



UCSB



Nano Photonics Lab




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Quantum Key Distribution (QKD) Using a Semiconductor Single Photon Source (SPS)

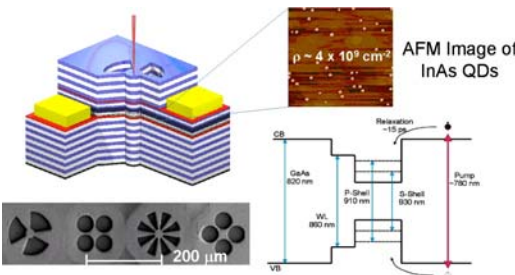
Will Walden-Newman
PEP/Nanophotonics Laboratory
May 6, 2009

Samples and Experimental Set-Up



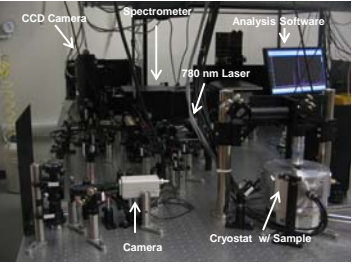
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InAs Quantum Dots (QDs)

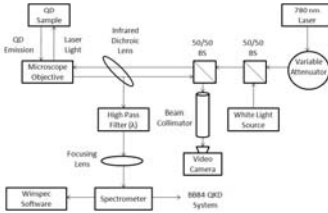


Strauf et al., Nature Photonics 1, 704 (2007), cover story

QD μPL System



- Samples grown by molecular beam epitaxy at UCSB
- QDs act as a 2-level system
- μPL setup can successfully characterize an SPS for QKD



Measurements and Application

Results

Quantum Cryptography

Advantages and Future Activities

Secure Commercial Product

QKD systems used in Companies and Start-Ups:
 Toshiba, HP Labs, IBM, NIST, Bell Labs / Alcatel,
 Mitsubishi, NTT, NEC, SmartQuantum, Quintessence Labs

<http://www.idquantique.com>

<http://www.magiqtech.com>

Estimated Market Size [2]:
 \$30m by 2008, \$300m by 2015
 \$3b by 2030 (Annual doubling)

Problem: Use Attenuated Lasers: Not Secure!

BB84 QKD System

- Transmit a quantum key between sender (Alice) and receiver (Bob)
- Use SPS and an H/V polarization modulator for base selection
- Implement a full QKD system using this high-frequency SPS with world-record performance.

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