Optical Packaging Challenges for Low-Cost, Data-Center Transceivers

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Photonic Integration May Enable Lower Costs, But Not Without Significant Challenges

High data-rates & optical loss budgets place increasing demands on packaging

- Small, compact, high-density designs
- Wide BW, low parasitic RF connections
- High optical coupling efficiency (over temp)
  - Planar-processed waveguides still require coupling to fibers/lasers
  - Challenging with single-mode waveguide tolerances
- Thermal management
  - Low power dissipation
  - Thermal isolation and high thermal conductivity trade-offs
- Hybrid packaging
  - Compatible (incompatible) materials & processes
Features

- Only two WDM filters
- Polarization Multiplexing

Transmittance

Wavelength L0 L1 L2 L3
WDM filter #1

Transmittance

Wavelength L0 L1 L2 L3
WDM filter #2

Estimated coupling loss: 3dB max.
Compact ROSA Design

- LC receptacle
- Collimating lens
- Quad Trans-impedance amplifier (TIA)
- Package
- Mirror
- Flexible Print Circuit (FPC) for DC
- FPC for RF
- Lens array

Thin Film Filter (TFF)-type O-DeMUX

- 4 thin-film filters
- Mirror

Back-illuminated PDs with the monolithic lens

- Monolithic lens
- Chip carrier
- PD chip

Flip chip bonding on carrier
Optical Mux Technology Candidates and Future Prospects for Integration

- Large-sized PLCs
  - Coupler/AWG
    - ~ 7dB/~4dB loss
- Small-sized space coupling
  - Filter/Polarization filter
    - ~ 3dB/~1.5dB loss
- Achieving lower costs is ongoing challenge
  - Trade-off between insertion loss & cost
    - Emergence of 2km- & 500m- links in place of 10km
    - Squeezing $$/dB for anticipated volumes can be problematic
- Historically, wider interfaces ➔ narrower ones
  - Single λ replaces multiple λ
    - More data throughput per lambda
      - Assuming reach is not significantly restricted
Optically Clear ● Wirelessly Agile ● Powerfully Reliable

-THANK YOU-