

Ultra-Fast Damping Ring Kicker Modulator Development at SLAC

Status update for ILC2010

C. Burkhart, A. Krasnykh, R. Larsen, & T. Tang

March 27, 2010

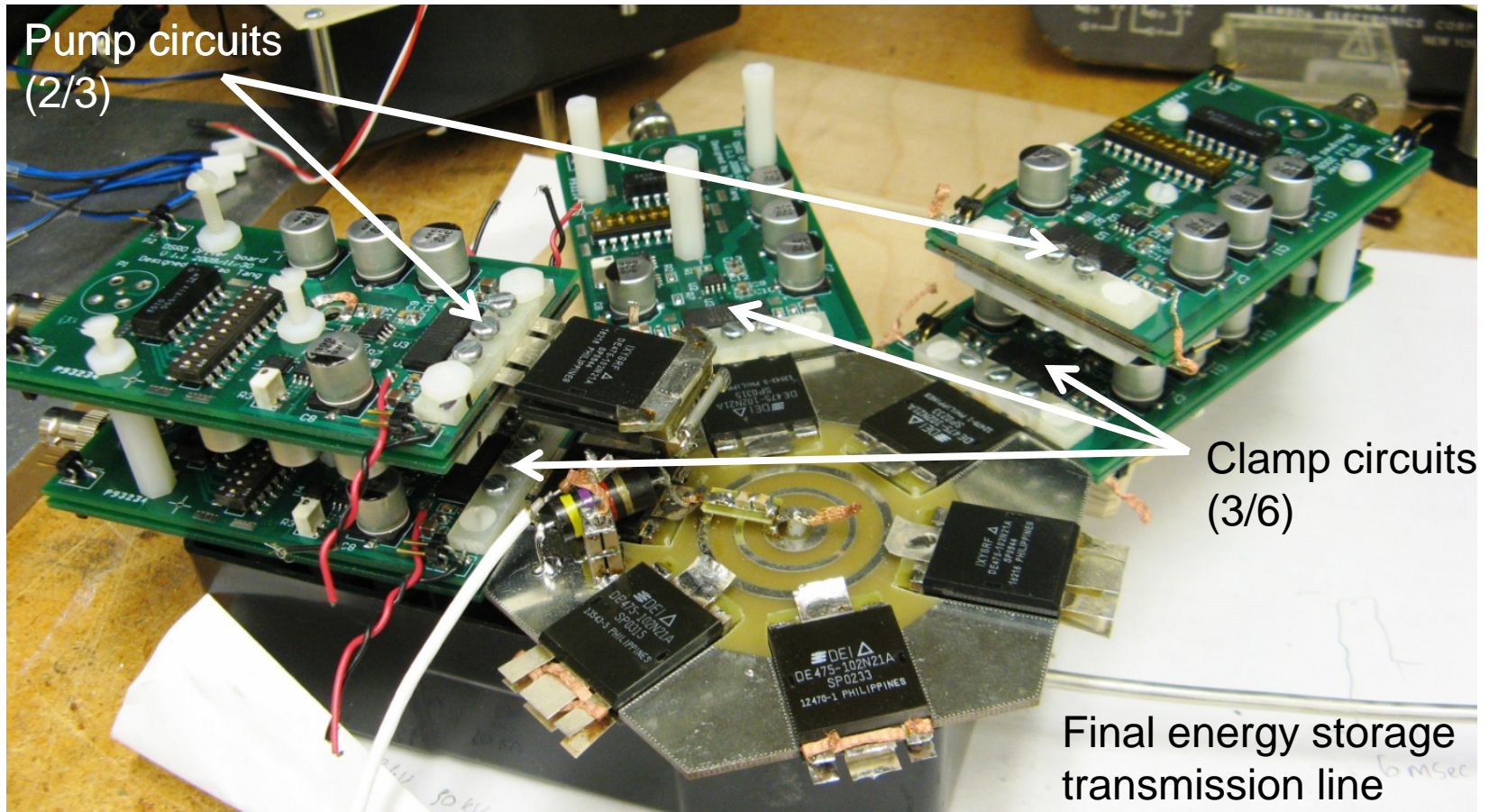
SLAC DR Kicker Modulator R&D

- SLAC program continues to investigate two approaches
 - Adder topologies: array ultra-fast MOSFET switches
 - Opening switch topologies: DSRD switch
- Adder Program
 - Hybrid MOSFET/driver
 - ~1 ns switching time (demonstrated FY08)
 - Improve assembly technique
 - Evaluate thermal stability
 - High bandwidth adder topologies
 - Preservation of pulse fidelity (demonstrated FY09)
 - Extend to ILC parameters
- Opening Switch Program
 - Functionally similar to DSRD systems marketed by FID GmbH
 - “Open source” design
 - 2-ns prototype demonstrated (FY08)
 - **Developing 4-ns modulator for ATF2**

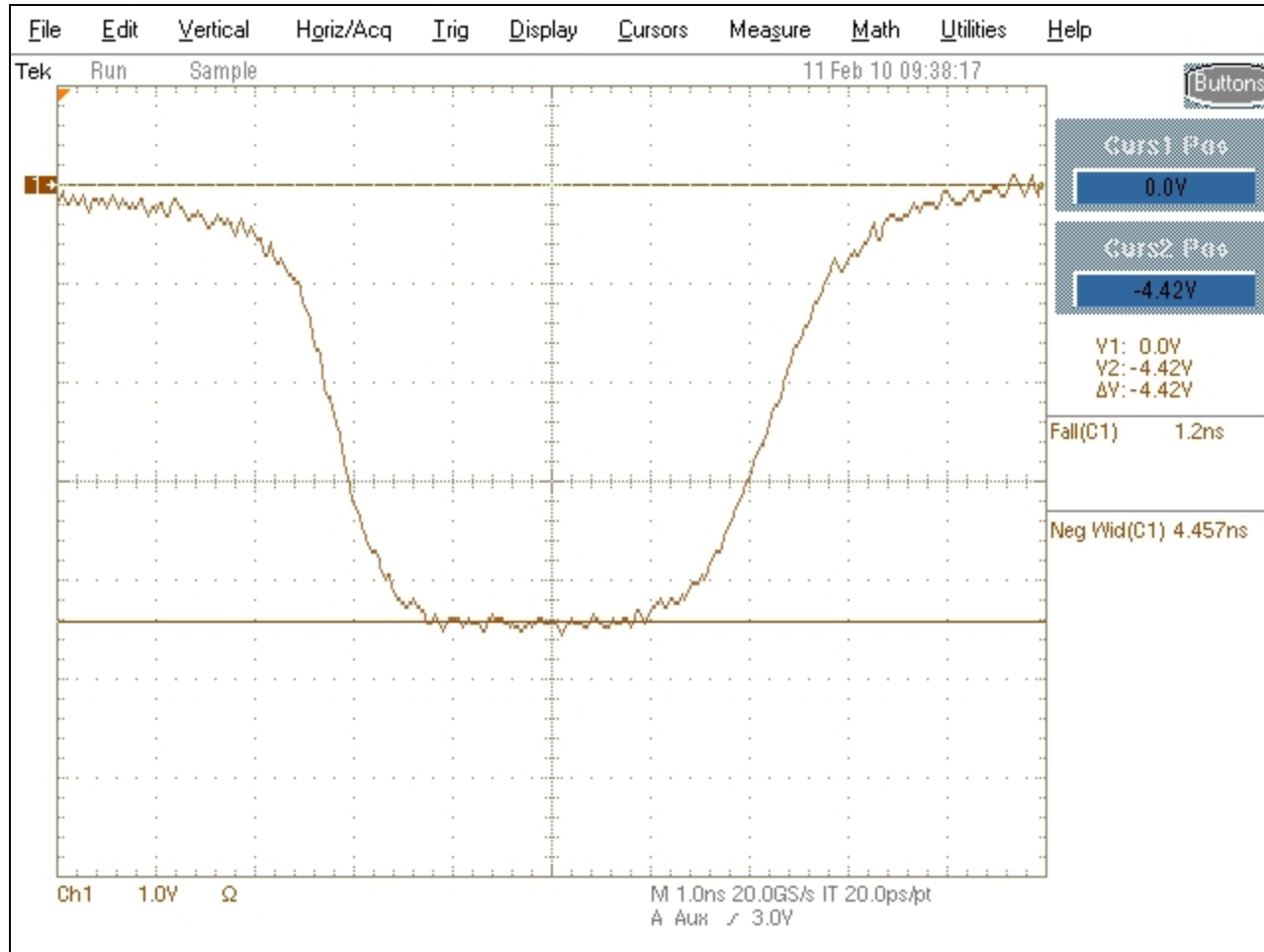
DSRD Program Developments

- Diversified Technologies, Inc. (under USDOE SBIR funding)
 - Commercialized DSRD production in US (Voltage Multipliers, Inc.)
 - Encountered insurmountable post-pulse issues with SLAC circuit topology
- SLAC developed alternative topology
 - Active clamping to eliminate post-pulse
 - Brass-board testing underway

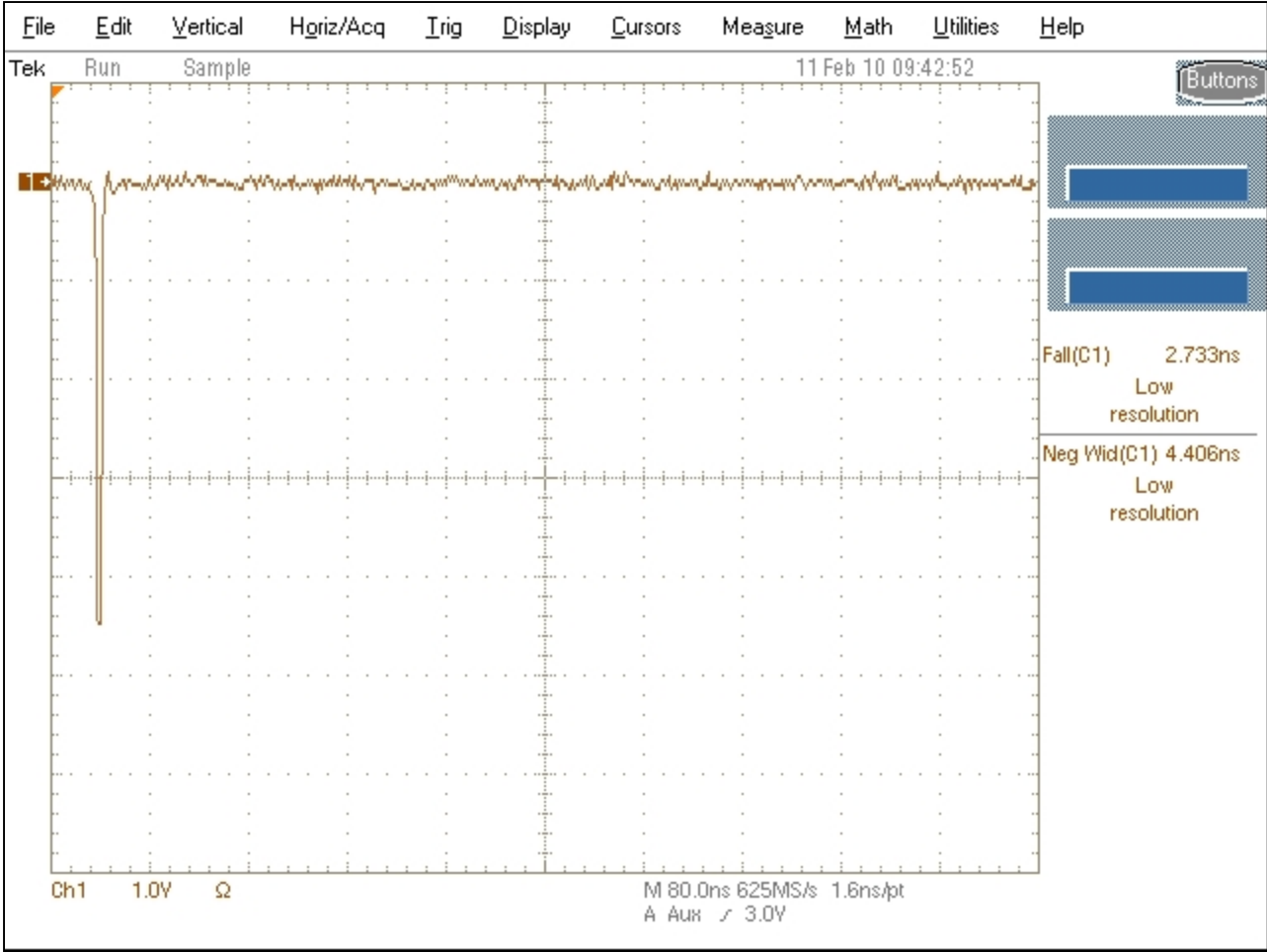
Partially Assembled DSRD Circuit



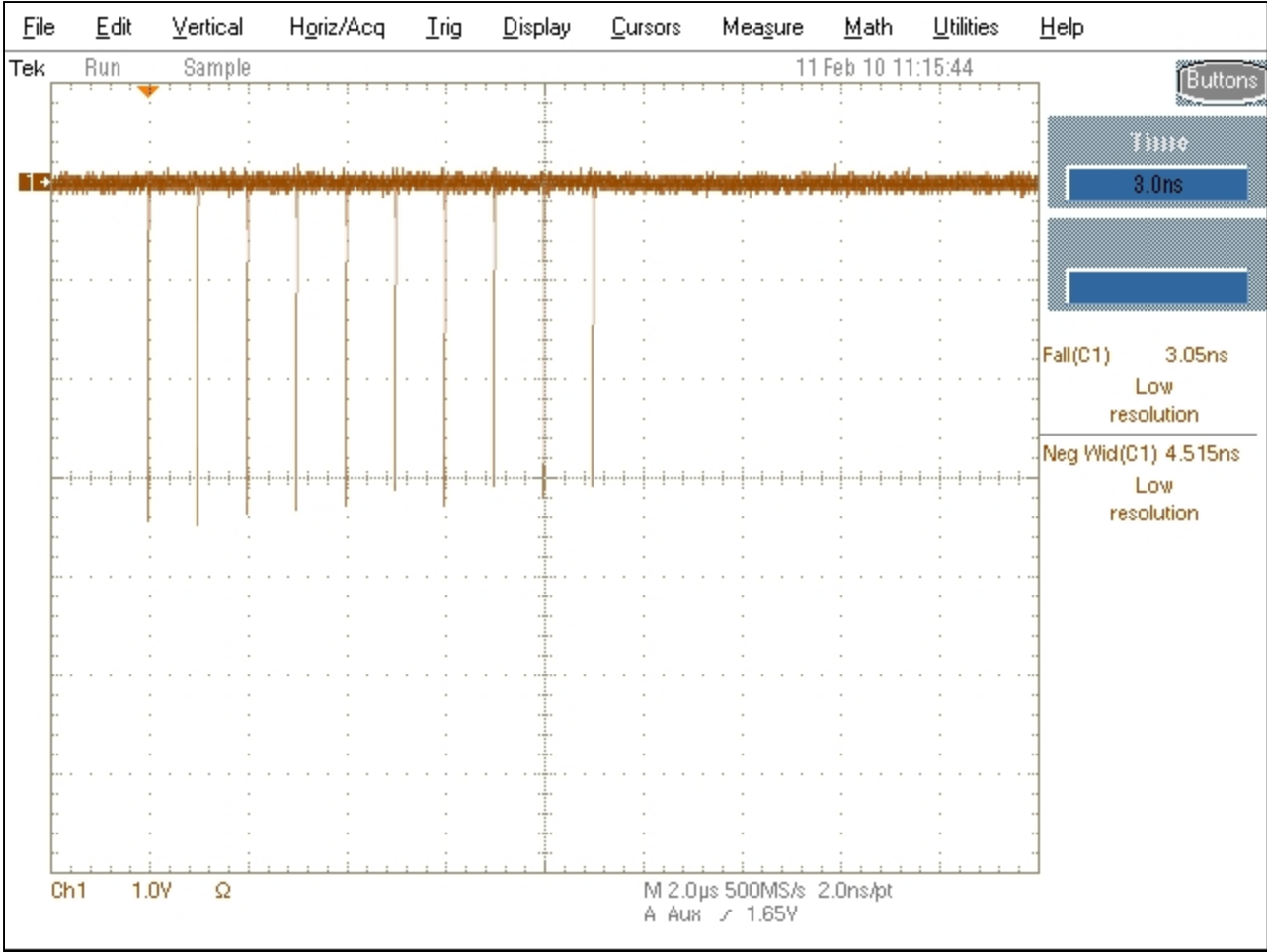
Reduced Width (2 ns) Output Waveform



Output Waveform: No Post-pulse



Output Waveform: 1 MHz Pulse Train



Development Plan

- FET-Adder
 - 2nd Generation MOSFET/driver (FY10-Q3&4)
 - Full scale adder (FY11)
- DSRD-Opening Switch
 - Full scale prototype (FY10-Q3)
 - Demonstration modulator (FY10-Q4)
 - ATF2 Testing (FY11)