Wavelength Converters

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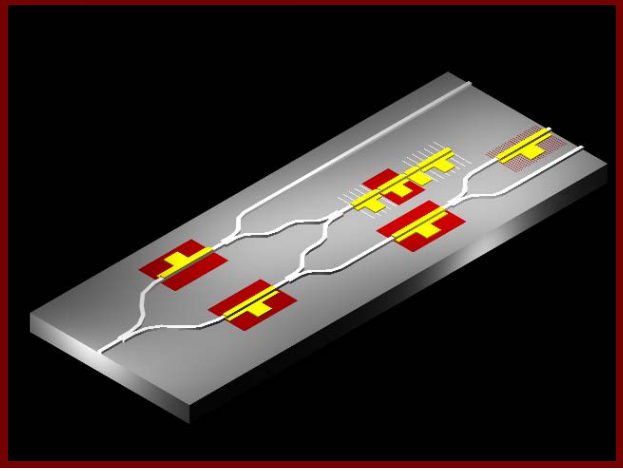
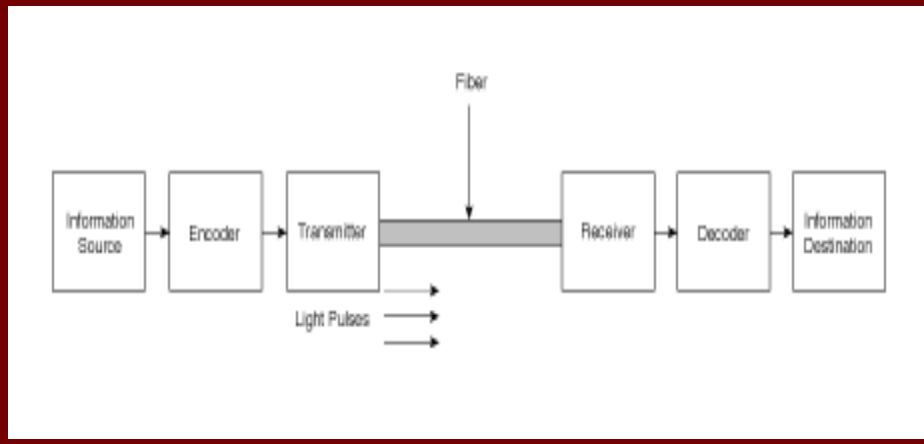
- Funding: D.A.R.P.A.

The Big Picture

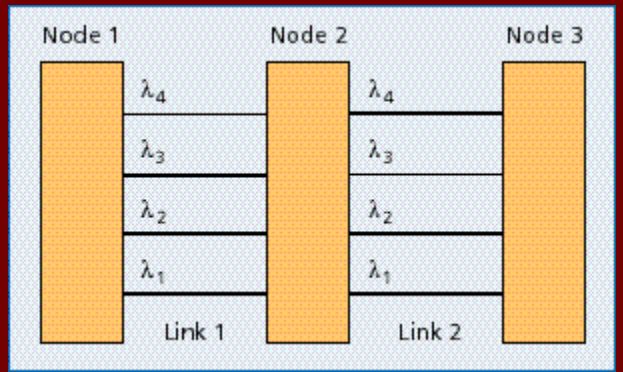
- A **Wavelength Converter** is a device that converts data from one incoming wavelength to another outgoing wavelength.



- They are used in Fiber Optic Communication Systems.



- WDM (Wavelength Division Multiplexing) Networks: Transmit data simultaneously at multiple carrier wavelengths (or equivalently frequency).

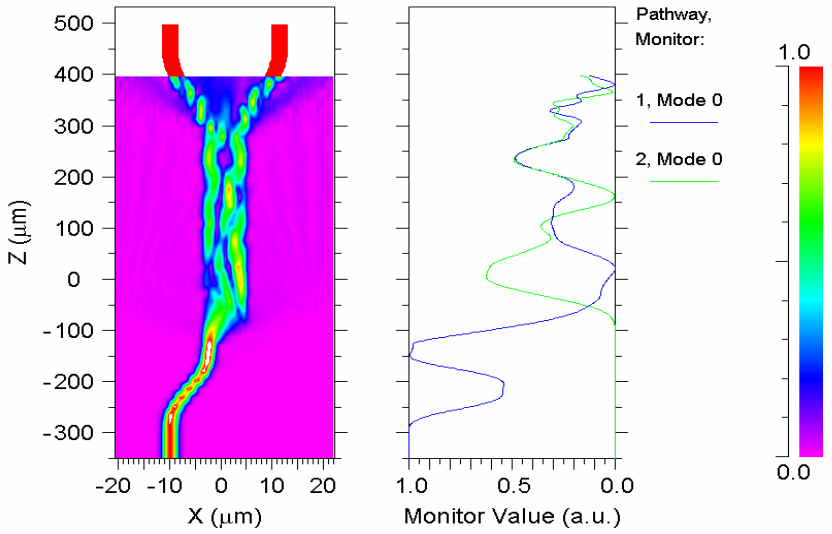


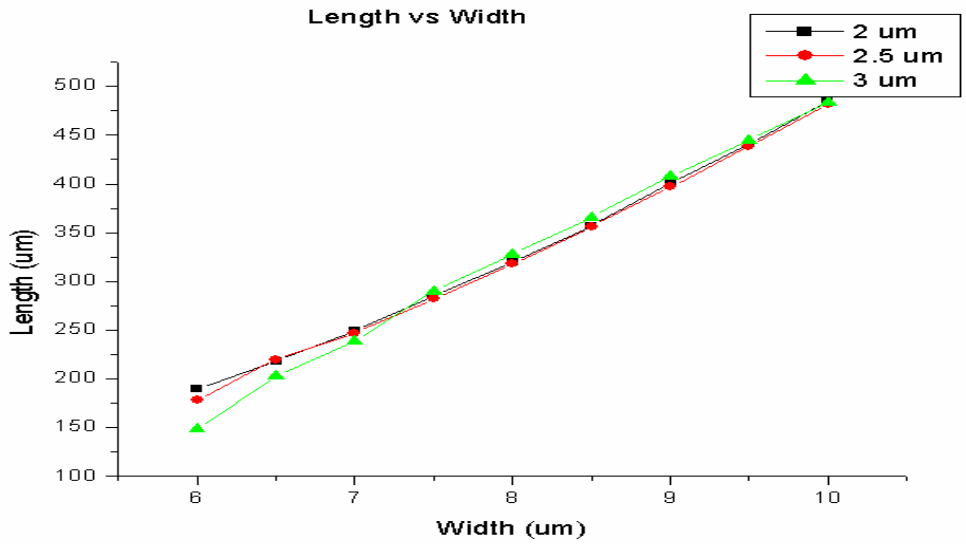
Research Goals and Objectives

- Monolithically integrate widely tunable laser and a wavelength converter.
- Demonstrate that any input wavelength can be converted to any output wavelength.
- Design Multimode Interference (MMI) Devices (Optical Splitter).
- Test devices for optimization.

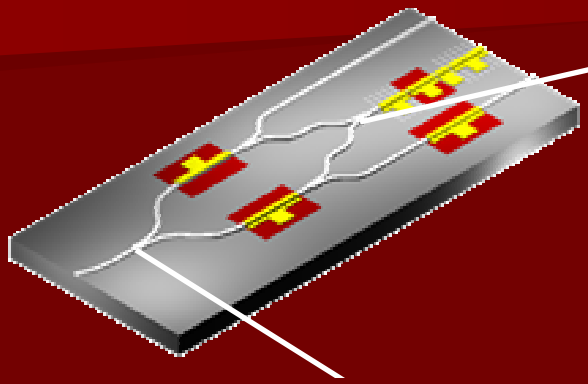
BeamProp Simulation and Data

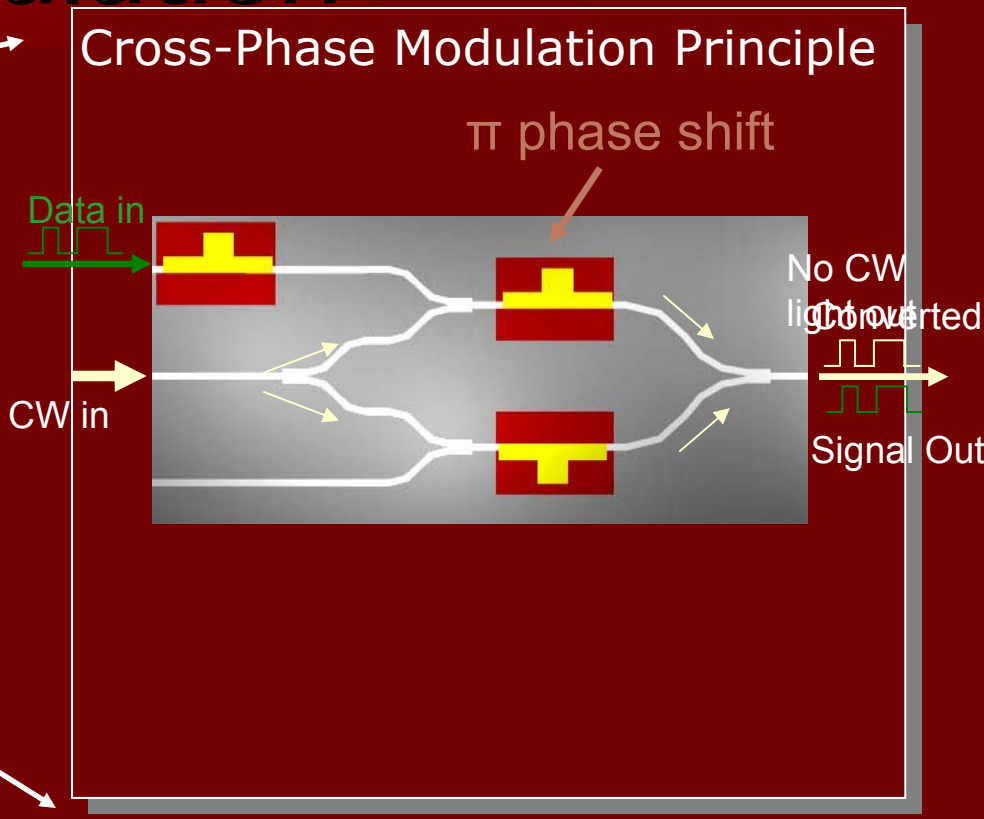
- This software monitors light through a chosen pathway.
- Vary width and length to minimize device area.
- Look for 50% output on each arm.
- Waveguide end tapered to eliminate coupling.





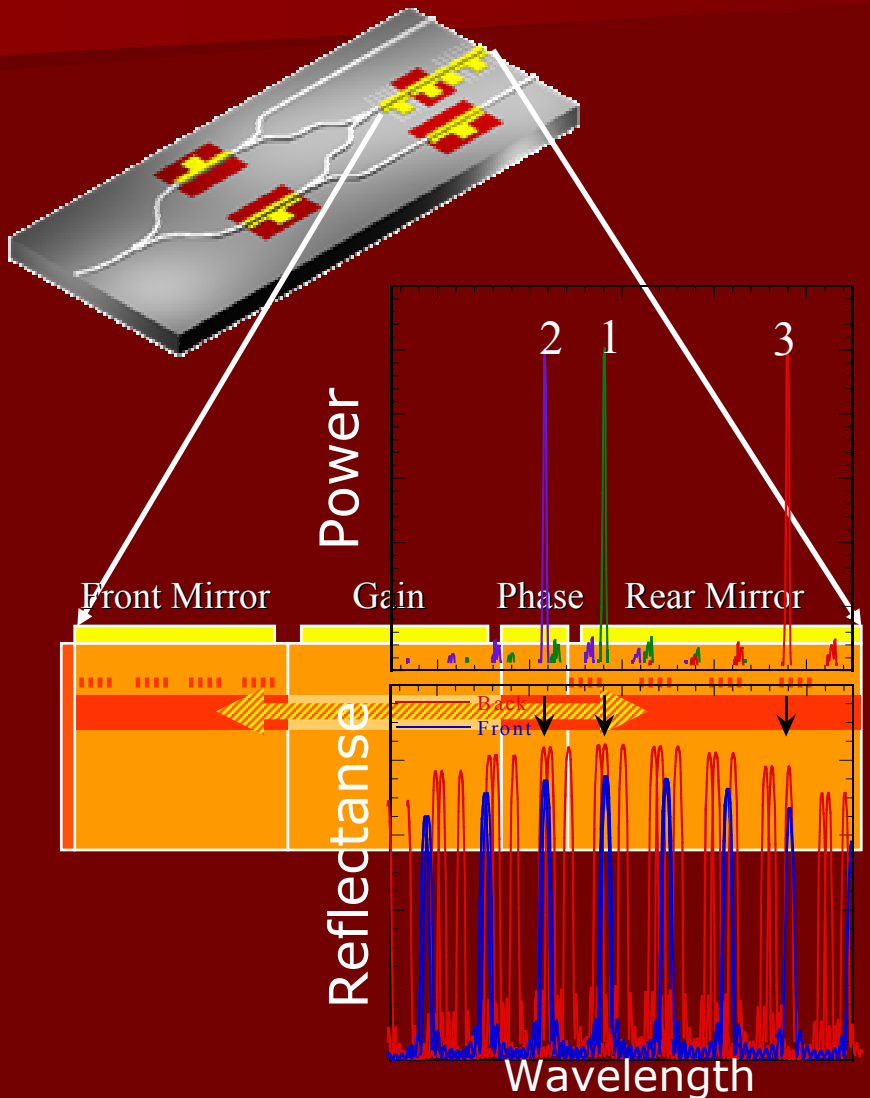
Interferometer - cross phase modulation





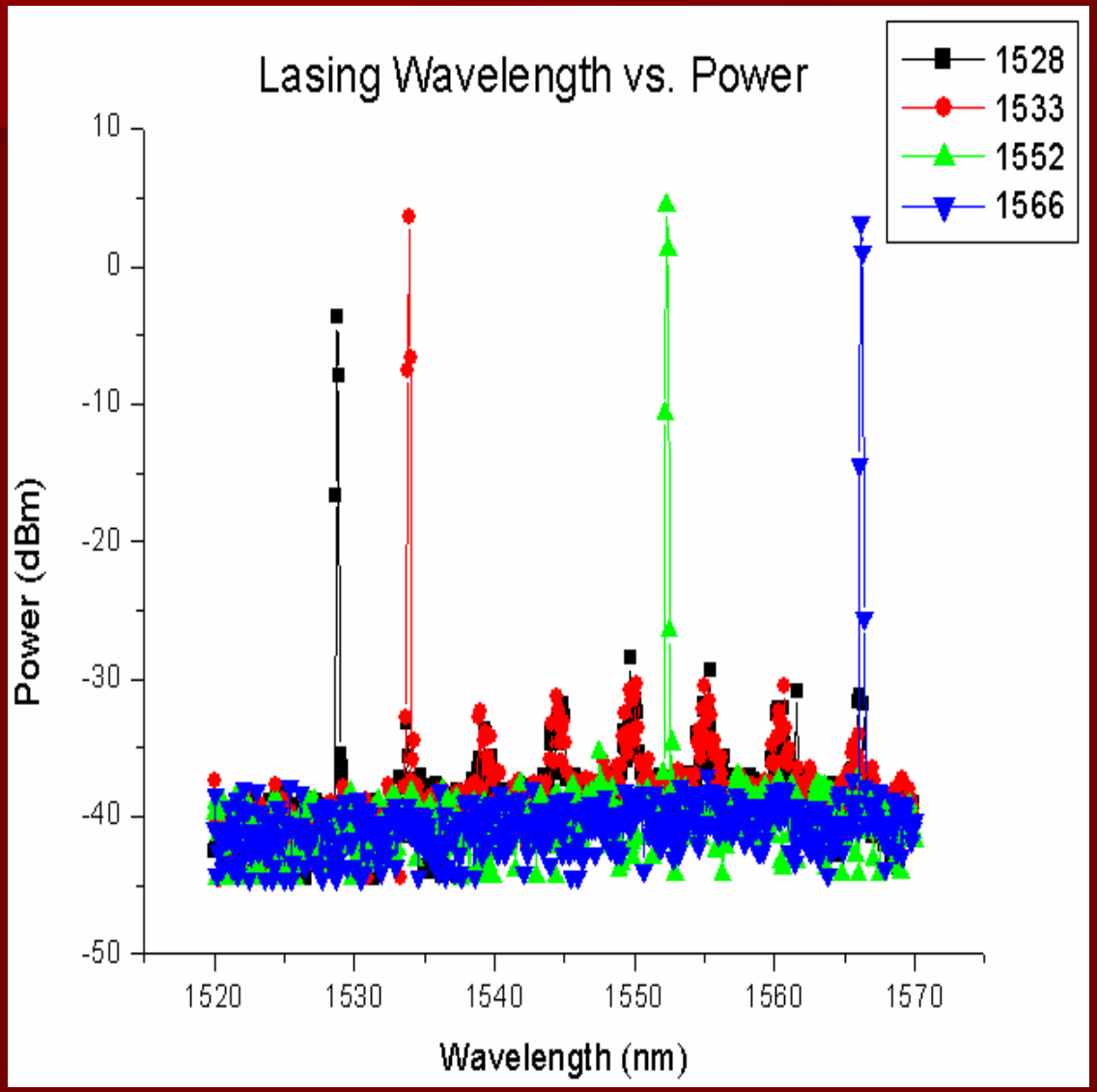
- Semiconductor optical amplifiers used to achieve π phase shift
- Incoming data disturbs phase balance
  $\Rightarrow$ data conversion

Laser Tuning and Reflection Spectrum



- Changing the current in each mirror changes it's index.
- We make use of the reflection spectra to observe the periodic mirror maxima.
- Inducing small index changes in one mirror relative to the other causes adjacent reflectivity maxima to come into alignment.
- Lasing occurs at the pair of maxima that are aligned.

Laser Tuning



I:Front Mirror	I:Back Mirror	Wave-length
(mA)	(mA)	(nm)
24	**20**	**1528**
21	**20.2**	**1533**
4	0	1542
24	**3.7**	**1552**
0	0	1559
3	**20**	**1566**

Future Plans

- Test devices to observe successful wavelength conversion.
- Observe errors in data transmission using the BER detector.
- Test the devices at 40 Gbps (Gigabits per second)

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