



Mainz Front End Electronics Status

Matteo Cardinali, on behalf of Mainz Group

Panda Collaboration Meeting, Darmstadt
25/06/2013



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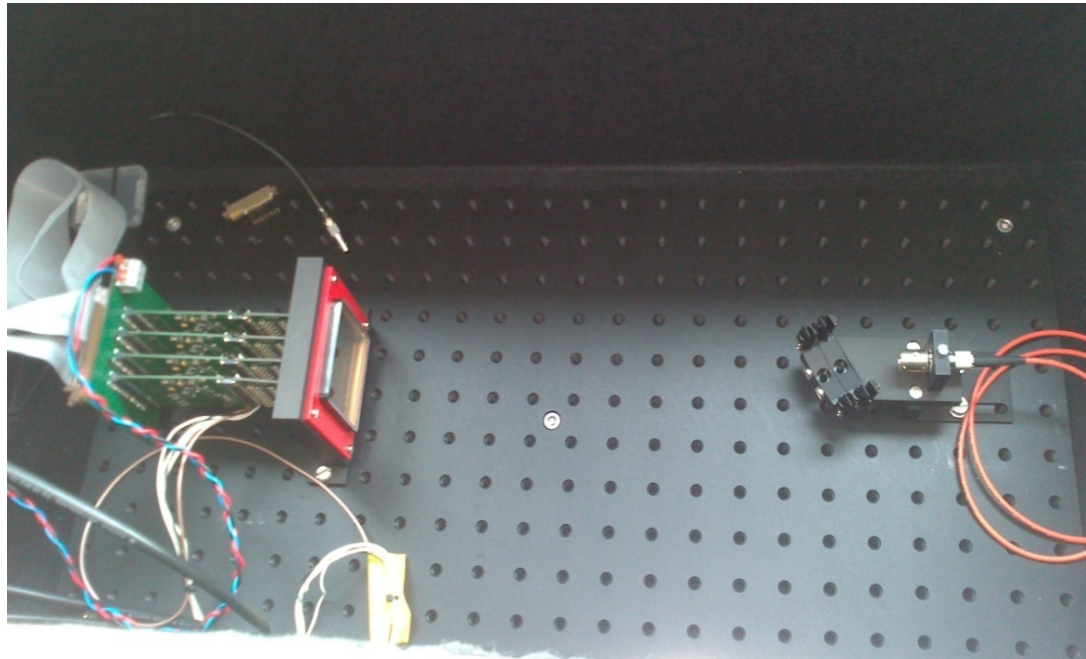
❖ Laser Test:

- ❖ MCP + FEE + TRBv3
- ❖ *focused/defocused laser*
- ❖ *NINO threshold studies*
- ❖ *time resolution*
- ❖ *synchronization studies*

❖ Outlook & Conclusions

Laser studies

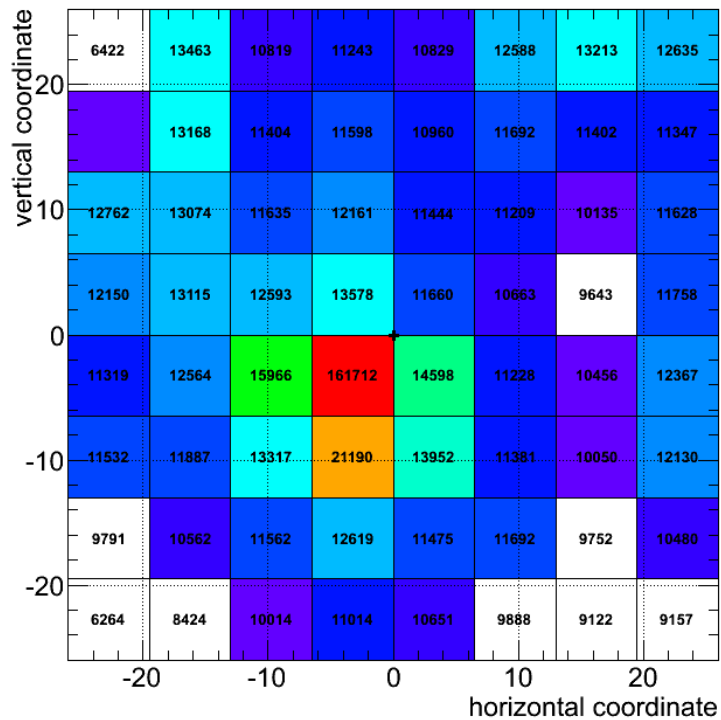
- ❖ Performance of the full chain:
 - ✧ MCP + FEE + TRBv3
- ❖ test in conditions similar to the DIRC



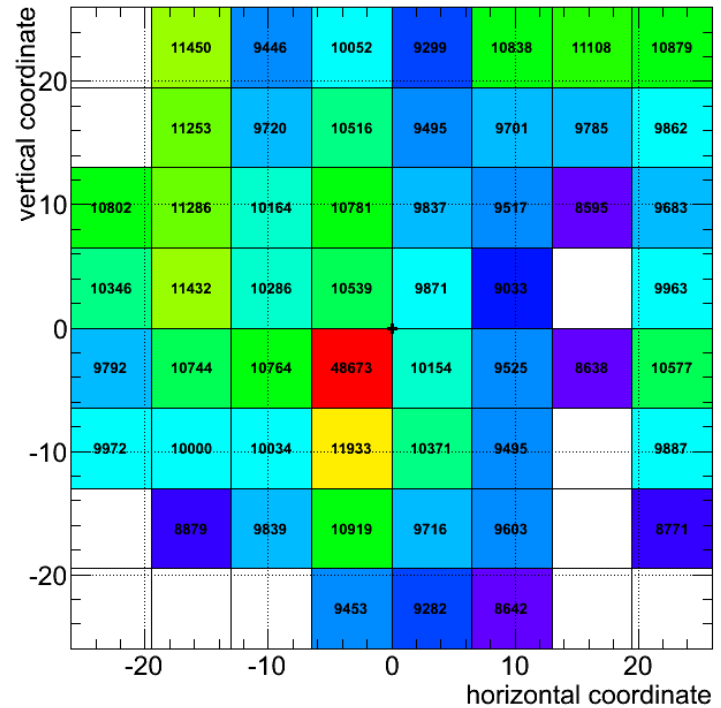
Pilas
rate 10 KHz
FWHM 35 ps

Laser Test

single photon setup

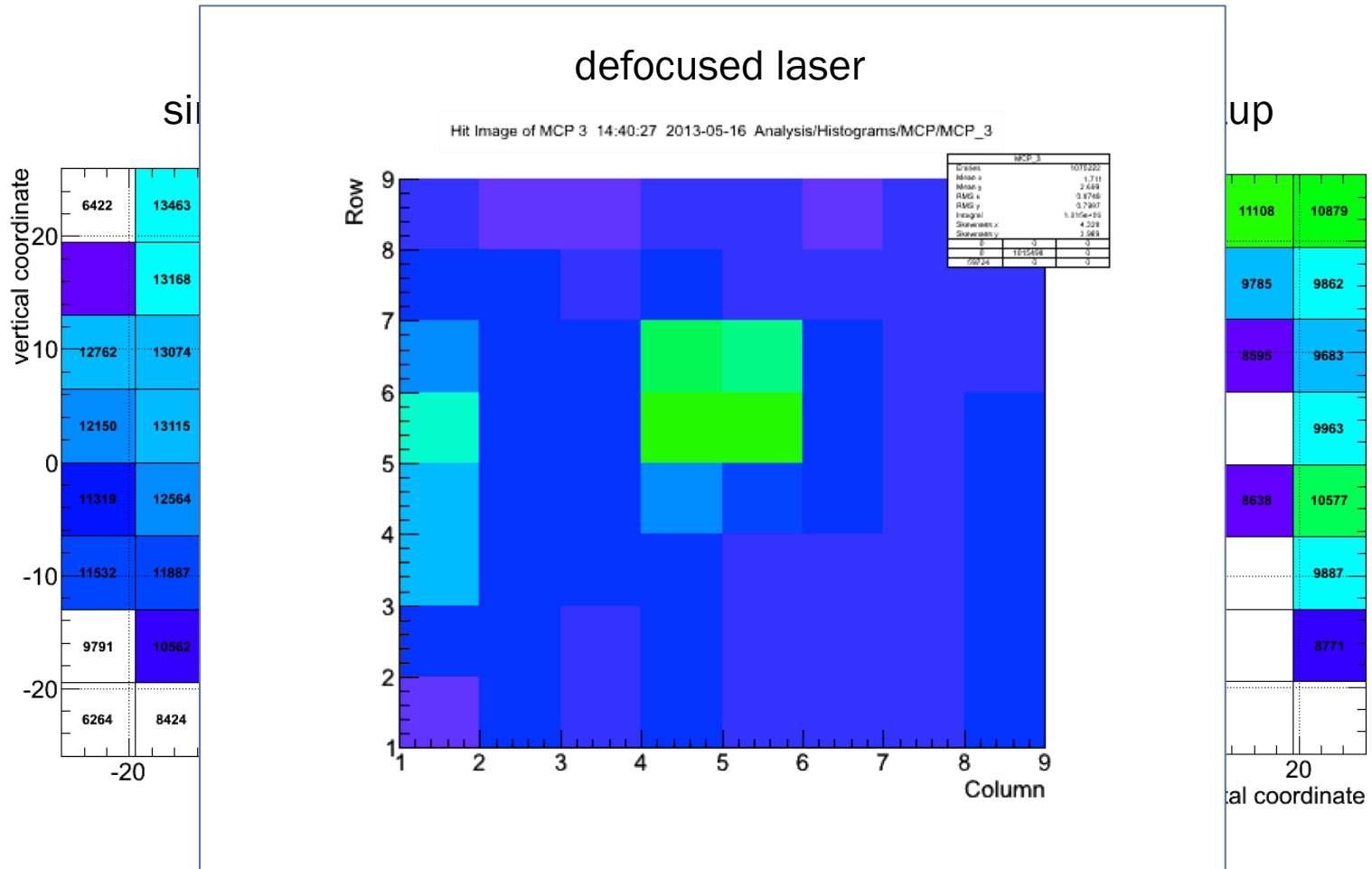


multiple photons setup



by M.Hoek

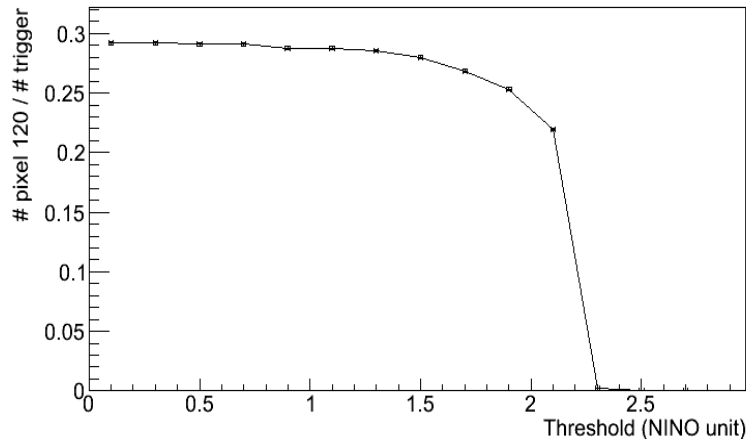
Laser Test



by M.Hoek

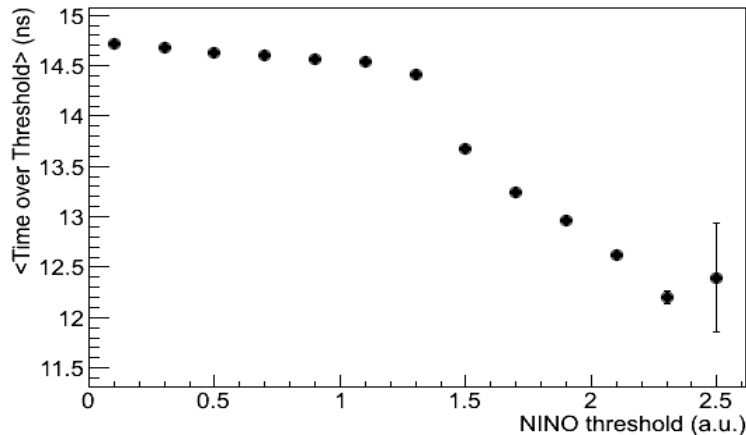
Laser Test

MCP signal / #triggers in function of NINO thresholds

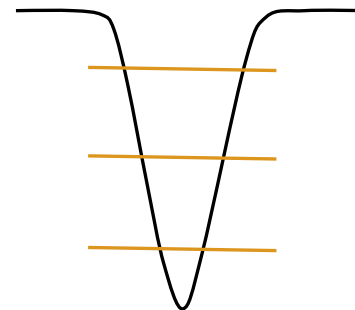


- ❖ find optimal threshold settings
 - ❖ bkg suppression
 - ❖ improve imaging

<time over threshold> in function of NINO thresholds

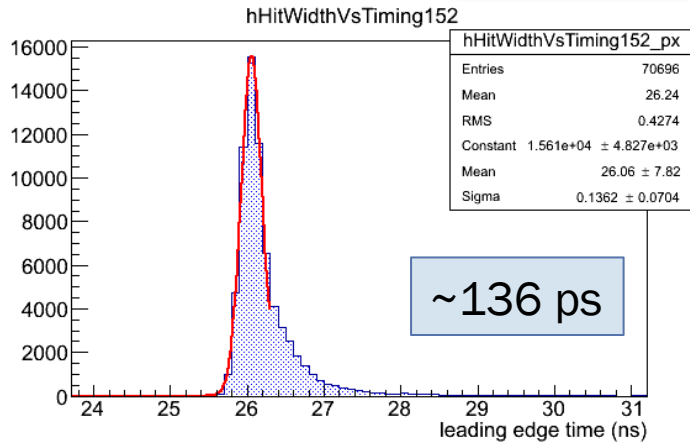


MCP - like signal

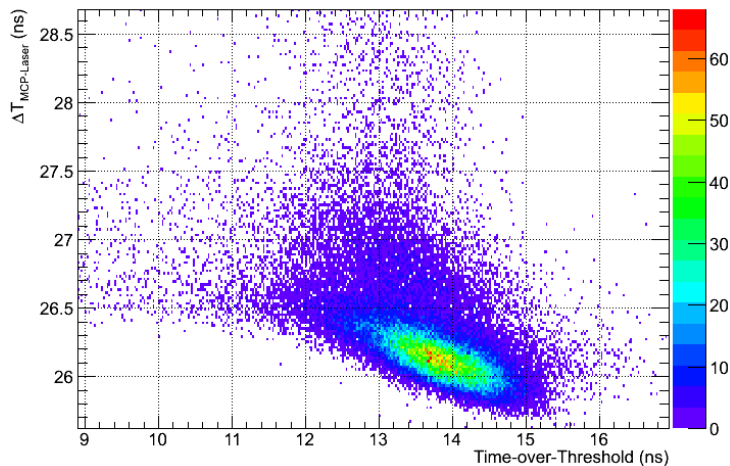


- ❖ find the baseline
- ❖ threshold definition

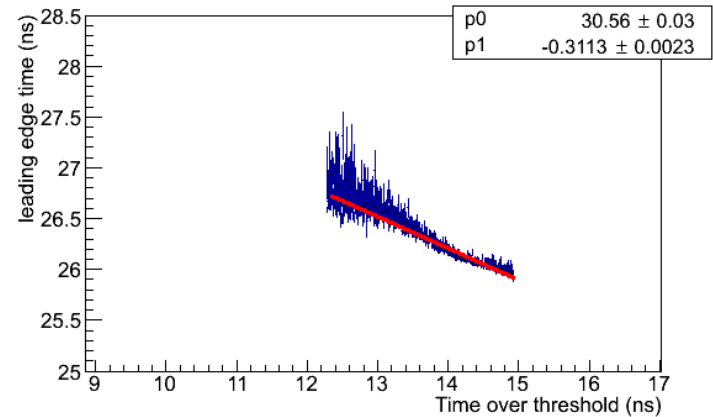
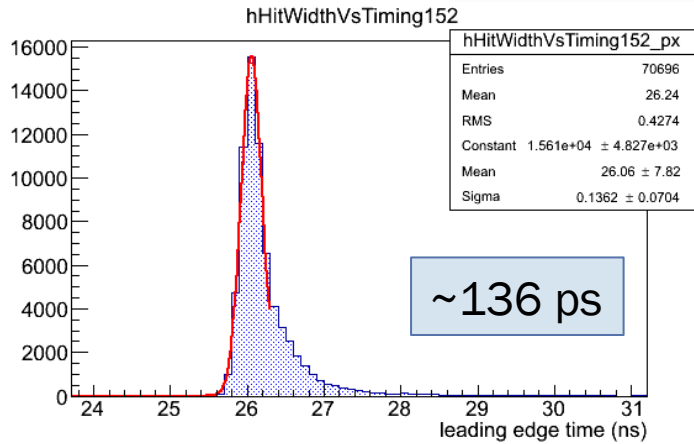
Time Resolution



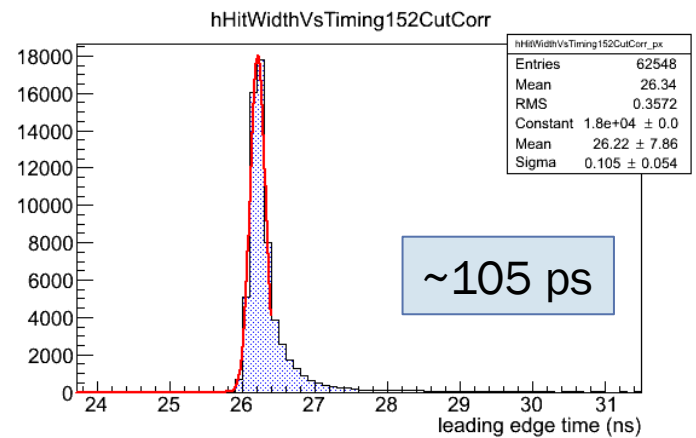
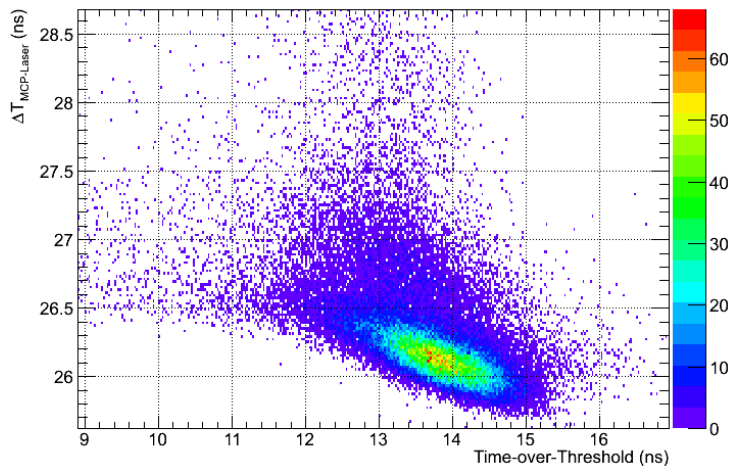
❖ Time walk correction?



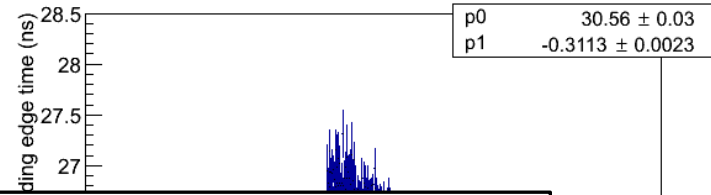
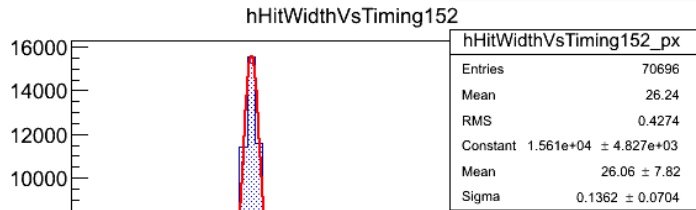
Time Resolution



❖ Time walk correction?



Time Resolution



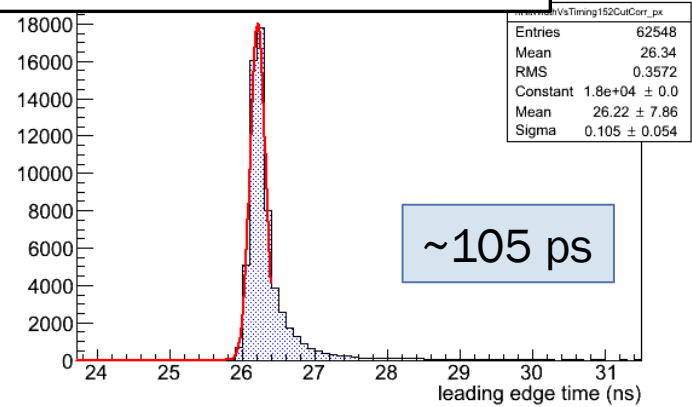
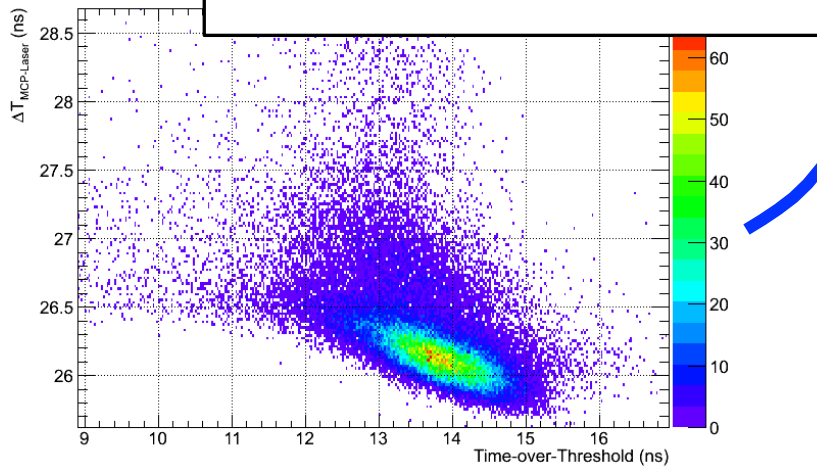
$$\sigma = \sqrt{\sigma_{fit}^2 - \sigma_{laser}^2 - \sigma_{jitter}^2}$$

98 ps

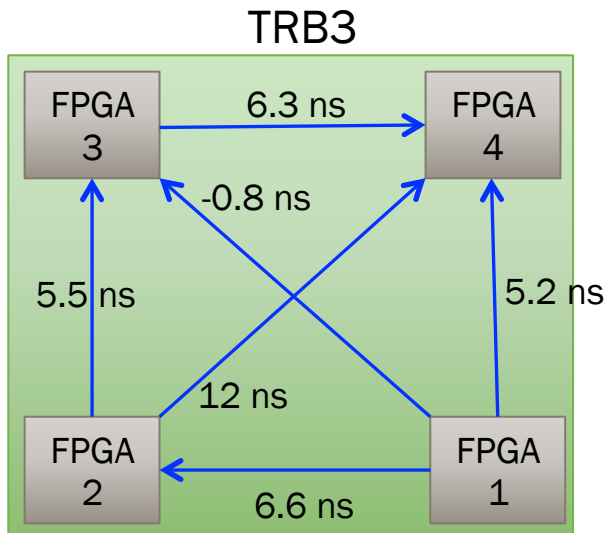
105 ps

35 ps

15 ps



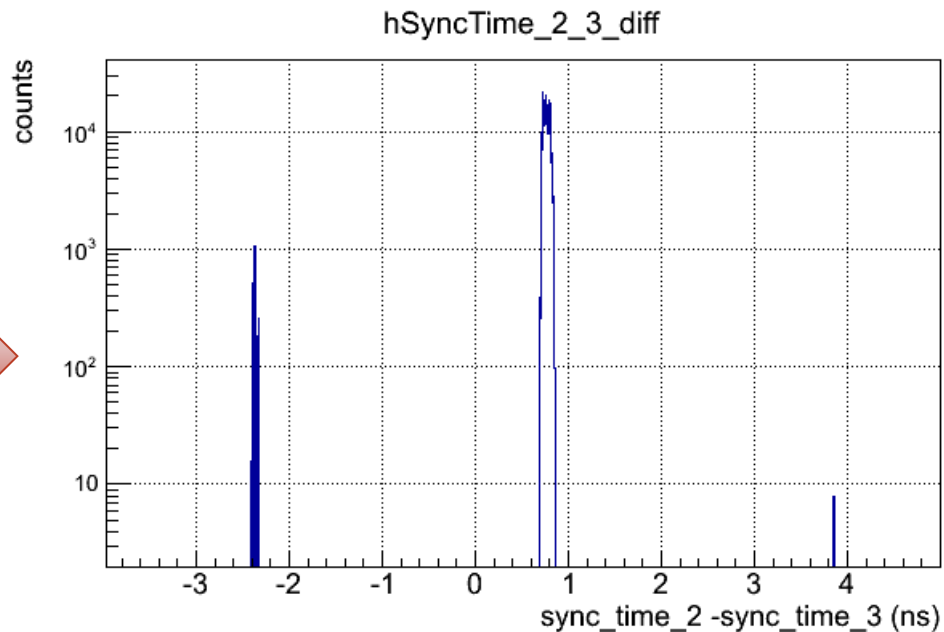
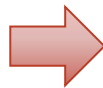
Synchronization Issue



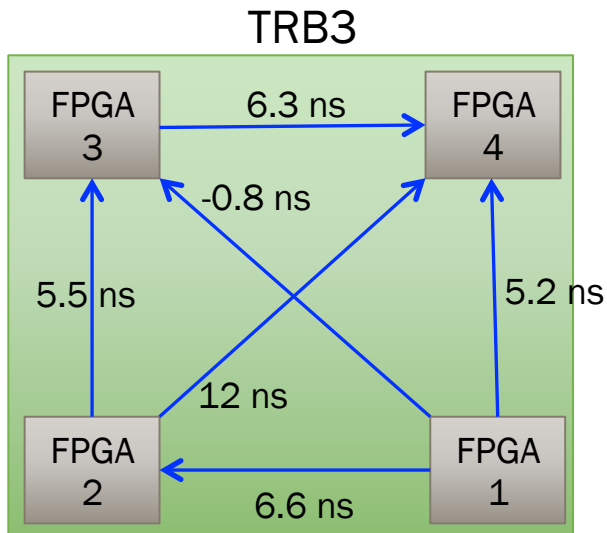
Sync. time should be the same in on board

$$t_1 = t_2 = t_3 = t_4$$

Sync time has coarse time differences
(multipeaks structure)



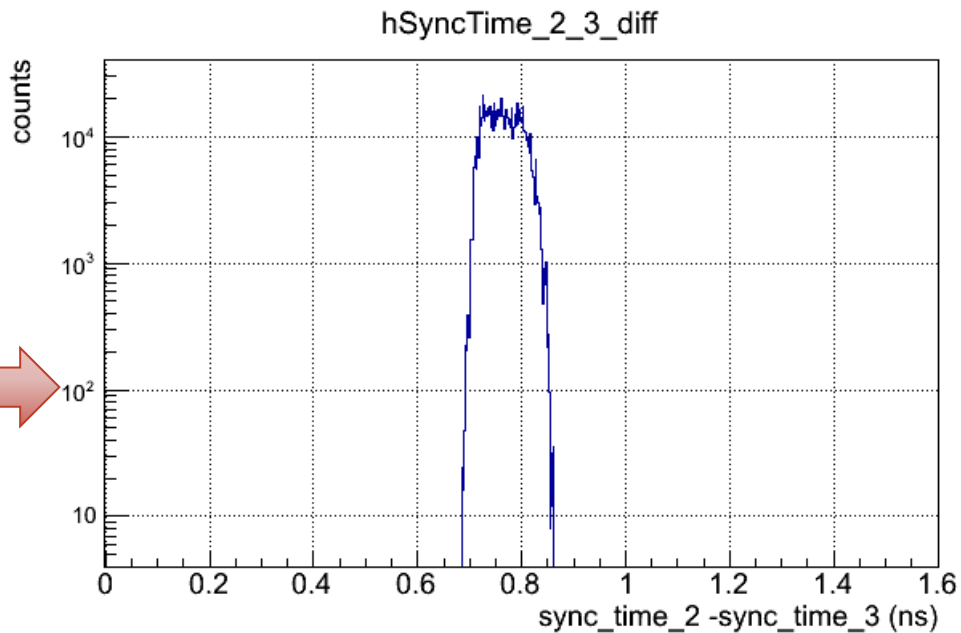
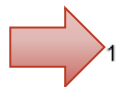
Synchronization Issue



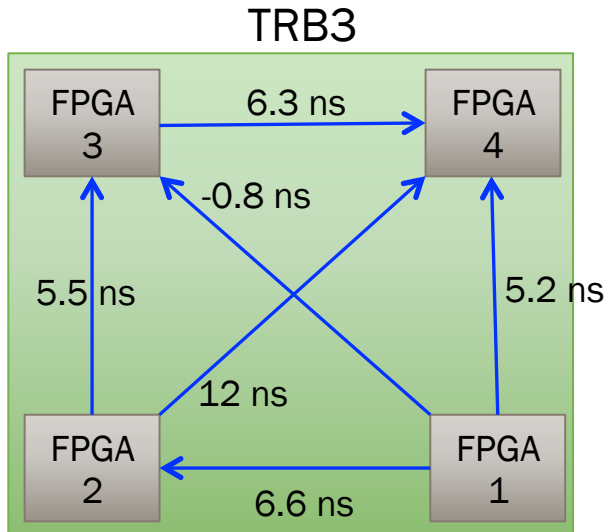
Sync. time should be the same in on board

$$t_1 = t_2 = t_3 = t_4$$

Broad Structure



Synchronization Issue

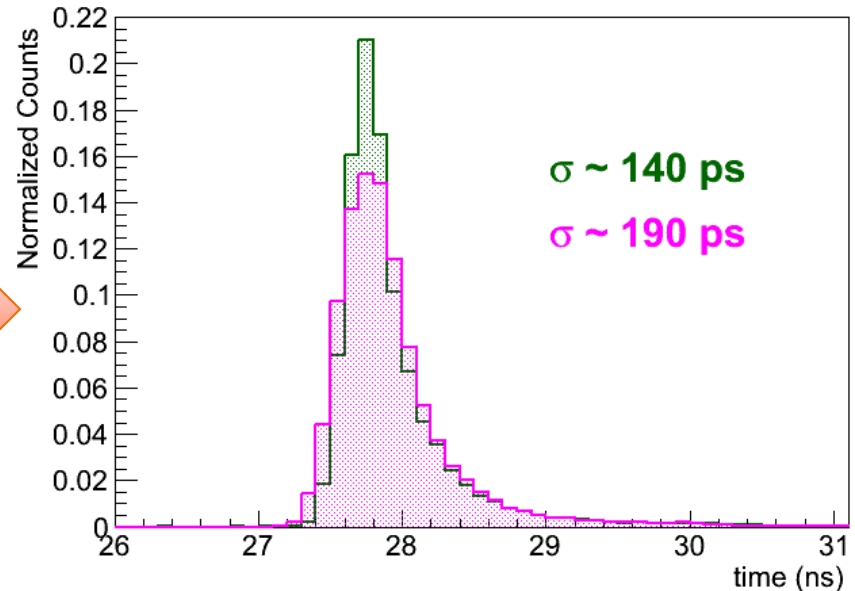


Sync. time should be the same in on board

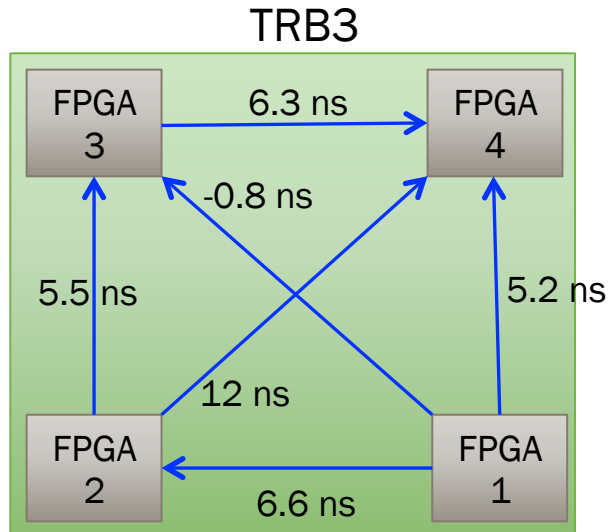
$$t_1 = t_2 = t_3 = t_4$$

MCP in FPGA 1, laser in FPGA 4

MCP in FPGA 2, laser in FPGA 4



Synchronization Issue

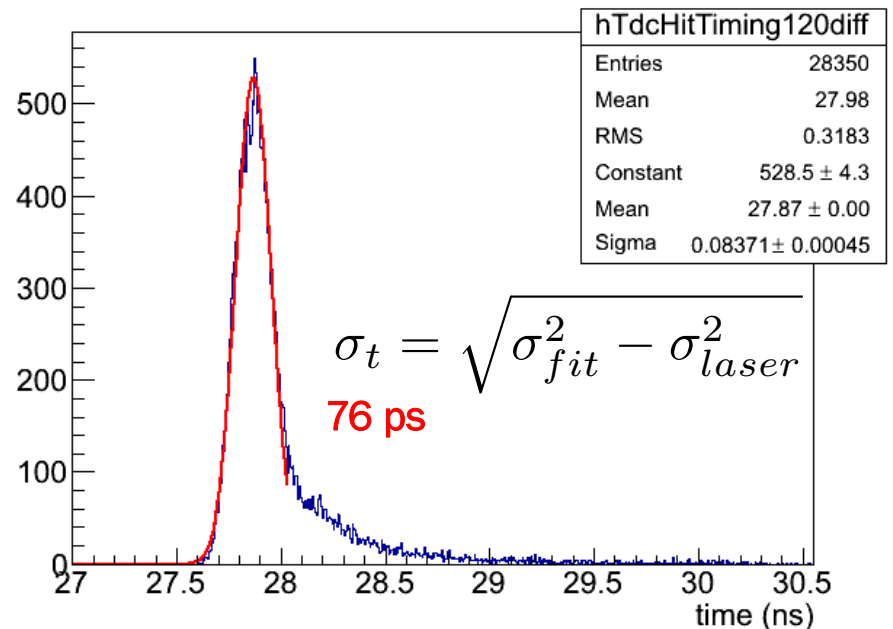


Sync. time should be the same in on board

$$t_1 = t_2 = t_3 = t_4$$

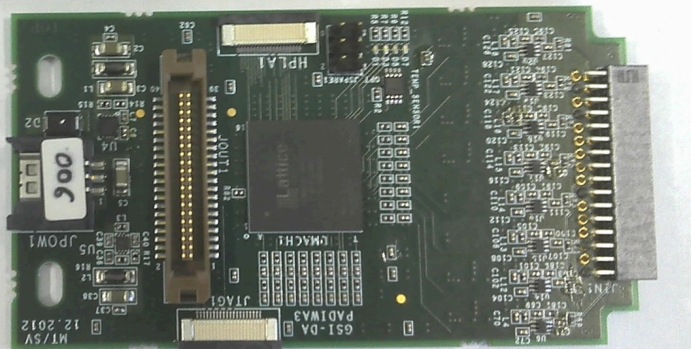
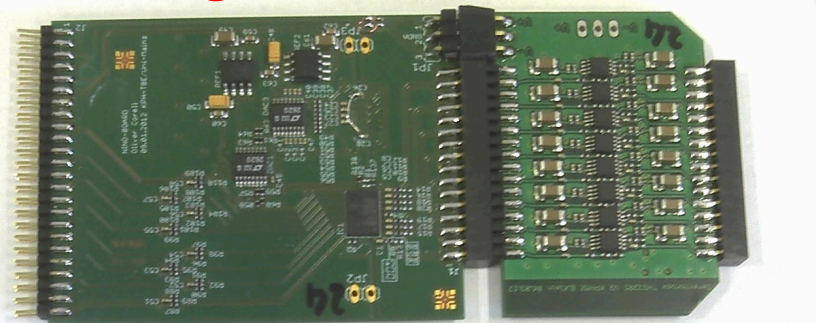
MCP in FPGA 1, laser in FPGA 4

MCP in FPGA 2, laser in FGPA 4



Current Activities: new FEE

1° gen. FEE



Padiwa

- ❖ 2° FEE generation (W.Lauth et al.)

- ❖ 4 NINO on board

- ❖ charge & fast timing

- ❖ Padiwa (developed by GSI)

- ❖ Pre-Amplifier on board

- ❖ FPGA to measure:

- ✓ time over threshold

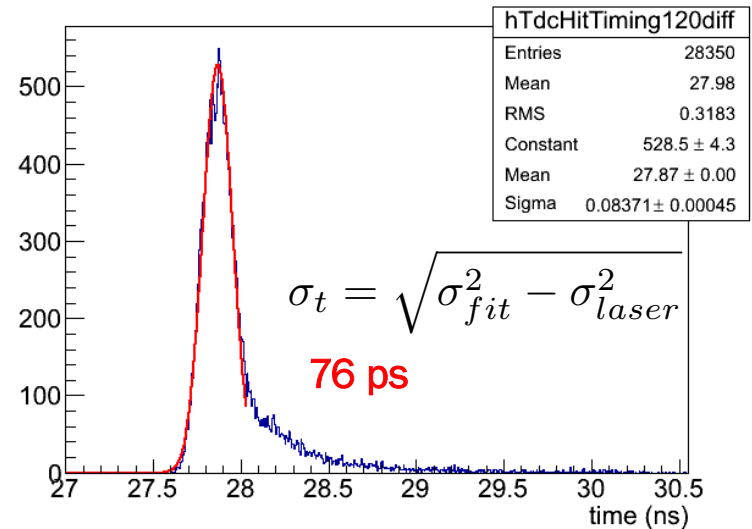
- ❑ charge to width

re-programmable

Conclusion & Outlook

✓ Laser Test:

- ✓ full readout chain
- ✓ *laser setup validated*
- ✓ *search of ultimate time resolution*
 - *<100 ps with walk correction*
- ✓ *synchronization issue*
 - ✓ can get better
- ✓ everything will be tested in the next beam time



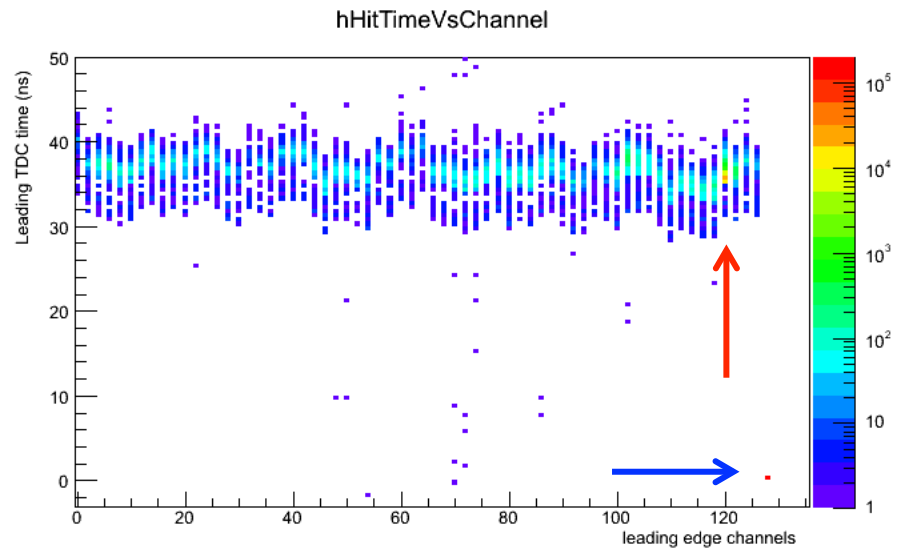
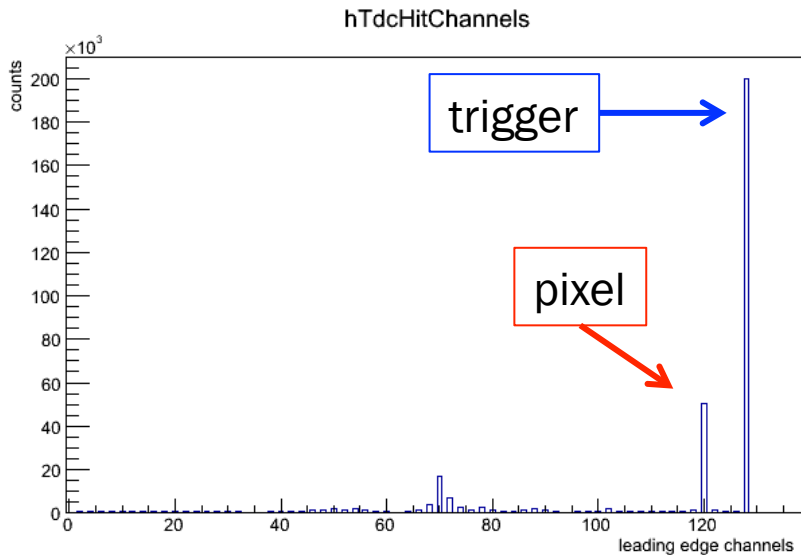
Thank you



back up slides

Laser Test

❖ single photon setup



- ✓ high correlation between MCP & Laser signal
- ✓ 100% efficiency in the measurements of laser signal
- ✓ no TRB errors
- ✓ low noise