DETOL Verification

Multiprocessing Pipelined Matched Filter Architecture Using Online Arithmetic.

ELEC 423

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Manik Gadhiok

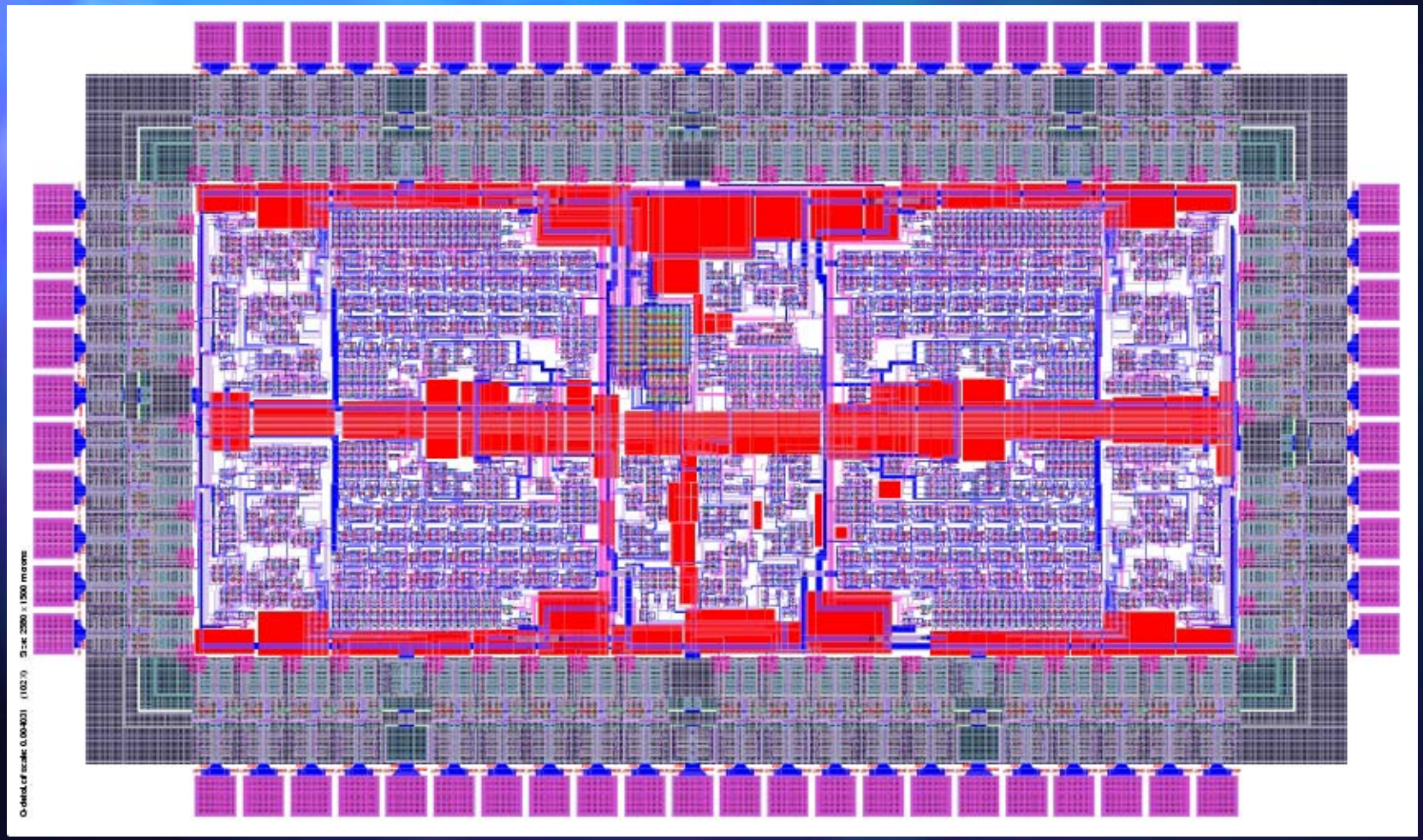
Predrag Radosavljevic

Nils Bagge

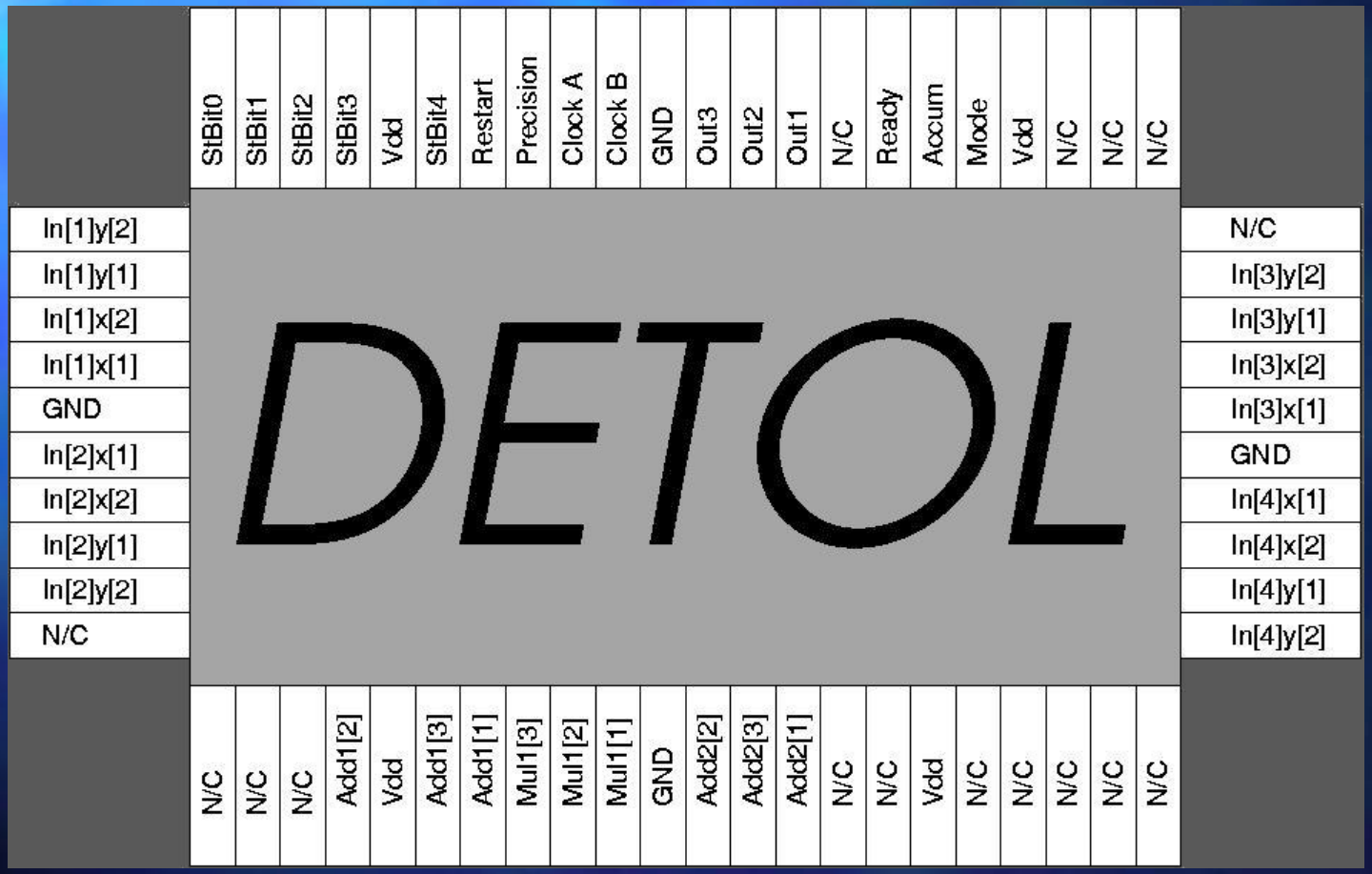
Outline

- Review of Functional Description
- Functional Test Results
- Speed Test Results
- Yield

Chip

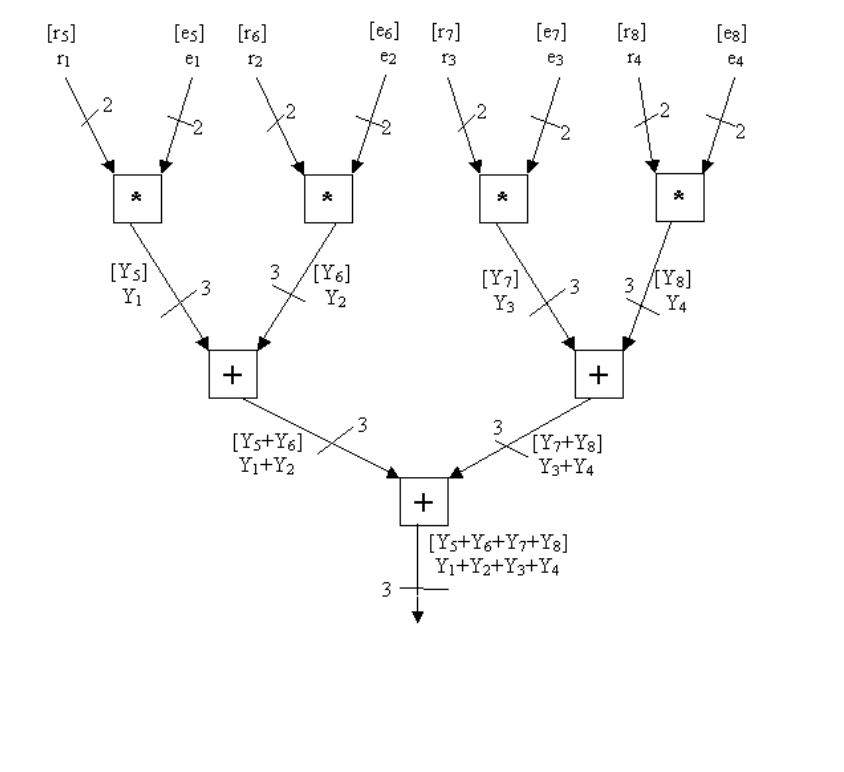


Functional Description: Pin Map



Functional Description

- Multiprocessing Pipelined Matched Filter architecture using online arithmetic



Functional Tests Performed

- Tests performed using TLA & Omnilab:
  - Full-precision (4-digit online output, 12-bit)
  - Fast Precision-1 (1-digit online output)
  - Full-matched filter mode
  - Online addition only (mult. bypassed)
- Goals:
  - Verify online multiplier functionality
  - Verify online adder functionality
  - Verify overall matched filter functionality

Functional Test Results

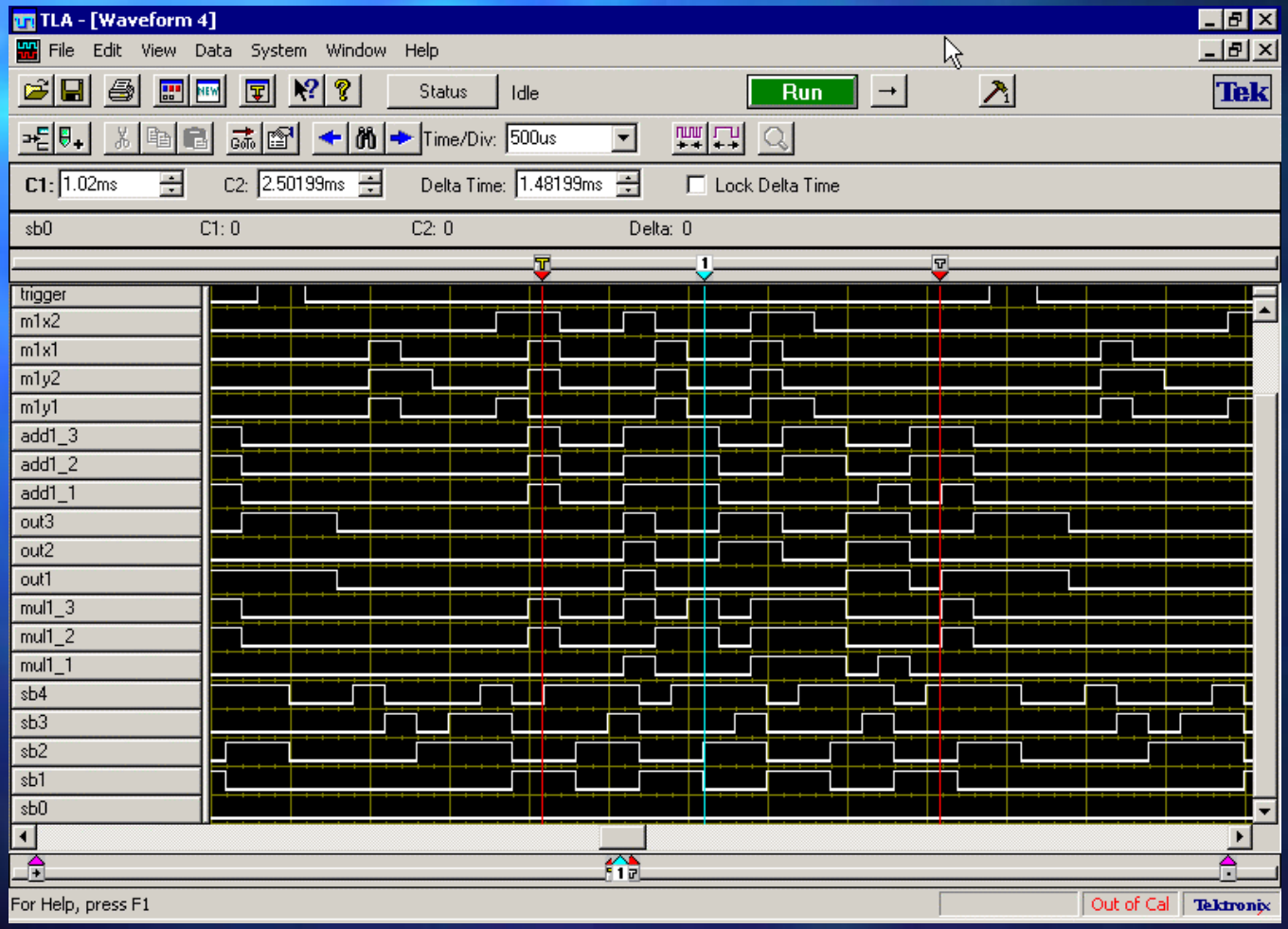
- Successes:
  - Online multiplier works properly
    - Very complex ➔Very gratifying!
  - Online adder works as designed
  - Proper transitions of the PLA states
  - Final Output:
    - Correct for Fast Precision-1
- Flaw:
  - Final Output incorrect for Full Precision
  - Suspected error: final adder receiving out-of-sync control signals (PLA load/clear of pipeline/adder registers)

Speed Test Results

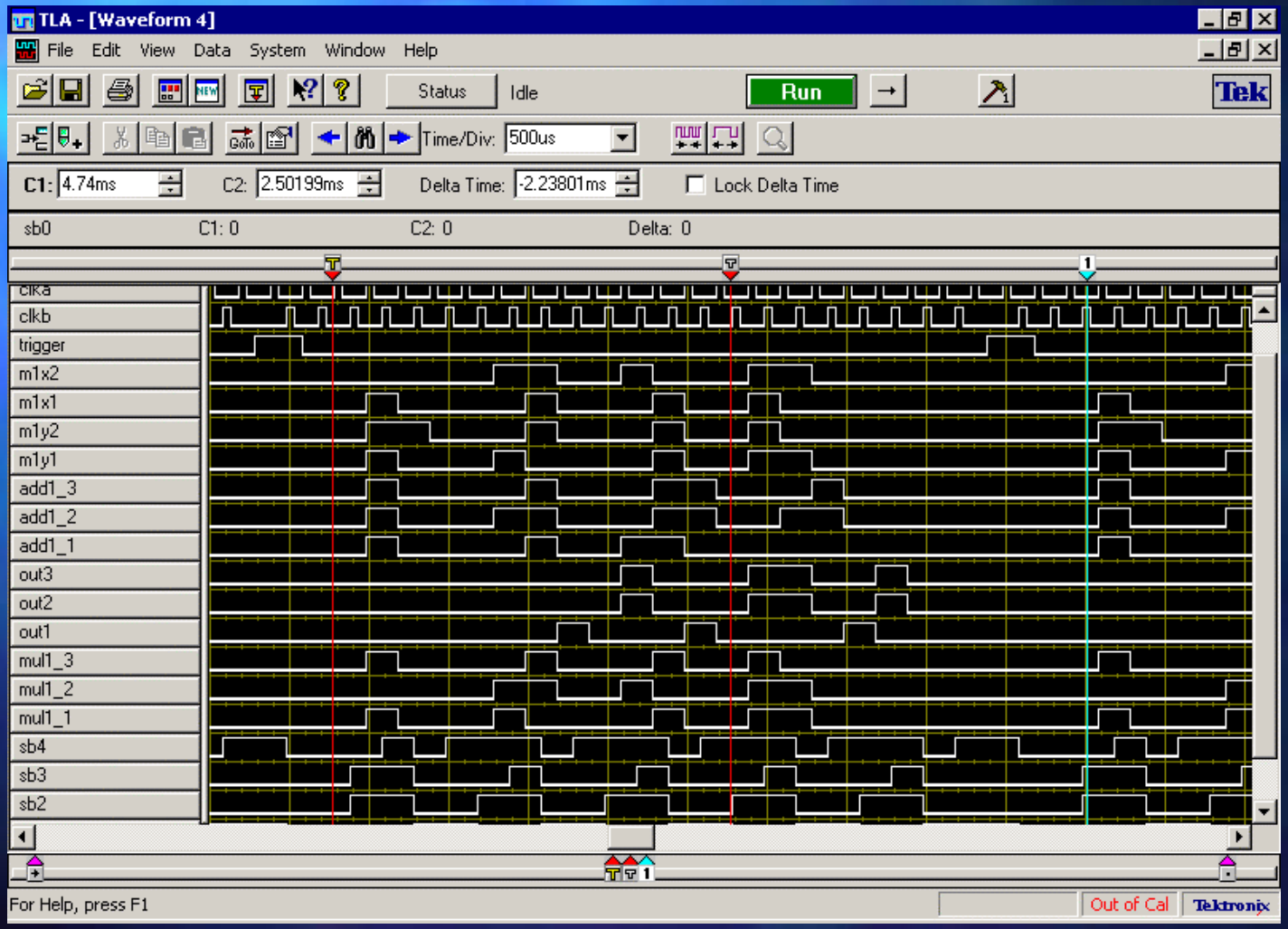
- Highest usable clock frequency:
  - ~45 MHz ⇔~22ns clock period.
  - Glitching becomes excessive at 50MHz.
  - Roughly same as Spice analysis suggested: 42.18MHz

Testing Portfolio

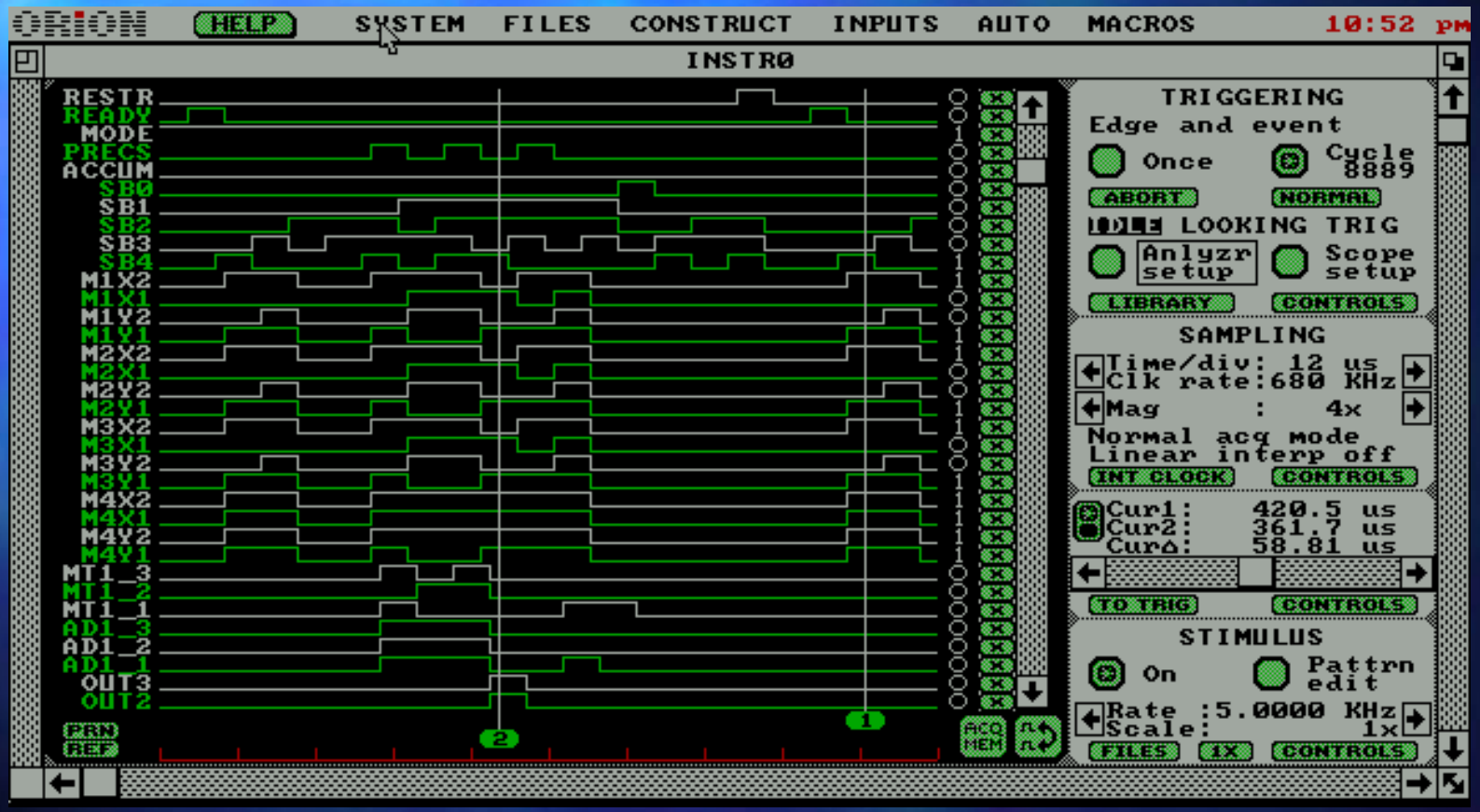
Testing Portfolio: Mode-1 Full-Precision



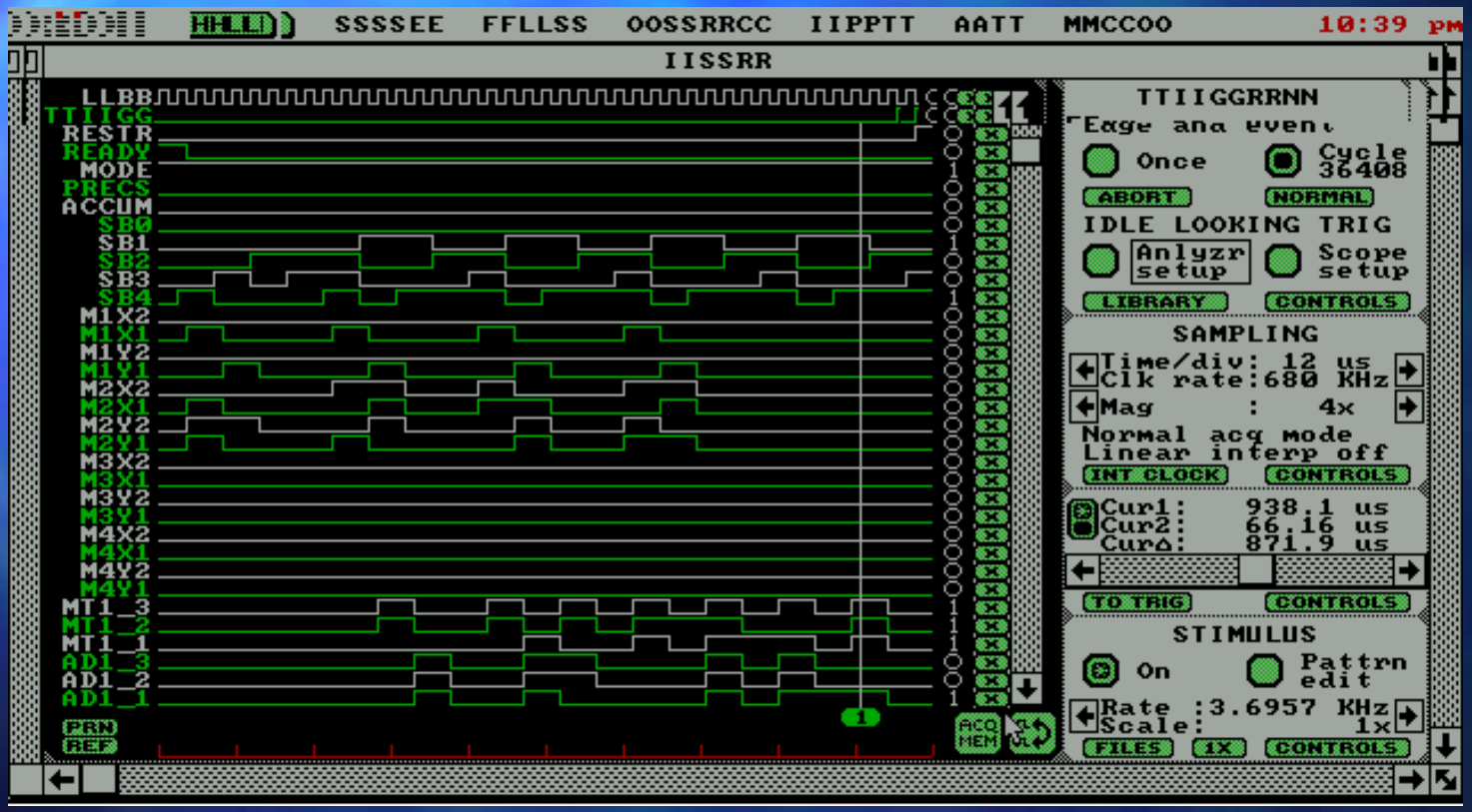
Testing Portfolio: Mode-0 Full-Precision



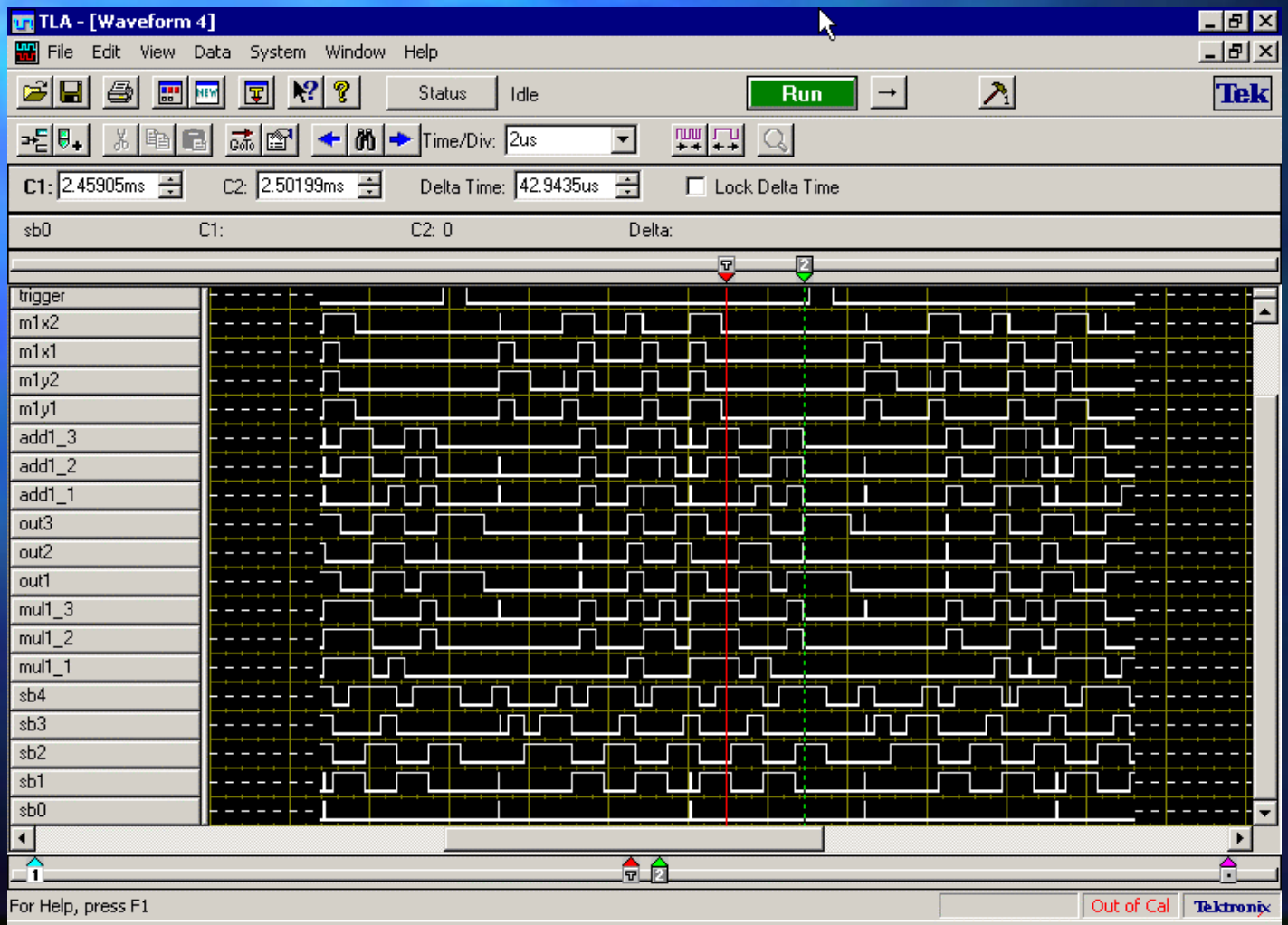
Testing Portfolio: Mode-1 Precision-1



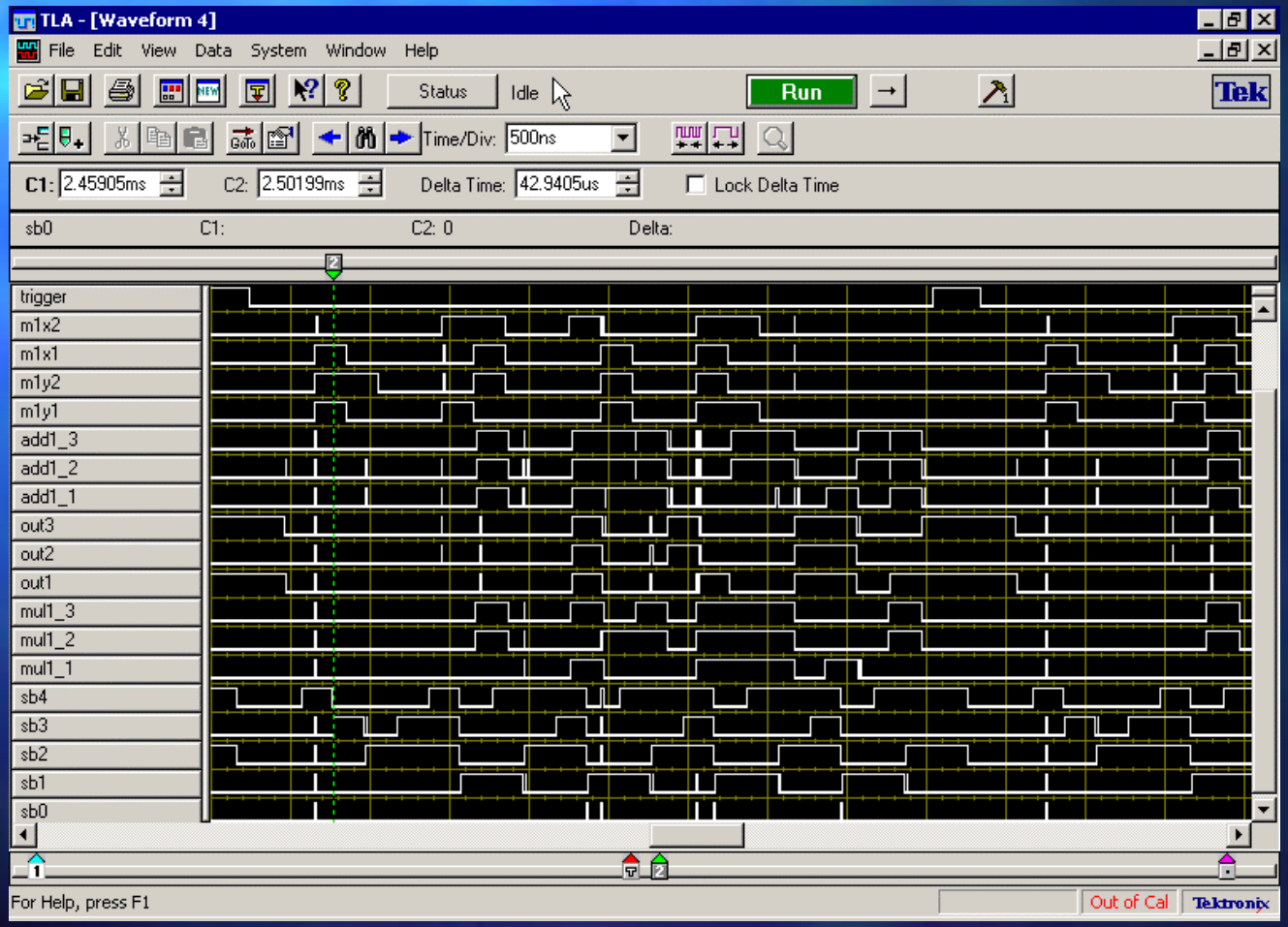
Testing Portfolio: Mode-1 Full-Precision



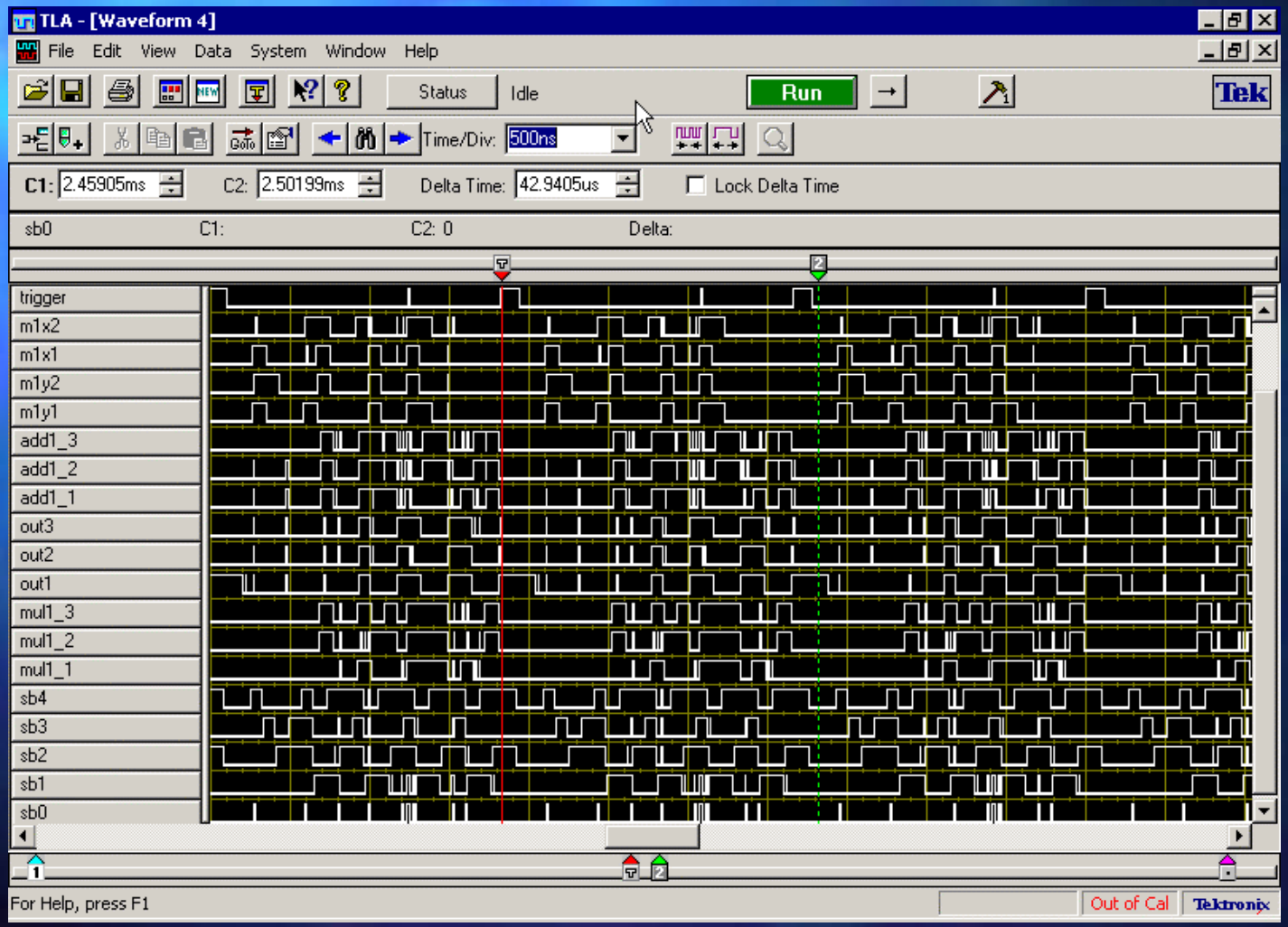
Testing Portfolio: Speed Test (f=10MHz)



Testing Portfolio: Speed Test (f=20MHz)



Testing Portfolio: Speed Test (f=50MHz)



Conclusions

- Work-around: Matched-filtering *still* possible using two multipliers on chip (thanks to redundancy in design)
- Using multi-chip configuration, can still achieve higher data-rate/longer spreading codes
- Yield: all 5 chips are working identically

Conclusions