Recent Progress in the development of 1310nm VCSEL technology for 10 GbE

(Excerpts from R.L. Naone et. al. CLEO 2001)

Presentation for

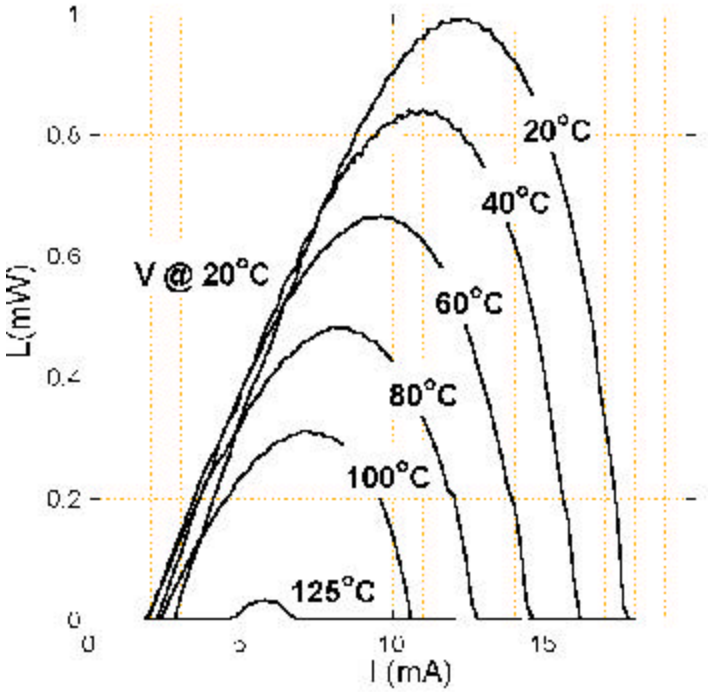
IEEE P802.3ae 10Gb/s Ethernet Task Force Interim

St. Louis Meeting

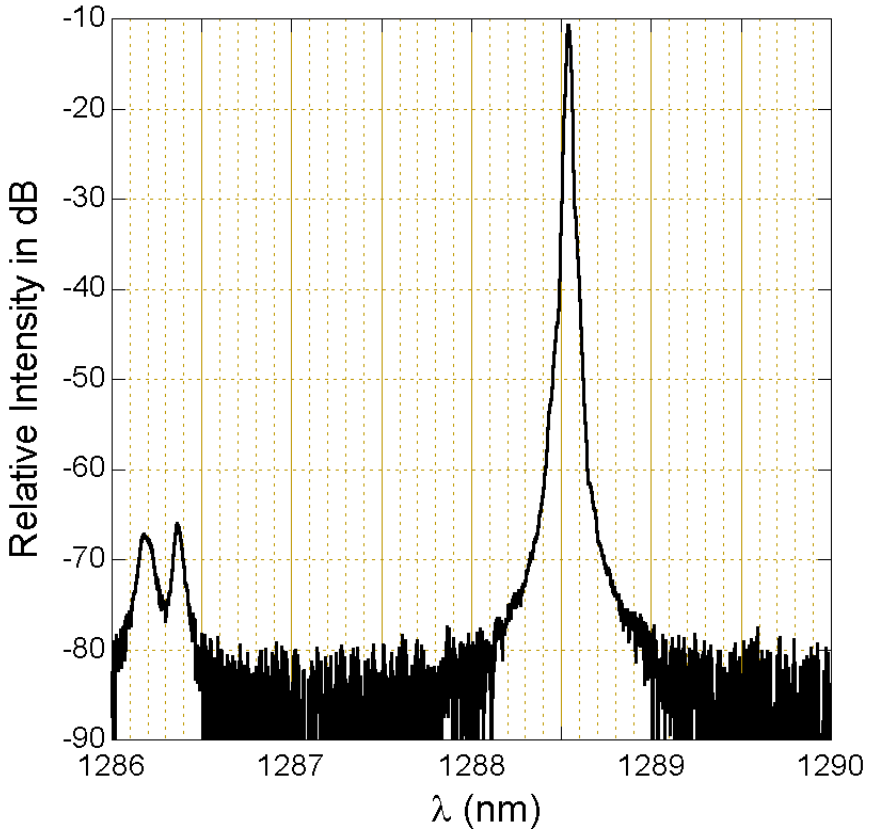
May 21st - 25th

Mike Dudek

Single-Mode Devices

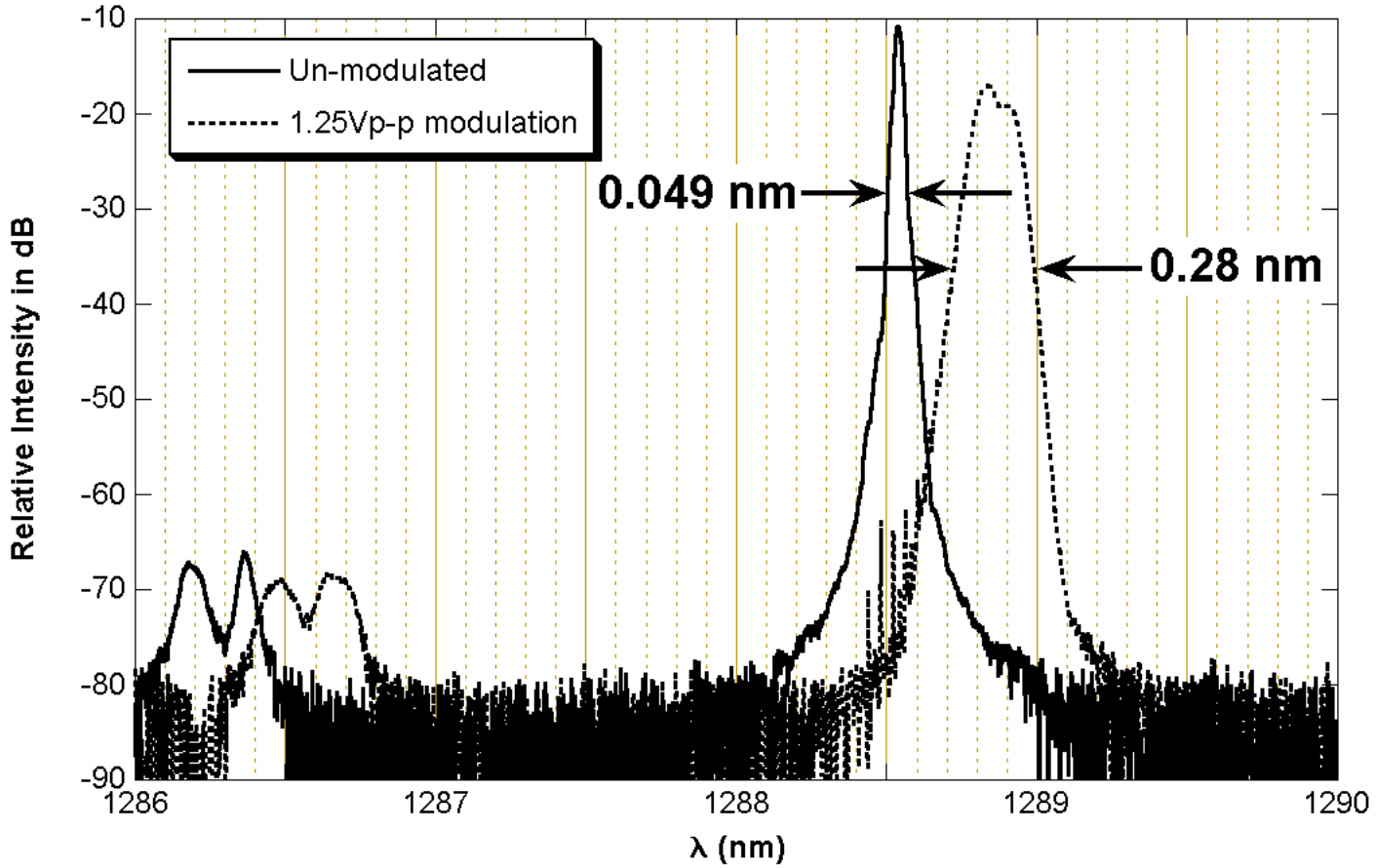


- Power: 1 mW @ R.T
  (min. @ 60 ºC)
- CW lasing up to 125ºC
- Slope efficiency: 0.17 W/A
- Ith: 2.0 to 2.8 mA



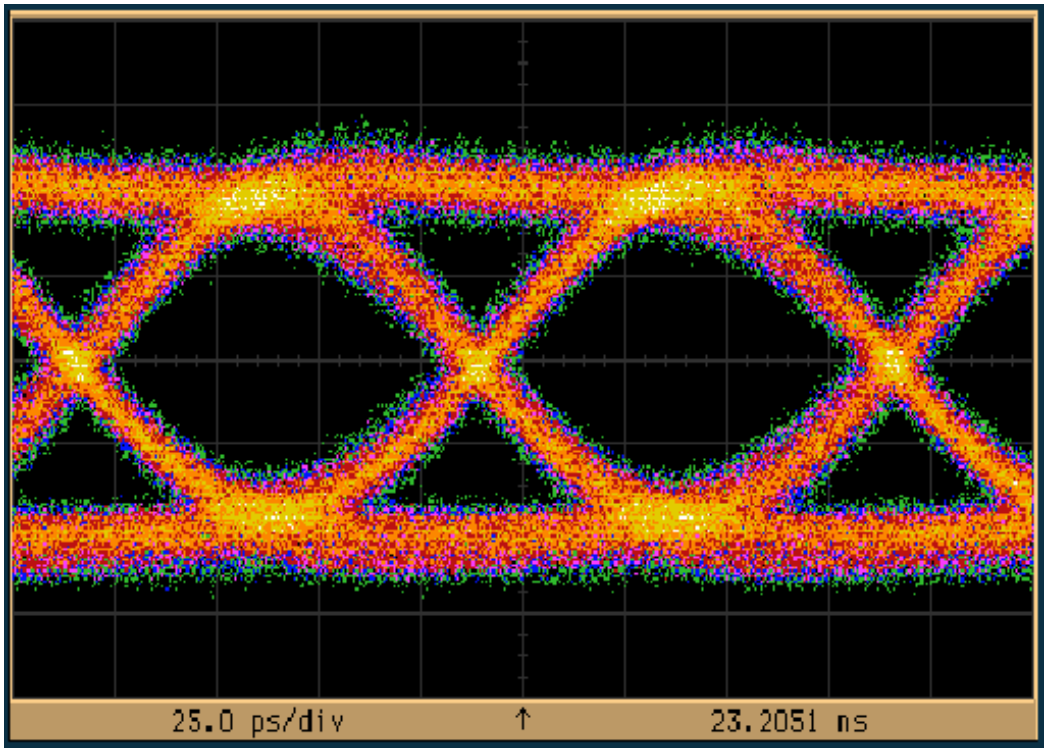
- SMSR: 50dB
- 20dB width: 0.049 nm
- $\Delta\lambda/\Delta T$: 0.08 nm/K

Low Wavelength Chirp



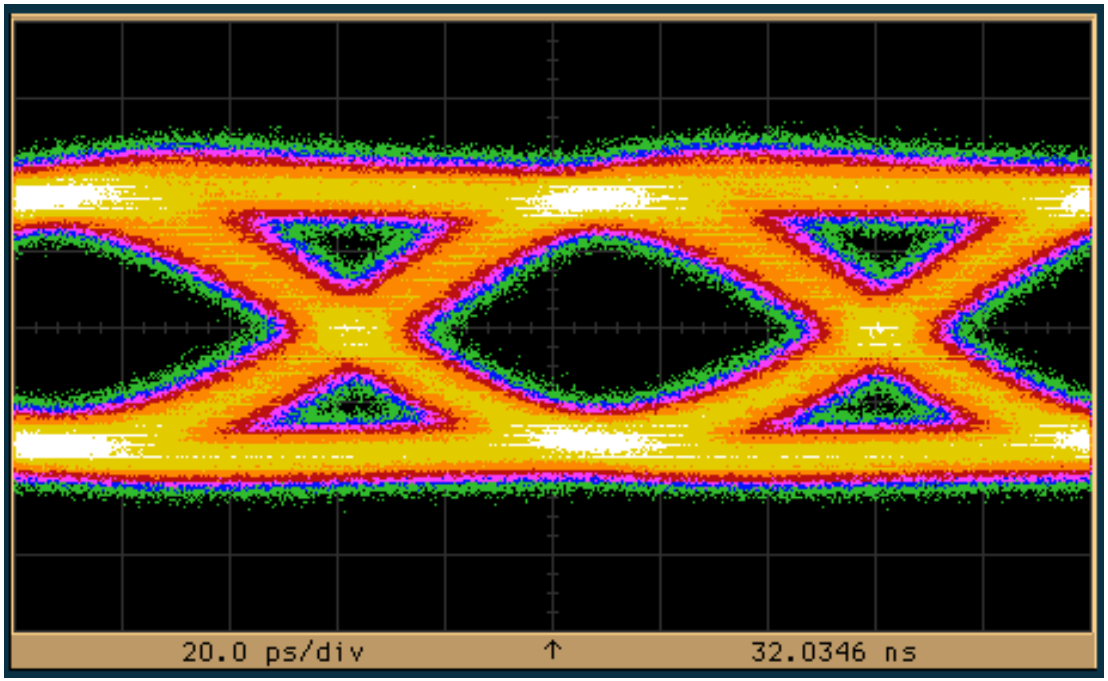
- Under direct modulation @ 10 Gb/s (1.25 Vp-p, 2^{31}-1 PRBS) peak
- **Low chirp** relative to edge-emitters due to small overlap of optical mode with active region
- Fully-modulated SMSR better than **40 dB**

Direct Modulation @ 10 Gb/s



- 10 Gb/s BERT (2^{31}-1 PRBS)
- VCSEL die mounted in a proprietary OSA
- 1 meter of SM fiber
- 8 GHz Picometrix O-E
- 37 ps risetimes limited by detector response

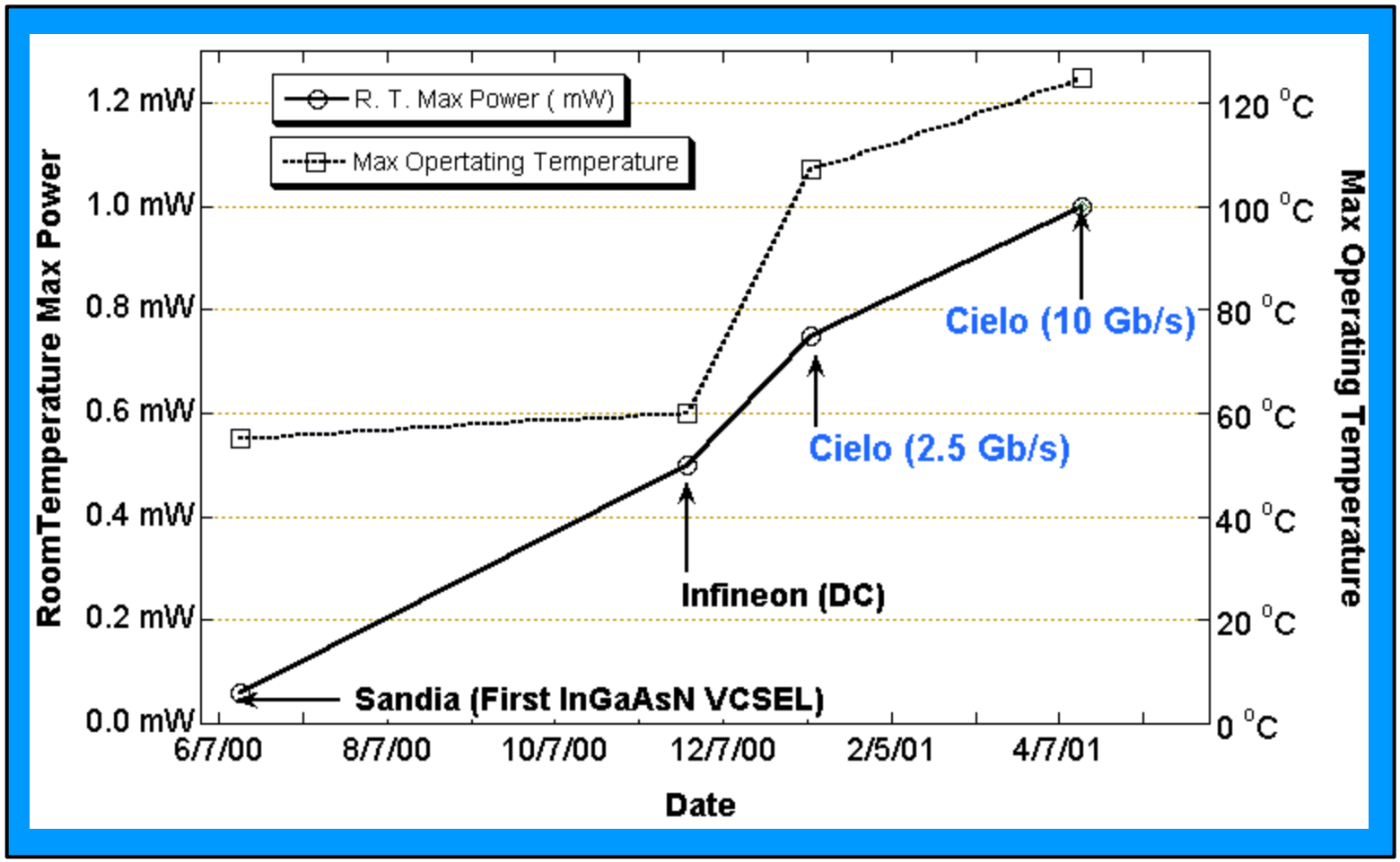
10 km @ 10 Gb/s Link



- 10 Gb/s BERT (2^{31}-1 PRBS)
- VCSEL die mounted in a proprietary OSA
- *10 km* of SM fiber
- Proprietary PIN/TIA receiver
- *BER better than* 10^{-13}

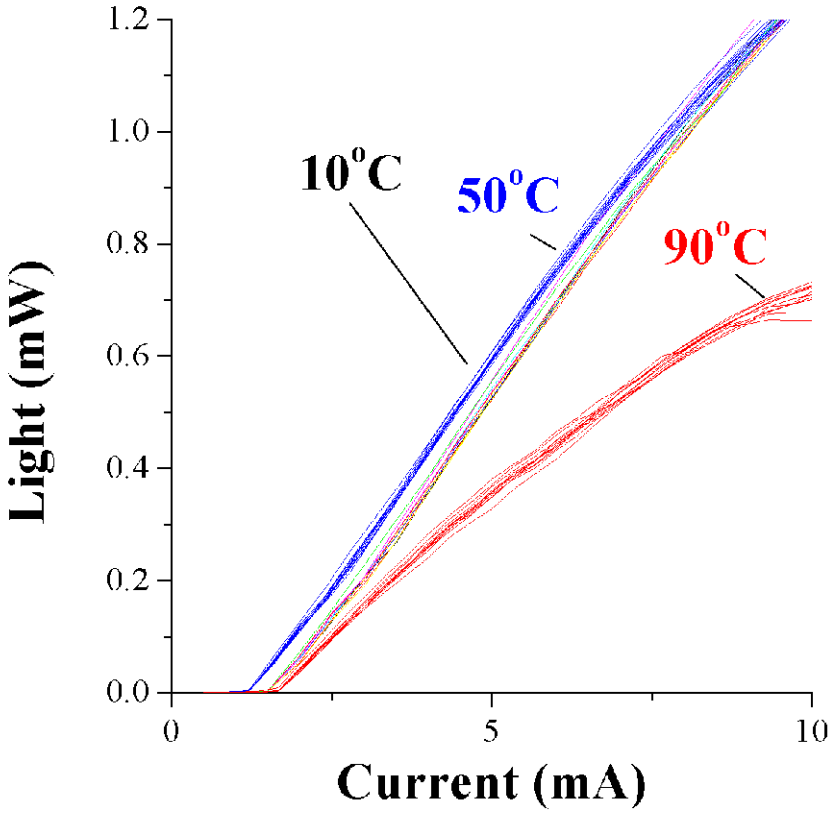
Summary

InGaAsN VCSEL Performance Timeline

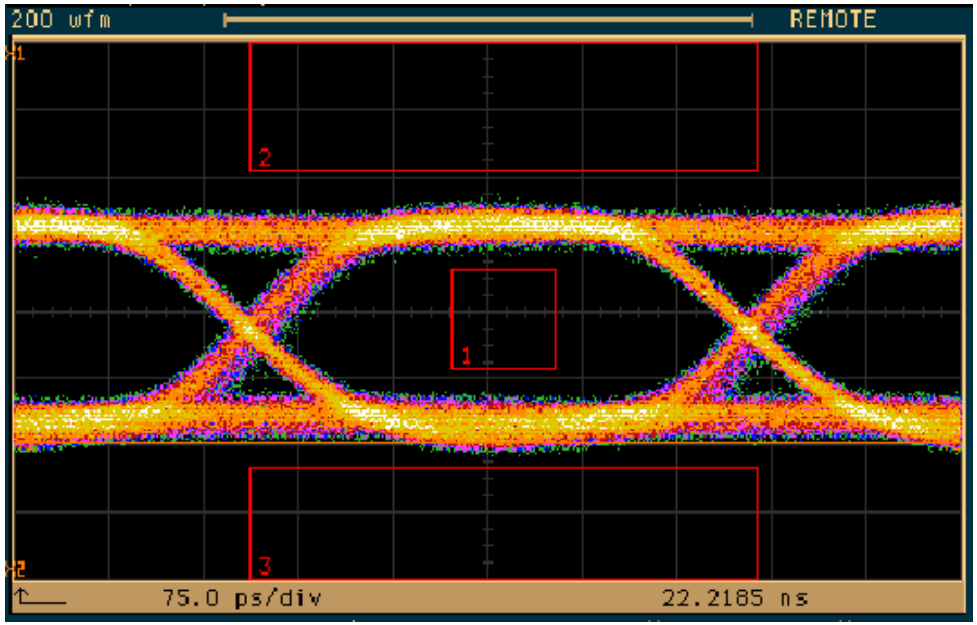


- It took 2 years for 850 nm VCSELs to displace edge-emitters in datacom
- 1.3 µm VCSELs will do the same in telecom

OC-48 Arrays



2.5 Gb/s over 10 km SMF
(OC-48 mask shown)



- Peak output power: **1.3 mW** (OC-48 IR-1 0.3 mW)
- λ: **1260 nm** (OC-48 IR-1 1260-1360 nm)