

Multi-Function Optical Filters for New-Gen Telecom Networks

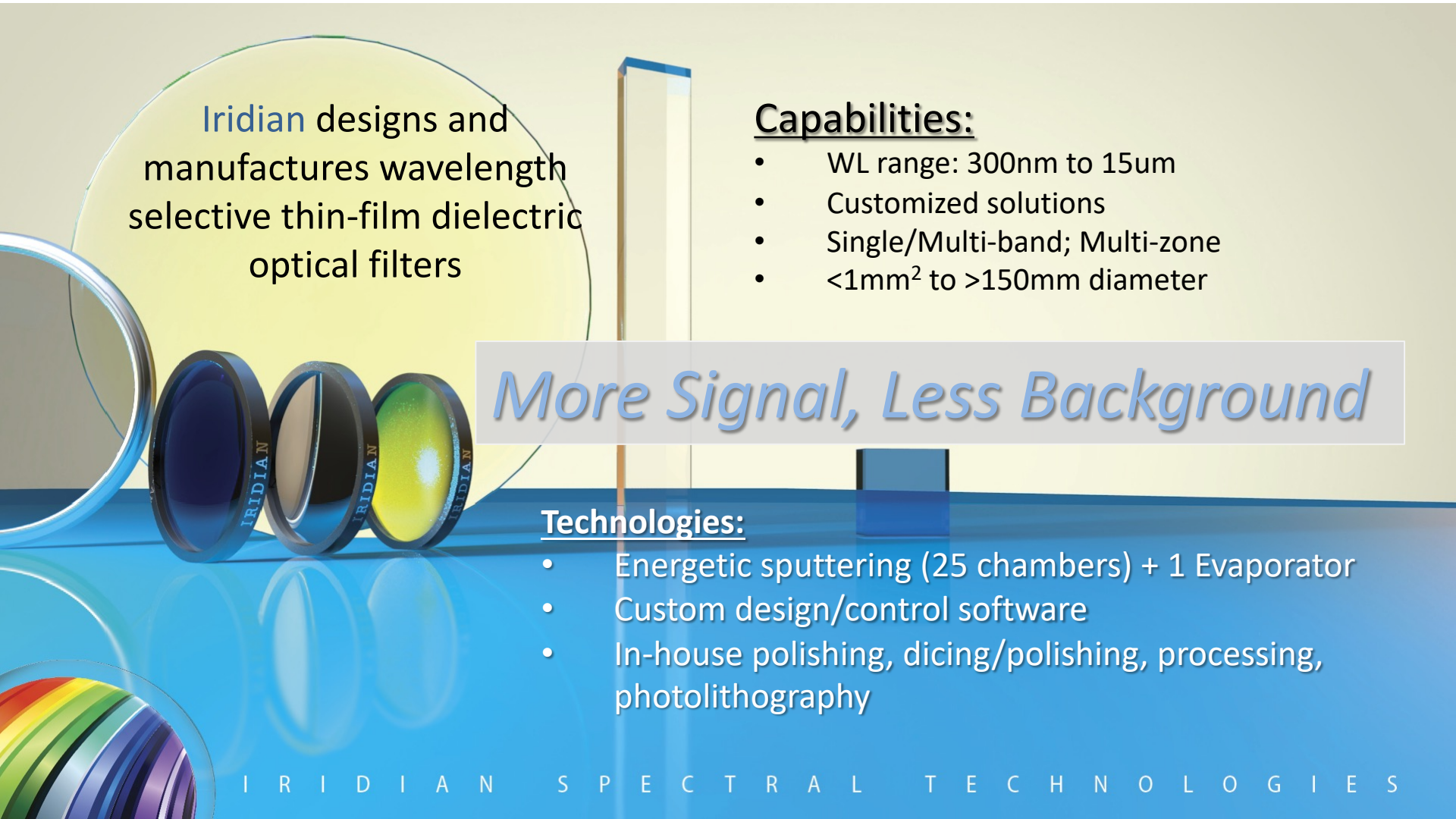


Who we are at Iridian

Canadian supplier of custom optical filter solutions

- ~170 staff providing extensive expertise in optical filter design and manufacturing
- Canadian corporation, established in 1998; ***now part of IDEX Optical Technologies***
- All manufacturing done in Ottawa, Ontario, Canada
 - Achieved ISO9001: 2015 certification in May 2016
- *Officially opened 45,000 sq. ft. custom-built facility Nov 2012*





Iridian designs and manufactures wavelength selective thin-film dielectric optical filters

Capabilities:

- WL range: 300nm to 15um
- Customized solutions
- Single/Multi-band; Multi-zone
- <math><1\text{mm}^2</math> to >150mm diameter

More Signal, Less Background

Technologies:

- Energetic sputtering (25 chambers) + 1 Evaporator
- Custom design/control software
- In-house polishing, dicing/polishing, processing, photolithography

Global leader in optical filter solutions for:

Telecommunications

- Terrestrial Fibre-optic networks – WDM, GFF
- Datacom – data center TOSA/ROSA, ITLA
- Satcom - OISL



Global leader in optical filter solutions for:

Bioanalytical

- Raman Spectroscopy
- Fluorescence

Sensing and Detection

- Earth Observation
- Gas Detection (MWIR)
- LiDAR

Aerospace

- Satcom
- Earth Observation
- Astronomy

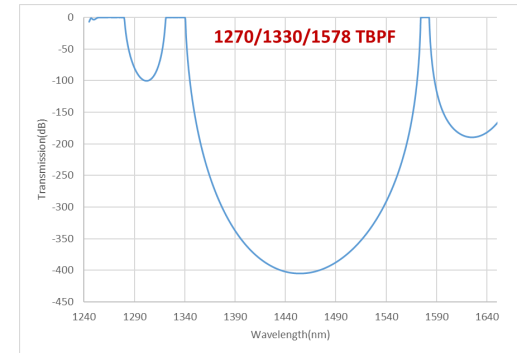
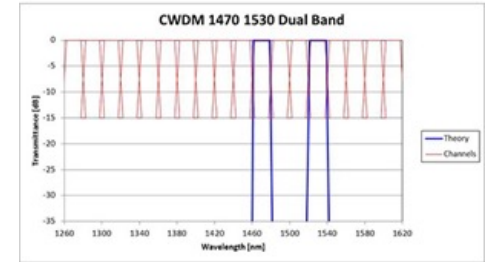
3D Cinema



Multi Band WDM Filters

Why use multi-band pass filters?

- Traditionally, single band pass filters have been used in telecom modules to perform wavelength/channel add-drop functionality and are commonly used components in WDM system and PON modules.
- Iridian has previously developed CWDM and wide band multi-band pass filters to reduce accumulated insertion loss in these module/systems by “grouping” of ITU channels/wavelengths.
- With this method, module and system designers can improve the performance of these optical modules by using less components, resulting in a reduction in IL and a more compact module size.

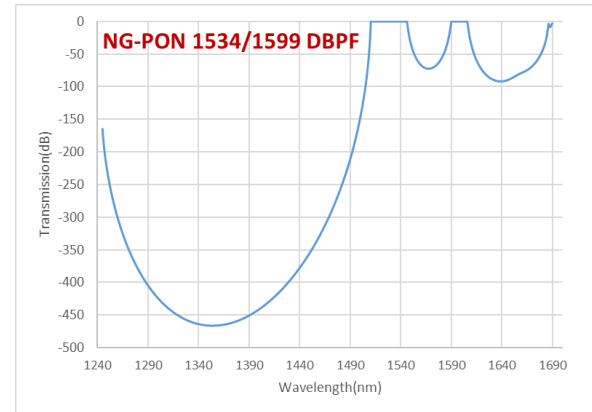
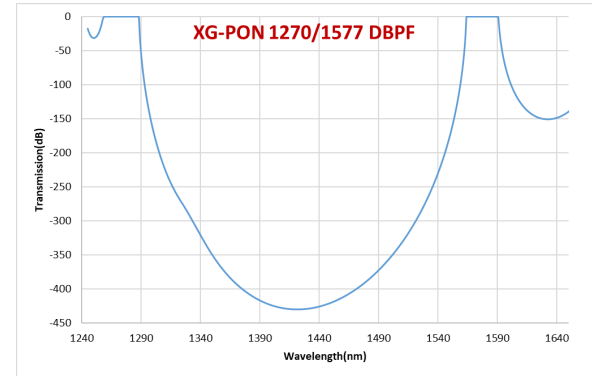


Multi-band filter in PON Application

From the application level, the Passive Optical Network (PON) solution has feasible, lower cost, better performance, and stronger competitive advantages.

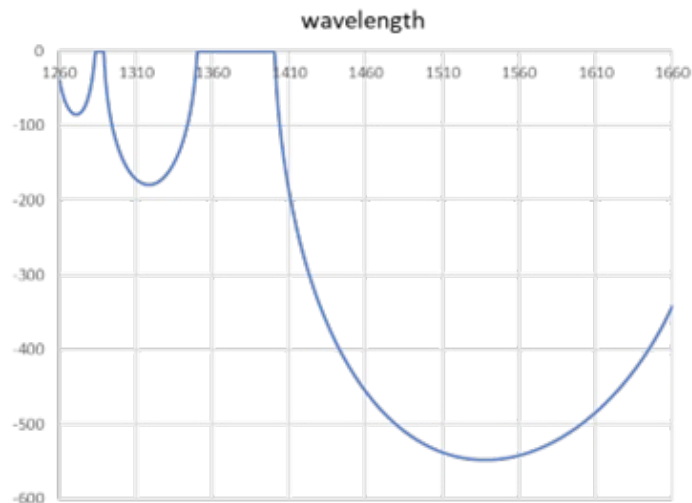
Compared with the optical Ethernet solution, industrial PON has fewer layers, lower cost, more reliable features, easier to be expanded, and satisfy telecom operation experience.

Our multi-band filters are demonstrated with many advantages in GPON, XG-PON, XGS-PON, 25G-PON, 50G-PON module applications.



DBPF in 25G-PON and 50G-PON

New generation of multi-band filter designs are being applied in PON modules recently. They provide narrower pass band and reflect band width, steeper in transit band, and custom pass band, reflect band wavelength and isolation requirement.



25G-PON 1286/1358 DBPF



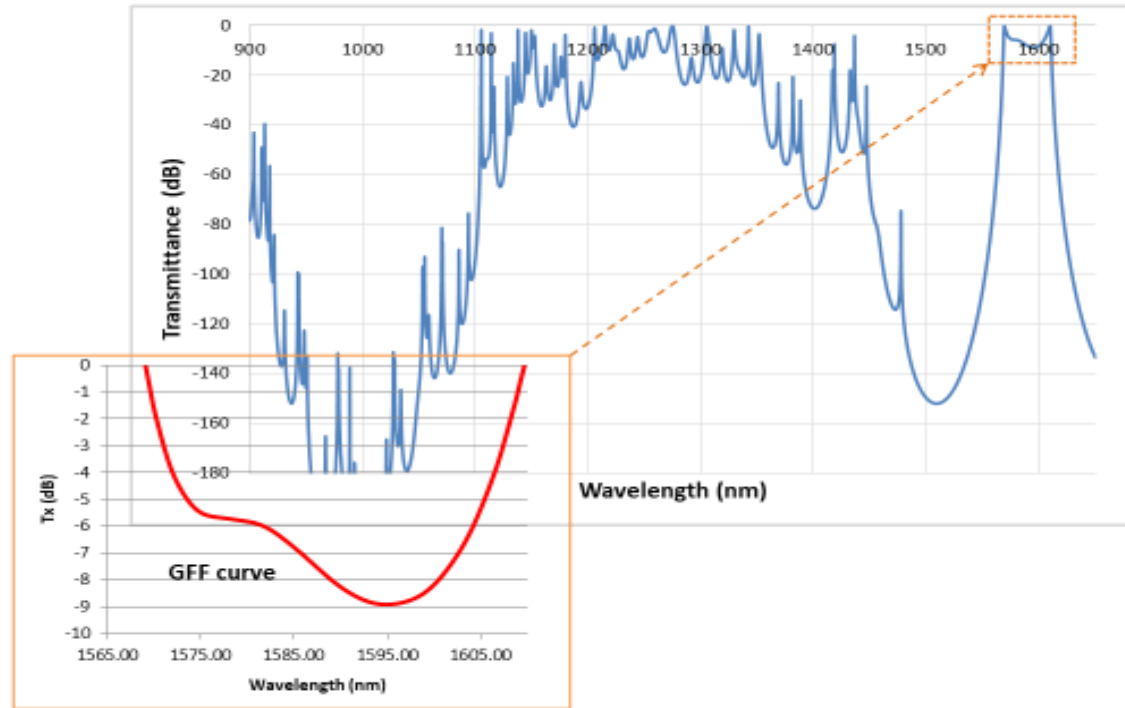
Hybrid GFF in EDFA Module

- Iridian Spectral Technologies has developed Hybrid GFF, which combines the functionality of both a WDM and the GFF on one component.
- Specifically, a Hybrid GFF can block the pump laser from light in the range of approximately 980 nm or 1480 nm while providing gain flattening for signal light amplification without additional pump wavelength blocking filter.
- Moreover, a Hybrid GFF can be designed to pass or block other wavelengths in the 900 nm to 1700 nm range.
- The most obvious benefit of Hybrid GFF is substantial cost savings; The Hybrid GFF cost is costs barely more than a base GFF while offering the functionality of two components. In addition to eliminating the cost of a separate WDM, use of a Hybrid GFF reduces system design complexity by cutting out a unnecessary element.
- Related, eliminating the separate WDM leads to more compact dimensions for the EDFAs and other optical amplifiers.



GFF with 980 nm Blocking

GFF with 980 nm Blocking



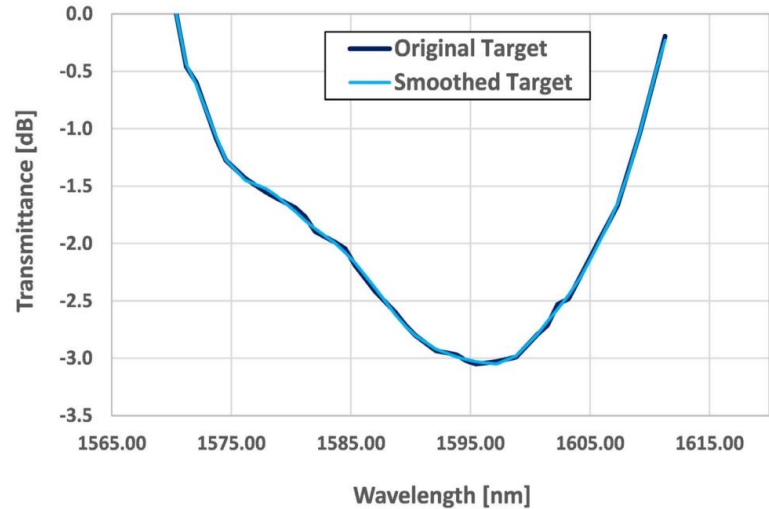
Premium GFFs Improve EDFA Performance and Optimize Module Design

- **Case 1: Noisy target curve correction**

EDFA spectrum data curve, usually is measured directly from the erbium fiber. Sometimes, significant measurement deviation is present on the curve, rendering it noisy (i.e., erratic and bumpy). It can make a low PPEF difficult because the modulation depth and steepness.

Thus is not truly representative of the EDFA's performance. Theoretically, EF performance should be smooth.

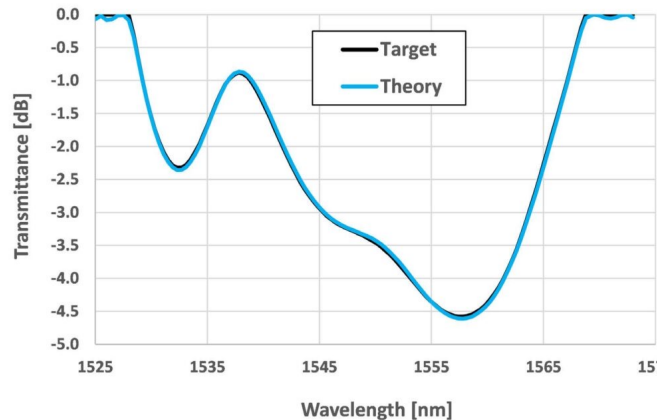
Before sending GFF design, Iridian has the experience and capability to smooth the target curve, bringing it closer to its theoretical optimization and the client's intent.



Premium GFFs

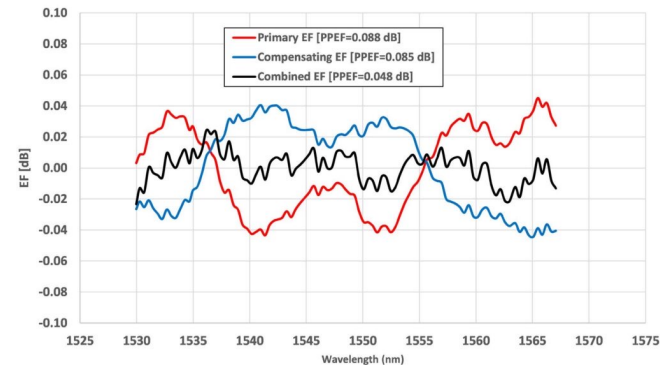
- **Case 2: GFF curve edge treatment**

Help customers to create a passband on the edge of the target curve, maintaining high transmission outside the gain-flattened region for signal carrying or other purposes. Traditional GFF curve is smoother on the edges, whereas extending the GFF wavelength branches the curve slightly on either side or both sides. But sometimes referred to as “wings,” then become flat in the desired spot. These edges are very small, often only a few nanometers, but it is difficult for most GFF providers to accomplish.



- **Case 3: GFF pairing for PPEF compensation**

Compensate the EF in GFFs. By designing and producing a filter set with opposite error functions, we can reduce the combined PPEF. Stated differently, we can produce a filter with a precise error function, and then compensate for that error function to cancel it out by using a pair of filters, achieving lower overall PPEF throughout the system.



Why Iridian

More Signal, Less Background

- Reliable Partner
- Valuable Expertise
- Custom solutions

Thin Film Filters of:

- Highest Quality & Reliability
- Competitive pricing

CCGP certified/non-ITAR
ISO9001:2015 certified



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