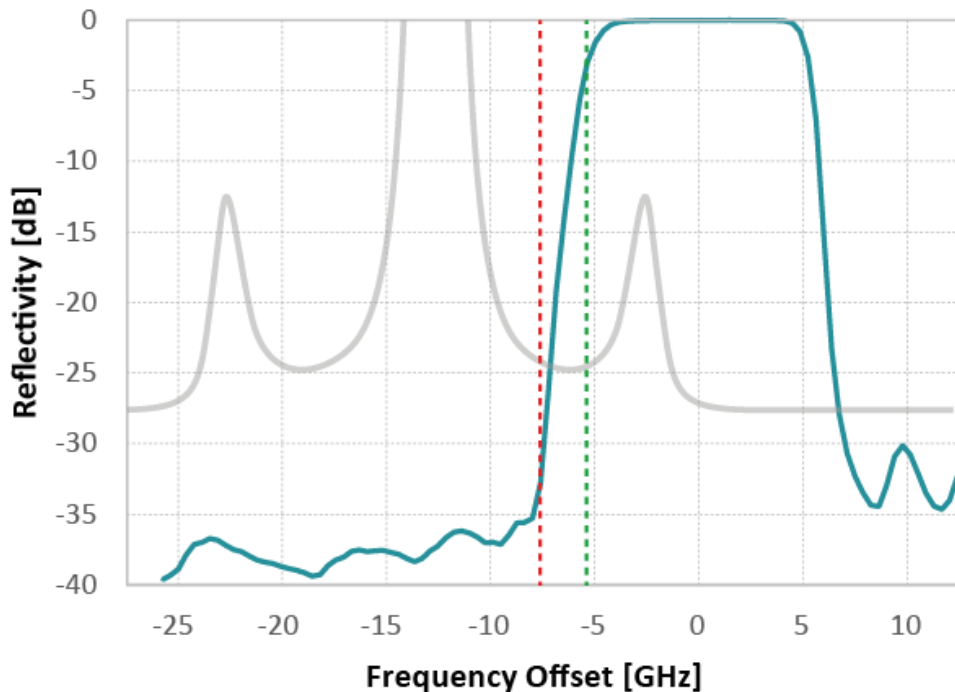


# Types of FBG Profiles and Examples



## Isolation of a signal few GHz away from a carrier

- Optimized for steepest edge profile (left edge on this example)
- Often packaged within the tunable platform for:
  - Best-in-class stability
  - Precise & dynamic alignment (2 pm resolution)



# Narrowband Tunable Optical Filter TFN

- Temperature-controlled FBG
  - Typical power consumption 3W
- Tunable over  $\pm 30$  GHz
- 2 pm accuracy
- 40 MHz<sub>p-p</sub> stability over 24 hours at room T
  - Possible to lock for <10 MHz<sub>p-p</sub>
- Suitable for all types of gratings

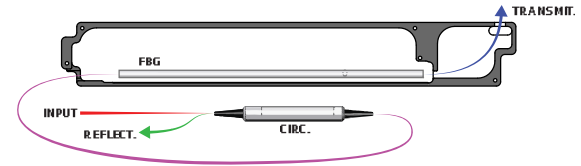
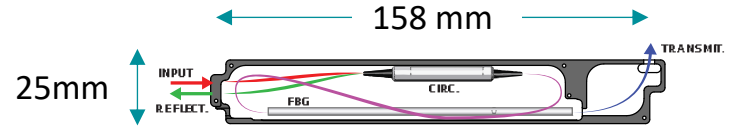


# New Compact TFN !

## Compact module with reflection and transmission outputs

- »Fiber pigtail input/outputs
- »Offered with or without circulator
  - »Integrated circulator for SM fiber
  - »External circulator for PM fiber
- »Ability to integrate two FBGs for extra isolation

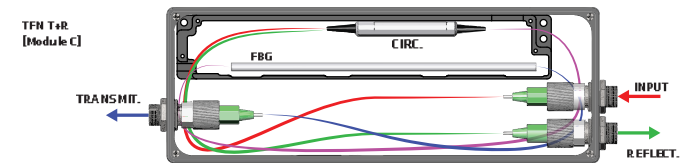
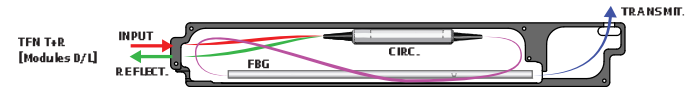
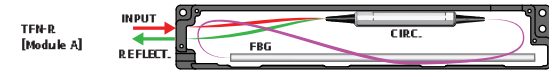
**NEW !!**



# Narrowband Tunable Optical Filter TFN

## *A versatile platform for high-performance FBGs*

- » Multiple packaging options to fit your need
- » 25 years designing high-end FBGs
- » Proven simulation tools and grating inscription methods
- » Best-in-class packaging and thermal control



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## Contact Us

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