

## Laser Test Stand Calibration Studies

### 1. Jitter From Electronics

#### a. TAC->ADC

Run #: 674

The Impeccable pulsar was used to trigger the start and stop of the TAC.  
The cable lengths were the same.

T Ortec 566

TAC: Range: 50ns

Multiplier: x1

Ortec AD114

ADC: LLC:  $20 \times 2\text{mV} = 40\text{mV}$

ULC:  $(100 \times 8\text{mV}) + 8.5\text{V} = 9.3\text{V}$

Mean	Mean Err	Sigma	Sigma Err
4407.98	0.0137088	1.08901	0.0101488

Jitter:  $3.40316 \pm 0.03172$  ps

Peak: 2 (The pulsar produces a random stop pulse from 5ns to 100ns after the start pulse. The stop pulses are in 5ns increments.)

Events at peak: 6301

#### b. CFD->TAC->ADC

Run #: 673

The Impeccable pulsar was used to trigger the start and stop of the TAC.  
The stop pulse went into the Ortec 9307 CFD and the output of that was the stop for the TAC. The cable lengths were the same.

Ortec 566

TAC: Range: 50ns

Multiplier: x1

Ortec AD114

ADC: LLC:  $20 \times 2\text{mV} = 40\text{mV}$

ULC:  $(100 \times 8\text{mV}) + 8.5\text{V} = 9.3\text{V}$

Ortec 9307

CFD: Thresh: 100mV

Slew: -11mV

Mean	Mean Err	Sigma	Sigma Err
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6476.99	0.0197579	1.61021	0.0144512
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**Jitter: 5.03191 ± 0.04516 ps**

Peak: 2 (The pulsar produces a random stop pulse from 5ns to 100ns after the start pulse. The stop pulses are in 5ns increments.)

Events at peak: 6994

c. Amp->CFD->TAC->ADC

Run #: 675

The Impeccable pulsar was used to trigger the start and stop of the TAC. The stop pulse was attenuated then amplified. The amplified pulse went into the Ortec 9307 CFD and the output of that was the stop for the TAC. The cable lengths were the same.

Ortec 566

TAC: Range: 50ns

Multiplier: x1

Ortec AD114

ADC: LLC:  $20 * 2\text{mV} = 40\text{mV}$

ULC:  $(100 * 8\text{mV}) + 8.5\text{V} = 9.3\text{V}$

Ortec 9307

CFD: Thresh: 100mV

Slew: -11mV

Attenuators:

The 10dB and the 30dB BNC attenuators were used at the same time at the pulsar.

Ortec 9306

Amp: Out 1: to CFD

Out 2: 50Ω terminated

Mean	Mean Err	Sigma	Sigma Err
7992.25	0.0852844	7.60329	0.0600685

**Jitter: 23.7603 ± 0.1877 ps**

Peak: 2 (The pulsar produces a random stop pulse from 5ns to 100ns after the start pulse. The stop pulses are in 5ns increments.)

Events at peak: 8384

d. CFD->TAC->ADC

Run #: 676

The Impeccable pulsar was used to trigger the start and stop of the TAC. The stop pulse was attenuated then amplified. The amplified pulse went

into the Ortec 9307 CFD and the output of that was the stop for the TAC. The cable lengths were the same.

Ortec 566

TAC: Range: 50ns

Multiplier: x1

Ortec AD114

ADC: LLC:  $20 \times 2\text{mV} = 40\text{mV}$

ULC:  $(100 \times 8\text{mV}) + 8.5\text{V} = 9.3\text{V}$

Ortec 9327

CFD: Thresh:  $-100\text{mV}$

Walk:  $5\text{mV}$

Attenuators:

The 10dB and the 30dB BNC attenuators were used at the same time at the pulsar.

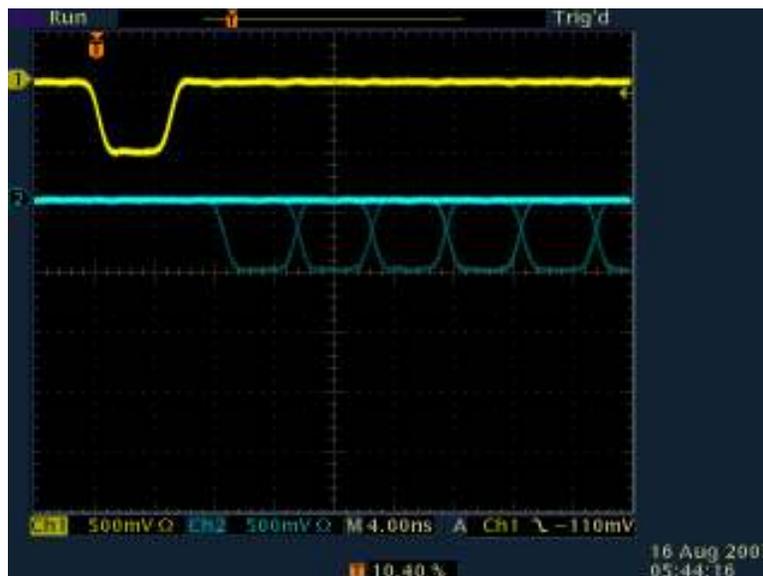
Mean	Mean Err	Sigma	Sigma Err
6566.15	0.0150780	2.66890	0.0117654

Jitter:  $8.3403 \pm 0.3677 \text{ ps}$

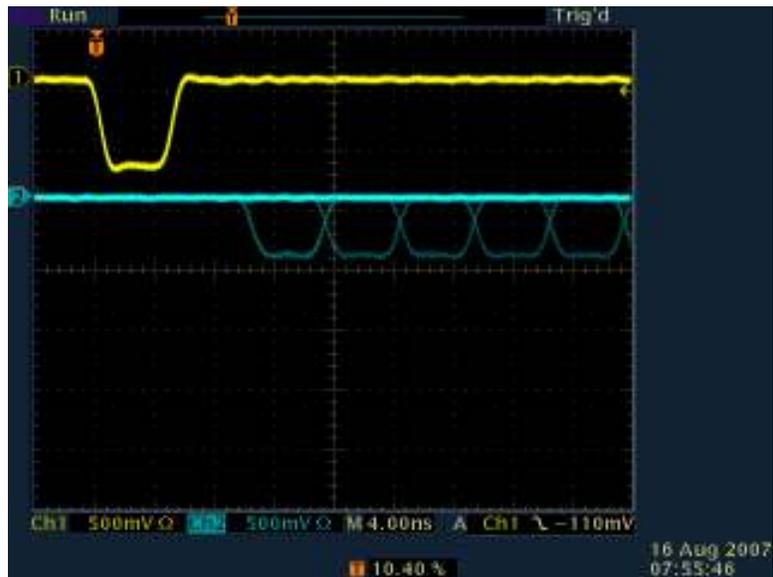
Peak: 2 (The pulsar produces a random stop pulse from 5ns to 100ns after the start pulse. The stop pulses are in 5ns increments.)

Events at peak:

e. Scope Pictures



Ch 1: Pulsar start pulse  
Ch 2: Pulsar stop pulse



Ch 1: Pulsar start pulse  
Ch 2: Pulsar stop pulse after attenuation and Ortec 9306 preamp

2. Manufactures' Specifications of Jitter
  - a. Hamamatsu Laser
    - i. 10ps