



**AGILITY**



**Workshop**

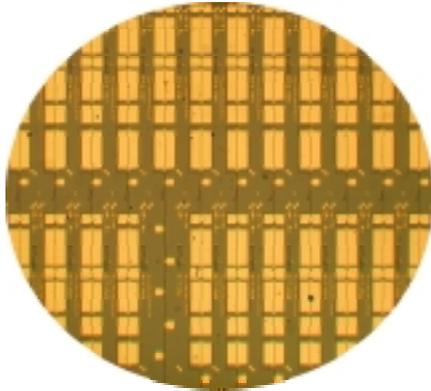
**Data in the Optical Domain**

**Daniel Renner**

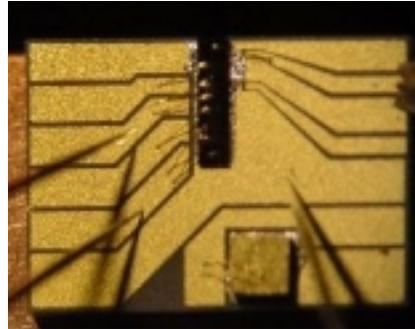
**March 18<sup>th</sup>, 2003**

# Opto-electronic Technologies @ Agility

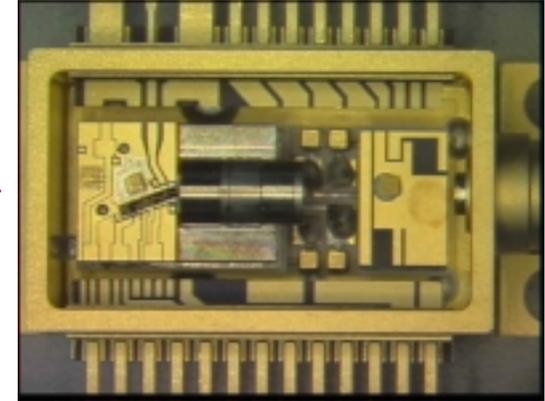
**Chips on Wafer**



**Chip on Carrier (COC)**

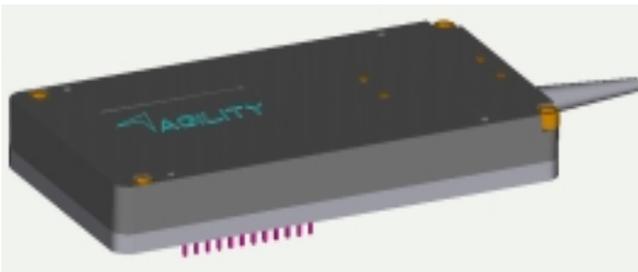


**Hermetic Package**

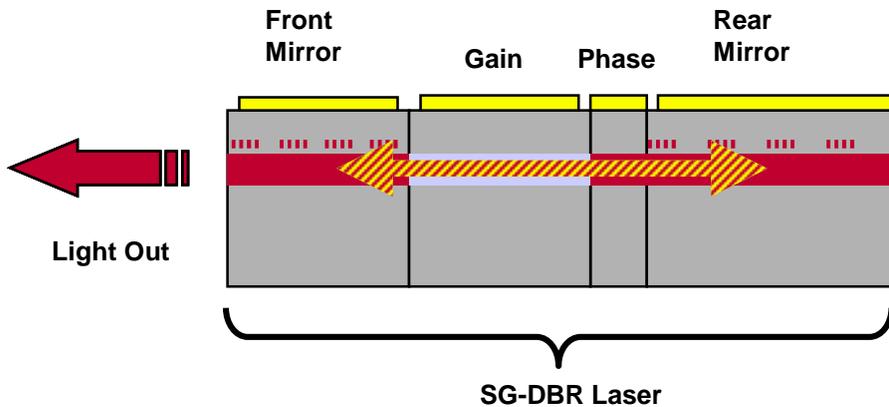


**Package + Control Circuits**

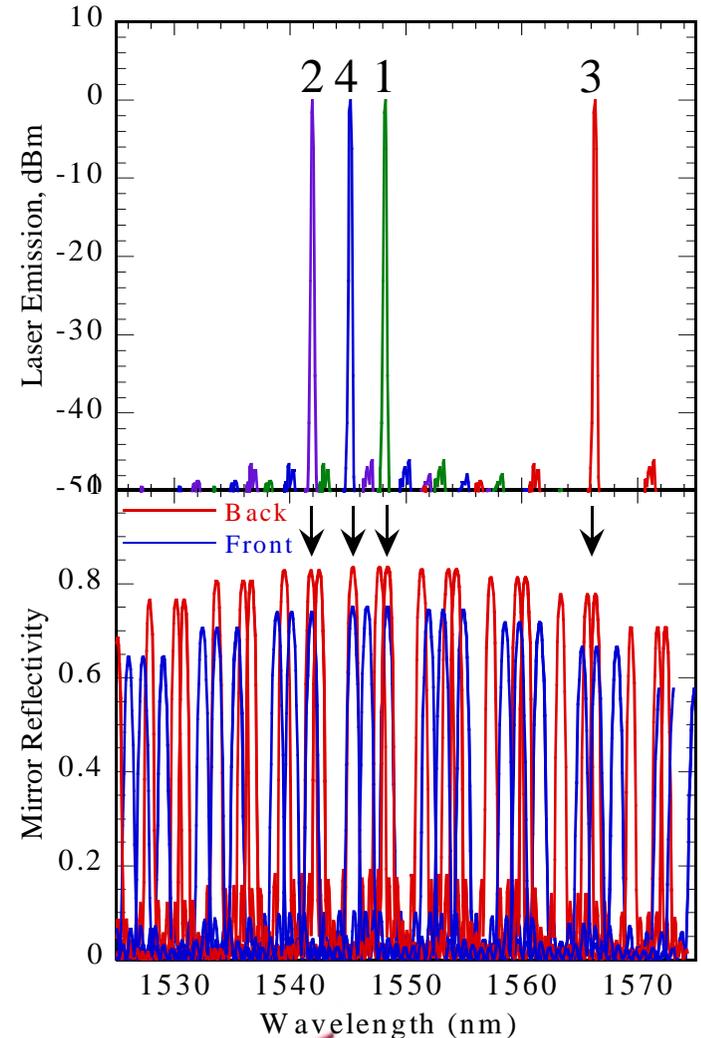
**Optical Transceiver/Transponder**



# Tunable Laser Core Technology

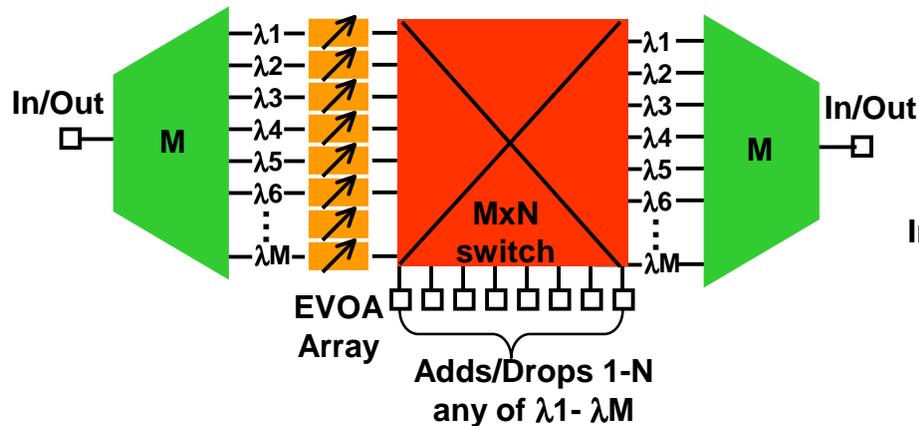


- **Electronic Tuning**
  - No Moving Parts
- **Fast Wavelength Switching**
  - Nanoseconds
- **Monolithic integration platform**
  - InP based PICs



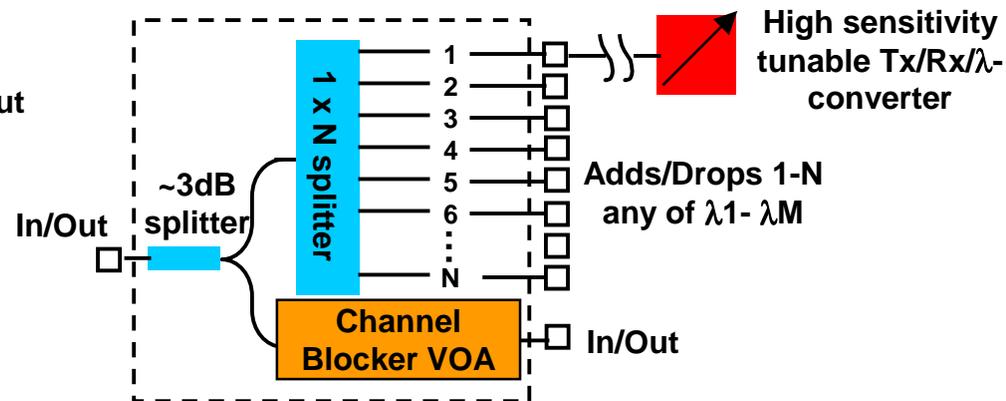
# Fully reconfigurable N port add/drop with M channels – Approaches

## Demux & Switch Approach



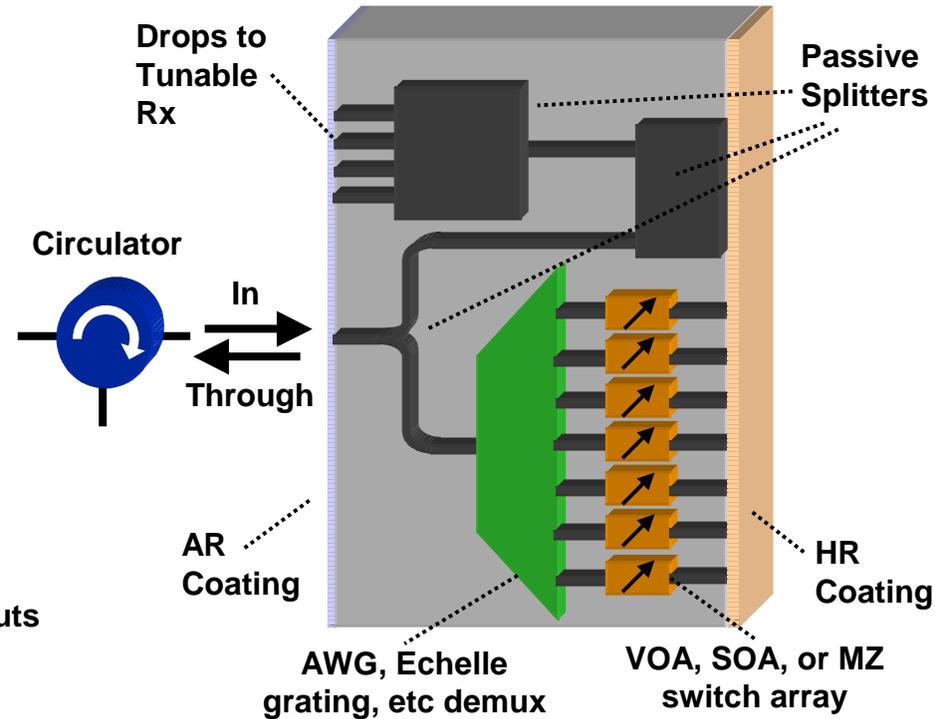
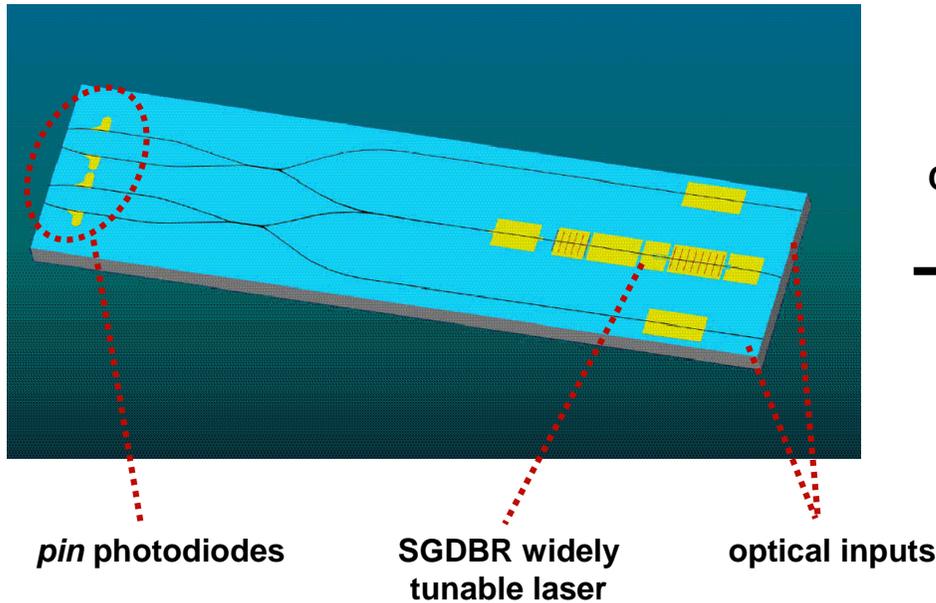
- MxN connectivity required to add/drop to any port
- Switch and demux both grow as channel count grows (independent of add/drop count)
- Without any correlation between add/drop  $\lambda$ 's, 2 NxN switch matrices must be used.
- MxN switch could be replaced with 3-D MEMs M+N type switch but no viable technology/company exists

## Passive Splitter with Tunable Rx/Tx



- Scales well for disparity of channel count compared to add/drop count
- Broadcast type architecture would not need channel blocker
- Integrate passive components and channel blocker on single chip (InP, Si, SiO2/Si)
- Integrated Tx/Rx chips
- High sensitivity receiver compensates for loss in passive splitter (aside from demux+switch typically having >10dB insertion loss)
- Very high speed possible

# Integrated Components For Splitting, Channel Blocking, and Tunable Rx



## ■ Monolithic, InP based coherent receiver

- Low noise parametric gain
- High wavelength selectivity due to filtering at RF vs optical

## ■ Monolithic integration of splitters and channel blocker

- Compact, low cost
- Potential for very high speed and/or optical gain

# Agility Communications

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- **Technology leader in:**
  - InP chip-scale integration
  - Widely tunable lasers
  - Multi-chip module integration / packaging
  - Opto-electronic component control
  - Transceivers / Transponders
  
- **Examples of Technology applications:**
  - Reconfigurable OADMs (ROADMs)
  - Optical line monitors
  - Wavelength converters
  - Multiwavelength 2R and 3R optical regenerators
  - Optical Packet Switching Transmitters