

Next Generation PON Enabling Technologies

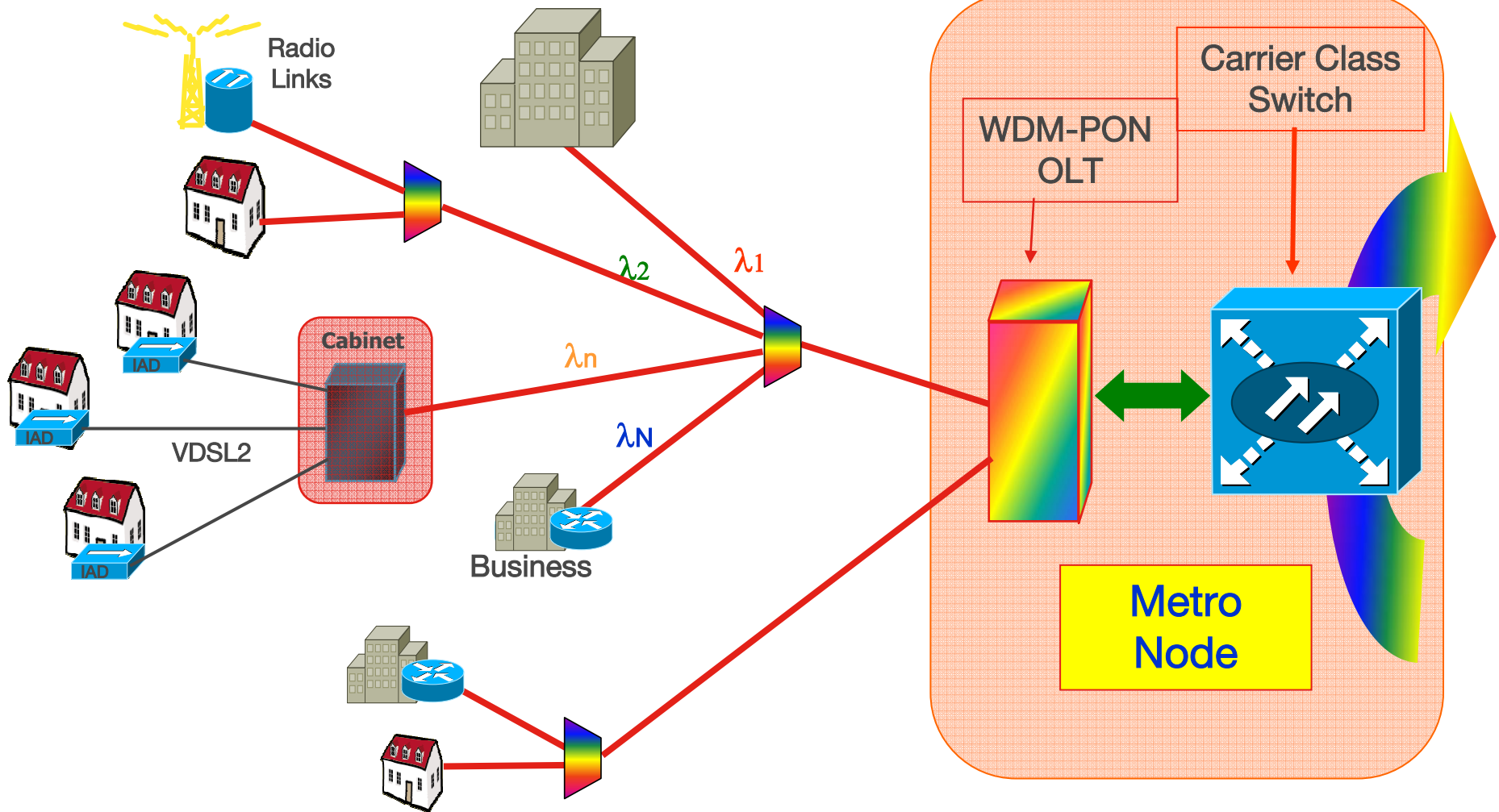
Giorgio Grasso
PIRELLI Labs – Optical Innovations

Outline:

➔ WDM-PON based access networks

- WDM-PON Enabling Technologies
 - Integration of OLT optical interfaces – PIC technology
 - Colorless ONU interfaces – PIC Based Tunable Interface

WDM-PON Scheme



WDM-PON Pros & Cons

- **Mobile access backhauling**
- **Service Agnostic**
- **Possible upgrade with TDMA and OCDMA**
- **Wavelength leasing for VIP customers possible**
- **Users are independent under a failure point of view**
- **Cost**

WDM-PON Service Agnostic Network

- **Client services support**
 - Transparently supports all services
 - Clients speed up to 10Gb/s
 - Possibility to mix any client interface
 - 1,25 GbE, 2,5 Gbit/s, 10 GbE, ...
 - Ethernet, ATM, TDM
 - no system pre-planning required, in-service upgrade

WDM-PON main cost factors

- **Two Main Cost Related Factors**
 - Many optical interfaces in the OLT (16 in the CWDM-PON)
(CAPEX problem)
 - Colored Interfaces in the ONU
(CAPEX /OPEX problem)

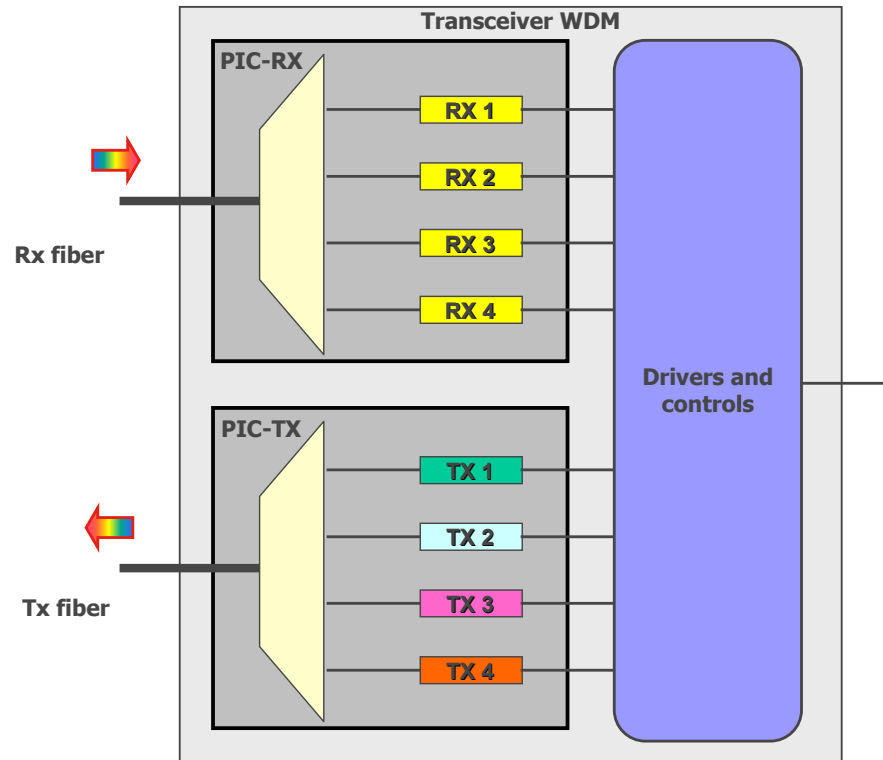
Outline:

- WDM-PON based access networks

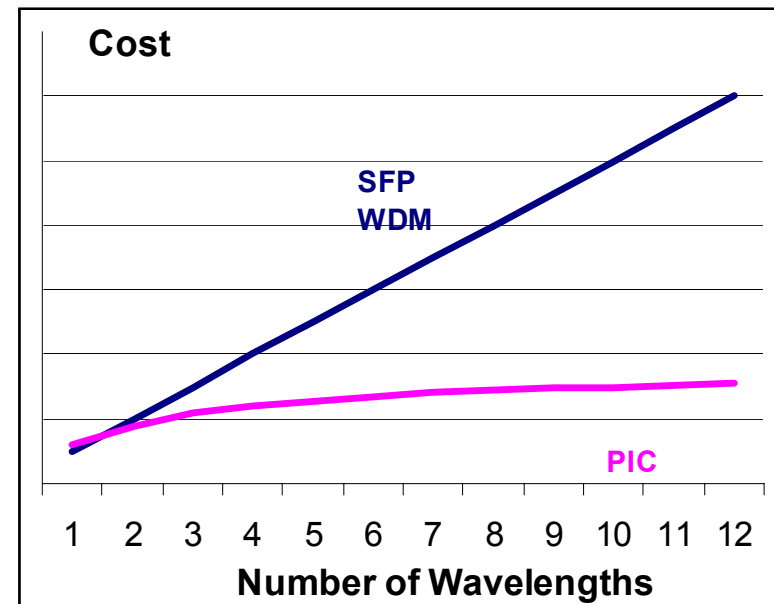
WDM-PON Enabling Technologies

- Integration of OLT optical interfaces – PIC technology
- Colorless ONU interfaces – PIC Based Tunable Interface

PIC Why and What



Cost is not linear with number of sources/Detectors

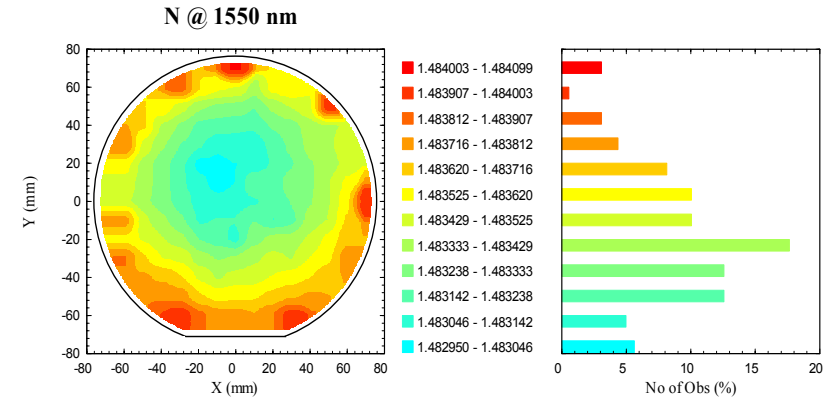
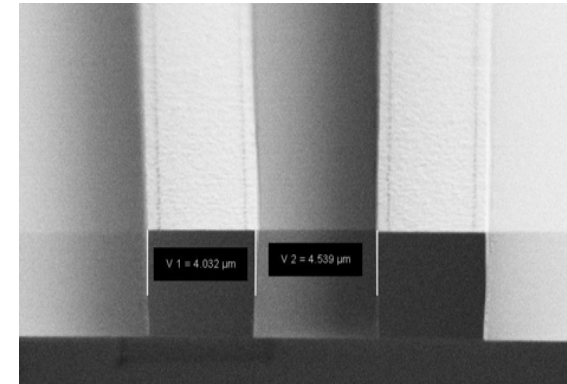


PIC technology approach

- 8 channel CWDM MUX:
 - DFB laser array
 - high index contrast silica waveguides (GeSiO_2 $\Delta n \cong 2.5\%$)
 - DFB / waveguide passive alignment

- 8 channel CWDM DEMUX:
 - PIN receivers
 - passive RX mounting
 - turning mirror on optical chip

- Athermal (no TEC)

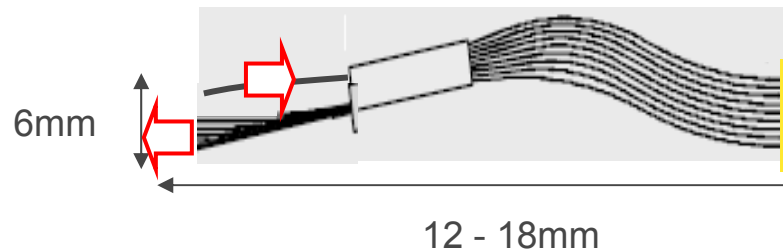


Average = 1.483416	Std. Dev = .000254	Minimum = 1.482950	Maximum = 1.484099
Median = 1.483381	Q. Range = .000339	10 % = 1.483088	90 % = 1.483767

Very high index uniformity ($\sigma \cong 2e^{-4}$)

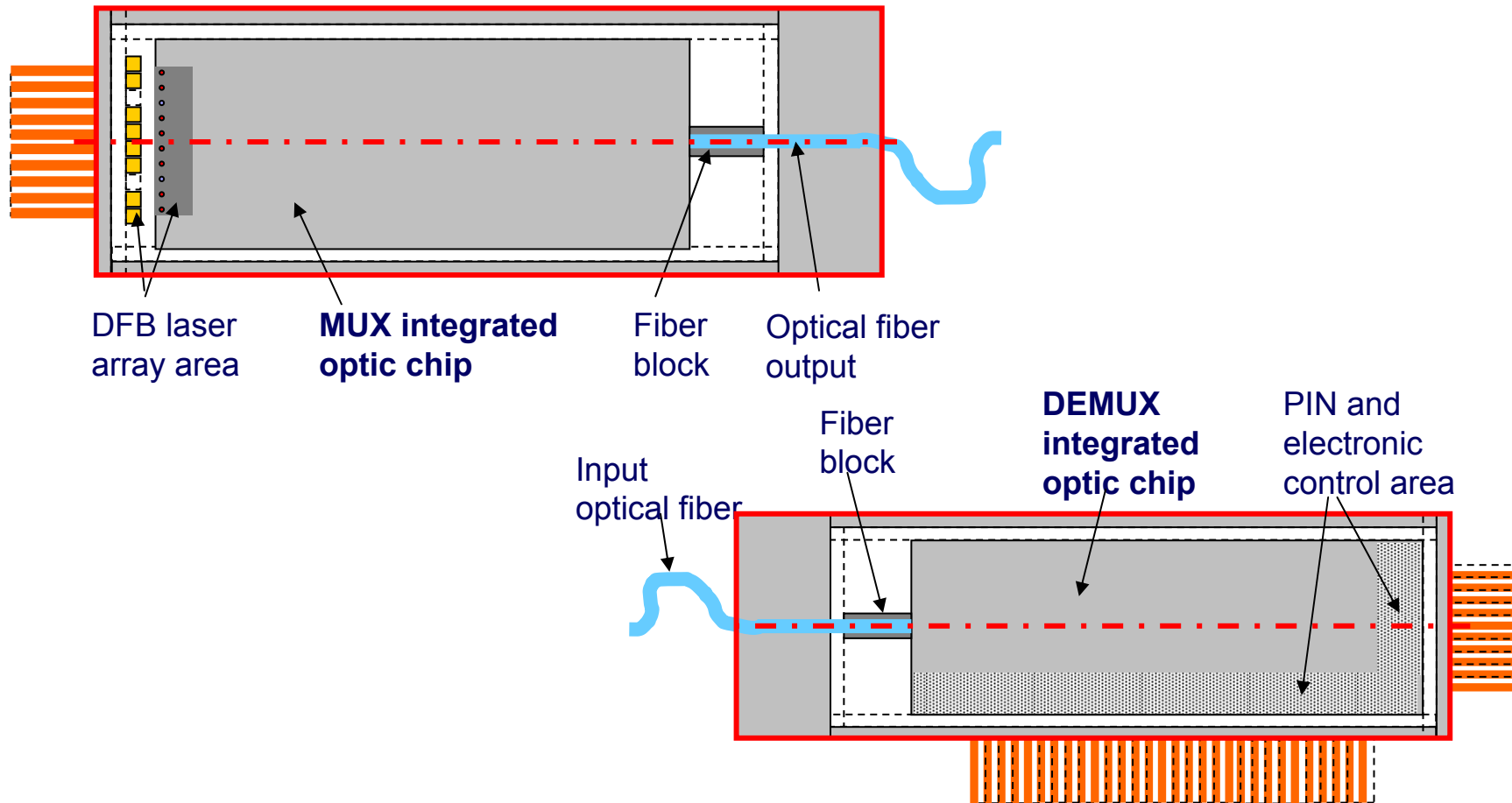
MUX / DEMUX design

- AWG filter:
 - compact
 - robust
- Chip dimensions:
 - CWDM:
 - channel spacing 20nm
 - low order diffraction grating
 - low L
 - decrease curvature longest chip

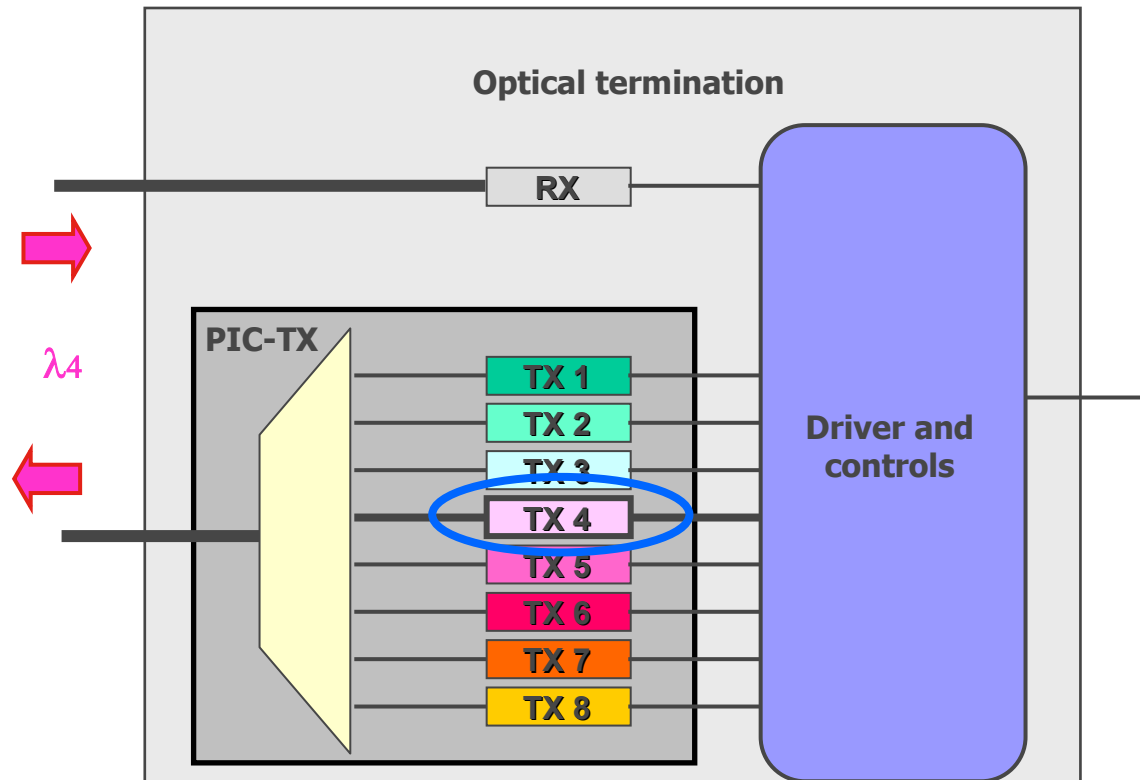


MUX / DEMUX design

- Target package dimensions: XFP (53 x 18 x 5 mm³)



PIC Based Tunable ONU Interface



THANKS

