

# “Beam On A Bench” CBPM Test System

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A backup/upgrade/replacement/duplicate of Len's test system

- ☐ More amplitude
- ☐ Higher frequency
- ☐ Triggers from a turns marker
  - ☐ output of the timing test box
  - ☐ any other turns marker source
- ☐ A second system for other uses

## Uses

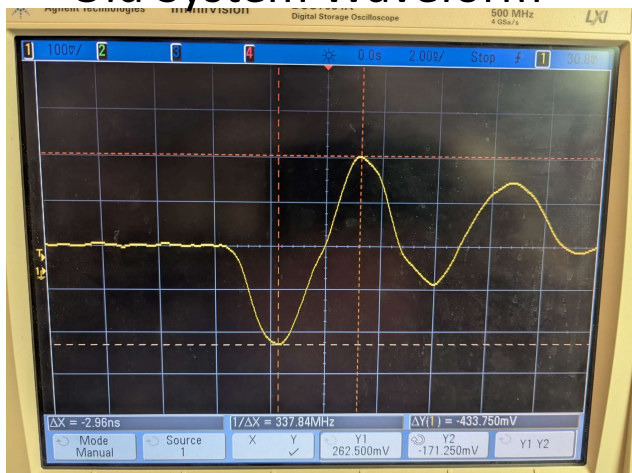
- ☐ Bench testing modules
- ☐ Developing time-in algorithm
  - ☐ Connect analog inputs with slightly different length cables (~1/2")
- ☐ Tunnel testing
  - ☐ Use special CBPM module that outputs a turns marker
  - ☐ Use front-panel SPI connector to access a turns marker (only on modules with latest Xilinx code)

## Waveforms

2 volts pk-pk into 50 ohm load after 1:4 splitter (8 volts into a single channel)

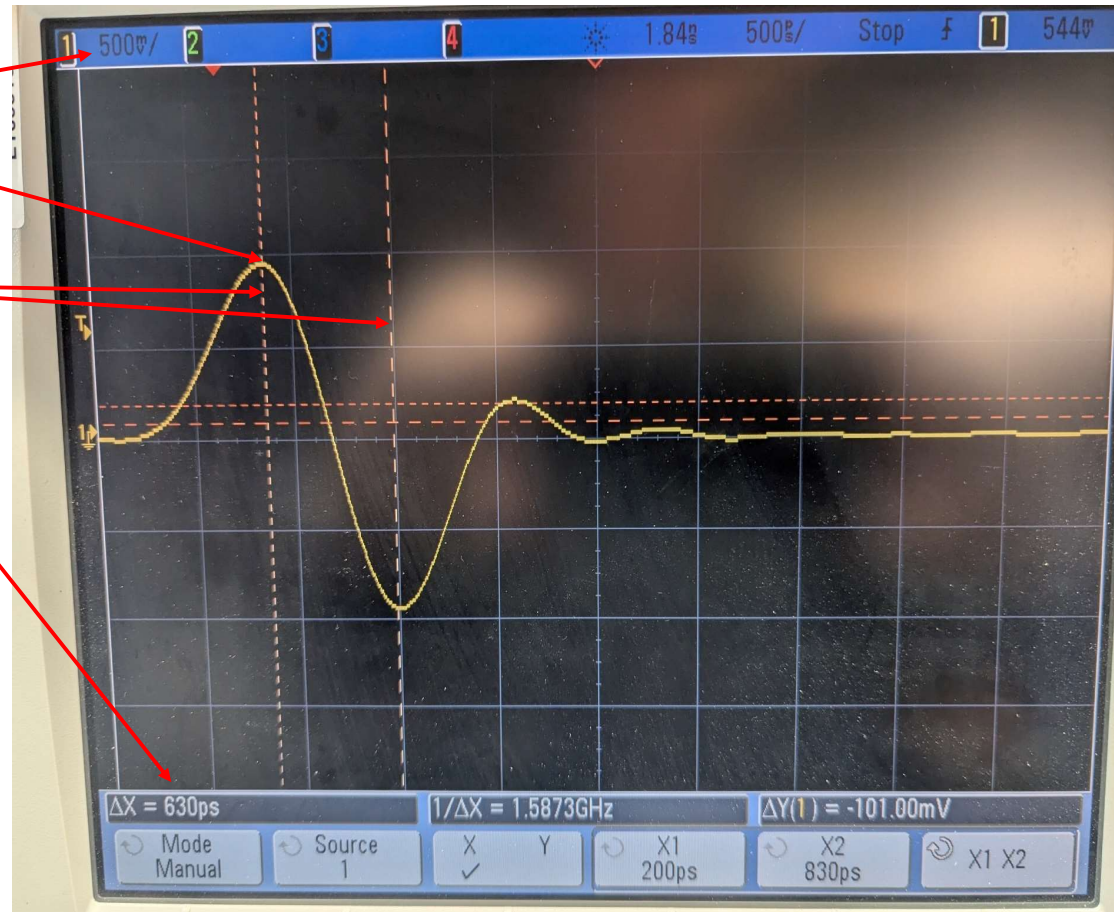
630 ps positive peak to negative peak with 4" cable length difference

### Old System Waveform

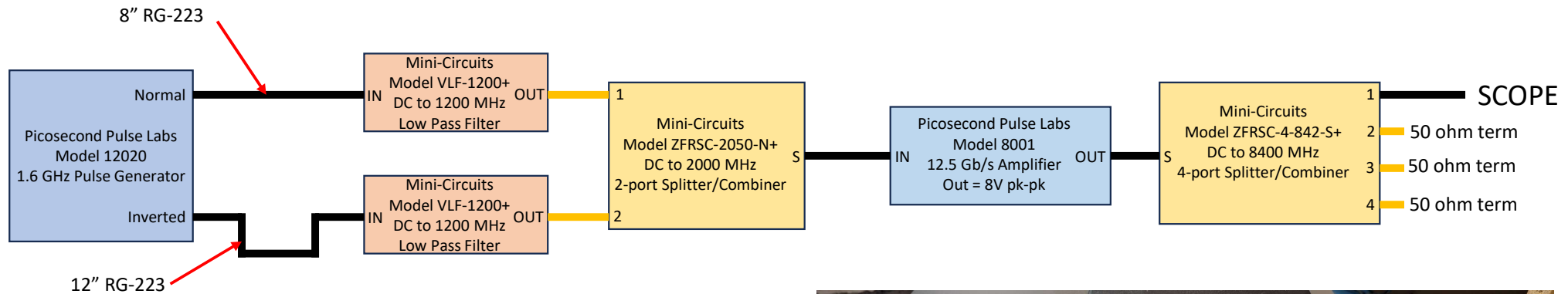


400 milli-volts pk-pk into 50 ohm load after 1:6 splitter, 2960 ps positive peak to negative peak

## New System Waveform



## Setup



- ❑ The extra cable length on the inverted output delays the signal by about 600 ps.
  - ❑ The pulse width is adjusted so the trailing edge of the normal pulse aligns with the leading edge of the inverted pulse
  - ❑ The connections on the pulse generator could be swapped to produce a signal of the opposite polarity
  - ❑ The length difference could be decreased to produce a shorter time between the first peak and the second peak. The generator can produce 250 ps. wide pulses.
- ❑ The low-pass filters limit the frequency content going into the scope
  - ❑ My scope has a bandwidth of 1 GHz and a maximum single-channel sample rate of 4 GSa/s.
  - ❑ There are only 4 samples per nano-second. The scope has a  $\sin(x)/x$  interpolation algorithm to smoothly connect the points for display. It may not represent reality.
  - ❑ A better scope should be used if you want to push the frequency for a narrower pulse.



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<https://docs.keysight.com/kkbopen/how-does-sin-x-x-sinc-interpolation-work-616372293.html>