



Ring filter and Wavelength Division Multiplexer (WDM)

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Outline



I. Motivation

II. CQDs Achievements and Present Activity

III. Future Work and Conclusions



Motivation for Ring filter and WDM



- **WDM Network**

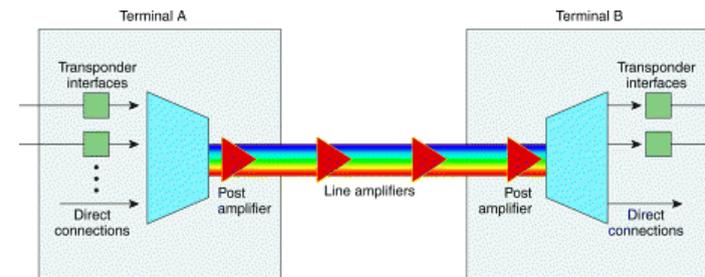
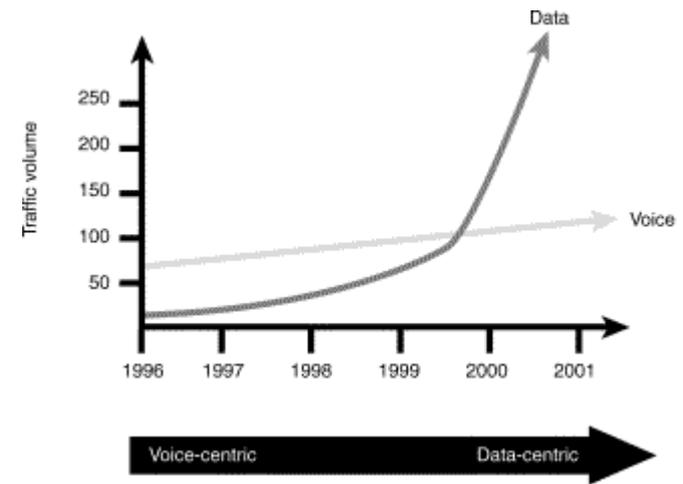
Bandwidth demand increase dramatically with the explosion of internet. WDM technology is the only way to meet the huge bandwidth based on the existing fiber network infrastructure. WDM optical network is expanding to MAN and LAN, Even further to Home.

- **All optical Network**

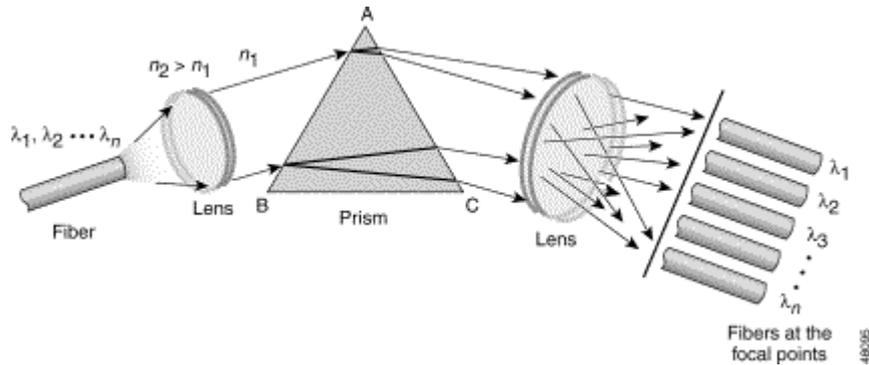
All optical network without the optical –electronic– optical signal transfer will overcome the bottleneck of electronics, and increase the bit rate dramatically.

- **Integration of optical components**

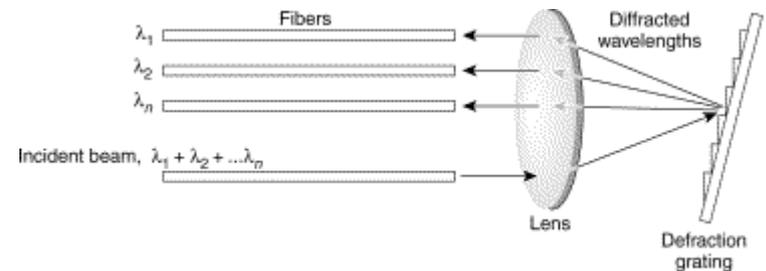
Integration of major optical function on single chip will reduce the cost dramatically.



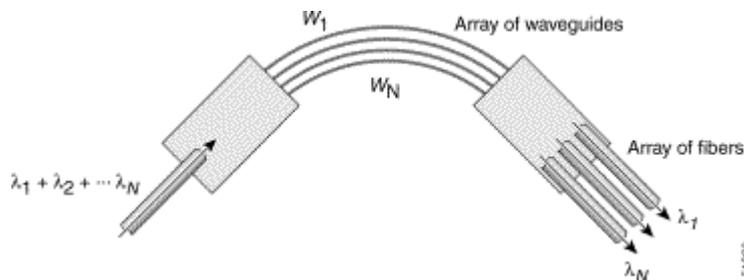
Prism Refraction Demultiplexing



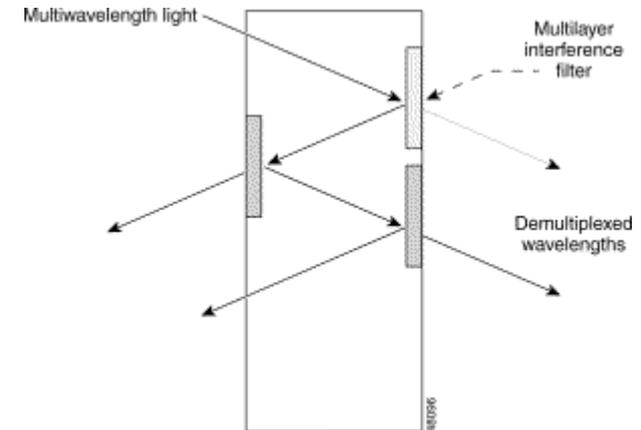
Waveguide Grating Diffraction



Arrayed Waveguide Grating

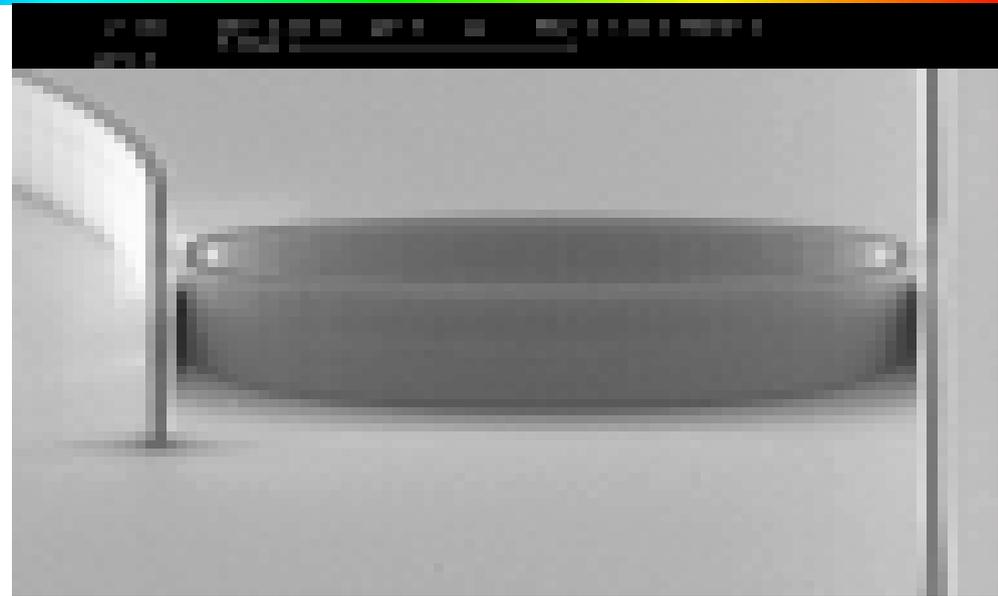


Multilayer Interference Filters



Resonant condition:

$$2\pi r = n\lambda$$



Advantage of ring filter

- Very easy to be integrated with the active device
- Compact
- Single Wavelength selectivity.
- Easy to select or drop any wavelength.
- Scalability

Problem of ring filter

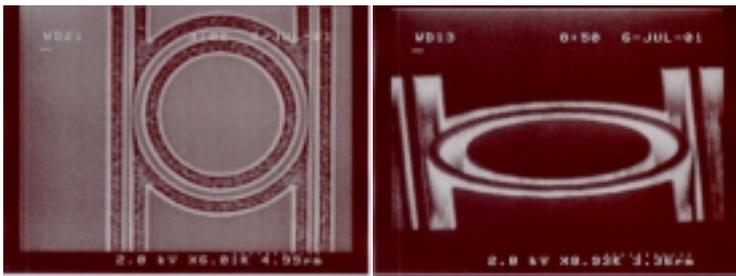
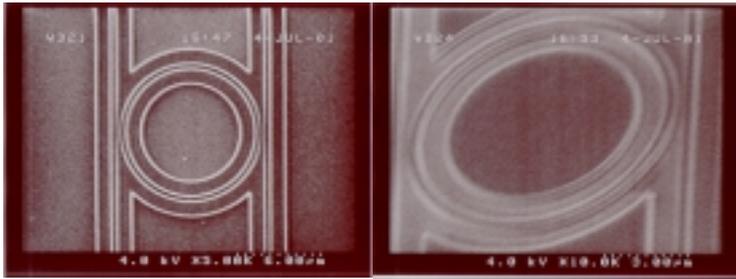
- Tuning ability and wavelength calibration.
- Insertion loss
- Polarization dependent loss.
- Integration with active device.



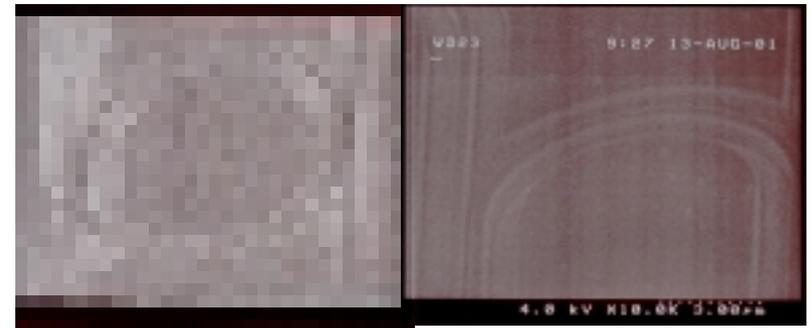
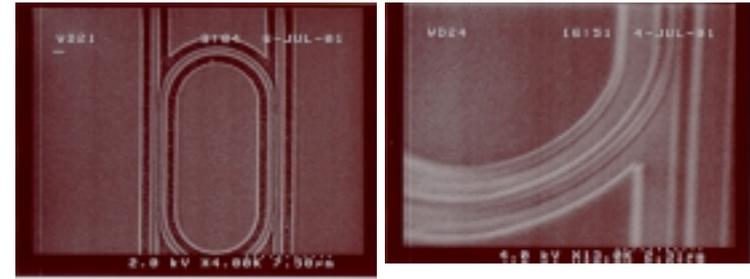
CQDs Achievements: Single Ring and Race track Filter



Ring Filter (200nm gap)



Race-track Filter (200nm gap)

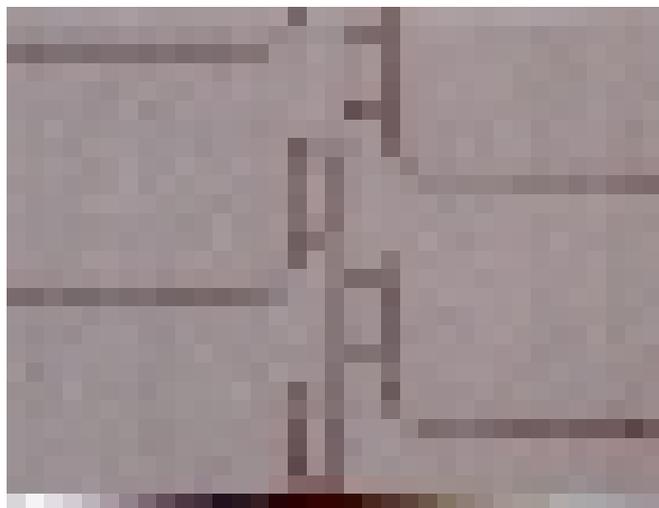




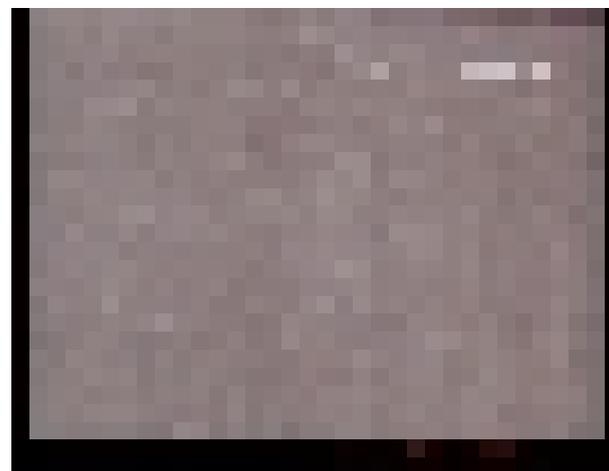
CQDs Achievements: MUX/DEMUX



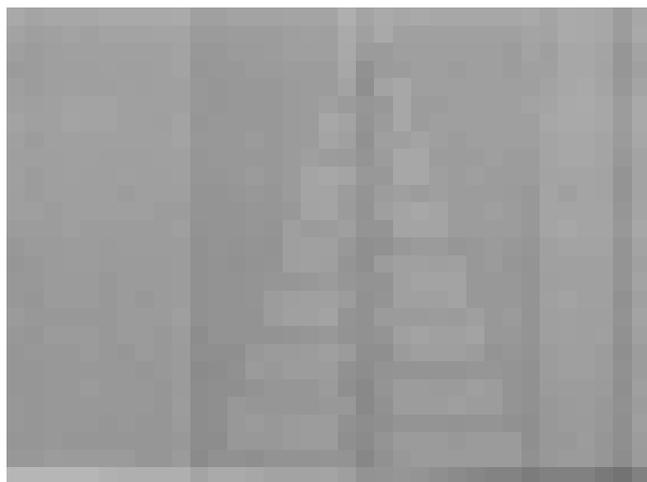
1x4 MUX/DEMUX



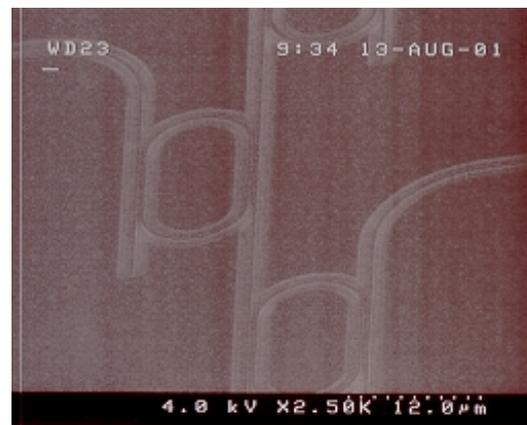
1x8 Mux/DEMUX



1x16 MUX/DEMUX

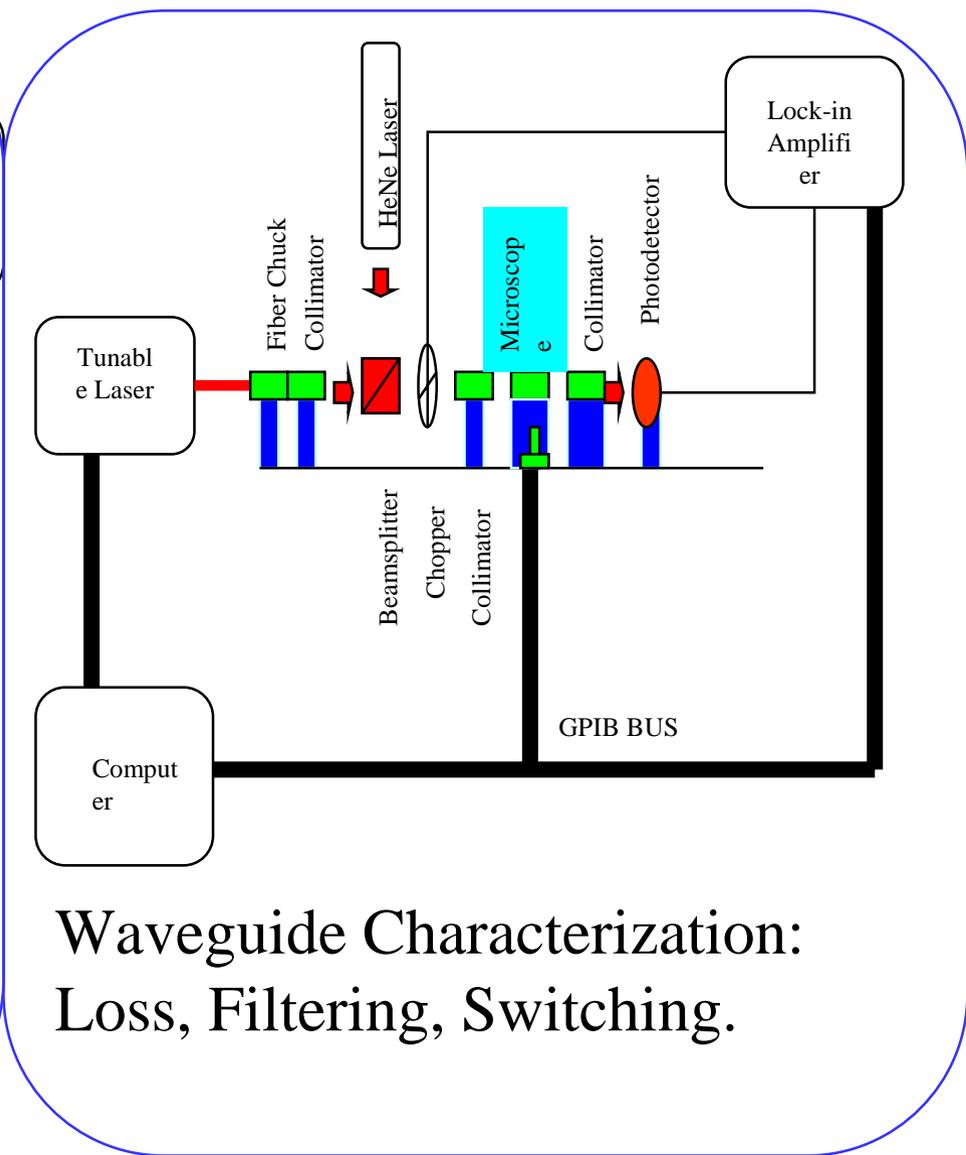
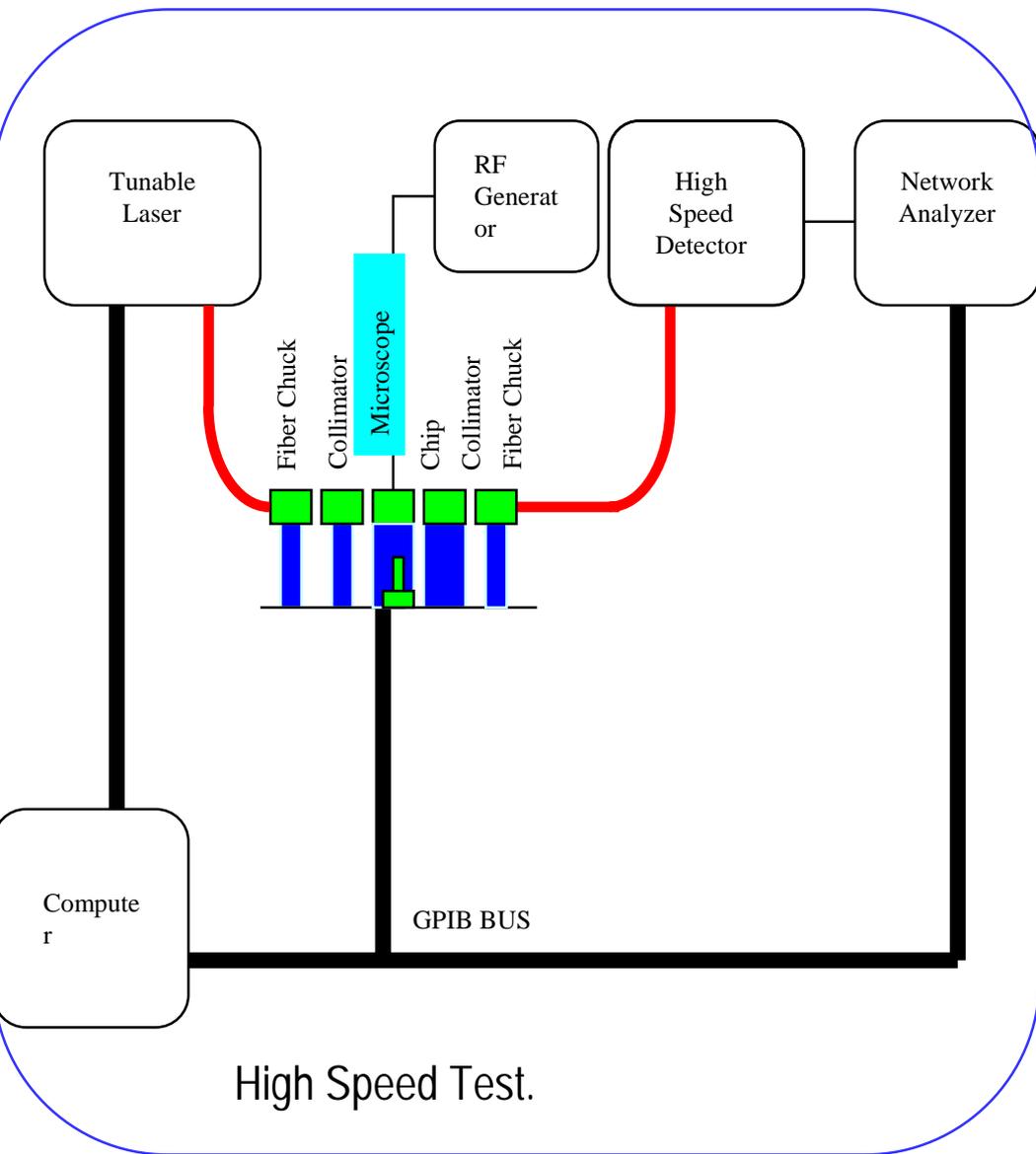


1x2 MUX/DEMUX





CQDs Achievements: Passive device testing setup





CQDs Achievements: Processing

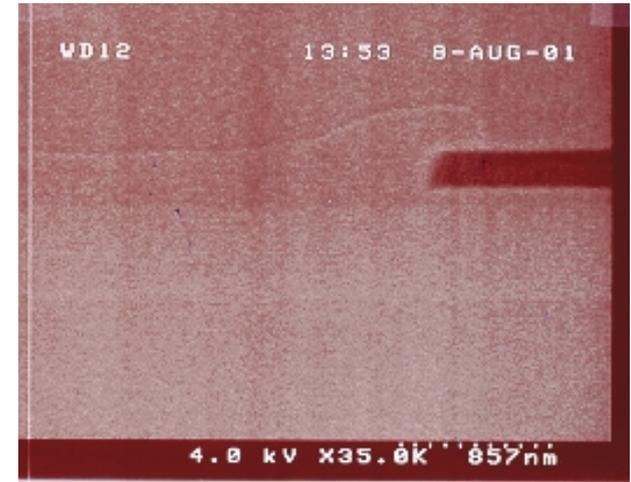
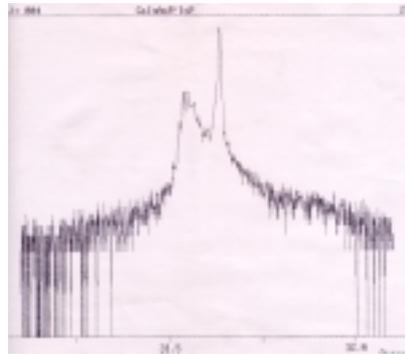


MOCVD: InP/InGaAsP Waveguide and Quantum Well Laser Structure.

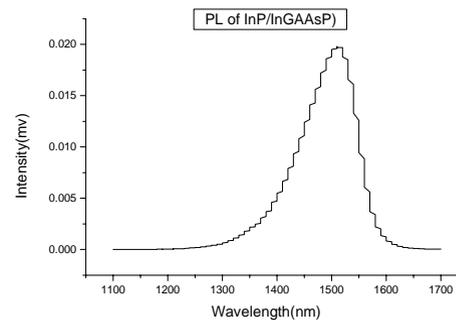


EffereI MOCVD

X-Ray Structure Analyzing



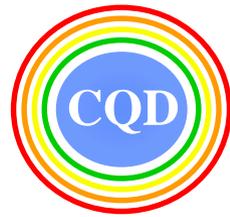
Photoluminescent



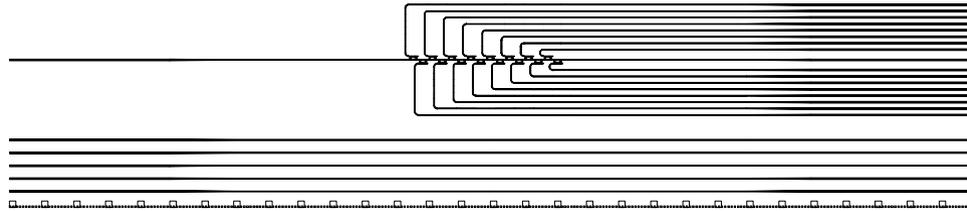
Selective Regrowth



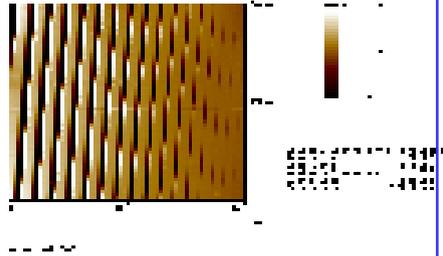
CQDs Achievements: Processing



Patterning

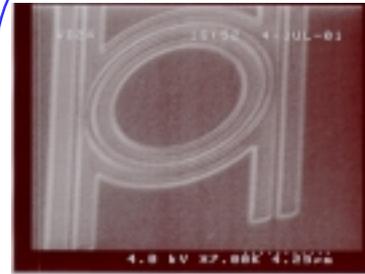


E-Beam Lithography



AFM Image of E-beam
Lithography Linewidth

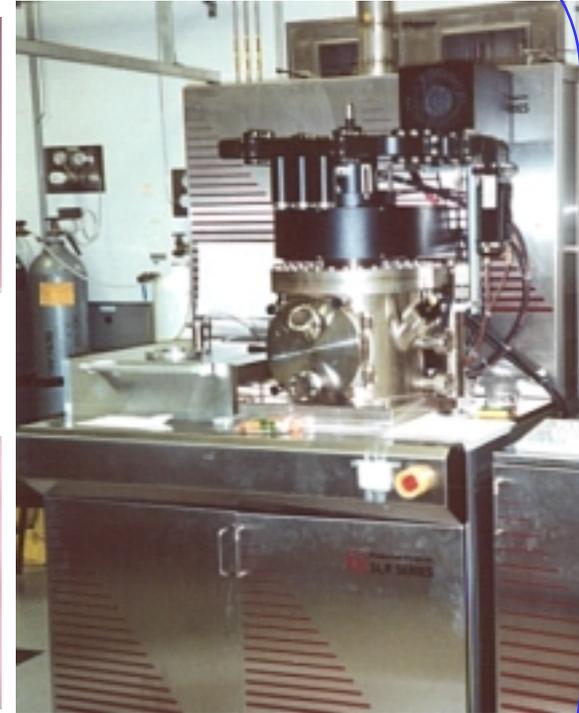
Dry Etching



SiO2 Etching

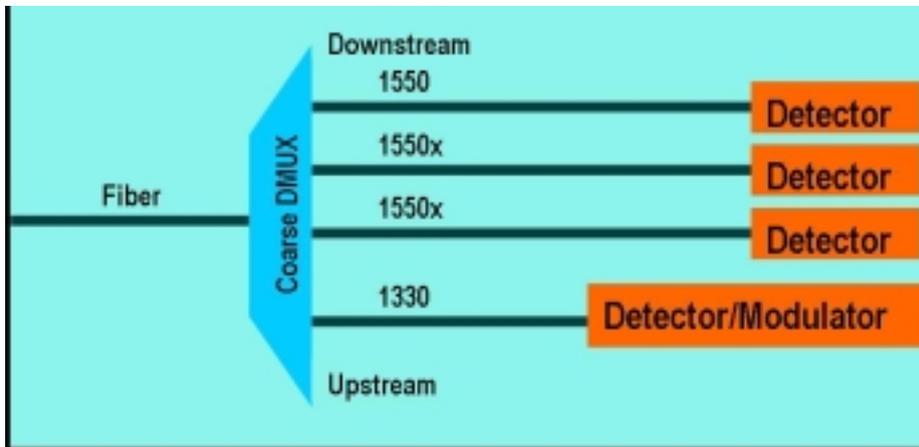


InP-Etching

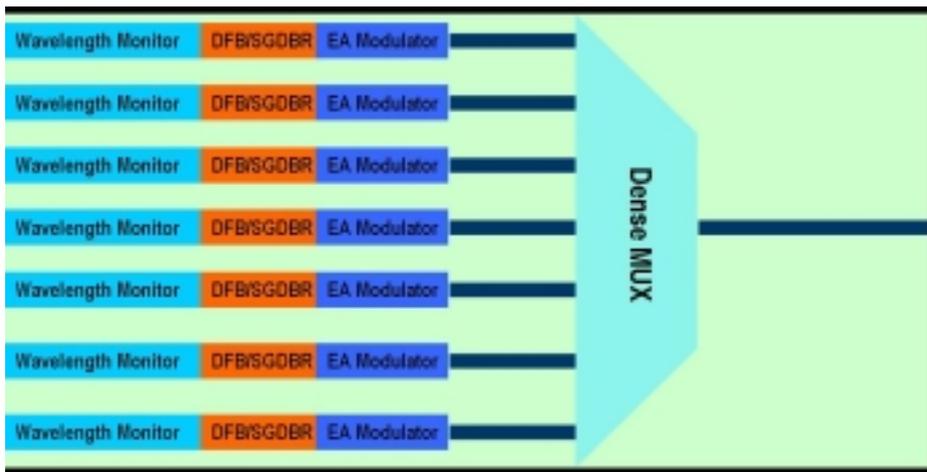


Plasma Thermal ECR

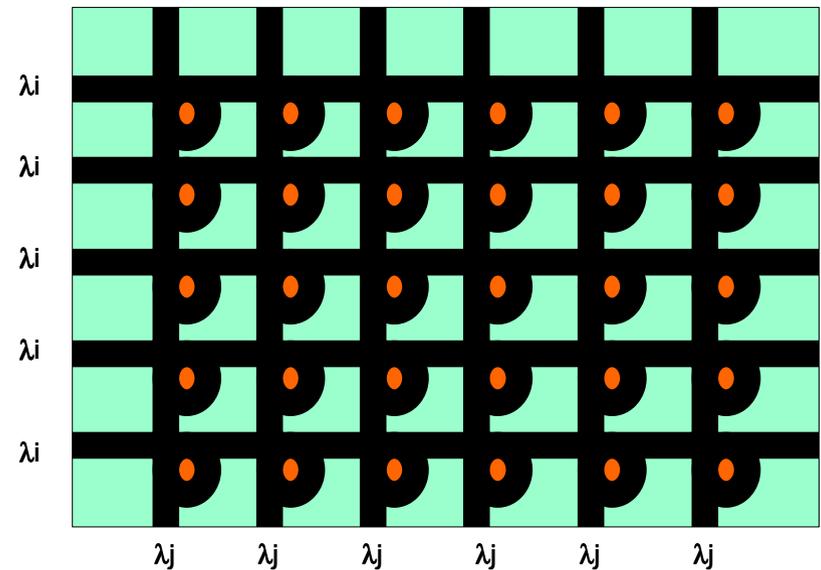
Cable TV Transceiver Module.



Transmitter and modulator for AON.



Switching Center.





Future Work and Conclusion



- I. Tuning ability of the ring filter
- II. Working house WDM based on ring filter.
- III. Integration of DFB Laser, Modulator, combiner.
- IV. Homodyne and heterodyne detector chip.
- V. Waveguide routing and integration.