Status of Optical Electronics

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ATLAS Pixel Week

Opto-electronics Team

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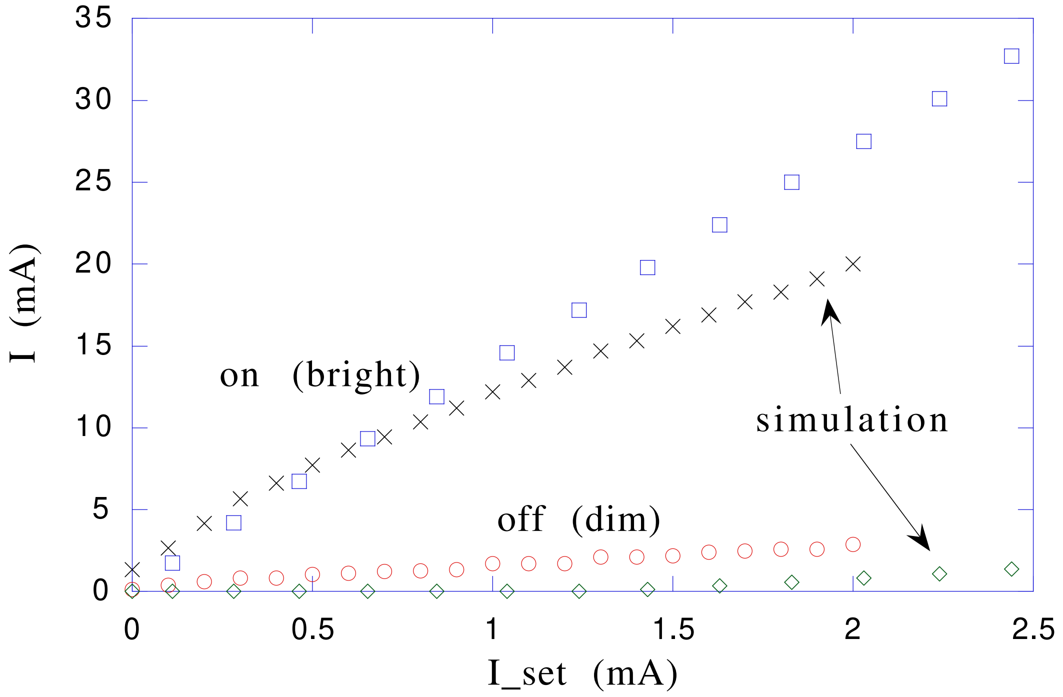
VCSEL Driver Chip

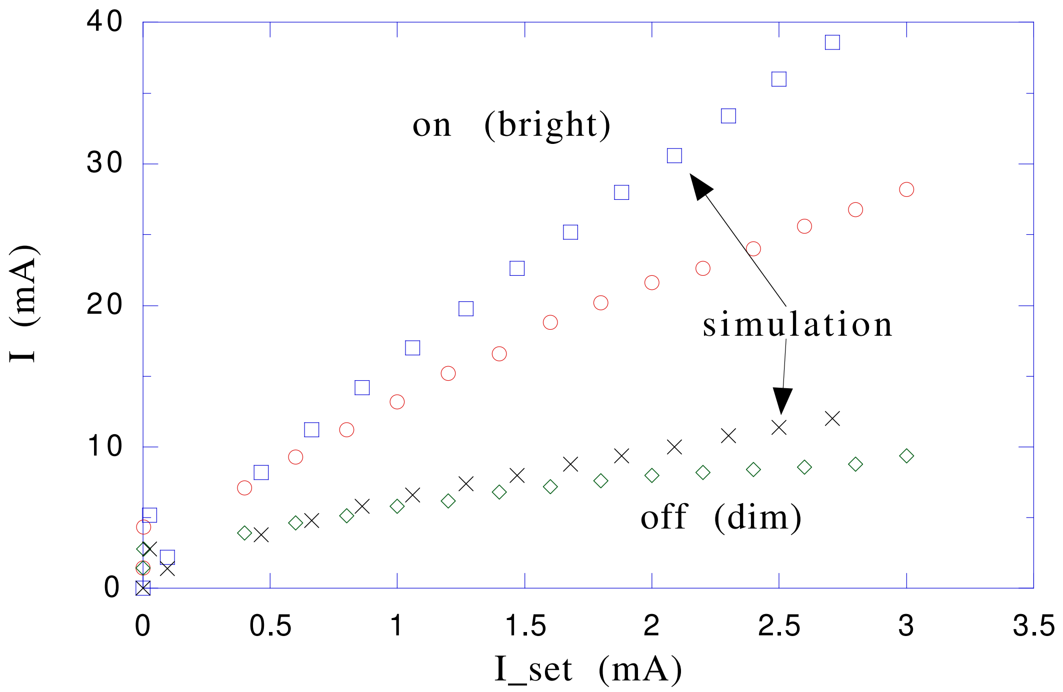
- VDC converts LVDS signal into appropriate signal to drive VCSEL
- V_{bias} generating circuit oscillates
  - can be cured by setting RESET to high
  - RESET circuit is removed in VDC-P2
- $\sim$ 10 VDC-P1 tested
  - properly convert LVDS signal into appropriate signal to drive VCSEL
- supply currents is stable over time

Dependent of Dim and Bright Currents vs I_{set}

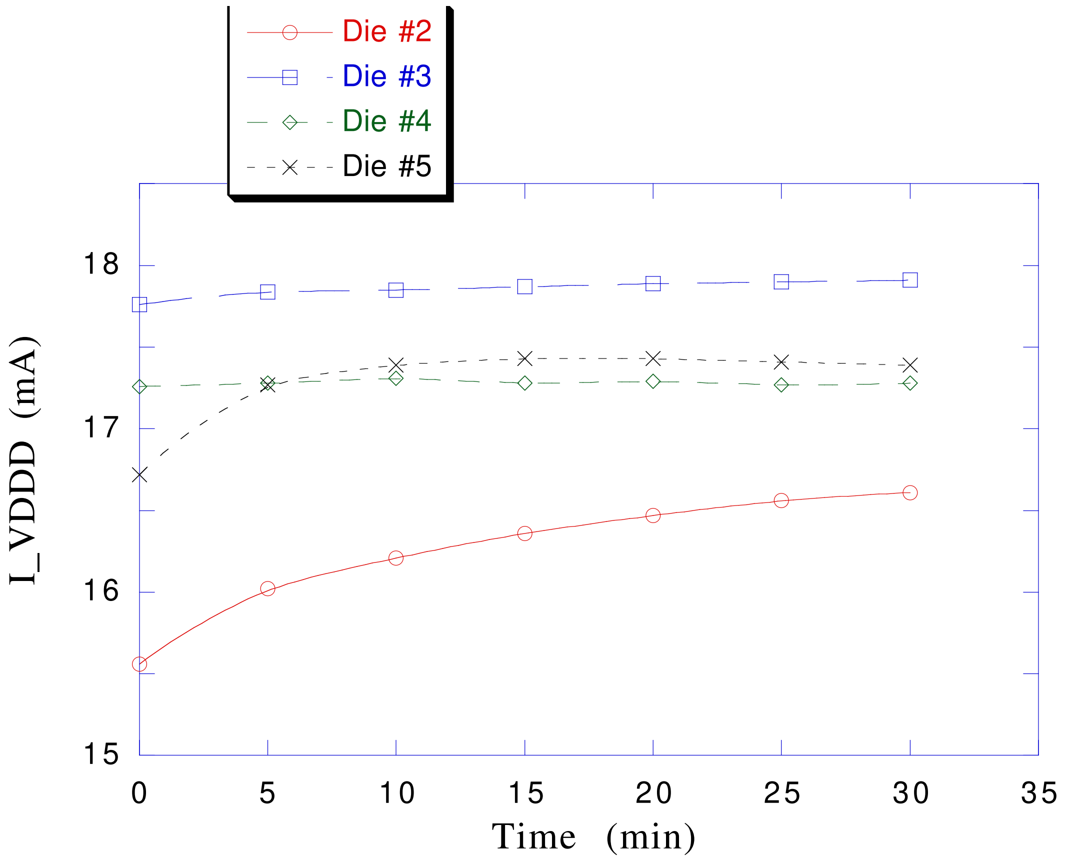


Dependent of Dim and Bright Currents through 50 Ω vs I_{set}

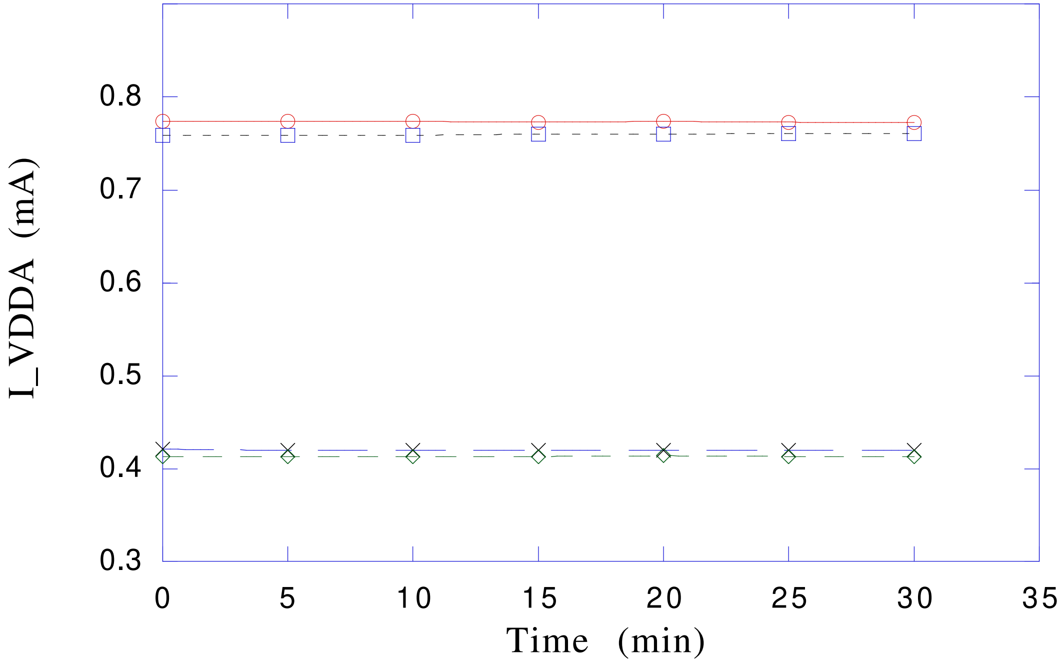
- Reproduction of currents through 50 Ω is better:



Digital Supply Current Stability



Analog Supply Current Stability



DORIC

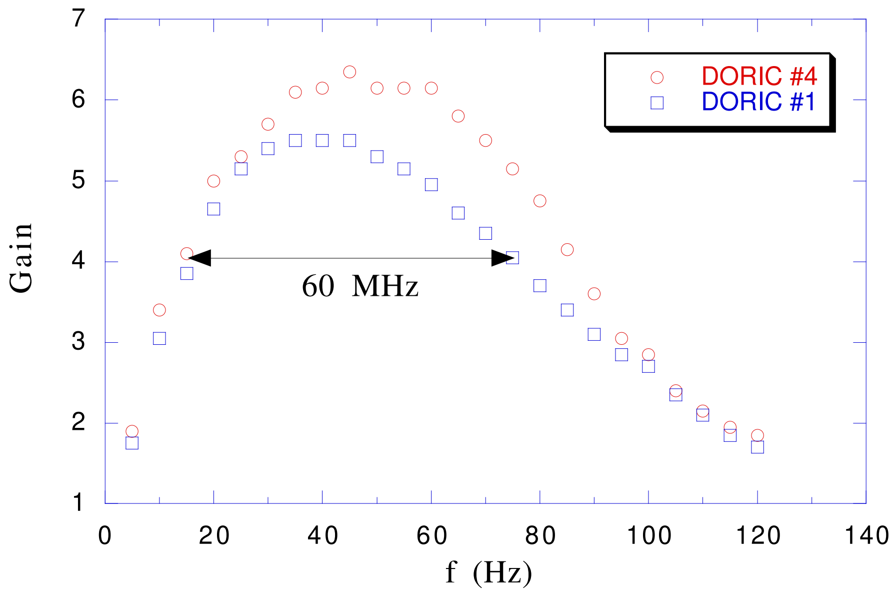
- DORIC-P1 is designed to decode clock and data from optical signal
- clock can be decoded at 40 MHz but not stable
- data can be decoded occasionally
- can not decode clock and data simultaneously
  - ◇ clock lost a bit if data is decoded

Deficiency of DORIC-P1

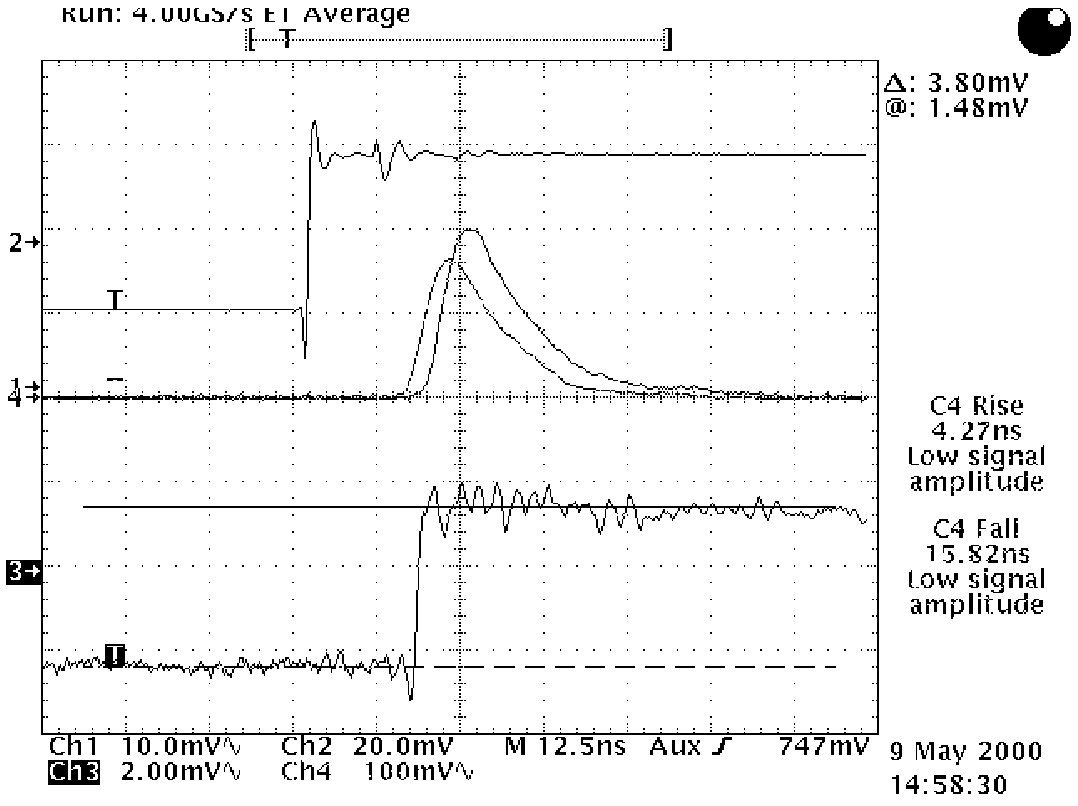
- pre-amp has limited bandwidth
  - ◇ limited by 1 KΩ PIN bias resistor and 2 pF stray capacitance between anode and cathode to ground
  - ◇ DORIC-P2 uses same PIN bias resistor as DORIC-4A: 100 Ω
- Edge detector is too slow due to stray capacitance
  - ◇ stray capacitance of load resistor $\sim$ 55 fF
  - ◇ stray capacitance of diodes associated with FET $\sim$ 25 fF
- Signal between flip-flop and edge detector swapped
  - ◇ use derived edge instead of edge driven by input clock

Pre-amp Bandwidth

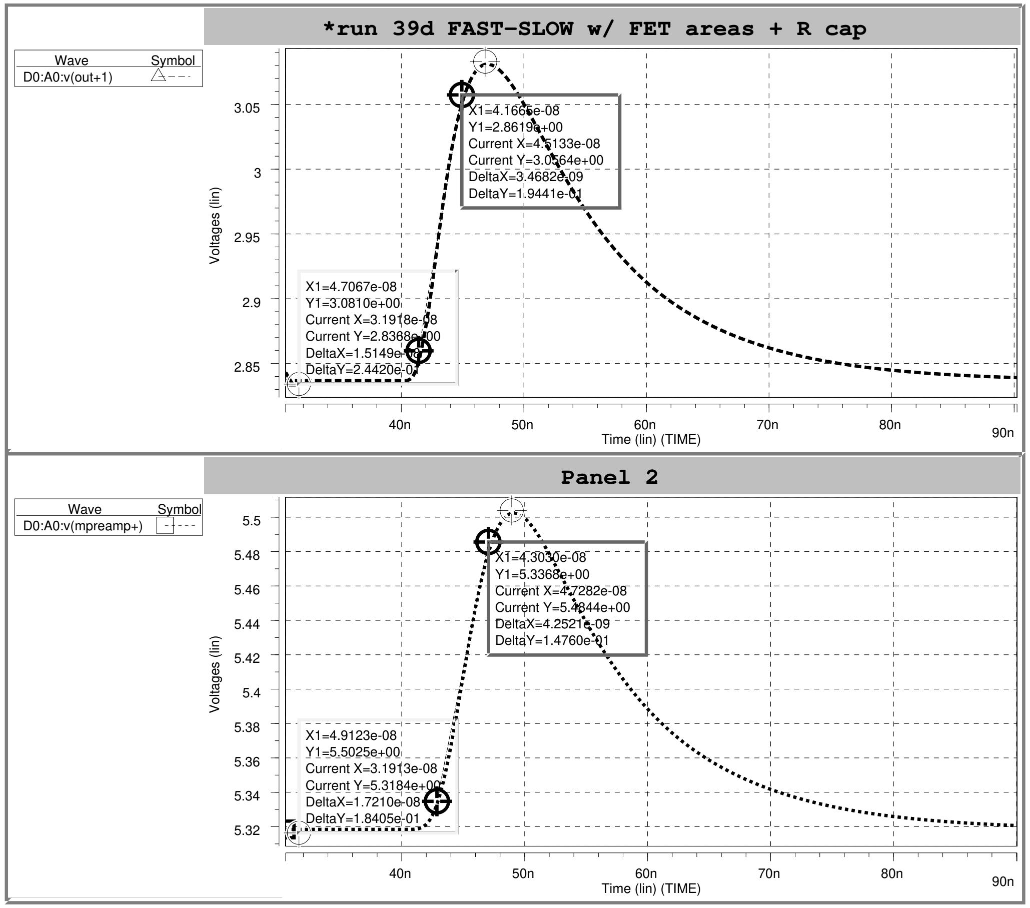
- Gain:
  - measure: ~ 6
  - simulation: ~ 13
- Bandwidth:
  - measure: ~ 60 MHz
  - simulation: ~ 100 MHz
- Need 4×40 MHz to pass 4th harmonic



Response of Pre-amp to a Long Square Pulse



Simulation of Pre-amp Response to a Long Square Pulse



Pre-amp Simulations with Various Models

	Amplitude (mV)	Rise time (ns)
Data	200	4.0
typ-typ	316	2.6
fast-slow	267	2.5
typ-typ (strays)	298	3.4
fast-slow (strays)	244	3.5

$\rightarrow$ best reproduction of pre-amp response with fast-slow model plus stray capacitance

Summary

- VDC-P1 is working with minor problem
- DORIC-P1 has several deficiencies which will be fixed in June submission