

EEE TRIGGER-GPS BOARD

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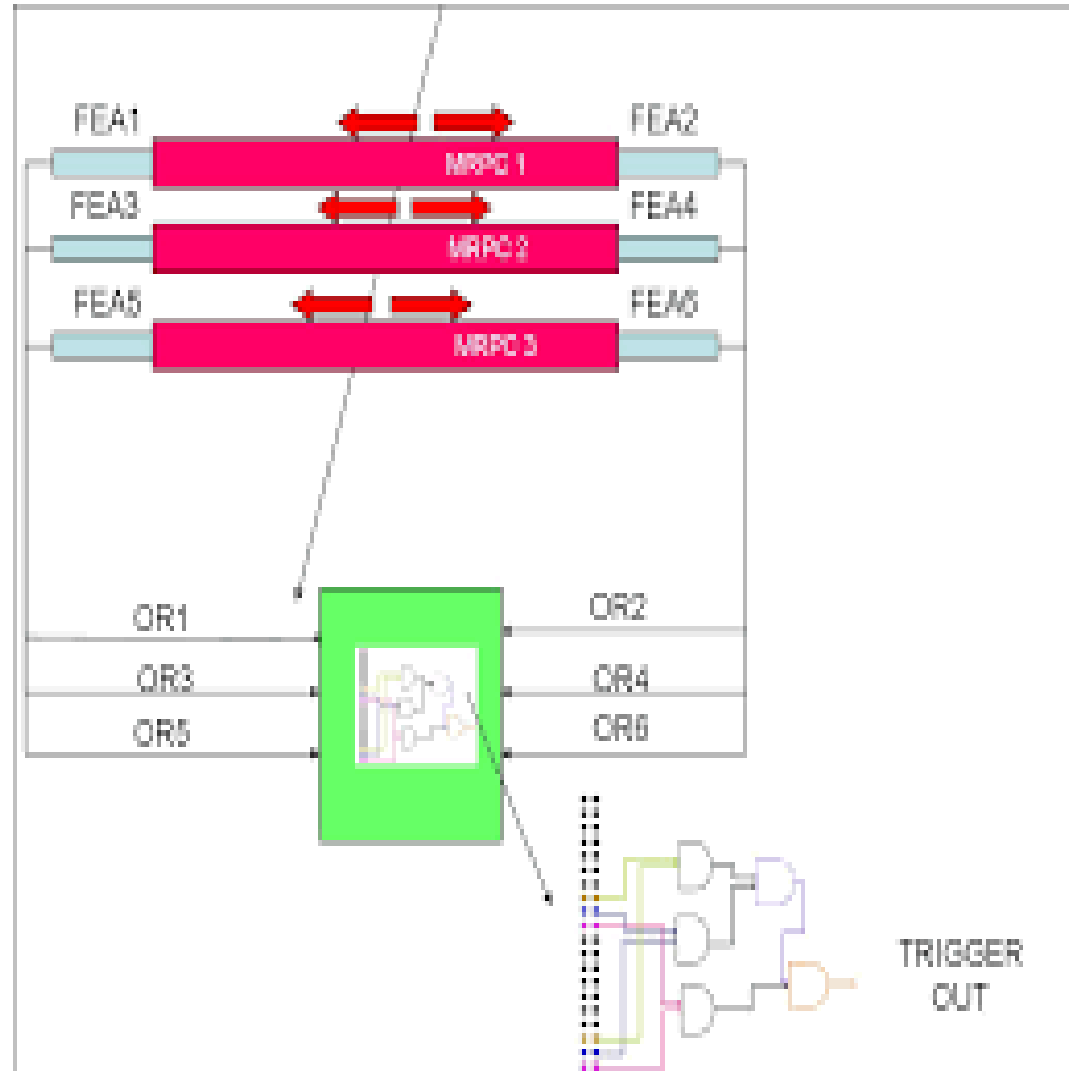
Museo Storico della Fisica e Centro Studi e Ricerche “Enrico Fermi”

for EEE Collaboration

Outlook

- The trigger for the EEE experiment
- A new trigger/time stamping board
 - 1st version (V.1)
 - 2nd version (V.2)
- Performances

The EEE experiment and its trigger



The trigger-GPS board: first version

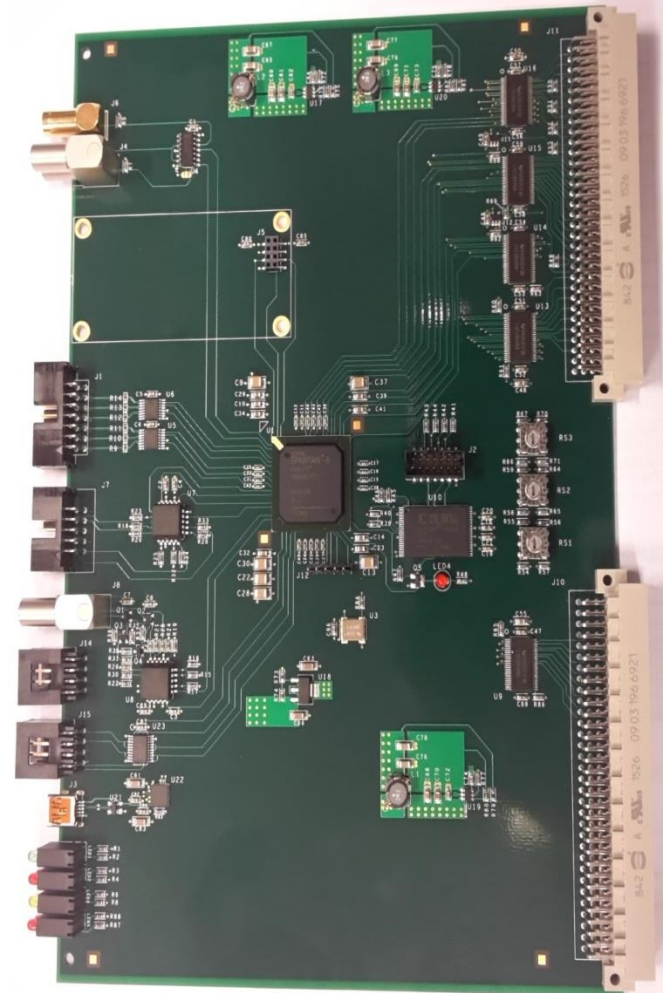
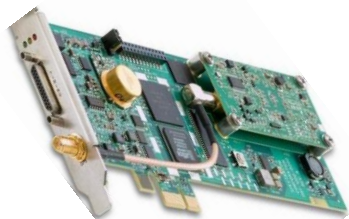
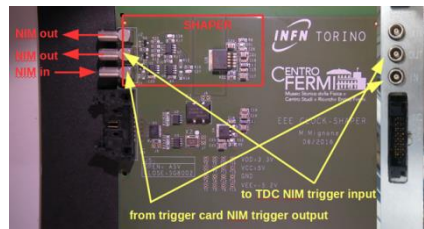


GPS
Interface

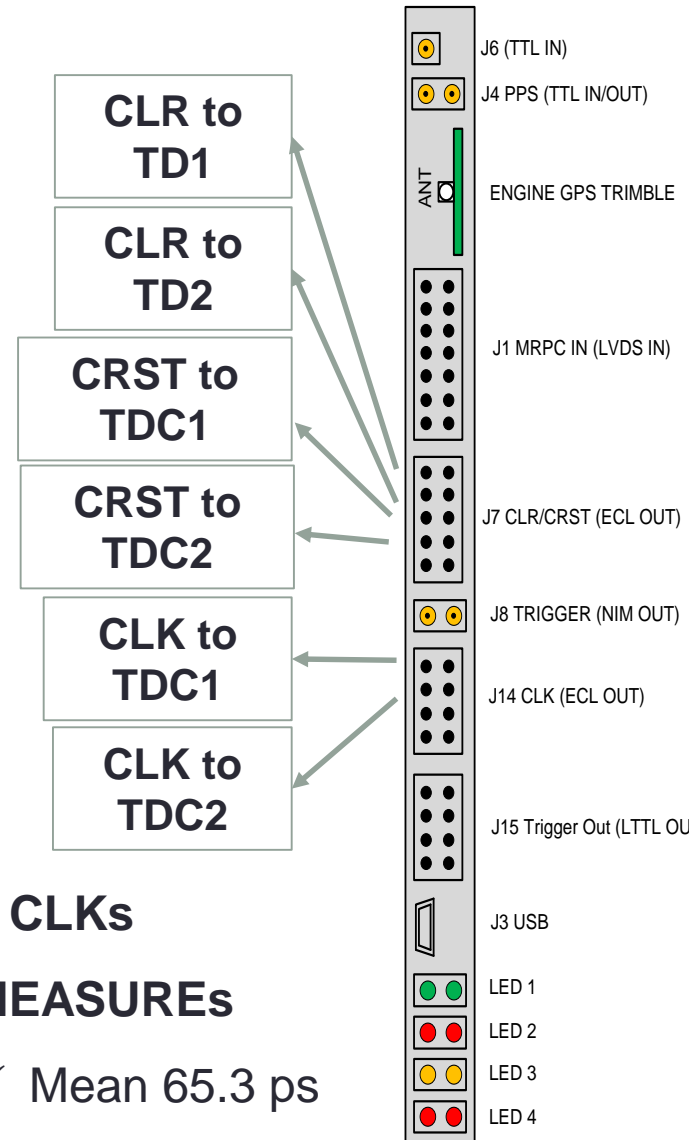
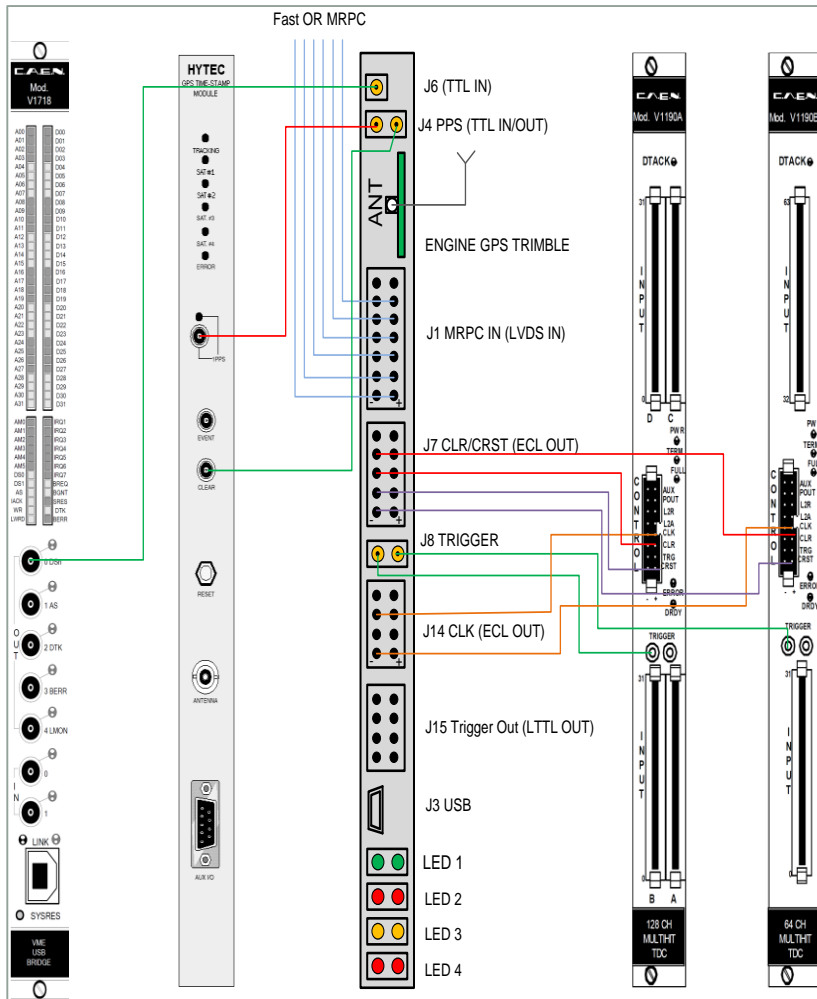
Clock
distributor

Trigger
(2 models)

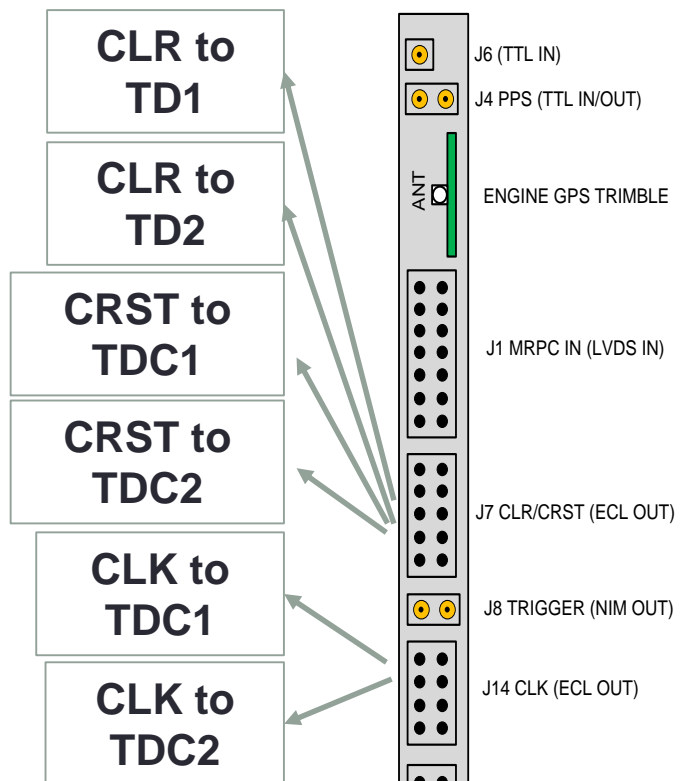
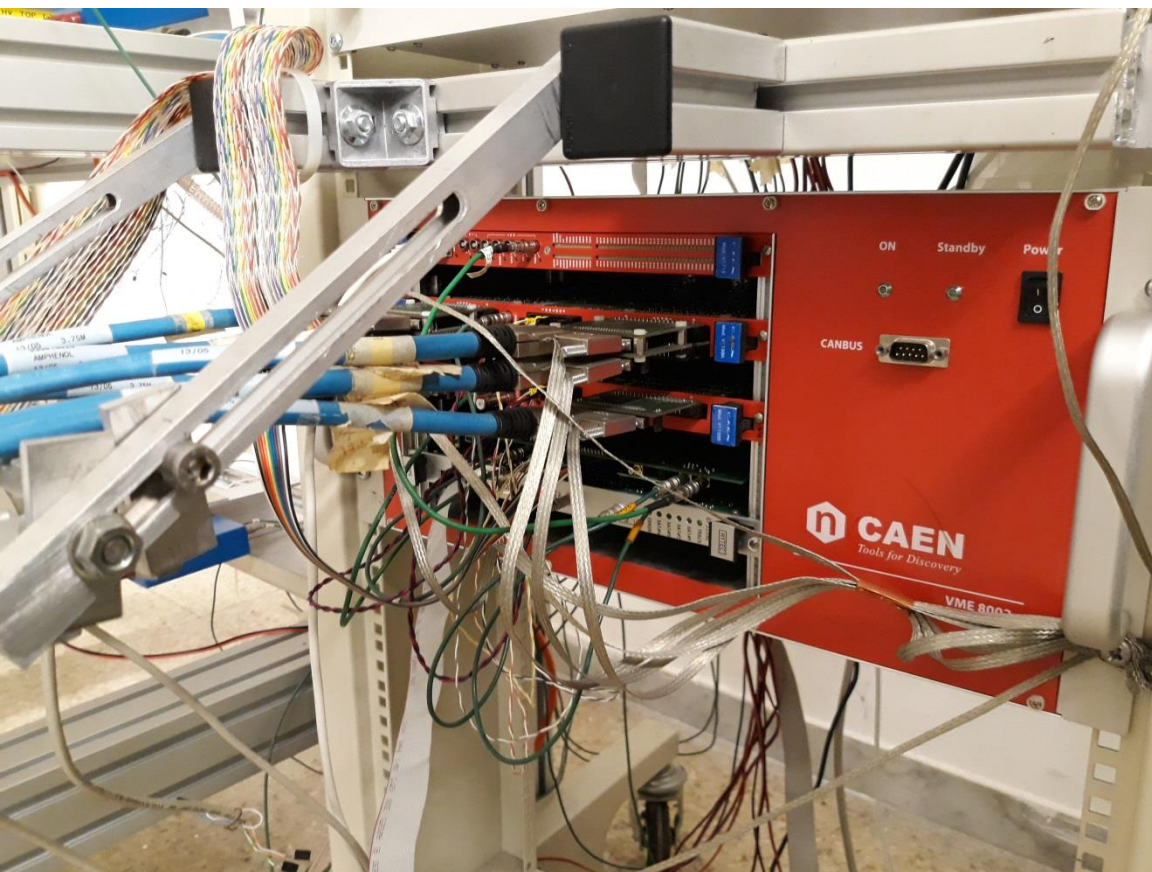
GPS
(2 models)



1st version's DAQ



1st version's DAQ



2 CLKs

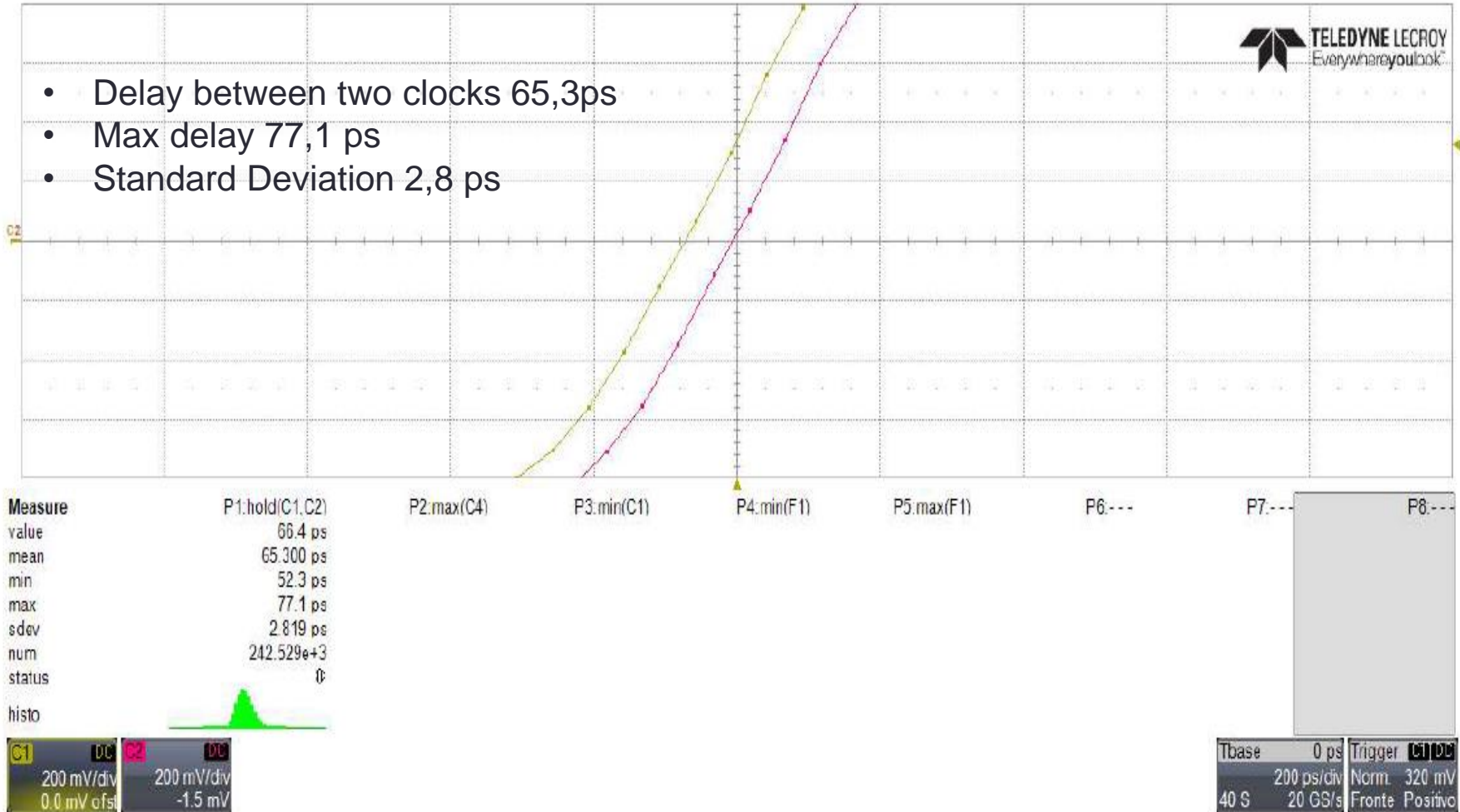
MEASURES

✓ Mean 65.3 ps

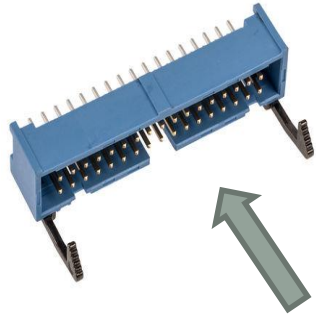
✓ Std dev 2.8 ps

40 MHz Disciplined clock tested

- Delay between two clocks 65,3ps
- Max delay 77,1 ps
- Standard Deviation 2,8 ps

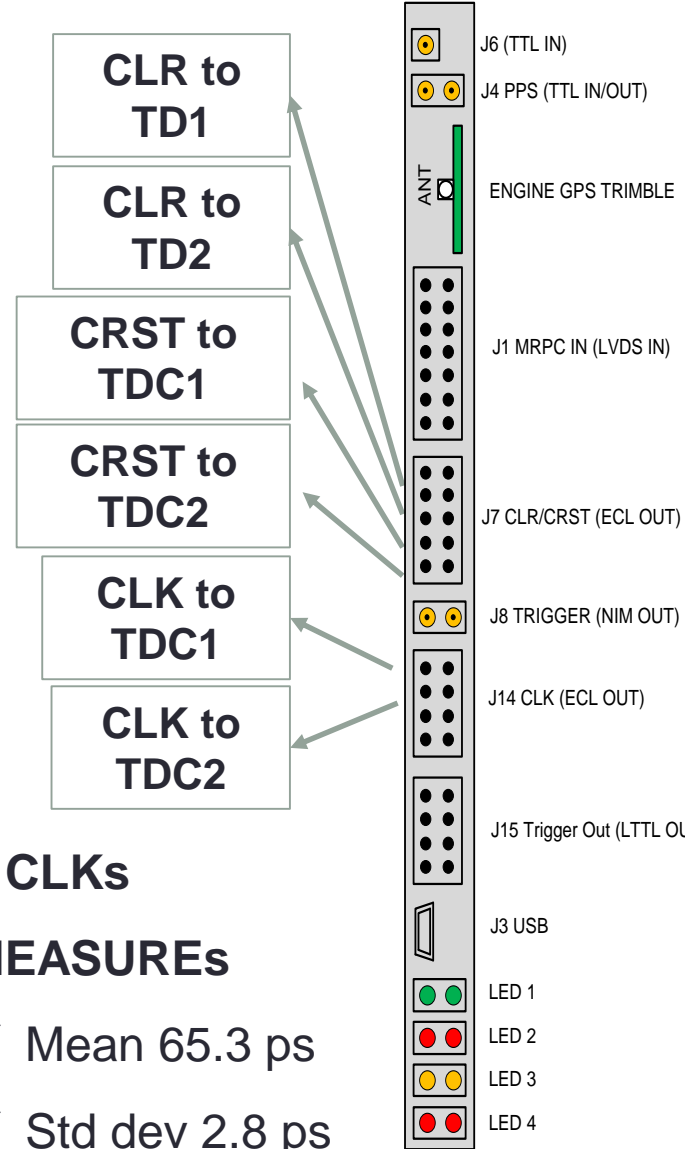
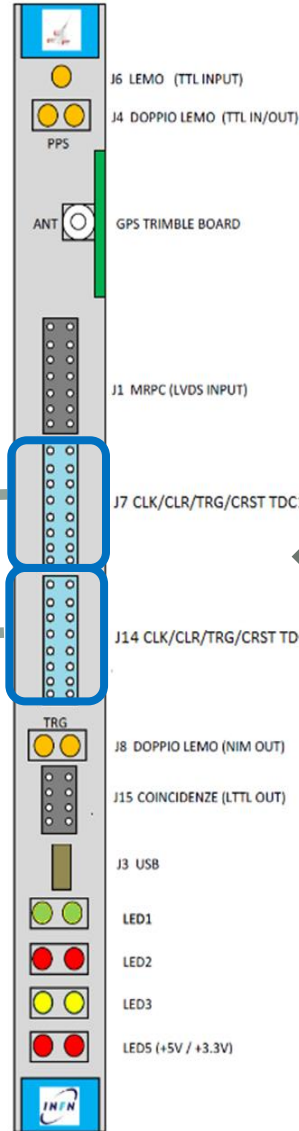


From 1st to 2nd version



CLK/CLR/TRG/CRST
to TDC1

CLK/CLR/TRG/CRST
to TDC2



In firmware 2.0

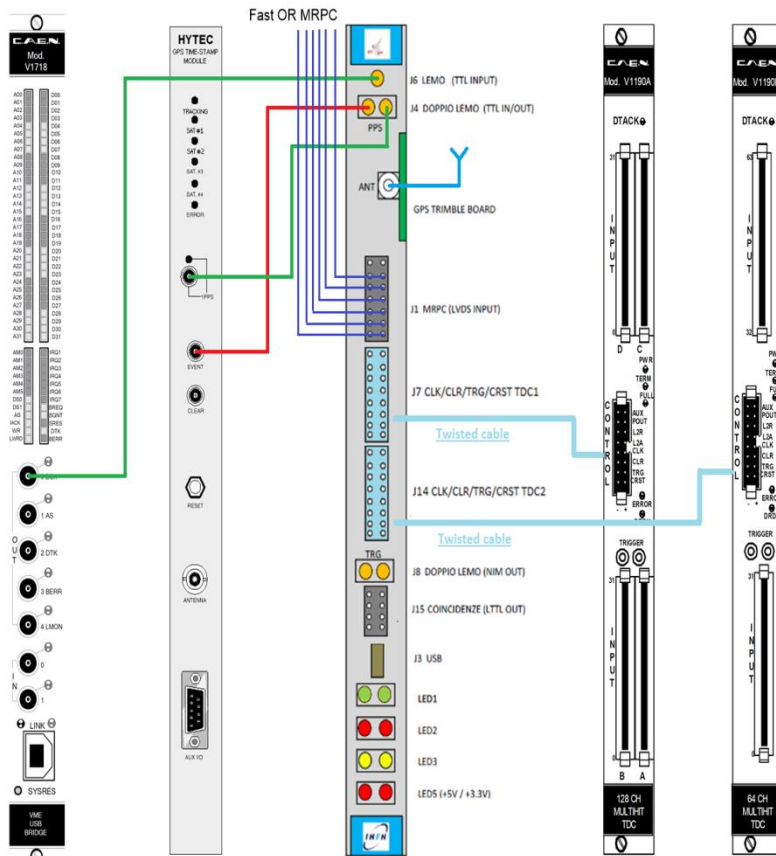
- ✓ Using a single clock line from FPGA (split on the output driver)

2 CLKs

MEASURES

- ✓ Mean 65.3 ps
- ✓ Std dev 2.8 ps

External GPS DAQ

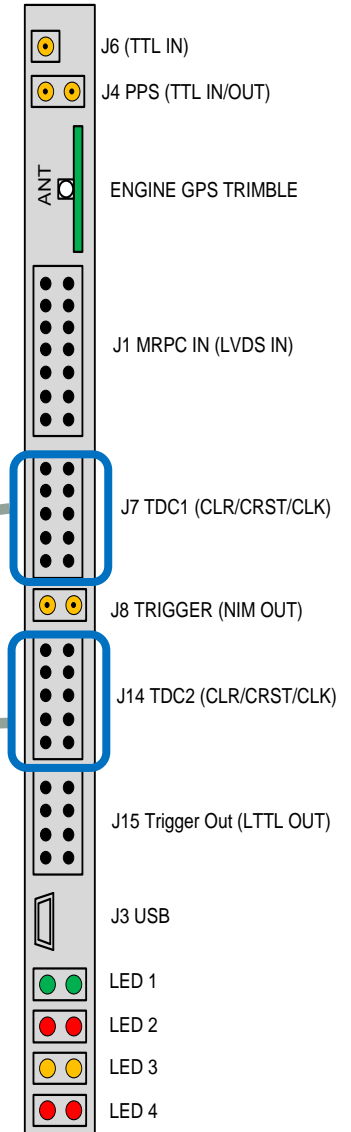


Connections simplified

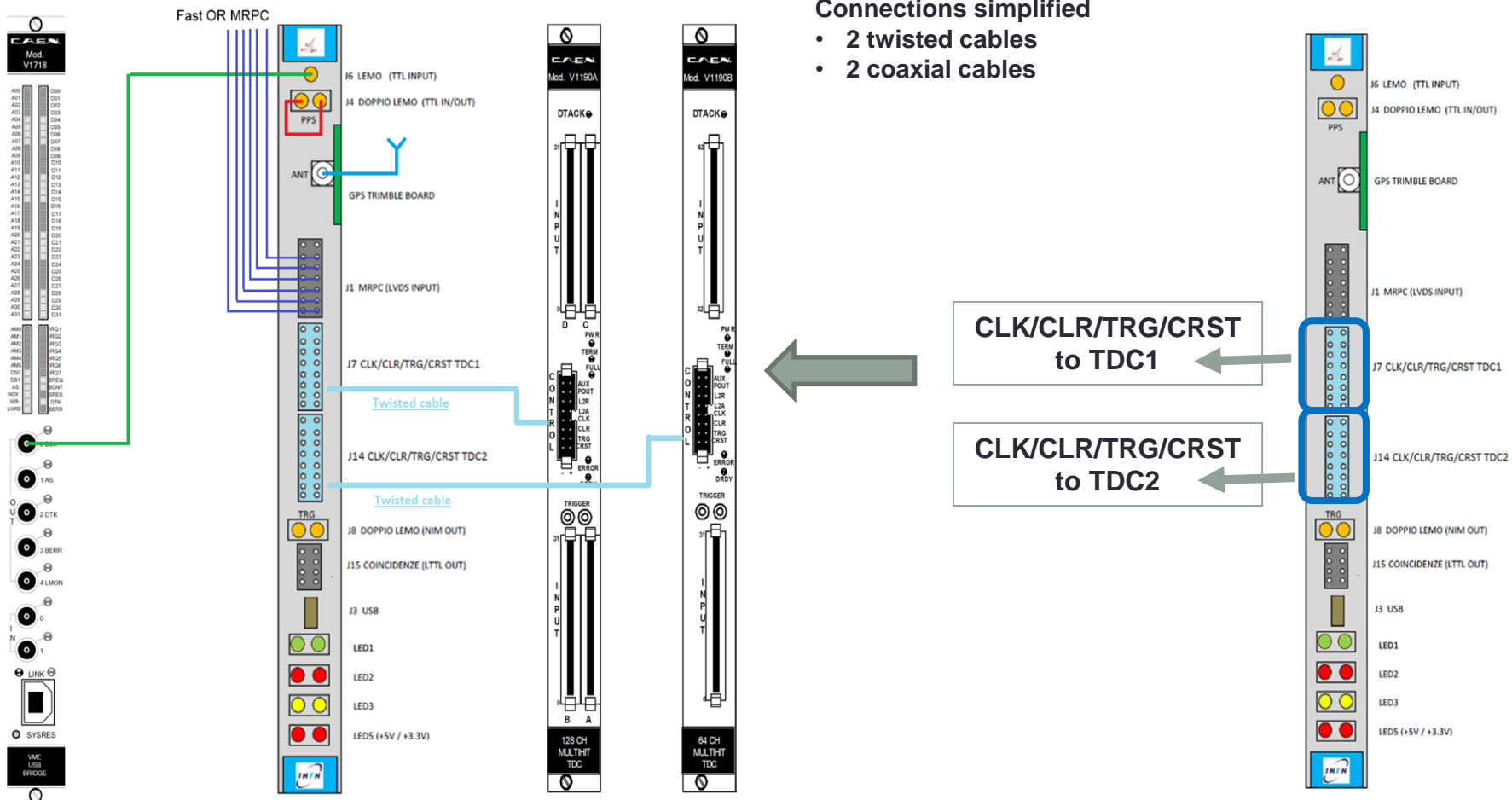
- 2 twisted cables
- 3 coaxial cables

CLR/CRST/CLK
to TDC1

CLR/CRST/CLK
to TDC2



External GPS DAQ

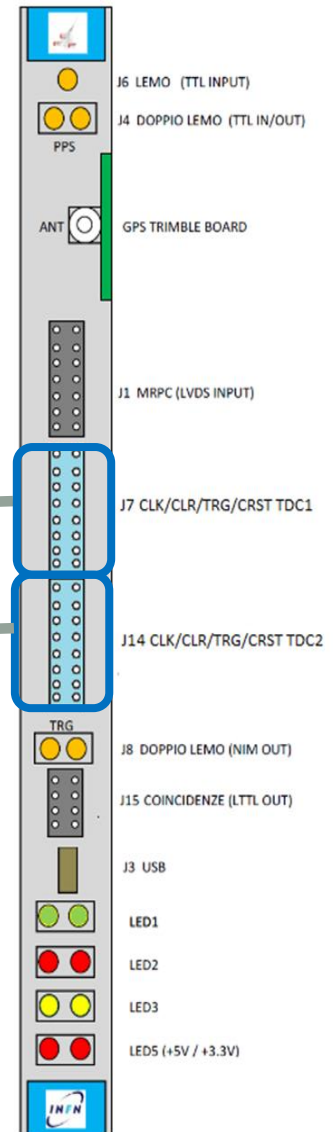


2nd version's DAQ

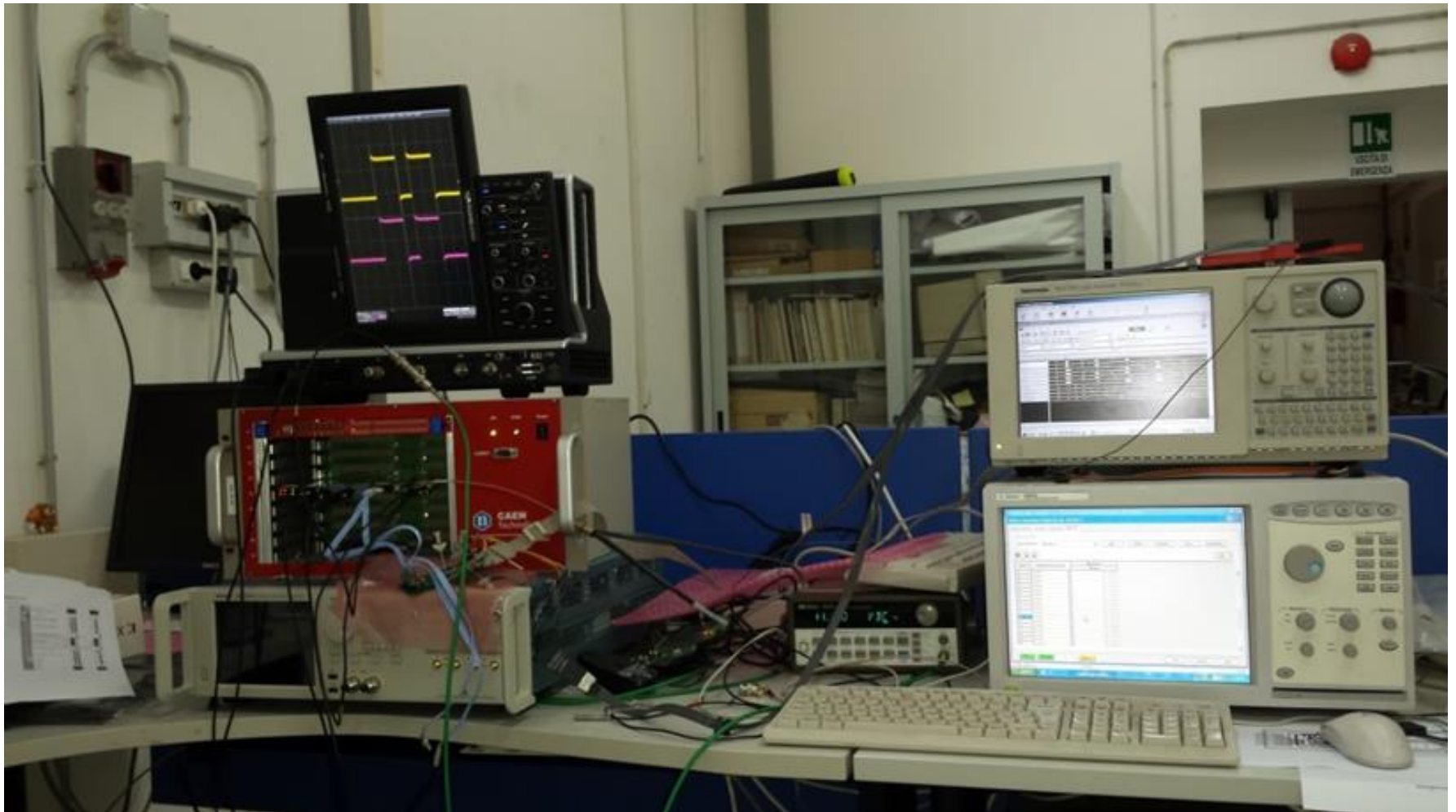


CLK/CLR/TRG/CRST
to TDC1

CLK/CLR/TRG/CRST
to TDC2

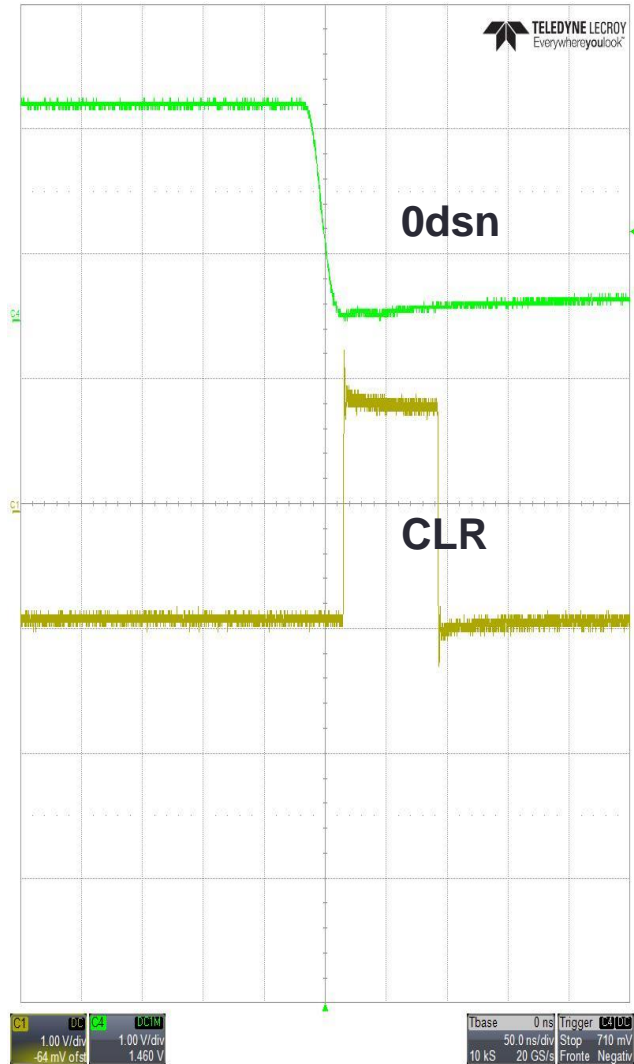


The test bench



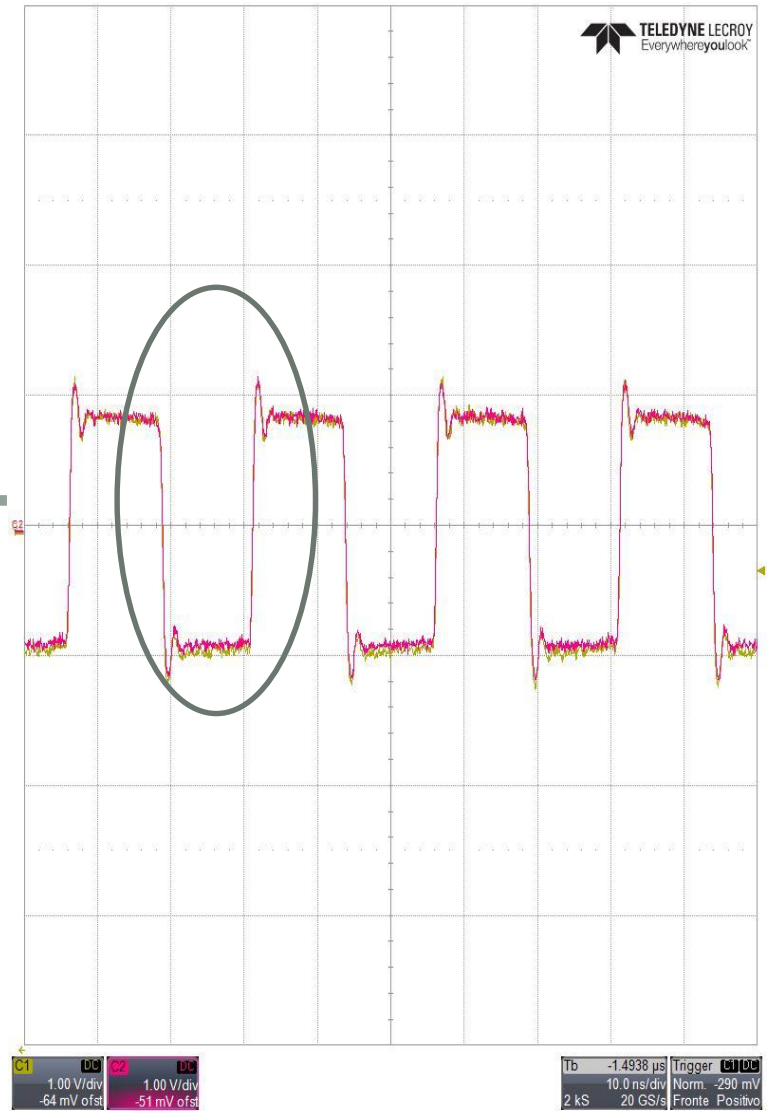
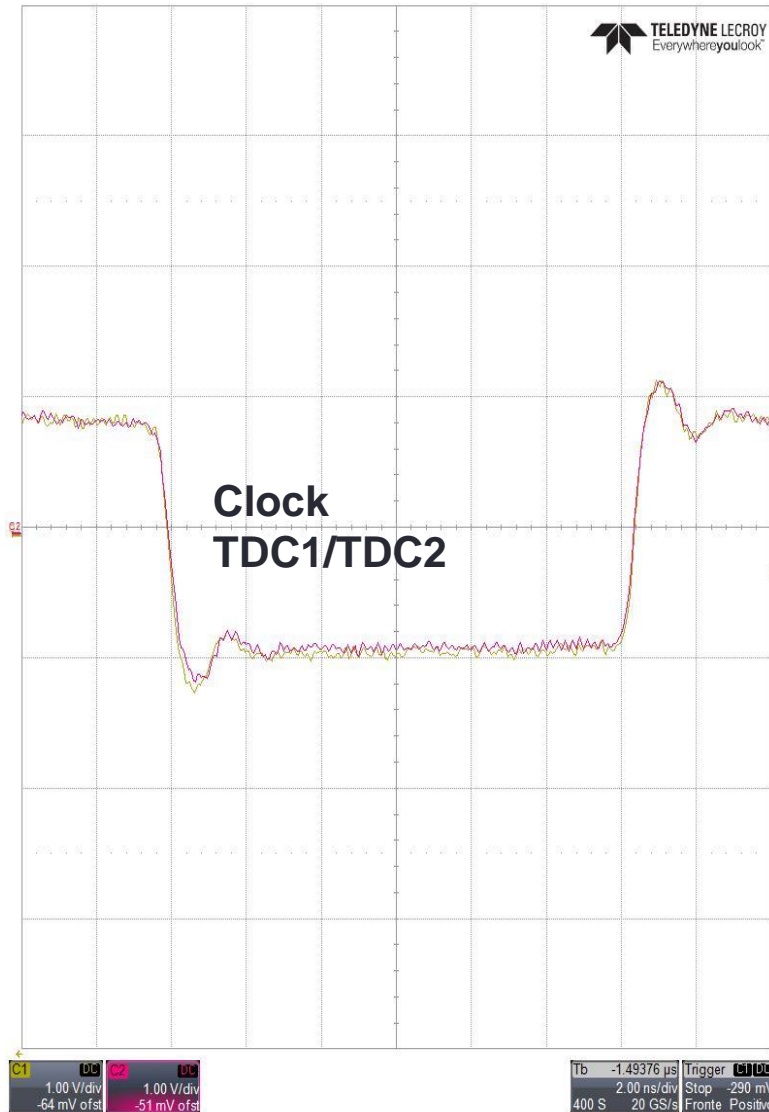
Test 1

IN 0dsn (bridge) TTL → Out CLR (TDC1/2) ECL



Test 2

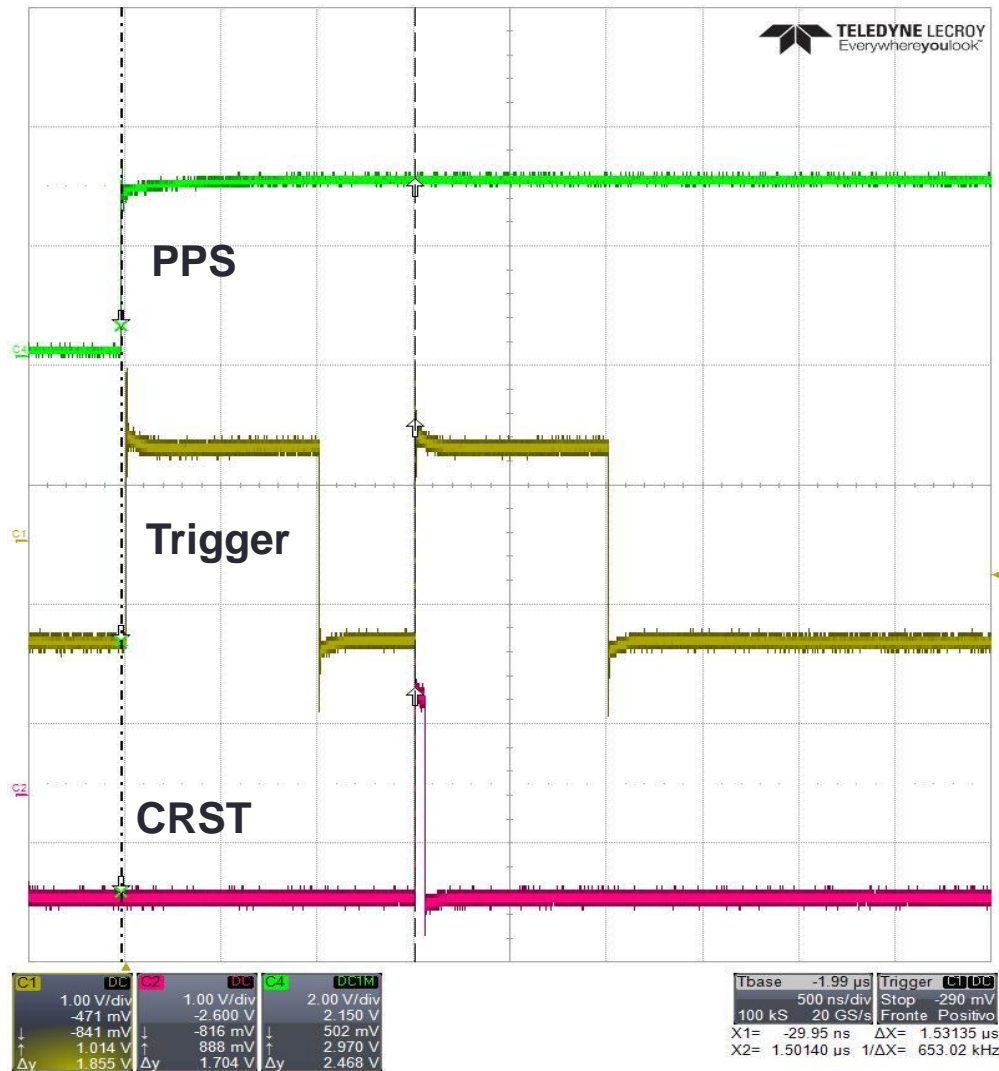
CLK 40 MHz (TDC1/2) ECL



Test 3

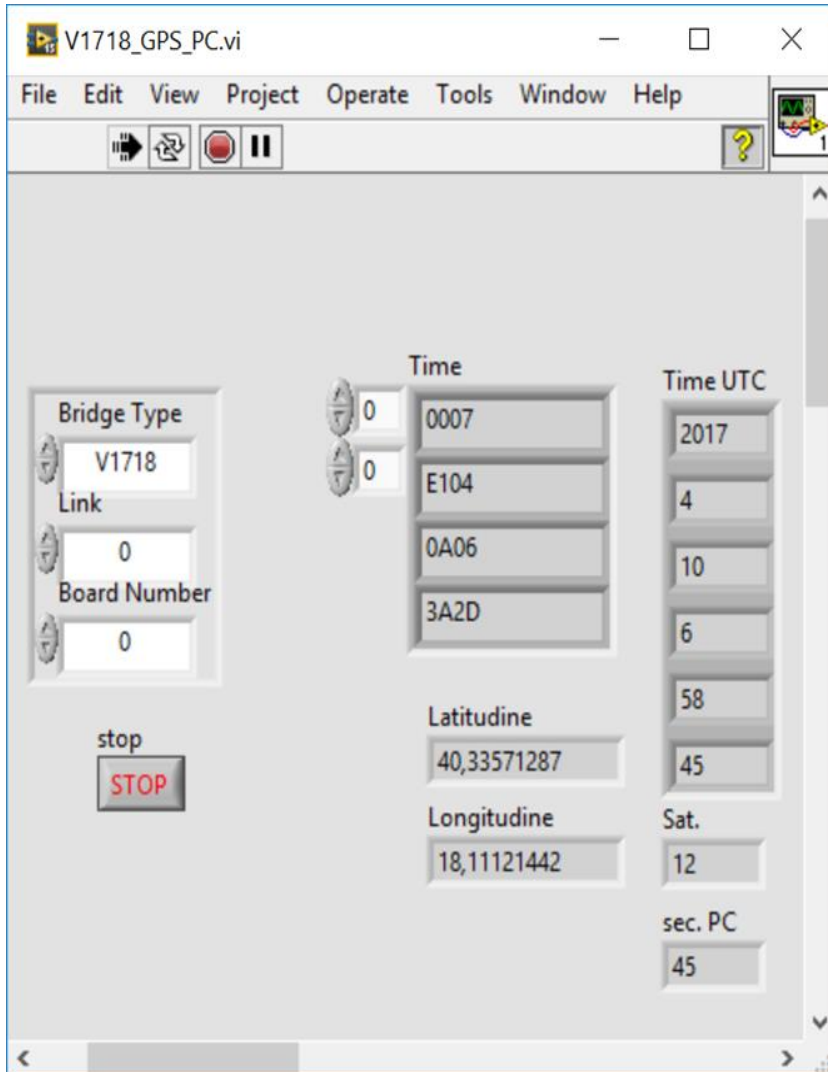
In PPS (GPS Int/Ext) TTL → Out Trigger (TDC1/2) ECL

In PPS (GPS Int/Ext) TTL → 1.5 μ s delay → Out CRST (TDC1/2) ECL



Test 5

GPS

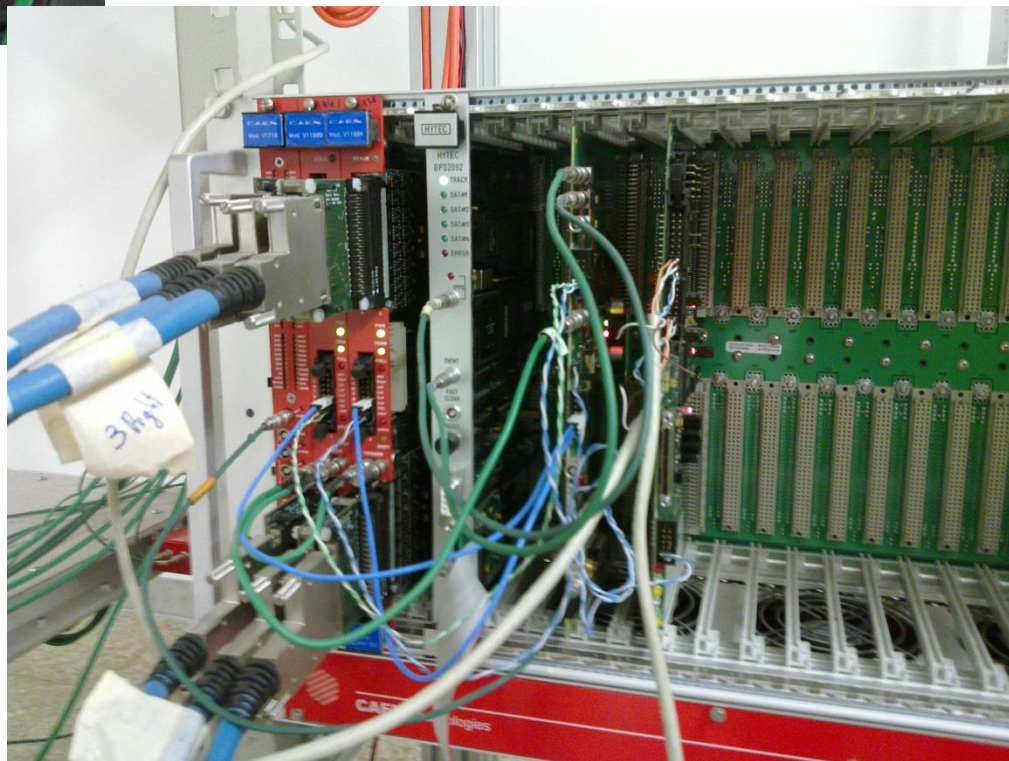


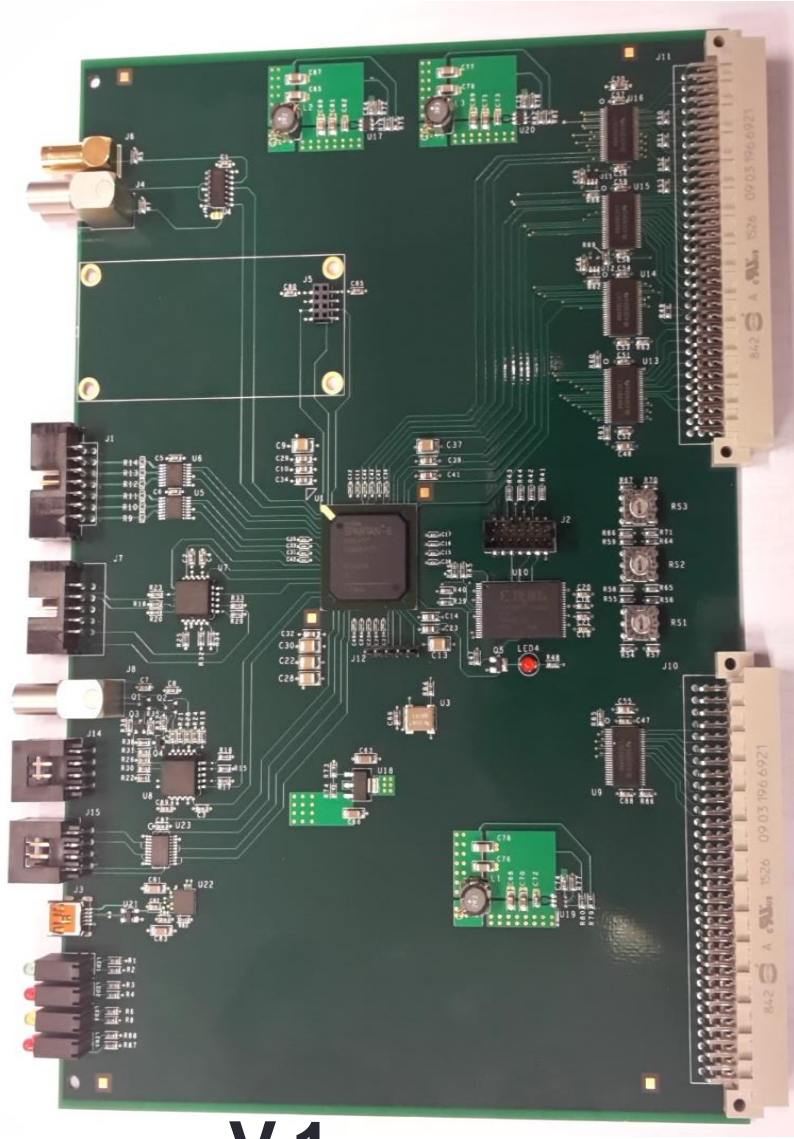
- After 7.5 hours of data acquisition (~27000 events)
- **Time**
 - 0 errors of seconds
- **Position**
 - Latitude/longitude differences between subsequent measurements $<10^{-4}$ degrees (according to GPS standard)

Summary

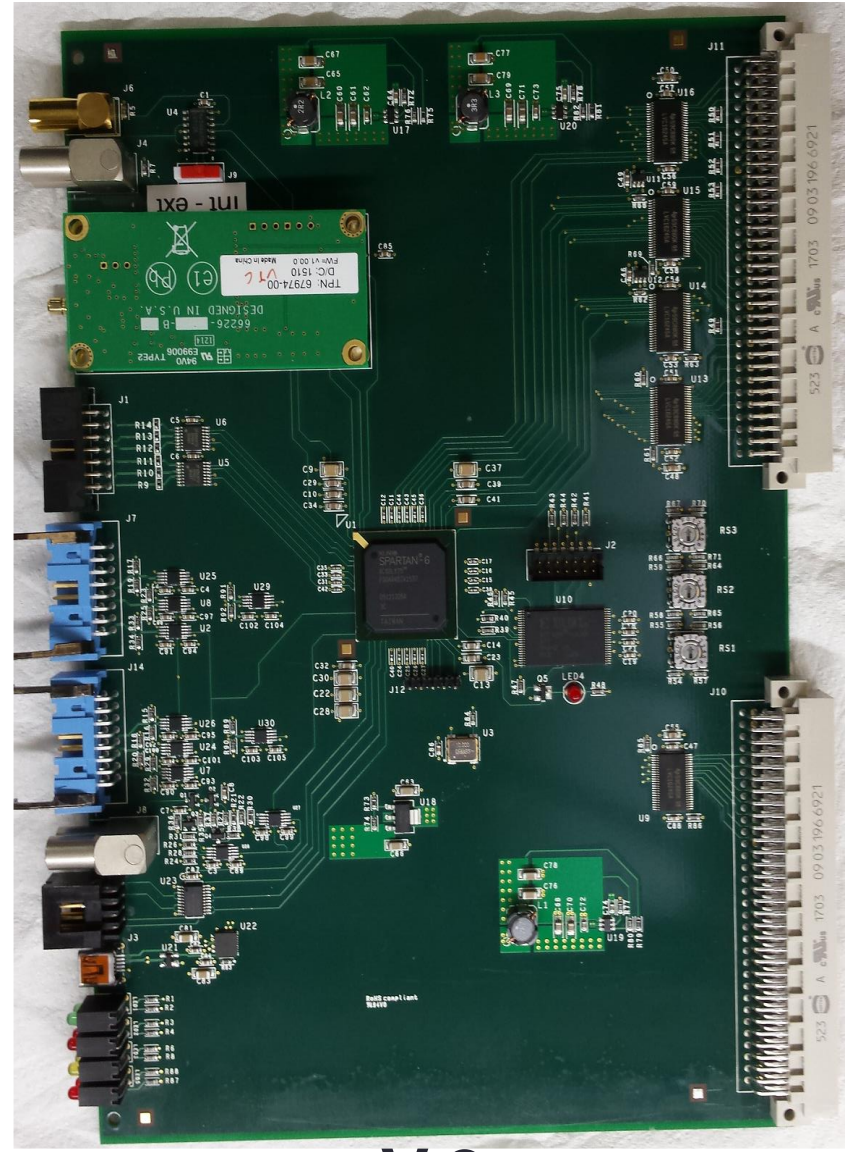
- The new version of EEE Trigger-GPS board (V.2) has completed and tested
- Minor problems were solved
- Performances are consistent with specifications
- DAQ integration (CERN commitment) is currently on progress

Spare slides





V.1



V.2