

A closer look at some 850nm serial PMD specifications

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Outline

New Focus 10GBASE-SX module

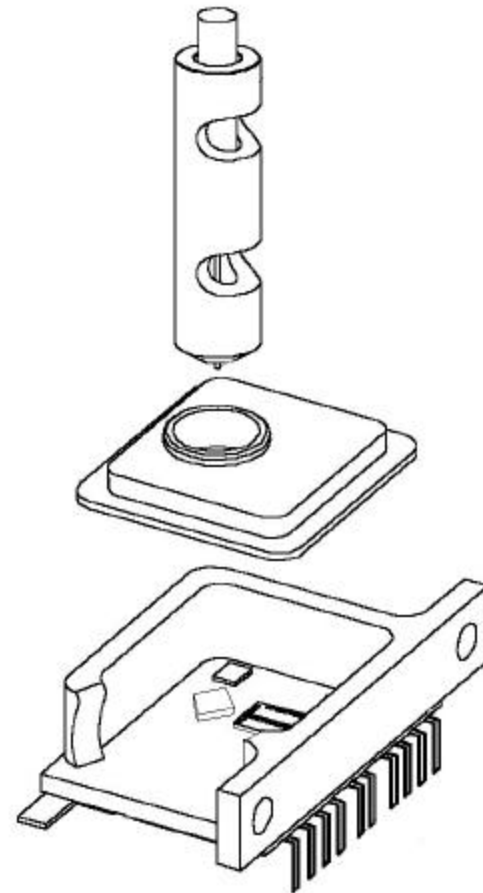
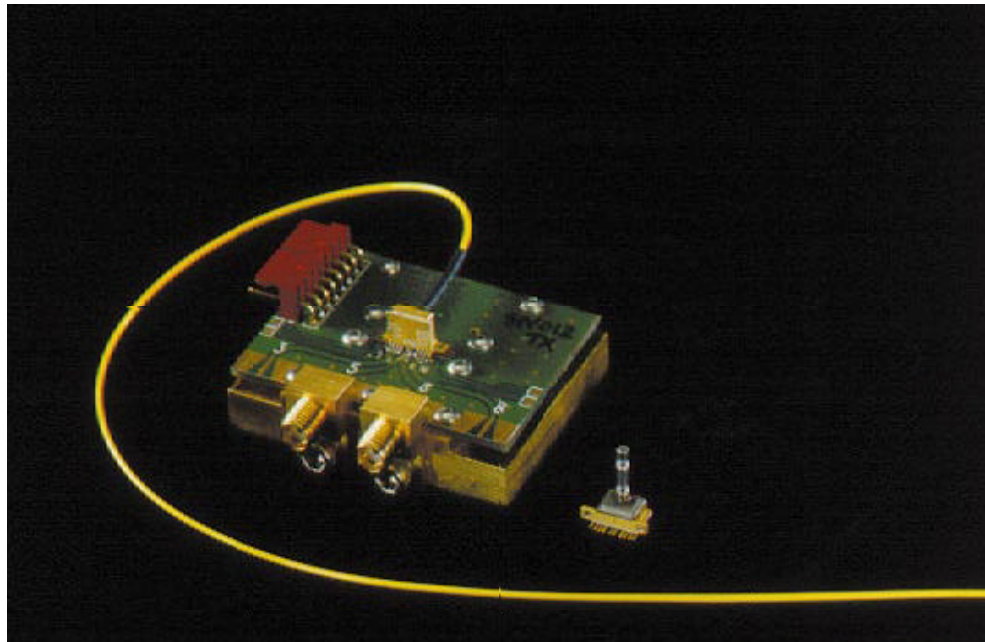
VCSEL specifications

Receiver specifications

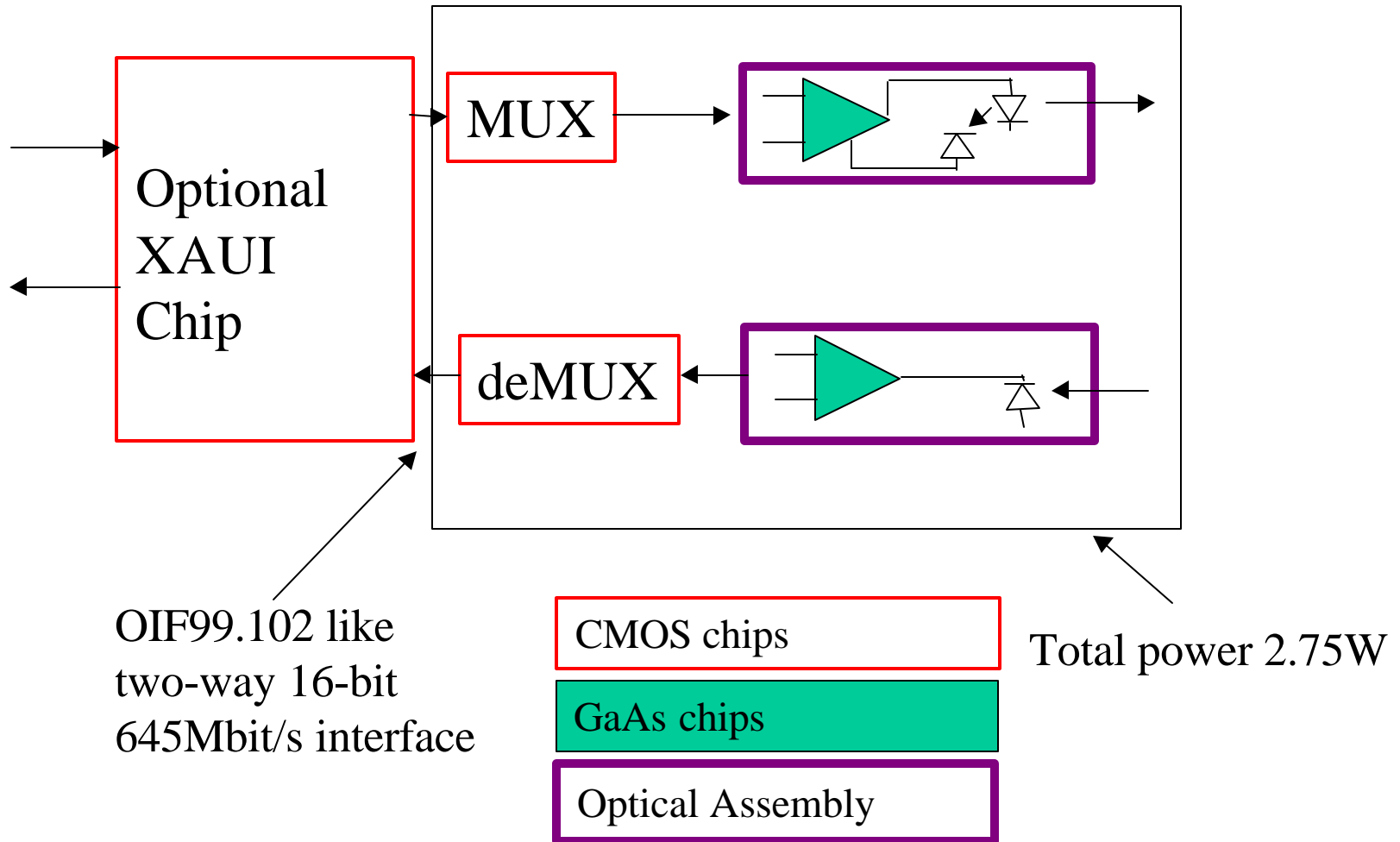
Cost issues

Summary

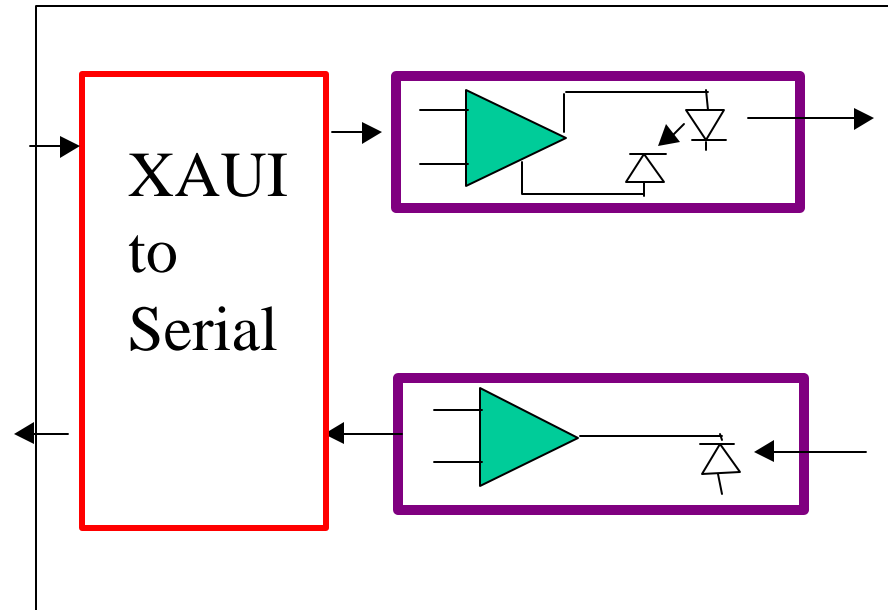
New Focus 850nm serial datalink



Implementation for next 12 months



Implementation - Early '01



CMOS chips

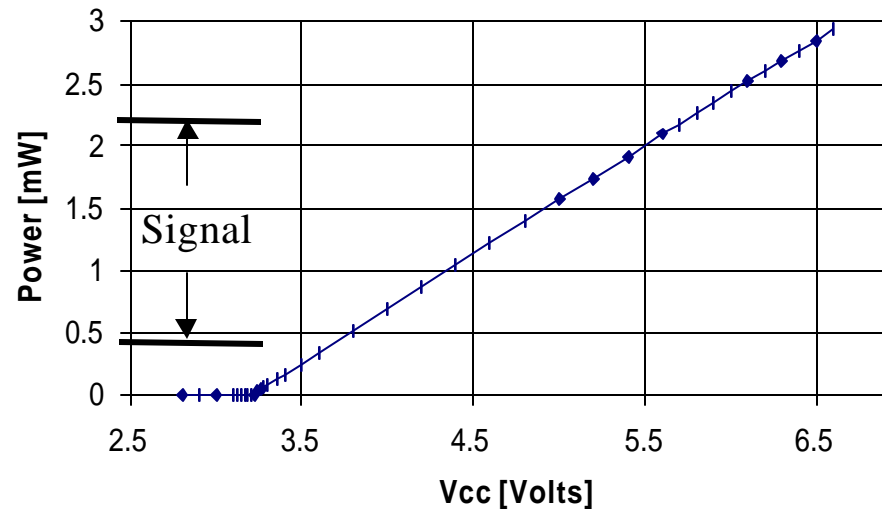
SiGe chips

Optical Assembly

VCSEL info

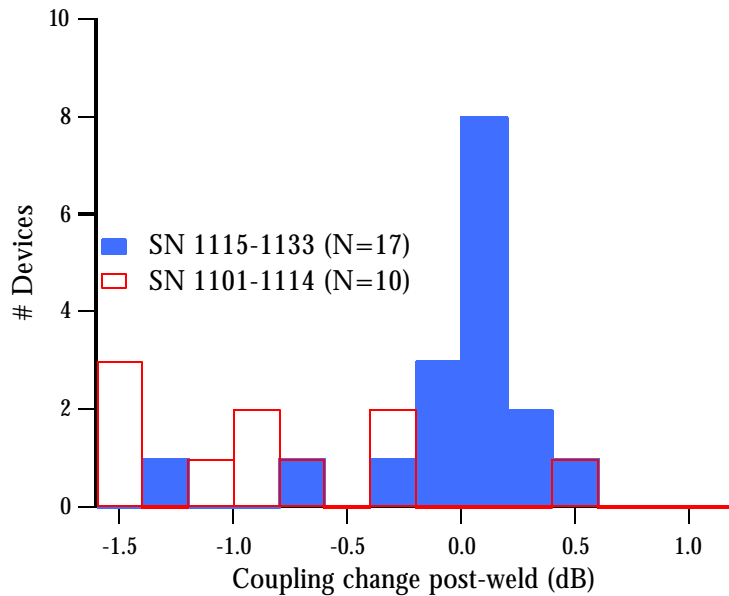
- We use 10 μ m Oxide VCSEL
- Reliability found to be “at least as good as proton devices”
- Operating far from roll-over point
- Other types, diameters work at 10G (Cielo, Picolight)

VCSEL power vs. Driver Chip Voltage

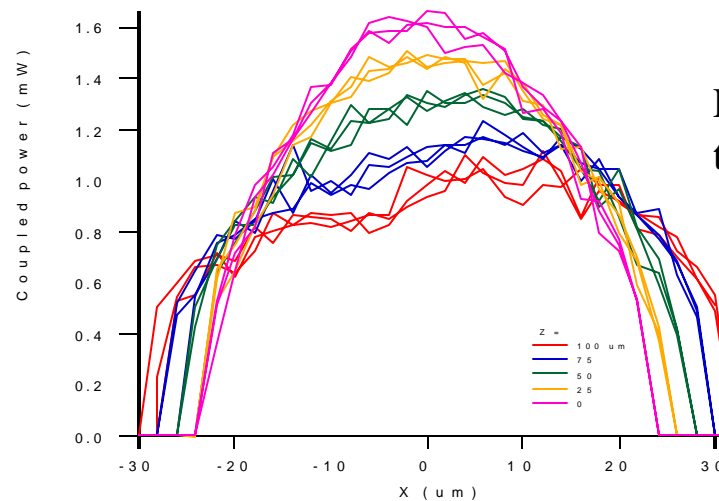
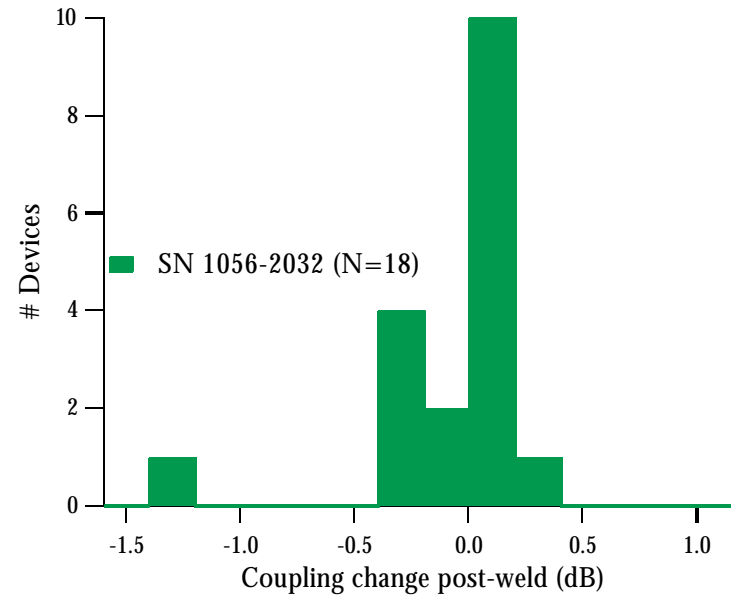


Fiber coupling results

Transmitter builds

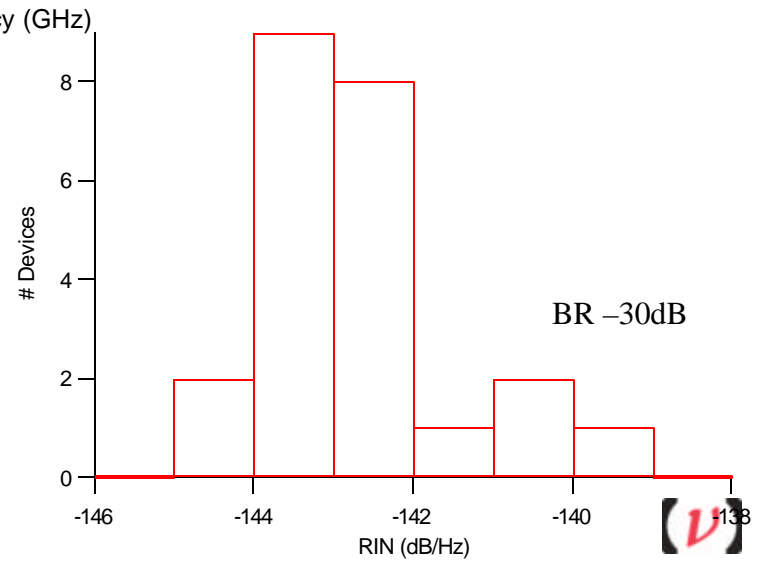
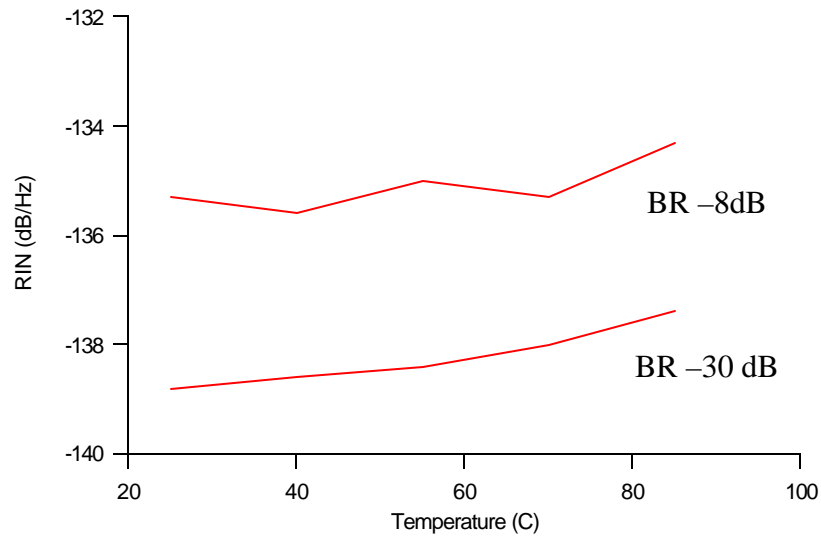
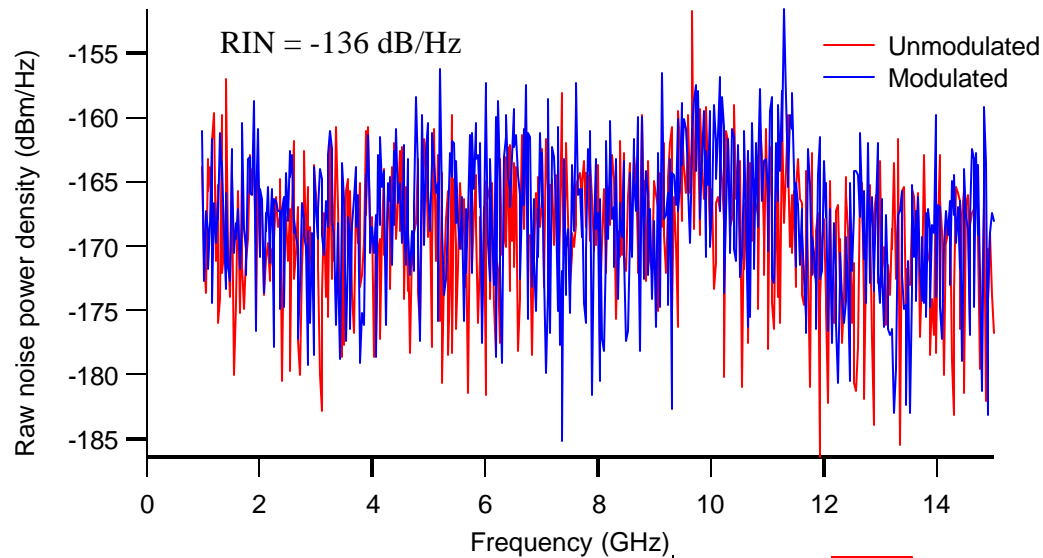


Receiver builds

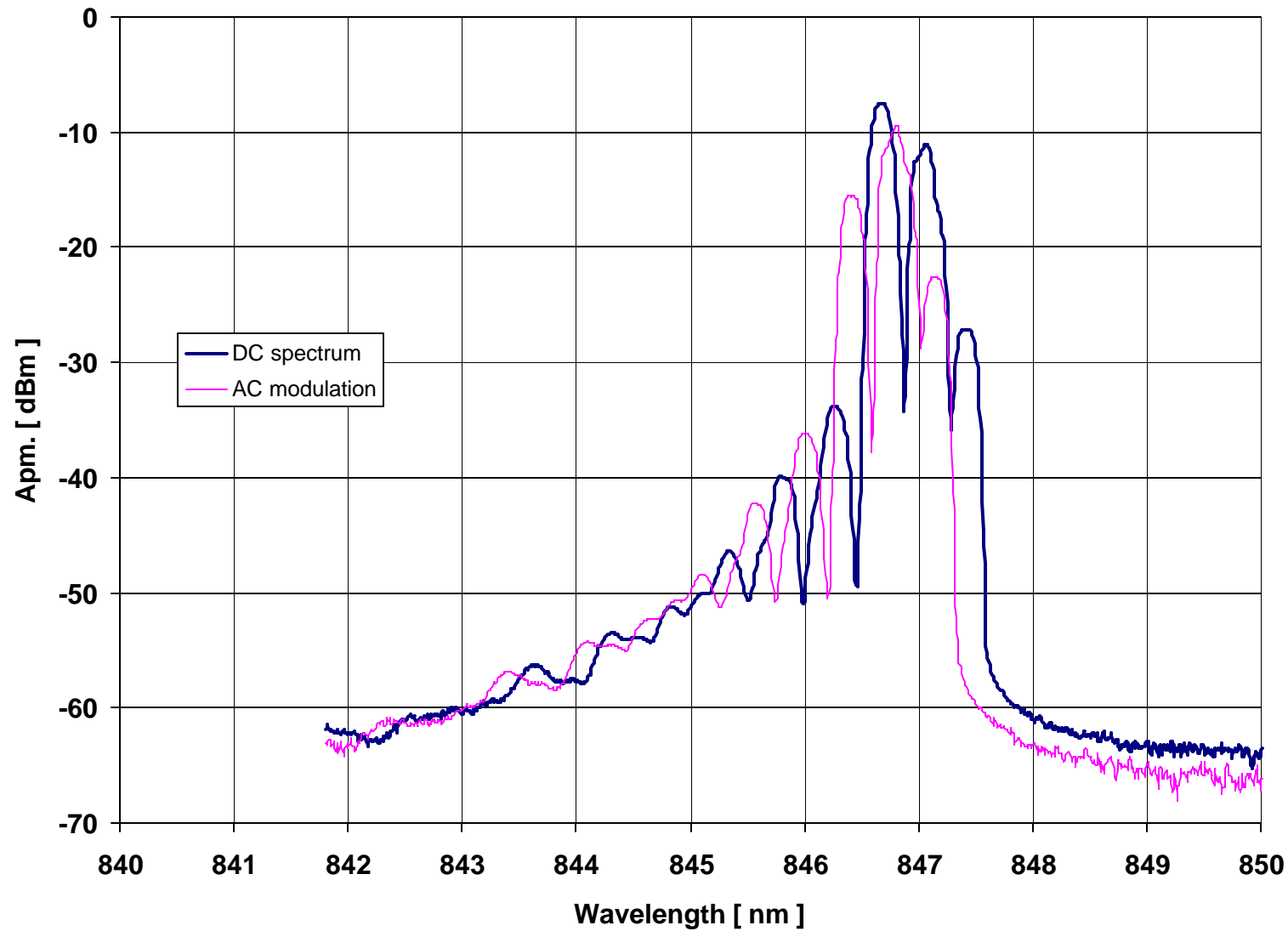


Lensed fiber coupling to VCSEL

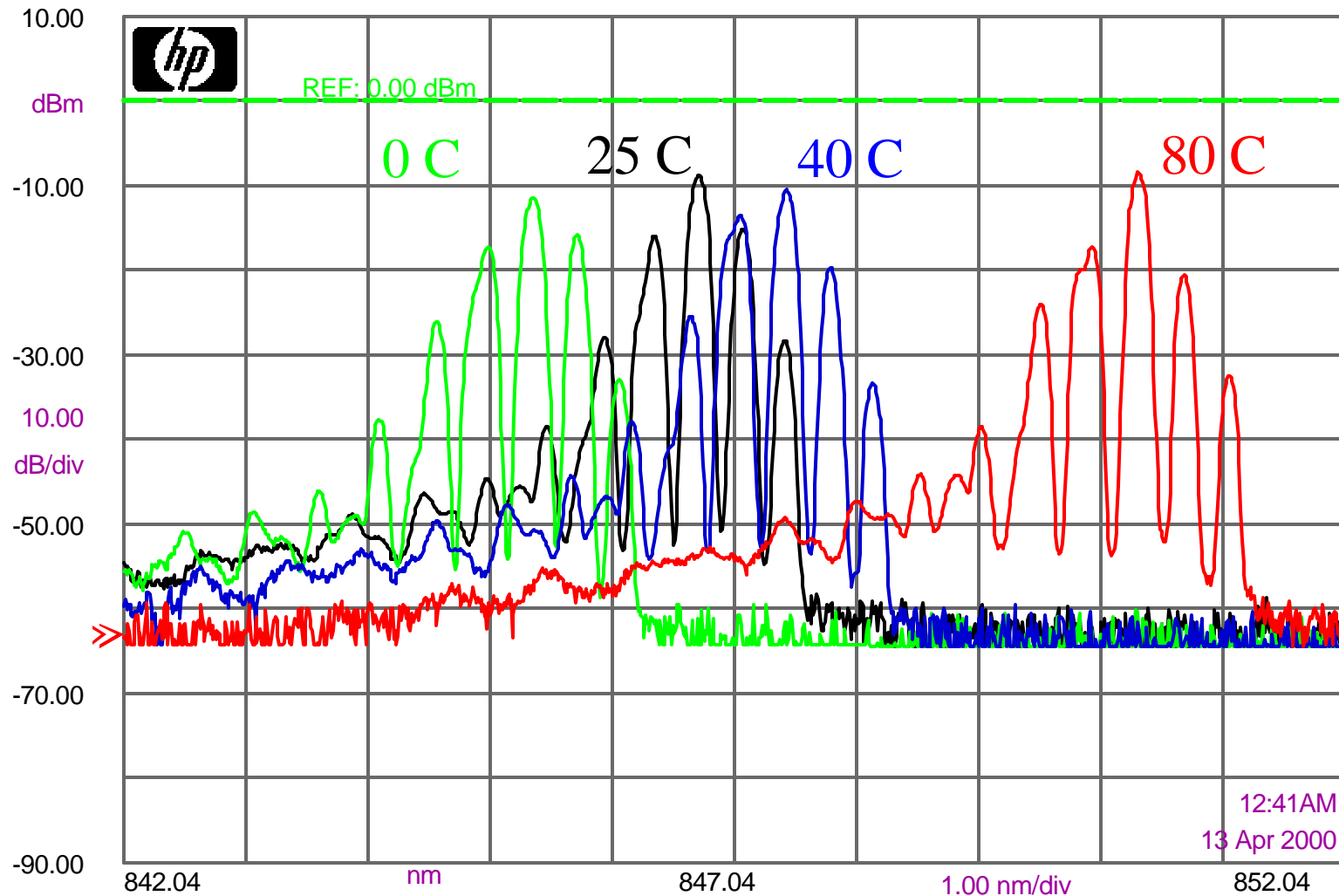
Transmitter RIN results



DC and AC VCSEL spectra

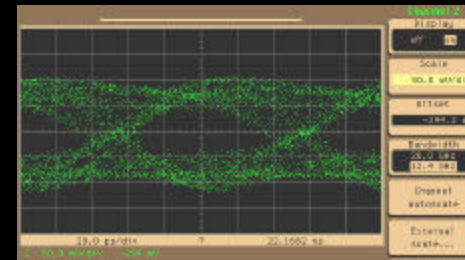
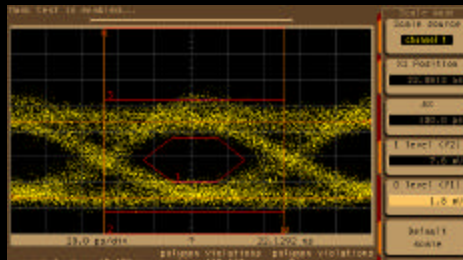


1044 Tx spectrum v. Temperature

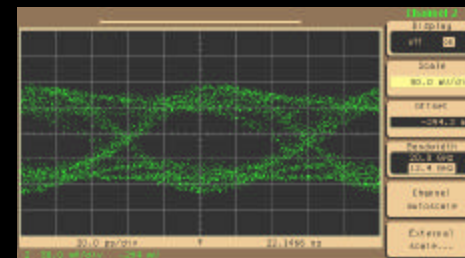
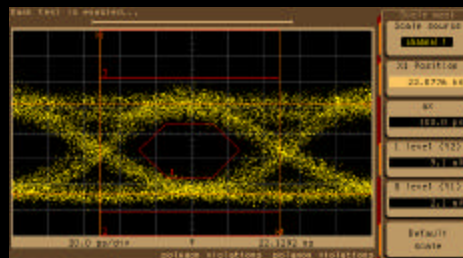


Transceiver link: transmitter (left) and receiver (right)

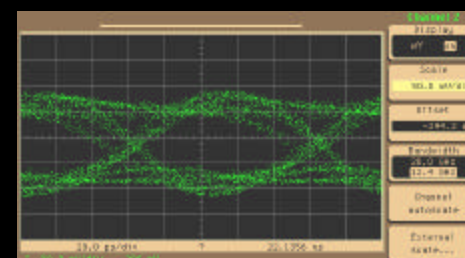
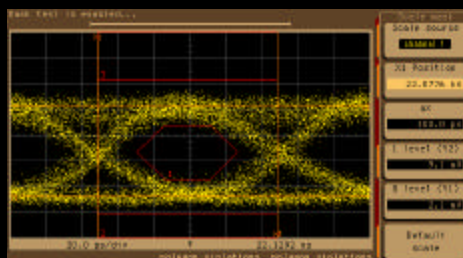
Average power -2.5 dBm; Tx and Rx same temp



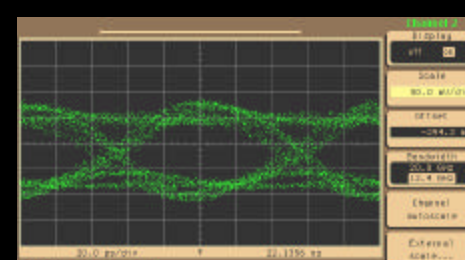
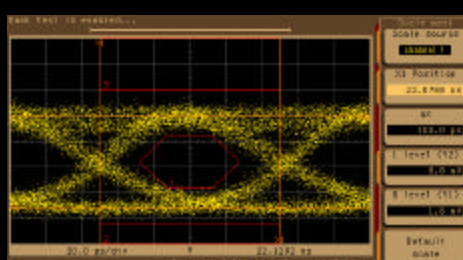
70 C



40 C



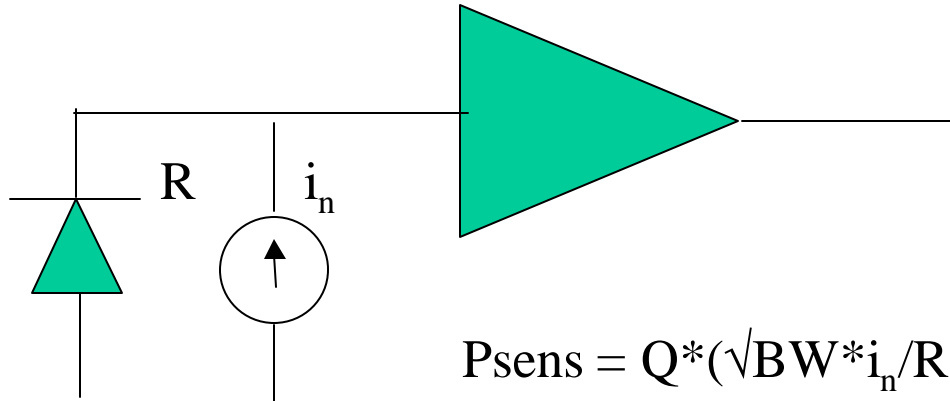
25 C



0 C



Receiver sensitivity



$$P_{\text{sens}} = Q * (\sqrt{BW} * i_n / R) * (ER + 1) / (ER - 1)$$

- FRI and other companies have >65um, <0.25pF 850nm diodes with R=0.4 to 0.6
- AMCC has announced SiGe TIA chip with 18pA/√Hz worst case with 0.2pF PD
- FRI custom integrated TIA/AGC achieves 25pA/√Hz
- Standard SONET parts achieve 12pA/√Hz
- Worst case receiver sensitivity of -13dBm is quite achievable

Cost Issues

Package

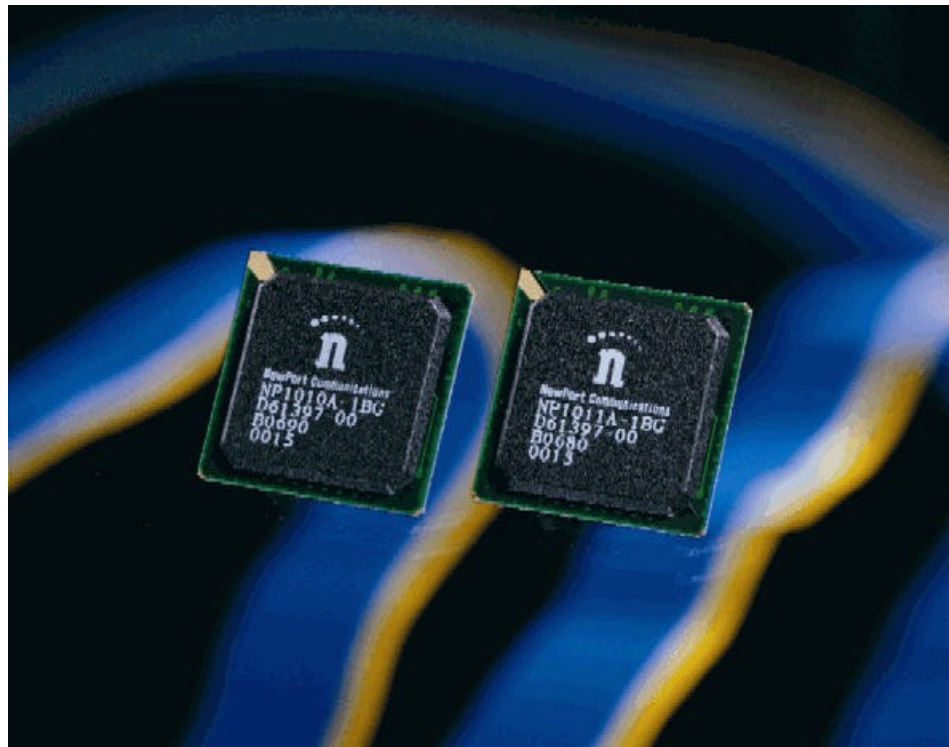
- Focused Research has developed low-cost, hermetic, pigtailed module
- Infineon recently published a 10GHz PD/TIA packaged in TO-46:
“High performance optical receiver module for 10 Gbit/s applications with low cost potential,” A. Ebberg et al, *Electronics Letters* 36, 741-2 (2000)

XAUI to Serial Chip

- CMOS versions being developed for release first part of '01
- CMOS OC-192 Mux/DeMux available now
- Silicon bipolar OC-192 Mux/DeMux available
- NewPort Communications projects that their CMOS designs will follow the traditional CMOS price curves



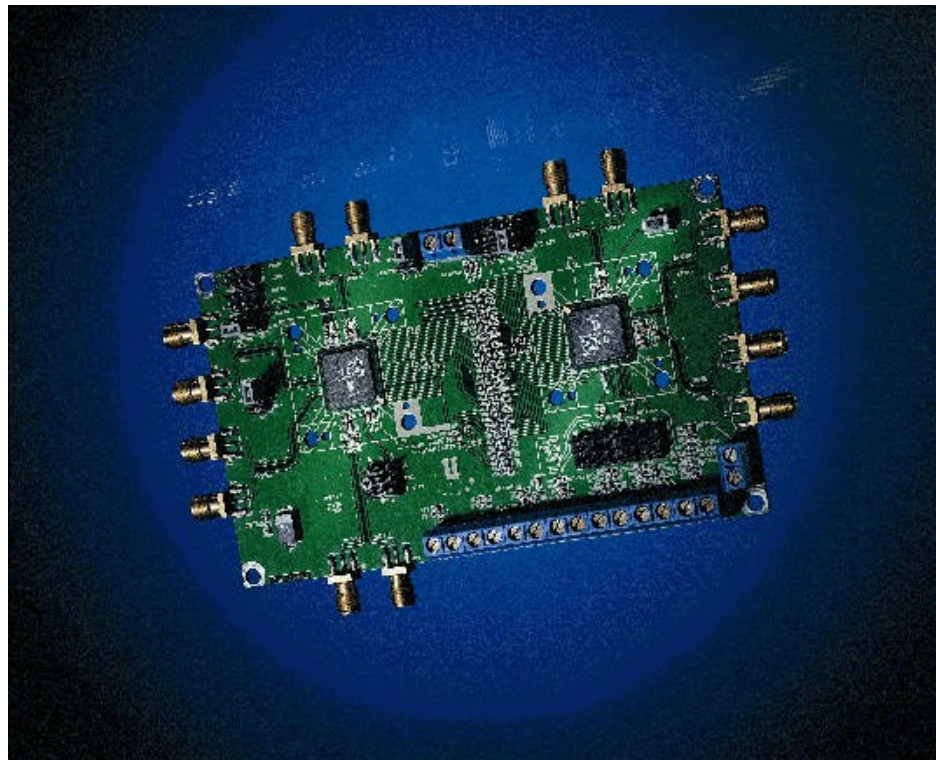
NP1010 & NP1011 – OC-192 Transceiver



NewPort Communications



NP1010 & NP1011 Evaluation Board



NewPort Communications

Summary

The 850nm serial PMD specifications are readily achievable and full feasibility has been demonstrated

Multiple vendors are available for every component, including high-BW fiber, VCSELs, photodiodes, driver circuitry, and Serdes

10GBASE-SX is the lowest-cost PMD for the high-volume 300m application space