

GigaWaM

— a Cost-Effective WDM-PON System

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Ignis Photonix

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GigaWaM: FP7 project

Participants

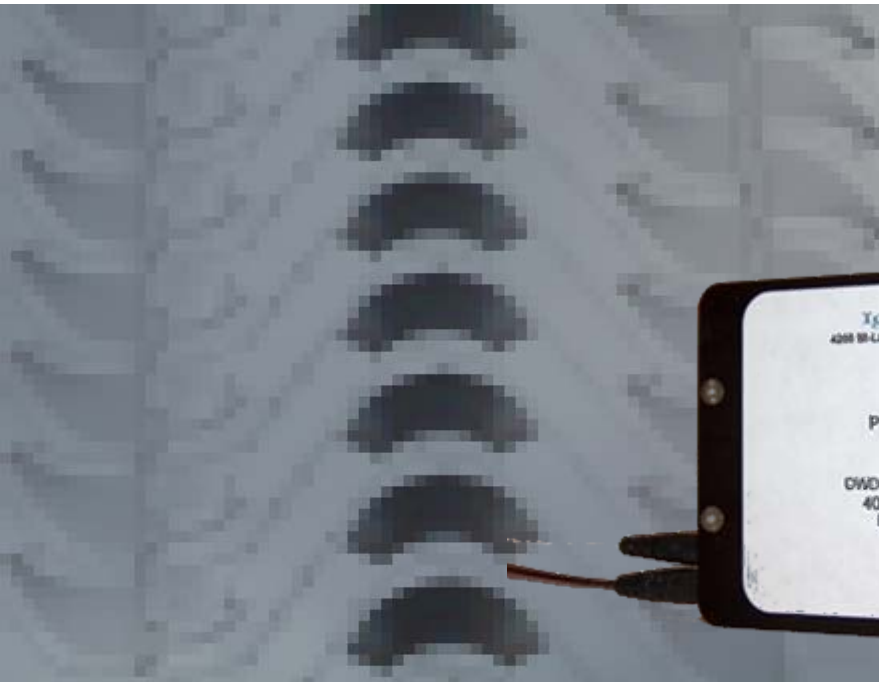
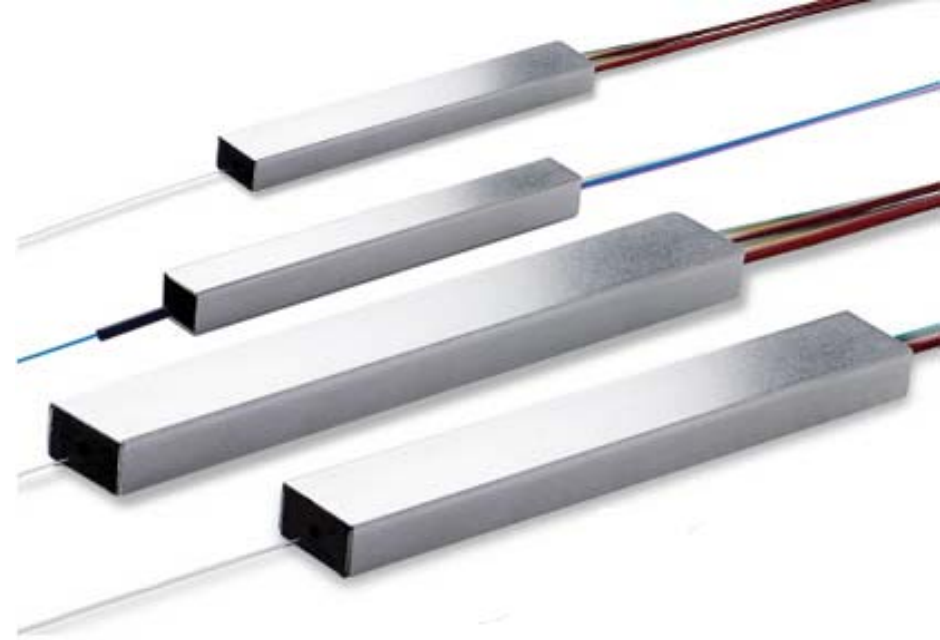
- ↳ Aifotech GmbH assembly house, Germany
- ↳ DTU Fotonik university, Denmark
- ↳ Ericsson equipment, Sweden
- ↳ ficonTEC GmbH assembly equipment, Germany
- ↳ Fraunhofer ILT research, Germany
- ↳ Ignis Photonyx A/S PLCs, Denmark
- ↳ Ignis Syntune AB tuneable lasers, Sweden
- ↳ Vertilas GmbH VCSEL lasers, Germany

- ↳ Nor-Tek project management, Norway

- Ends April 1, 2012

About Ignis

- PLC splitters
- Athermal AWGs
- AWG chips
- Tunable lasers



Where we are

Wafer Fab in Denmark
(43 employees)



HQ in Norway



Tunable Laser and transmitter fab in Sweden
(40 employees)



Packaging and Testing of
Integrated Optical Modules
Canada
(4 employees)

Packaging and sub-contractors
China (1 employee)



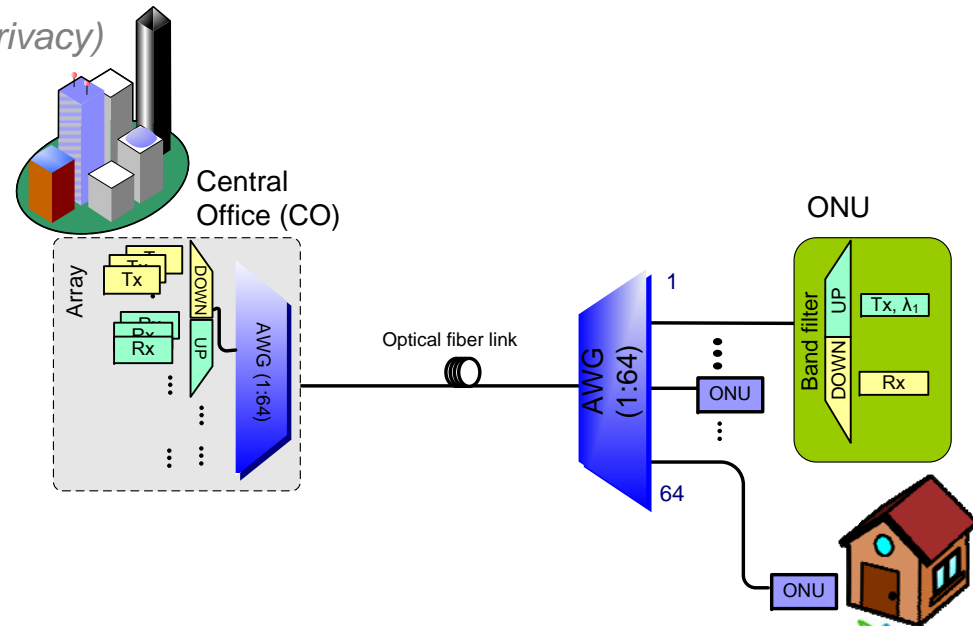
Splitter fab (Fi-ra) in Korea
(161 employees)

Wavelength Division Multiplexing-PON

- Dedicated wavelengths for each (group of) subscriber
- Is there a need?
 - ↳ WDM-PON makes sense if ...
 - ↳ *sufficient need for bandwidth*
 - ↳ *need for dedicated bandwidth (privacy)*
 - ↳ *need better power budget*

- Common concerns

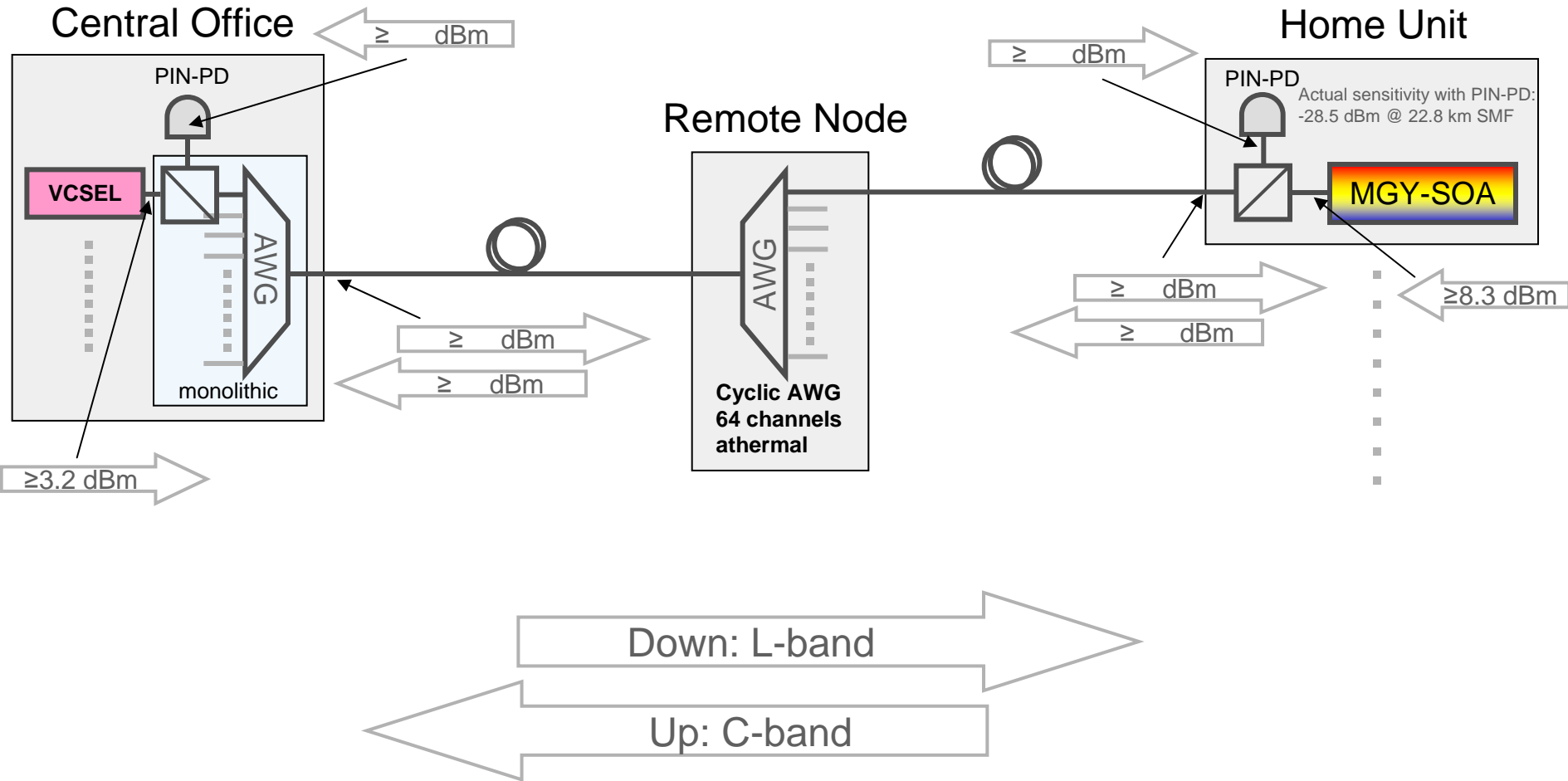
- ↳ Prohibitive cost
- ↳ Time-scale



Goal

- €120
 - ↳ Price per subscriber to a system integrator, in 2012, in volume
- Technical
 - ↳ 64 channels, 1.25 Gbps
 - ↳ 50 GHz channel spacing in C-band (~48.7 GHz in L-band)
 - ↳ Reach 20 km over SMF
 - ↳ Improvement of components
 - ↳ Integration of components

GigaWaM architecture and power budget



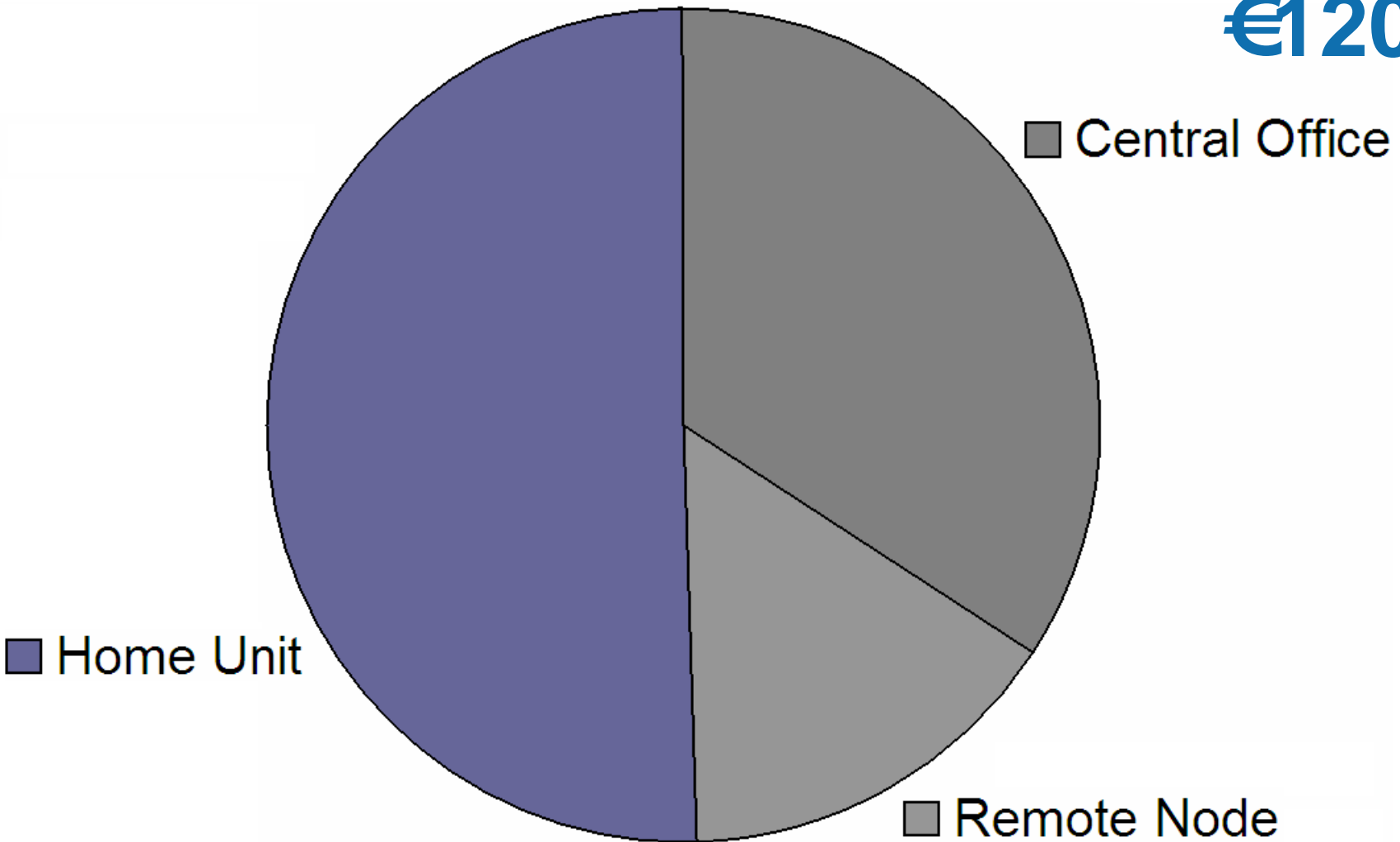
1.25 Gbps x64 symmetric over 20 km SMF, *) Optical modulation amplitude

Key technical challenges

- **Assembly**
 - ↳ Tight tolerances
- **Fast signals**
 - ↳ 1.25 Gbps, (upgrade path to 2.5 Gbps and 10 Gbps)
- **Heat**
 - ↳ Compact design
- **Composite yields**
 - ↳ 99% single yields, not enough

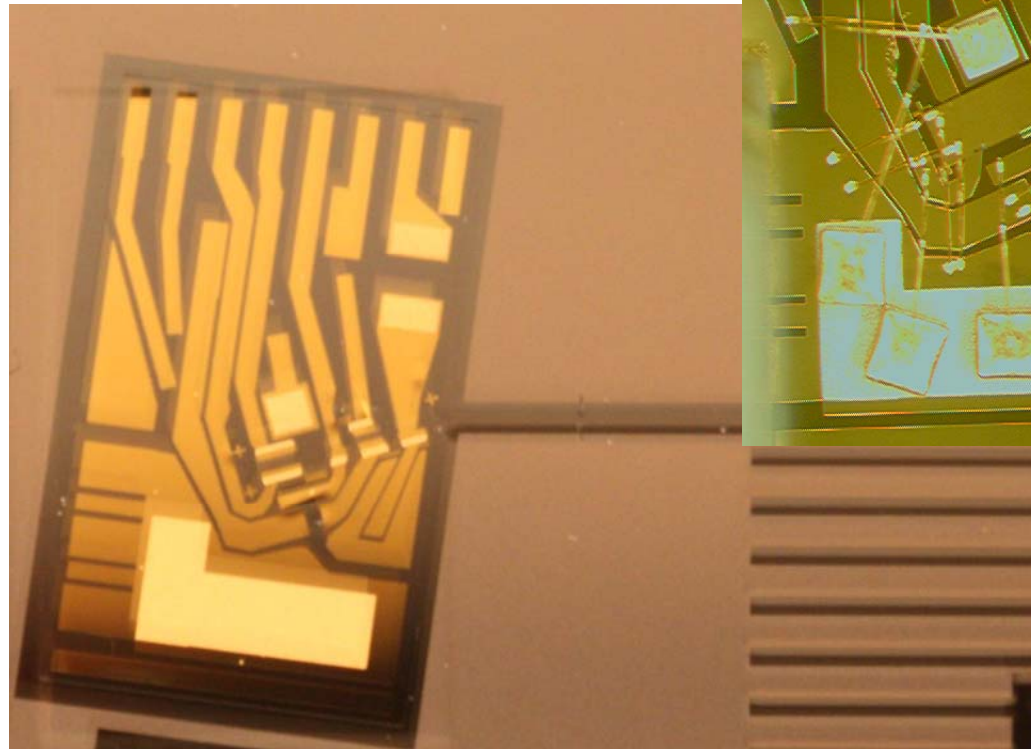
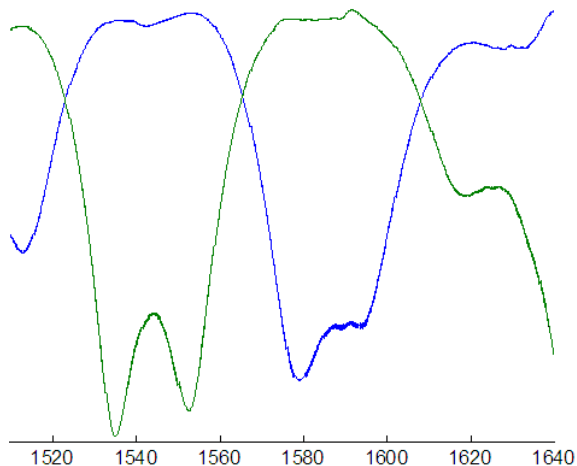
GigaWaM's answer: Cost breakdown

€120



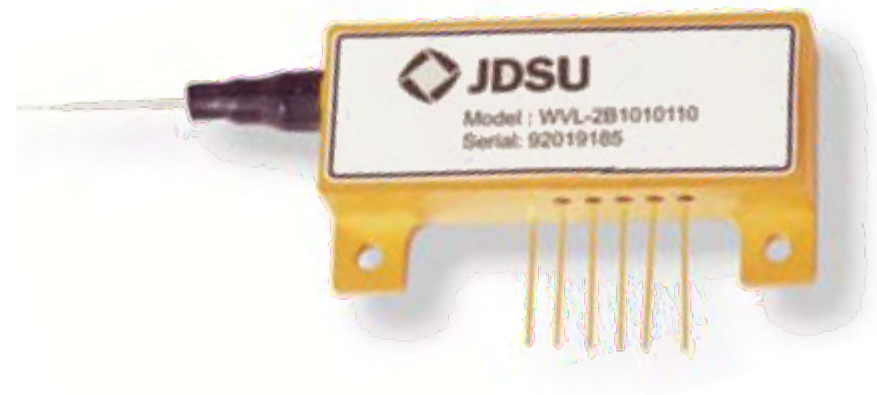
GigaWaM: Home Unit technology

- PLC diplexer separating C- and L-band
- Tuneable laser
- Photodiode
- Electronics

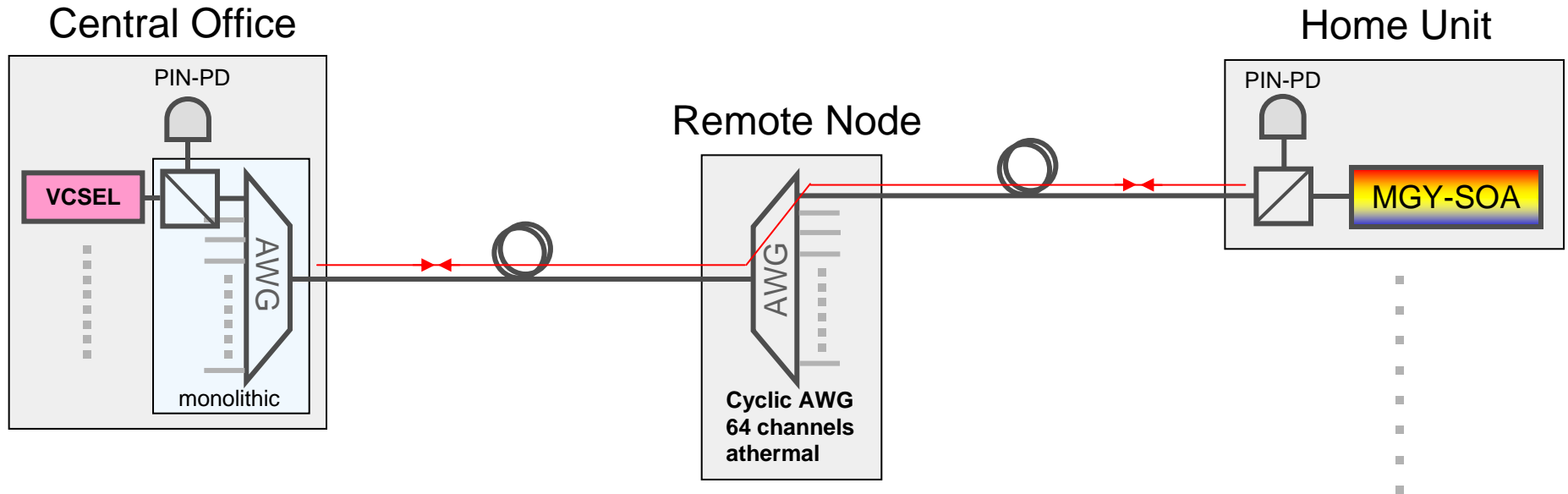


GigaWaM: Home Unit savings

- Do away with
 - ↳ Wavelength locker
 - ↳ *Using remote node AWG*
 - ↳ Calibration
 - ↳ *Using remote node AWG*
 - ↳ Optical isolator
 - ↳ *Management of reflections*
 - ↳ Cooling
 - ↳ *Operation at elevated temperature*
 - ↳ Packaging
 - ↳ *Integration*



GigaWaM: System-wide tuning algorithm



- VCSEL lasers

- ↳ Continuous tuning

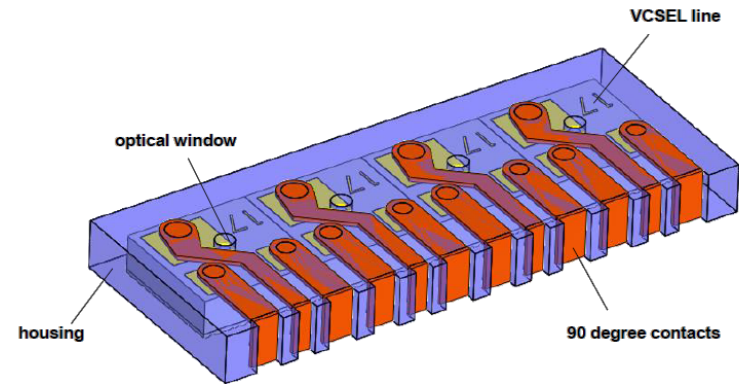
- Tuneable laser

- ↳ Calibration at wake-up
 - ↳ Continuous tuning

GigaWaM Central Office technology

- 64 channel integrated component

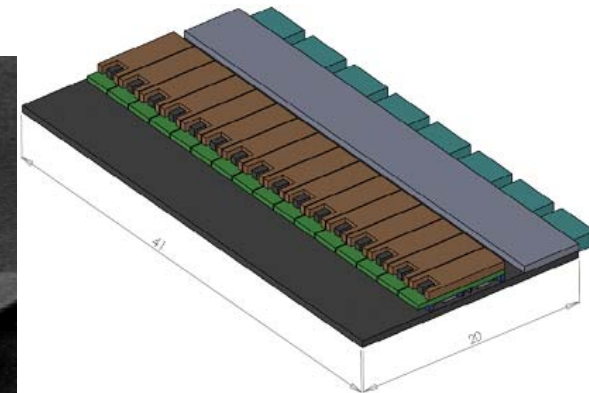
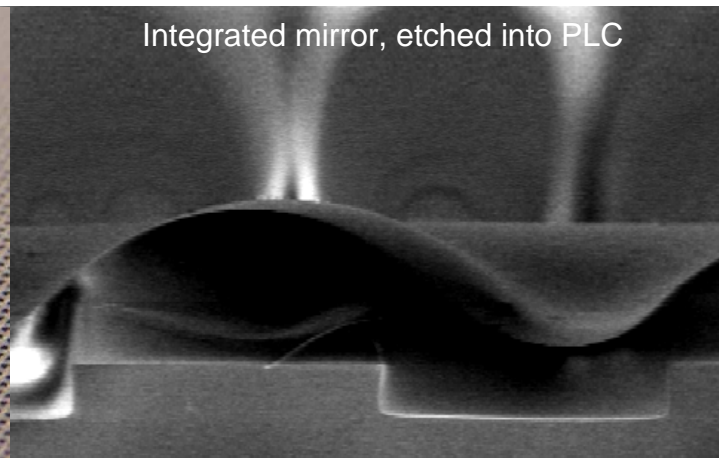
- ↳ Flat-top AWG from IgnisPhotonix
- ↳ Diplexers integrated on PLC
- ↳ VCSELs in modules of 4 or 8
- ↳ Photodiodes, amplifiers in modules on top of PLC



Quad VCSEL transmitter module

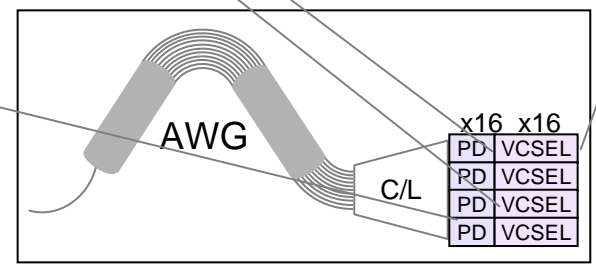
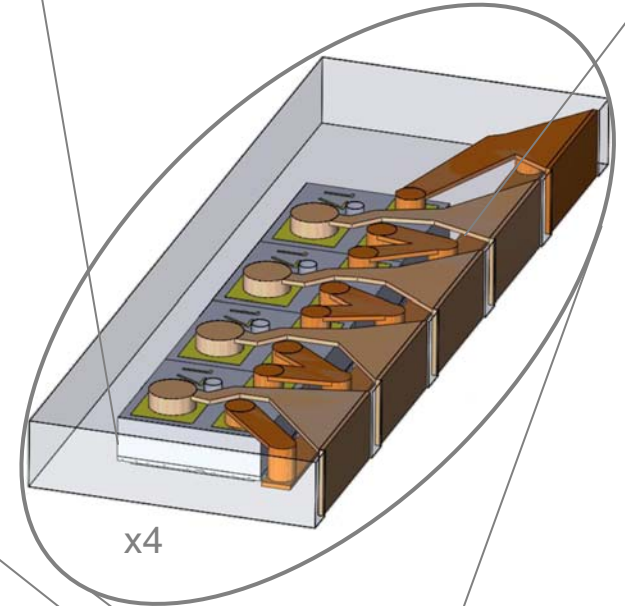
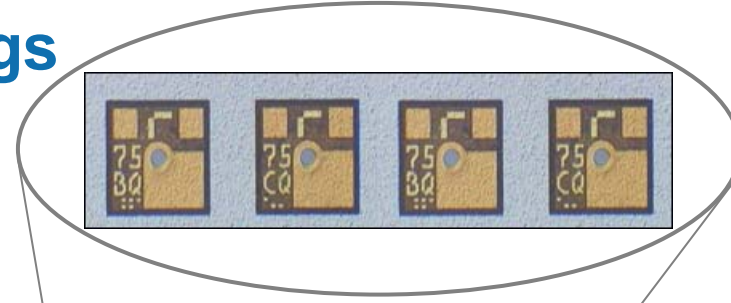
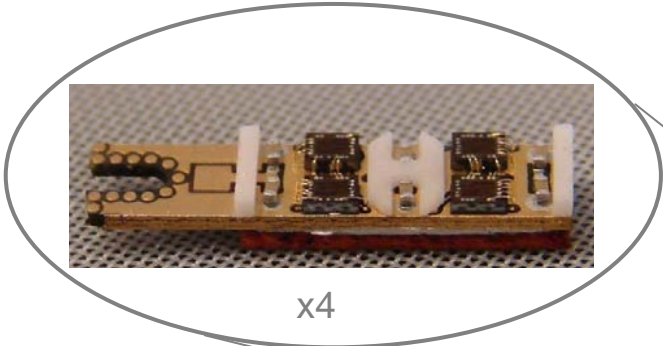


Quad receiver module



GigaWaM: Central Office savings

- Pack into modules
 - ↳ Hierarchical approach to integration
 - ↳ *Testable, functional units*



Thank you for your attention!