LUMENTUM

Recap and update on 940 nm VCSEL transmitter for 802.3db

David Lewis

IEEE 802.3db 100 Gb/s, 200 Gb/s, and 400 Gb/s Short Reach Fiber Task Force
April 15, 2021 Interim Teleconference

Background and Current Status

- 802.3db_D0p2 has TBD for the wavelength range of 100GBASE-VR, 200GBASE-VR2, and 400GBASE-VR4
  - This is a placeholder pending more information on 940 nm VCSEL transmitters
  - The study group contribution lewis_100GSR_adhoc_01_032620.pdf proposed an objective for 20 m with any wavelength in a range including 850 and 940 nm and allowing for interoperability with other 802.3db PMDs. The 20 m objective was not accepted but the TBD in the –VRn PMDs is intended to enable interoperability between 940 nm and 850 nm PMDs.

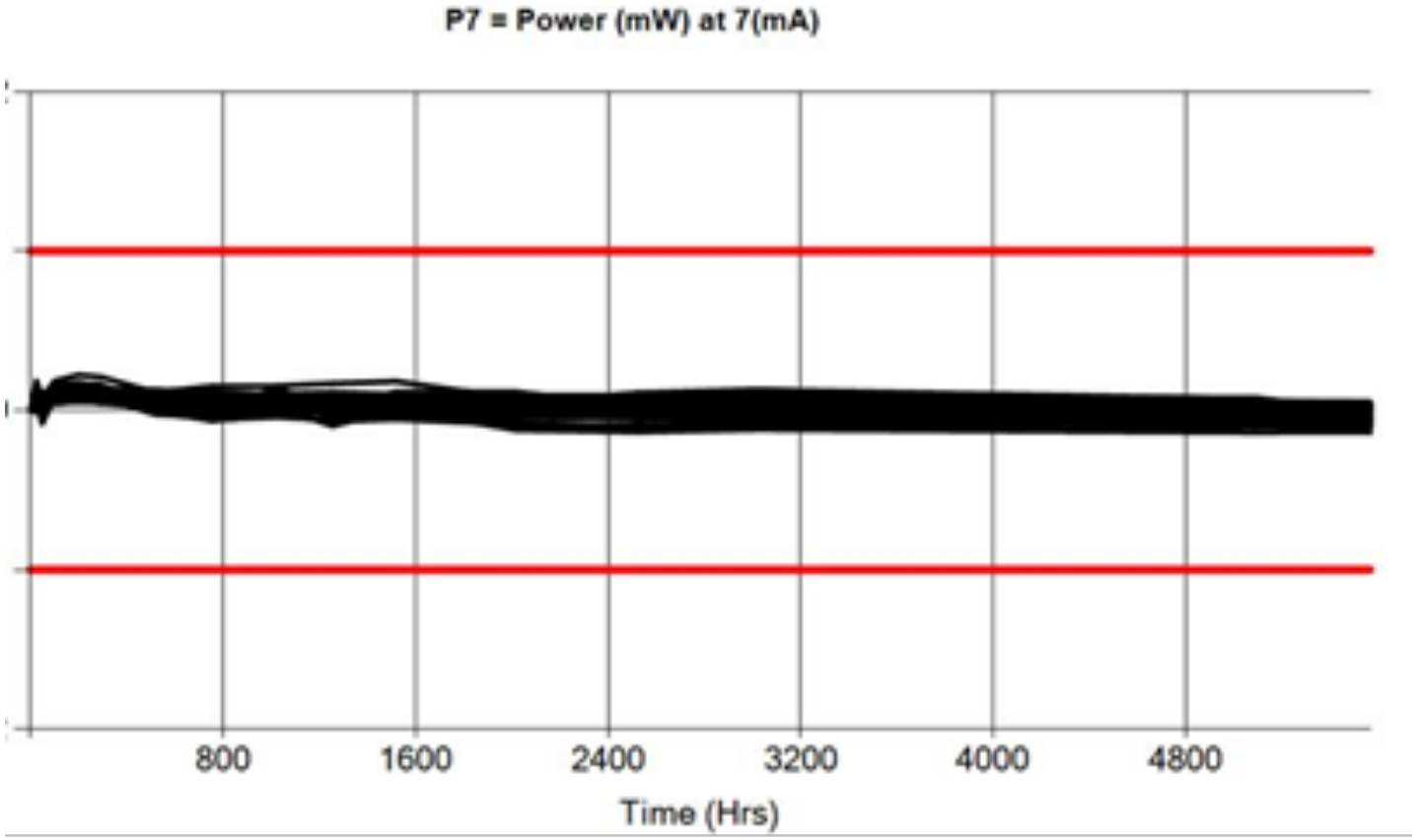
- Both 850 nm and 940 nm 50GBd PAM4 VCSELs have been fabricated and are in evaluation
- The results to date are encouraging for 940 nm
  - The 940 nm VCSELs operate at lower current than 850 nm and are predicted to have better reliability
  - The -3 dB bandwidth of the 940 nm VCSELs is higher than the 850 nm VCSELs with the same geometry (top side emitting)

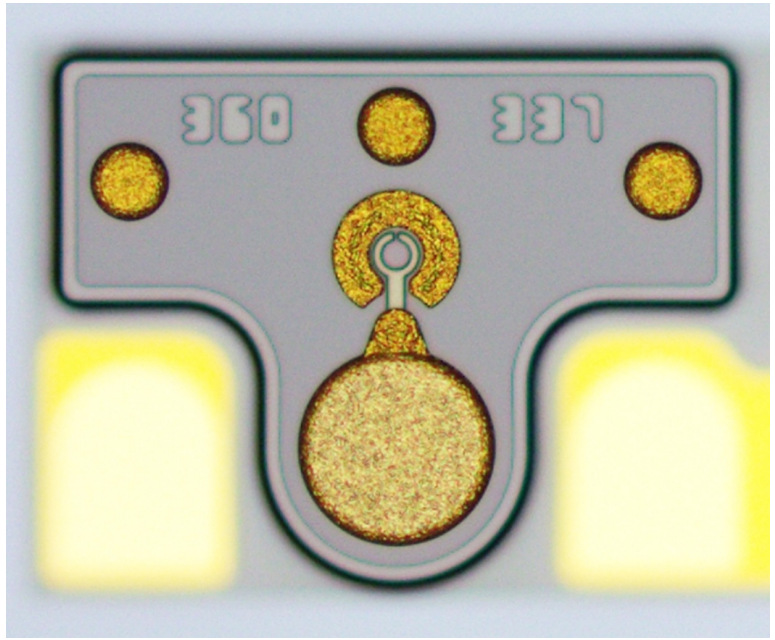
- Evaluation continues and RF test results are expected in the May 2021 timeframe

- Request that the Task Force agree to keep the wavelength range for the –VRn PMDs as TBD until test data has been presented

940nm 100G VCSEL HALT

- 940nm 100G VCSEL showing extremely long lifetime under high stress conditions
- 120 units, no burn-in, 130°C*, 9mA, ~4,000hrs
- 120 units, no burn-in, 130°C*, 7mA, >5,000hrs

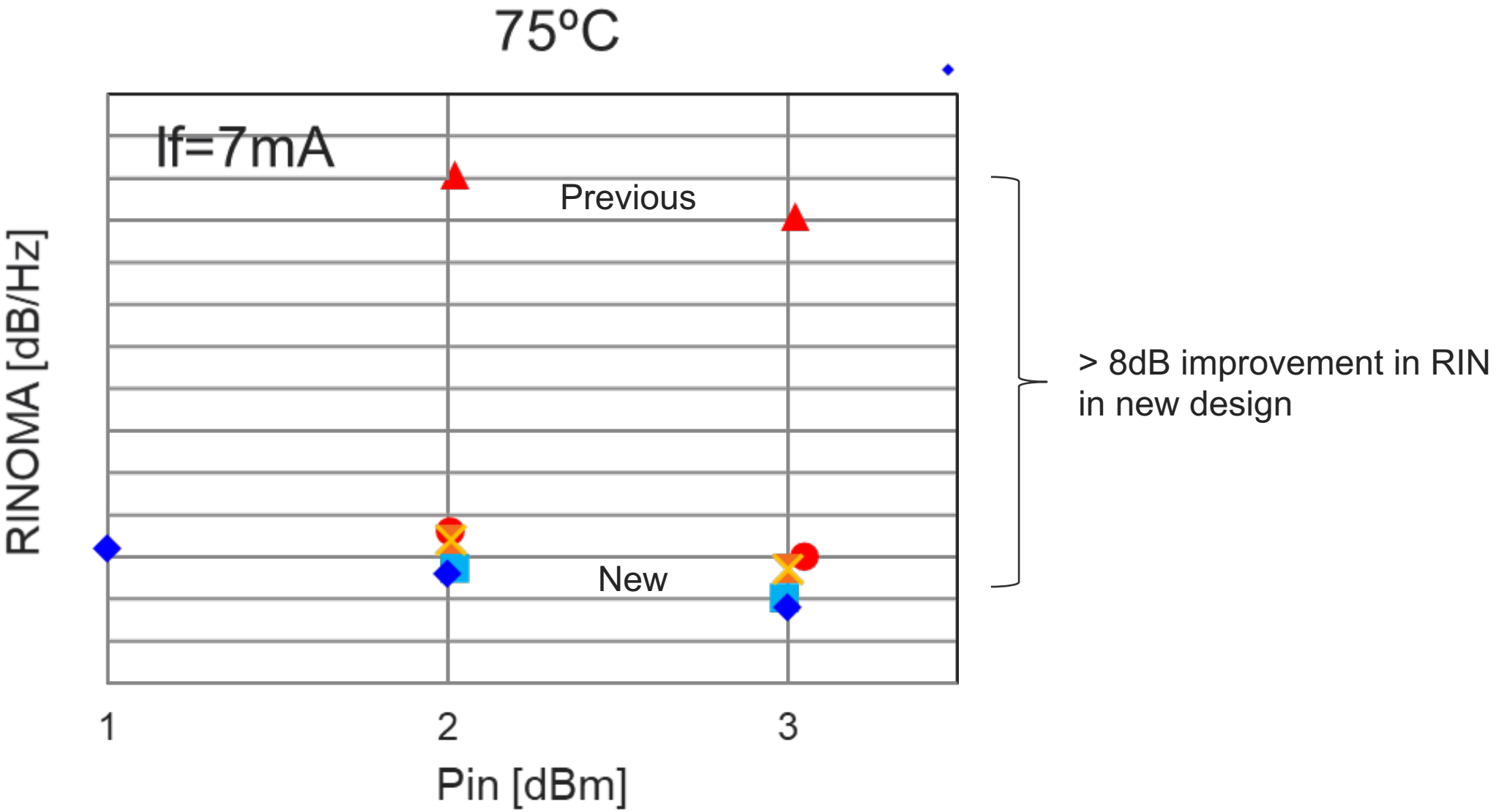




GSG Layout

* Substrate temperature

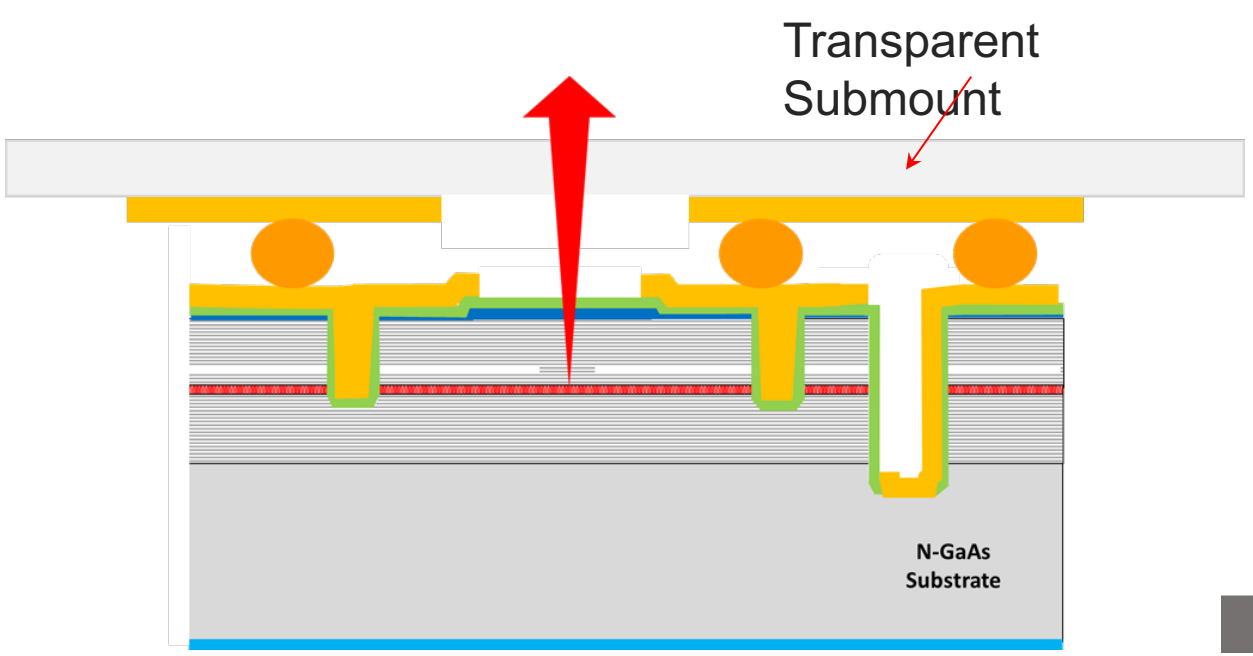
Relative Intensity Noise (RIN) Reduced in 100G VCSEL Design



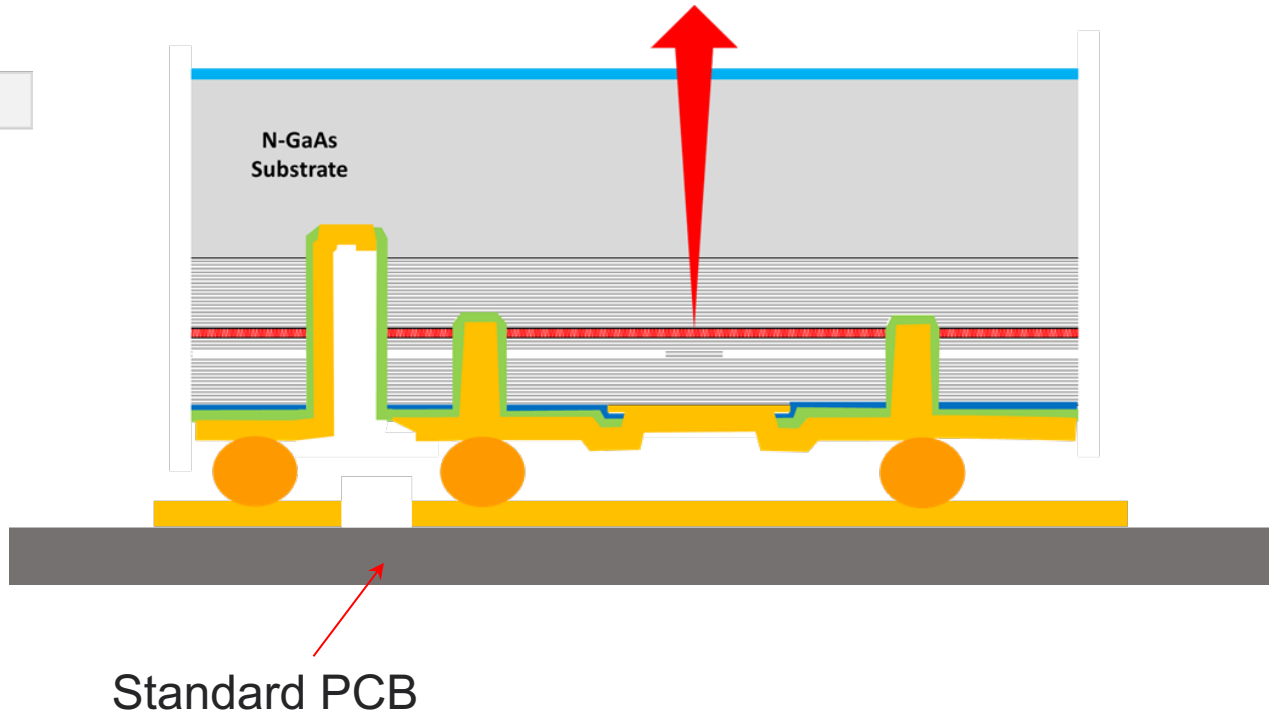
Flip-Chip VCSEL Attach – 850nm vs 940nm VCSEL

1. 850nm flip-chip attach requires expensive transparent submount to allow light to pass through
2. 940nm flip-chip attach can use standard PCB, since light can pass through the bottom of the substrate

Top Emitting



Bottom Emitting



Thank you