

MCP Front End Electronics Characterization

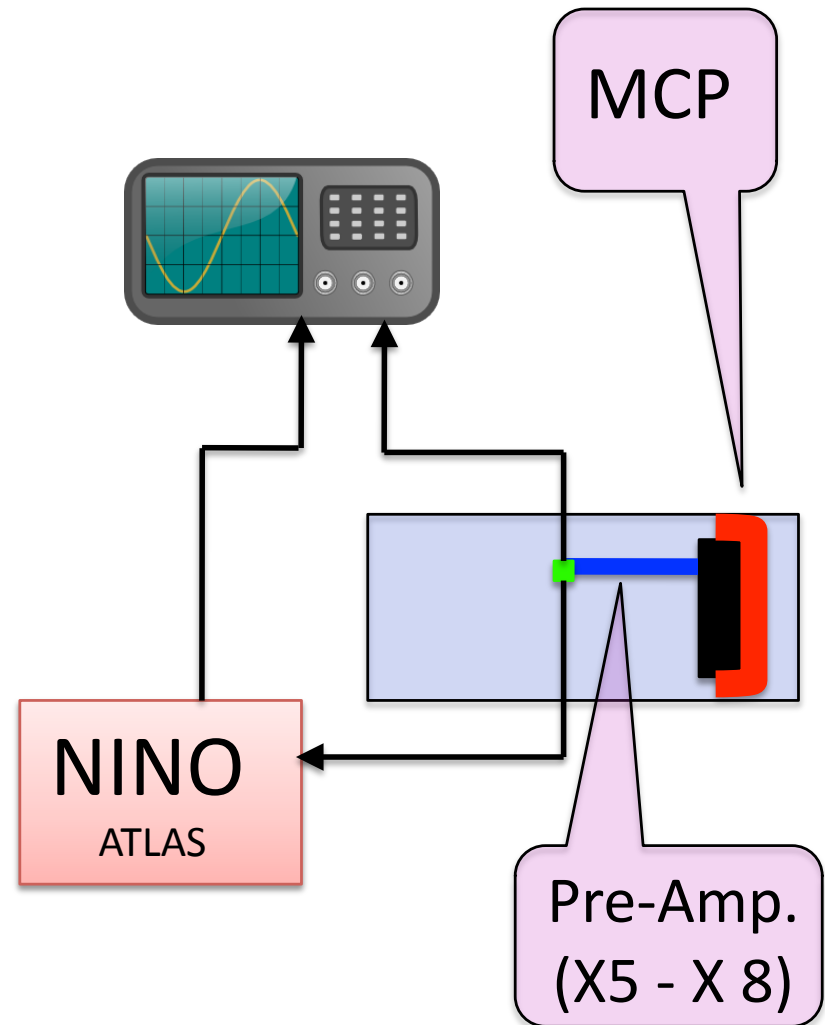
Matteo Cardinali on behalf of Mainz group

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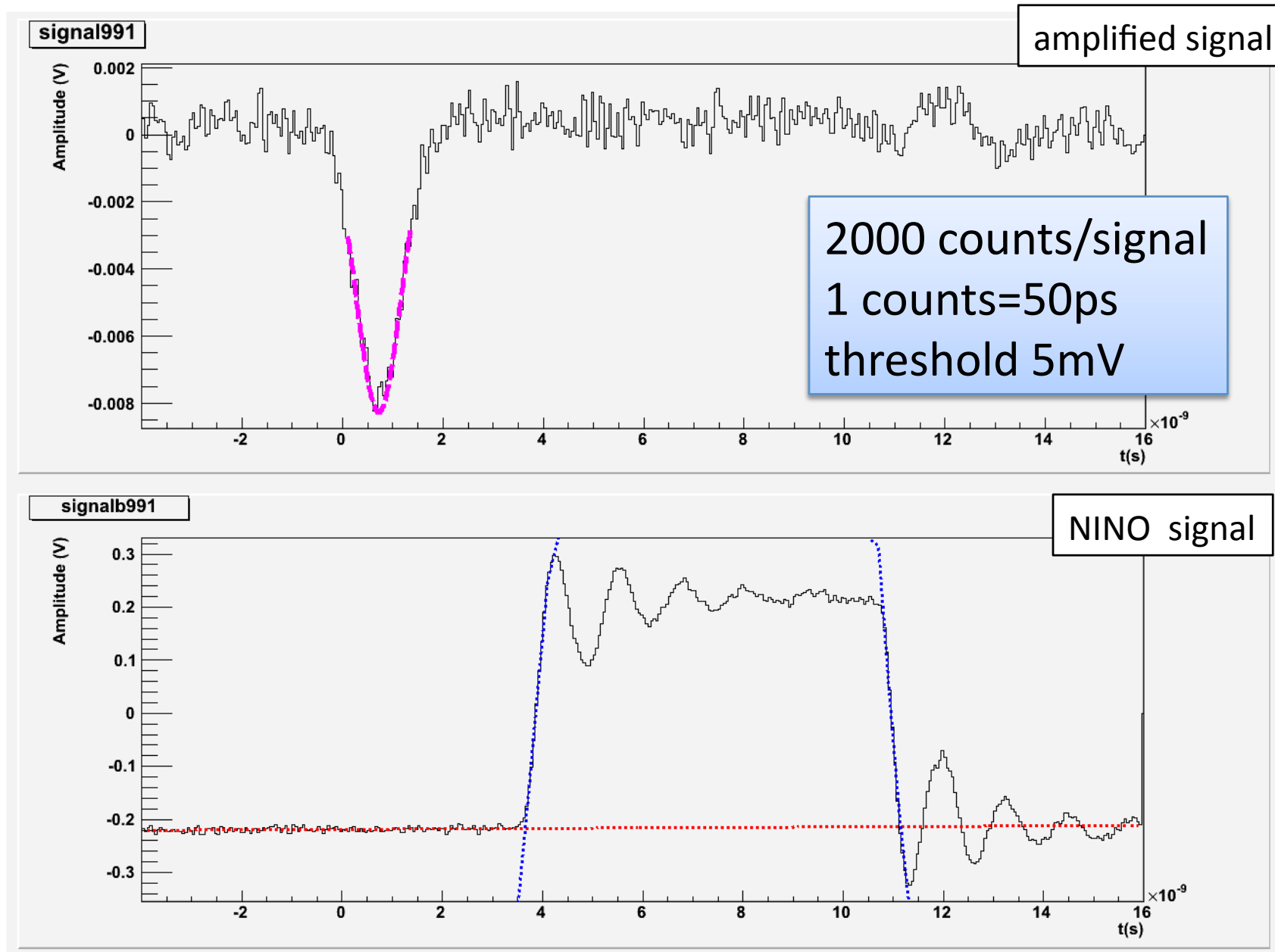
- Study of the MCP(Burle xp85012) FEE response:
 - dark noise
 - beam test @ MAMI
- Feasibility of Time-over-Threshold (NINO board)
 - time walk correction
 - stability under different conditions (bias level, pixel)
 - accuracy
- Outlook

Setup for dark noise study

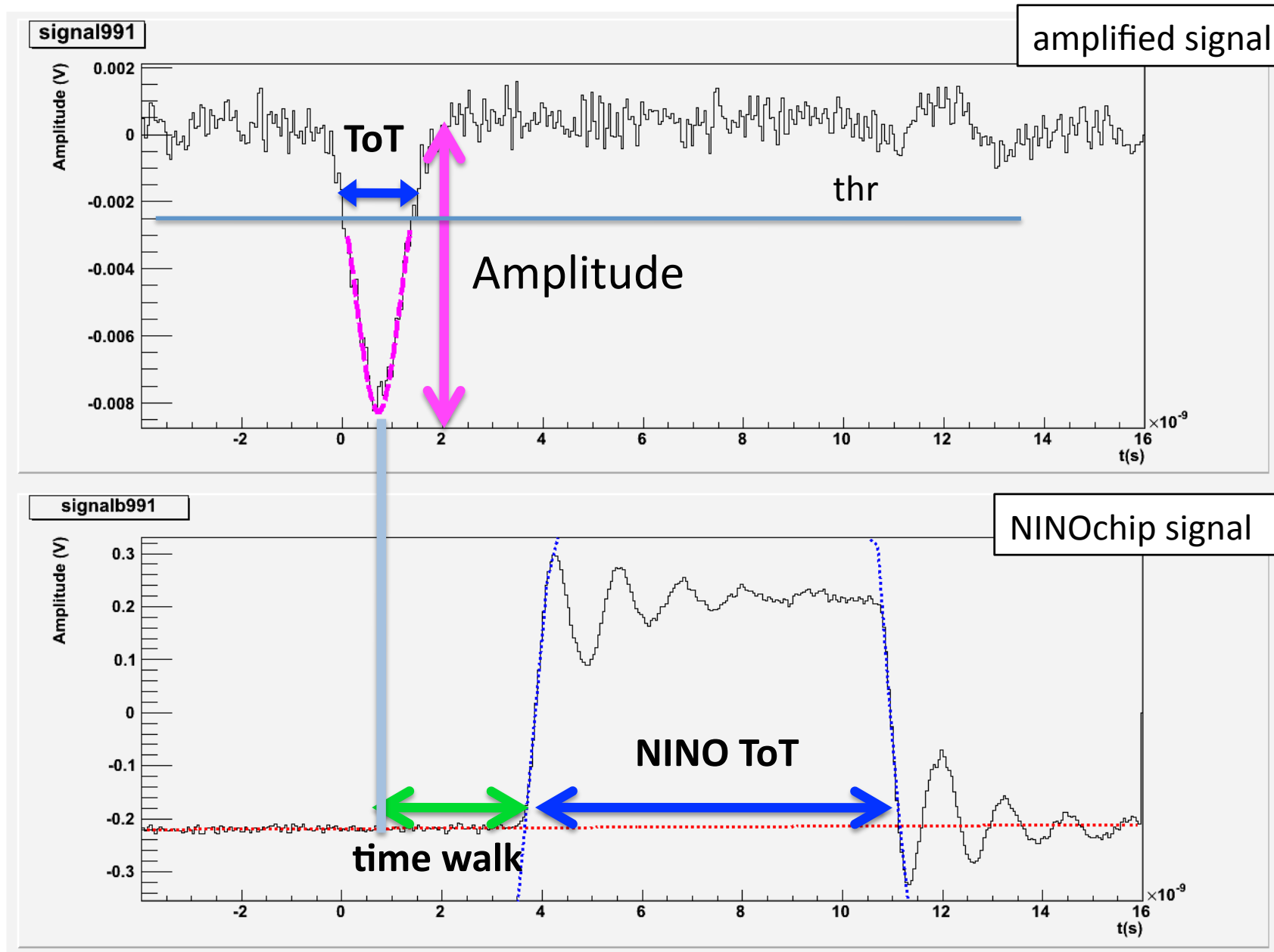
- MCP Burle xp 85012, 8x8 chs
- Pre-Amplifier board
- NINO test board (ATLAS exp.)
- Light Tight box
- Fast oscilloscope, Agilent Infinium series (20 GSamples/s)



Signals

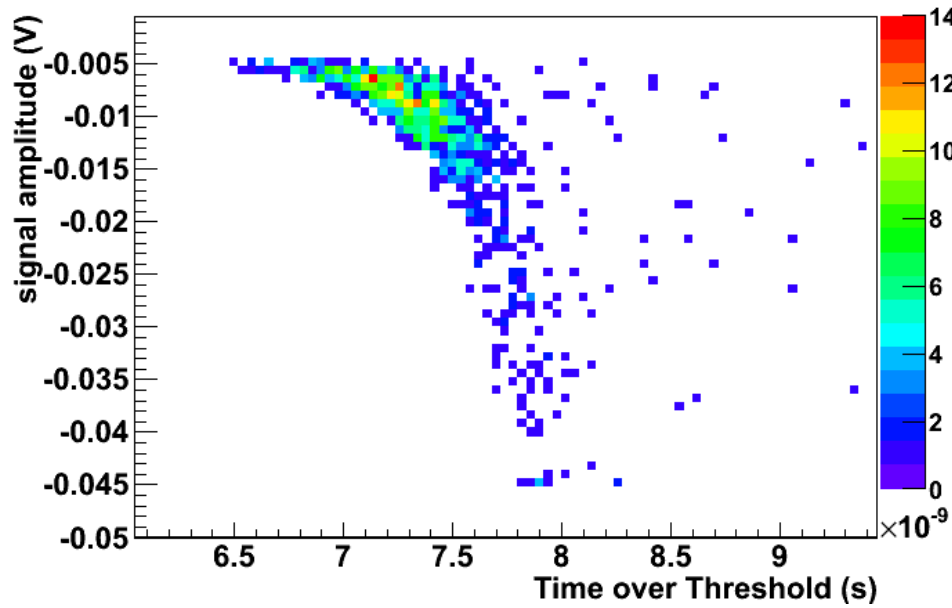


Signals



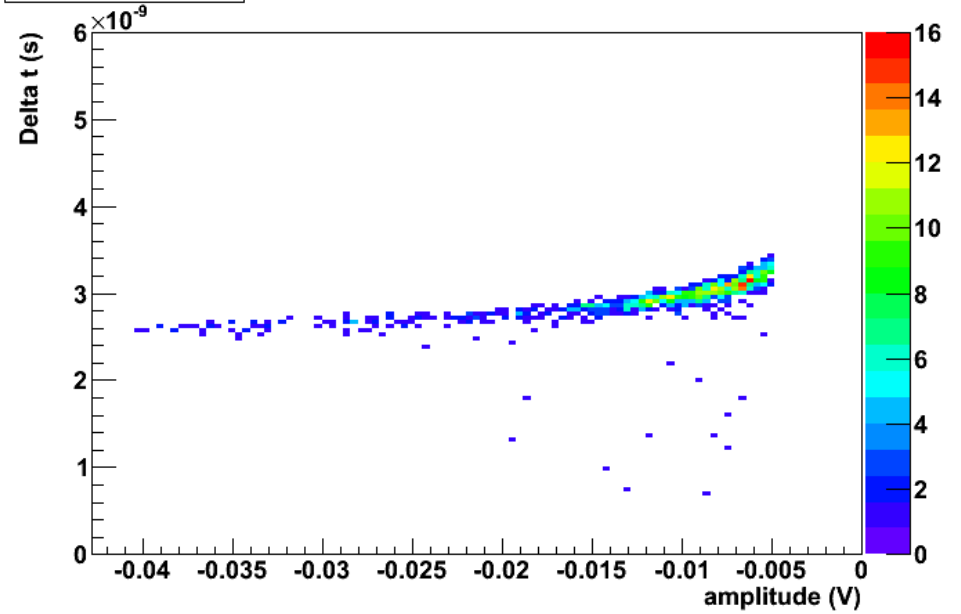
ToT vs Amplitude

Pixel 72: 1.9 kV

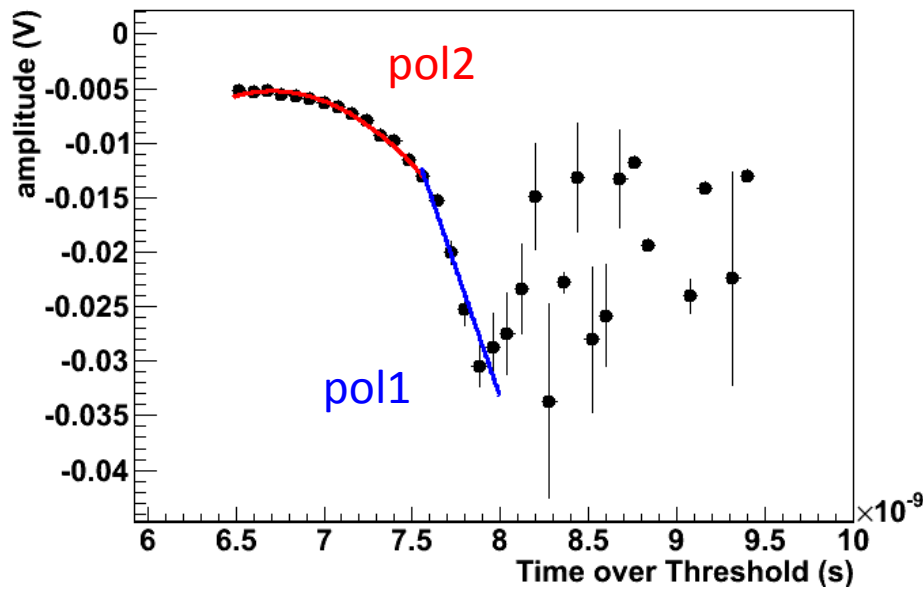


Amplitude vs Time Walk

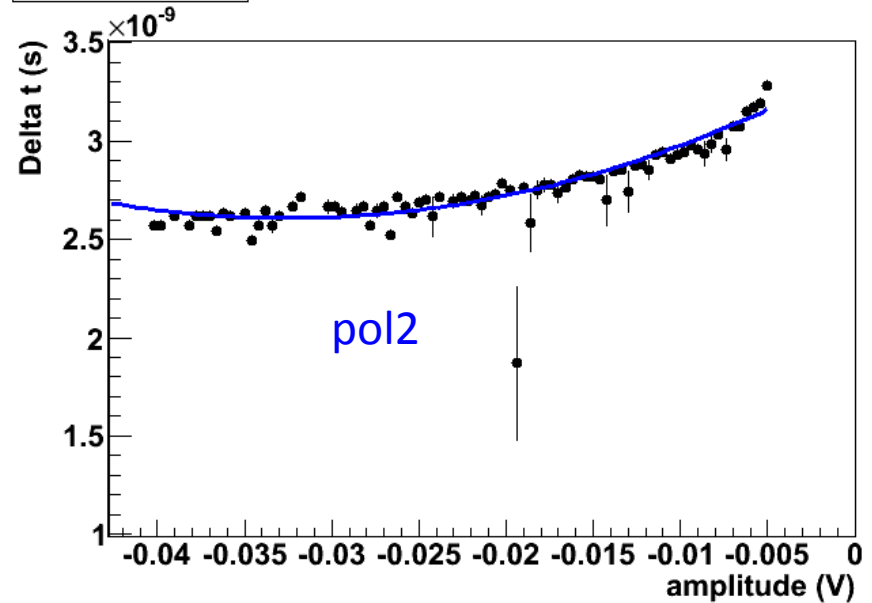
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Pixel 72: 1.9 kV

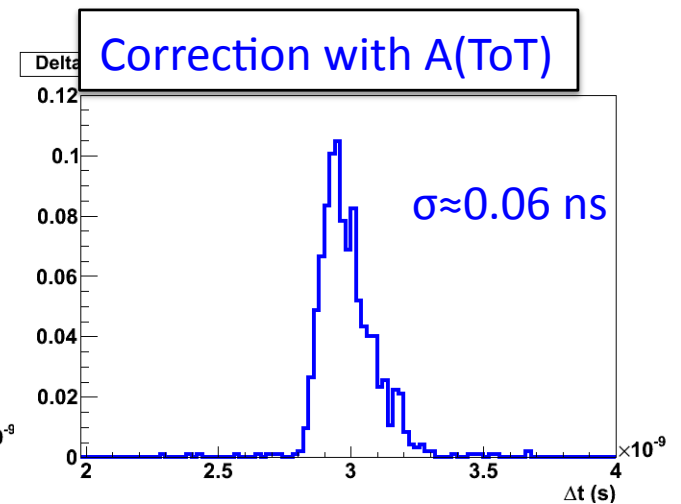
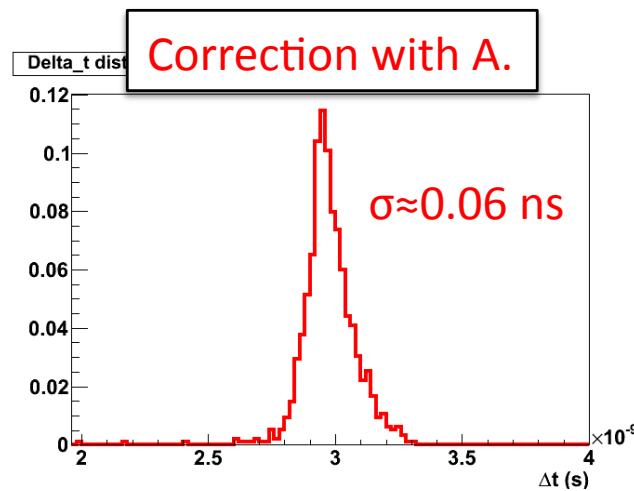
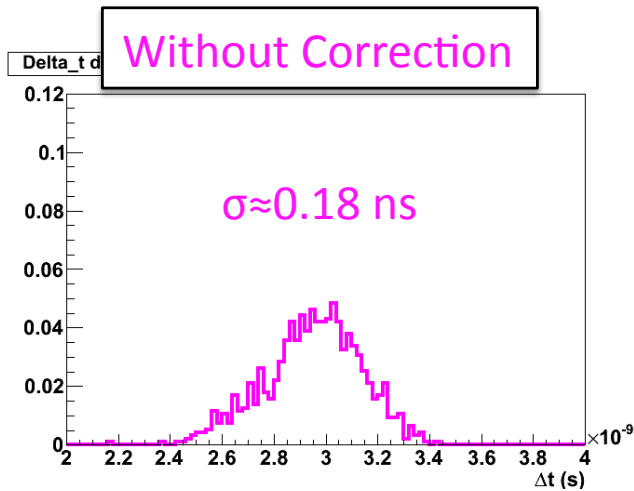
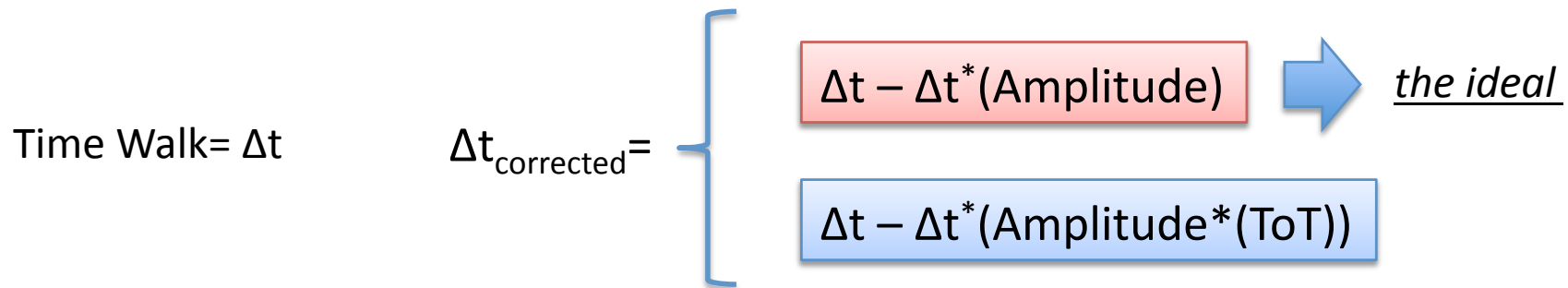


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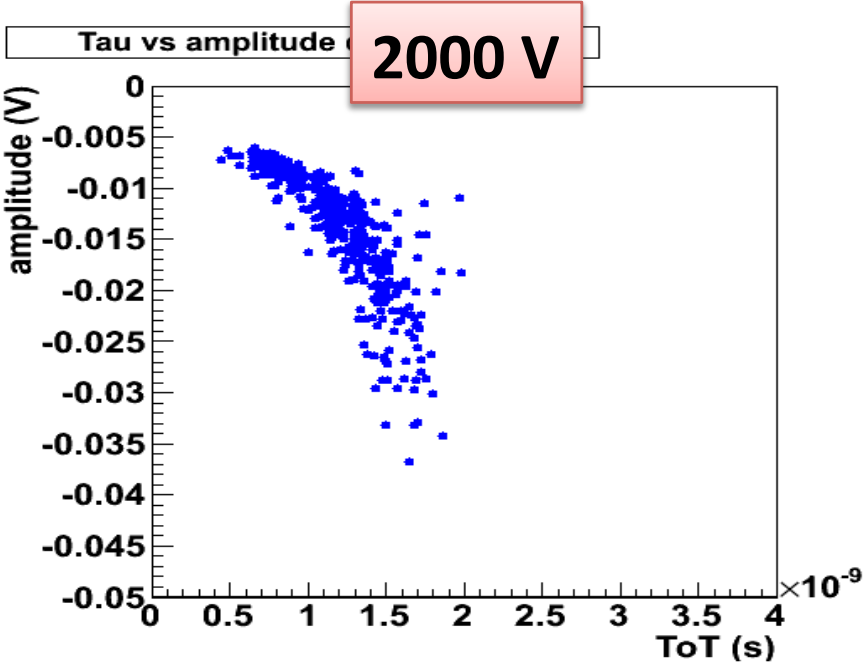
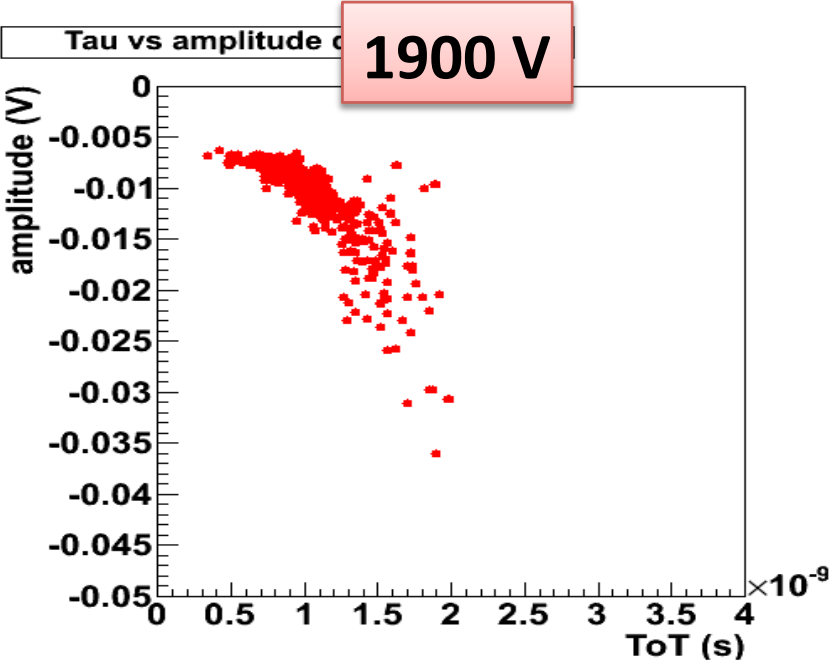
Time-Walk distribution

- The jitter introduced by NINO can be estimated by Time-Walk distribution
- Correction using measured and evaluated amplitude

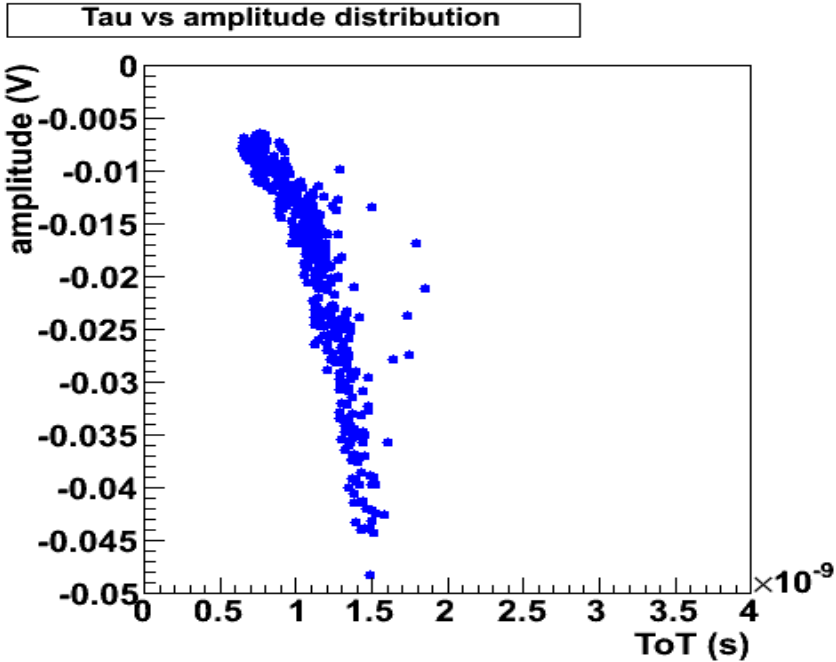
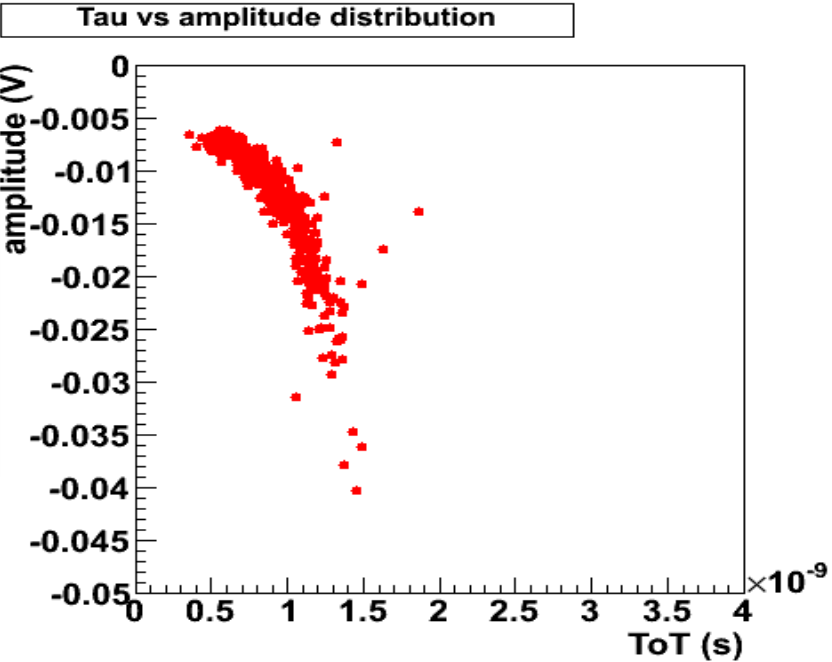


Different Bias & Pixel

Pixel 72



Pixel 45



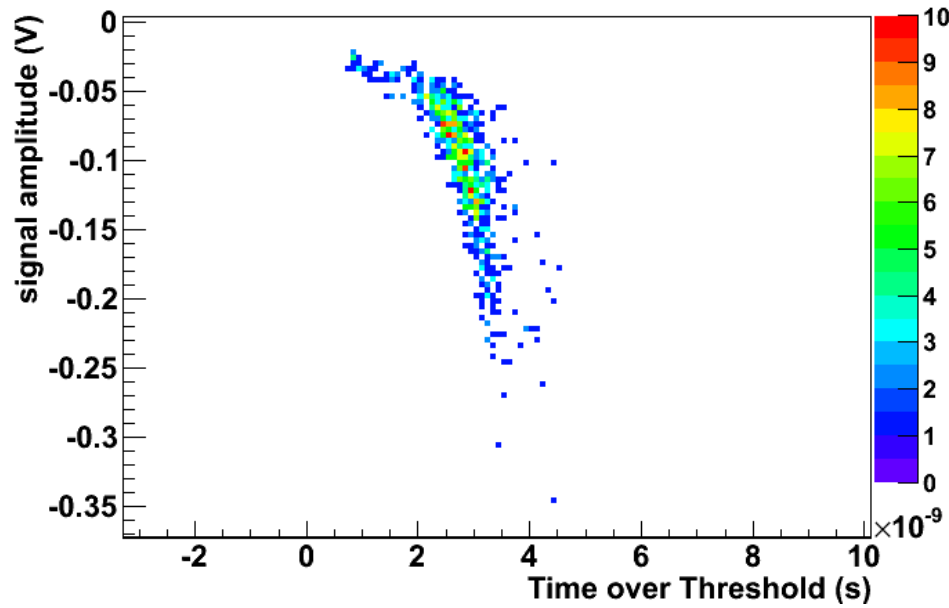
Beam Test Results

- Apply the same analysis using signals from Cherenkov light
- Check the method with two different bias level
- Data from 48° setup (see Maria's talk)

1900 V

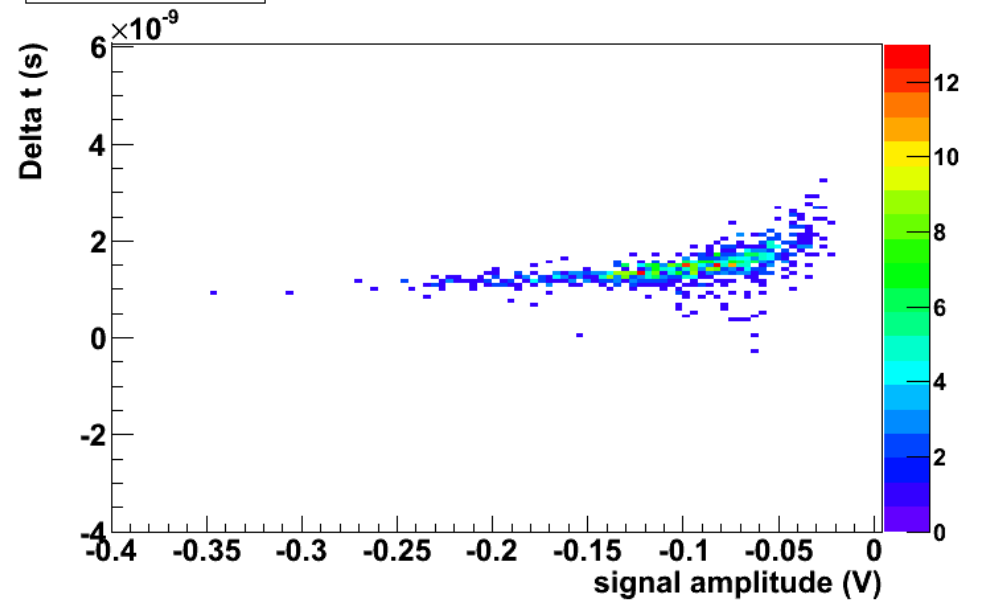
ToT vs Amplitude

Pixel 45: 1.9 kV

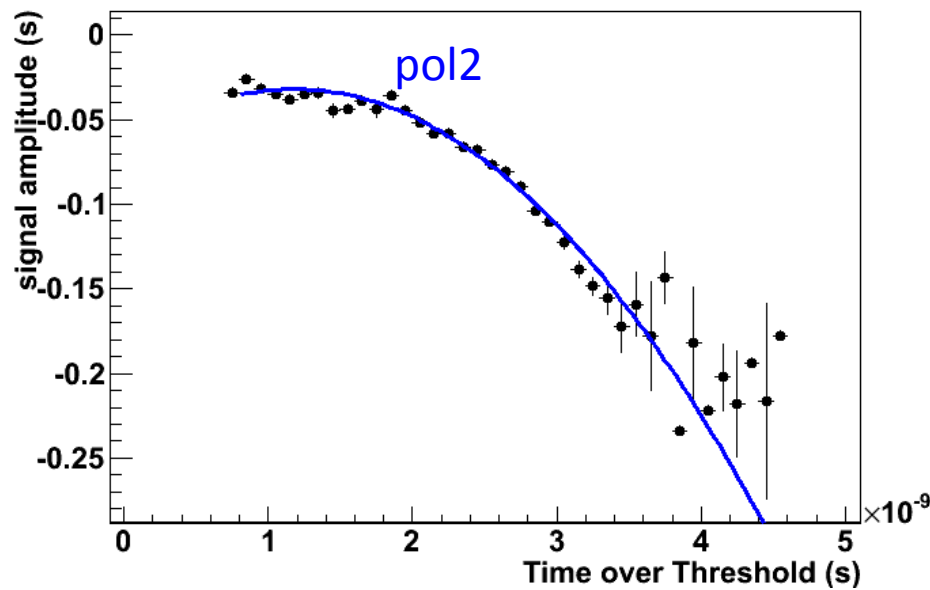


Amplitude vs Time Walk

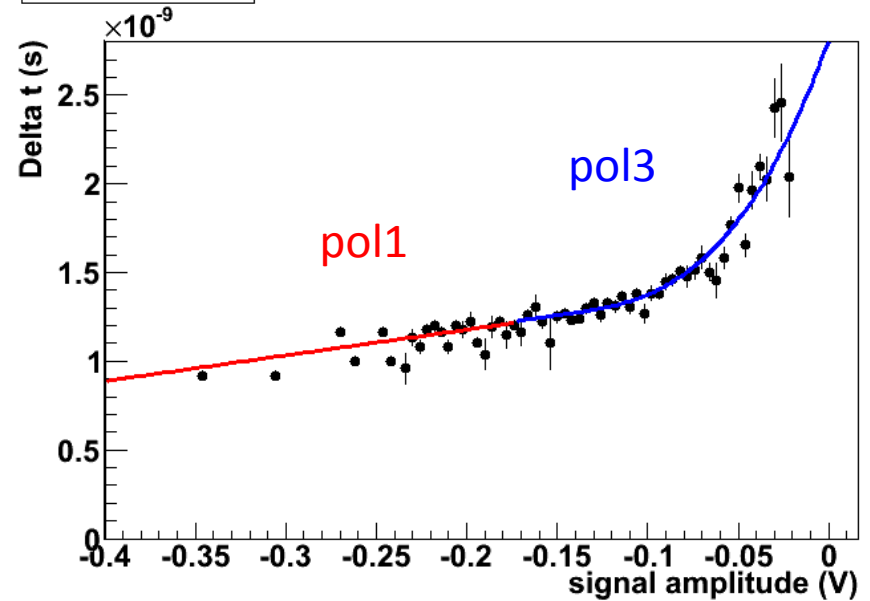
Pixel 45: 1.9 kV



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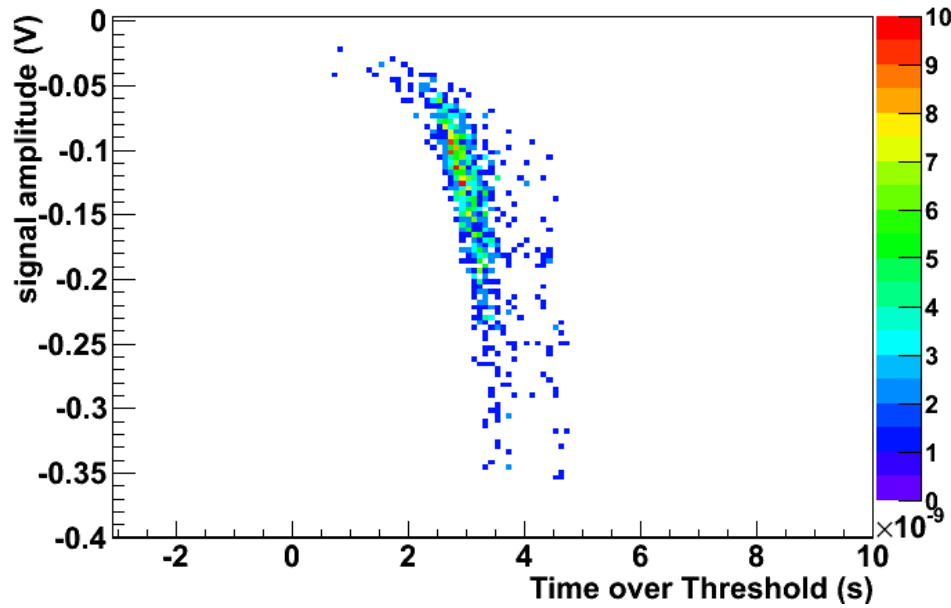
Pixel 45: 1.9 kV



1950 V

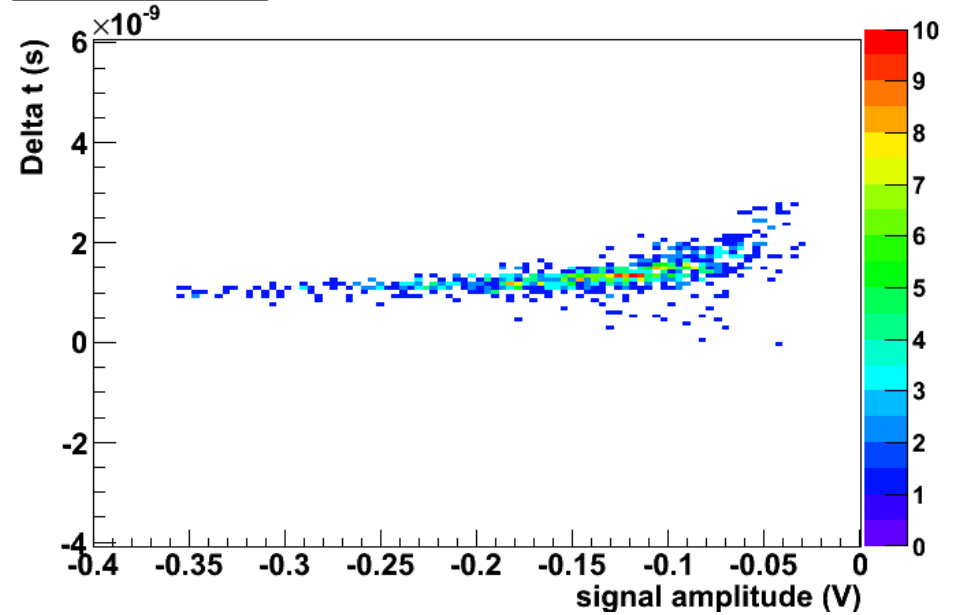
ToT vs Amplitude

Pixel 45: 1.95 kV



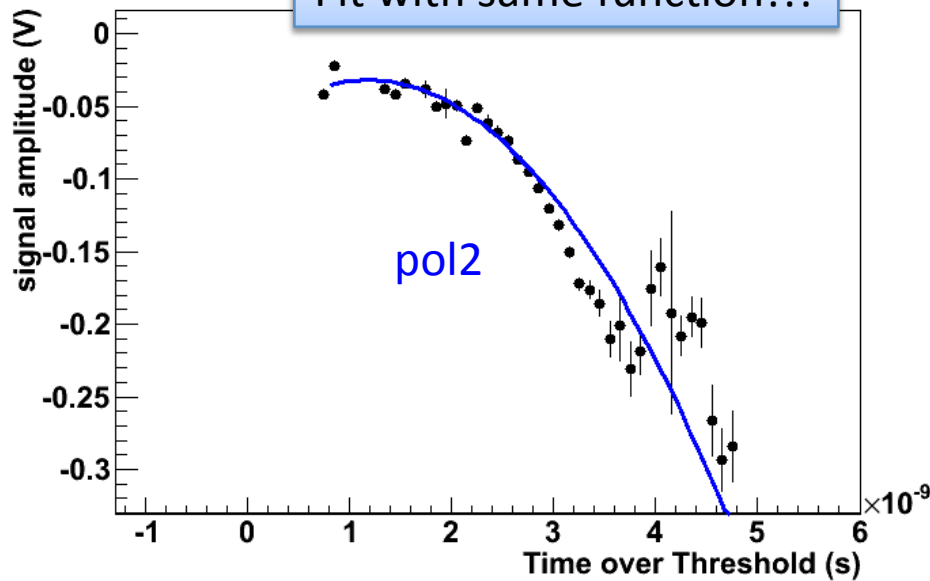
Amplitude vs Time Walk

Pixel 45: 1.95 kV



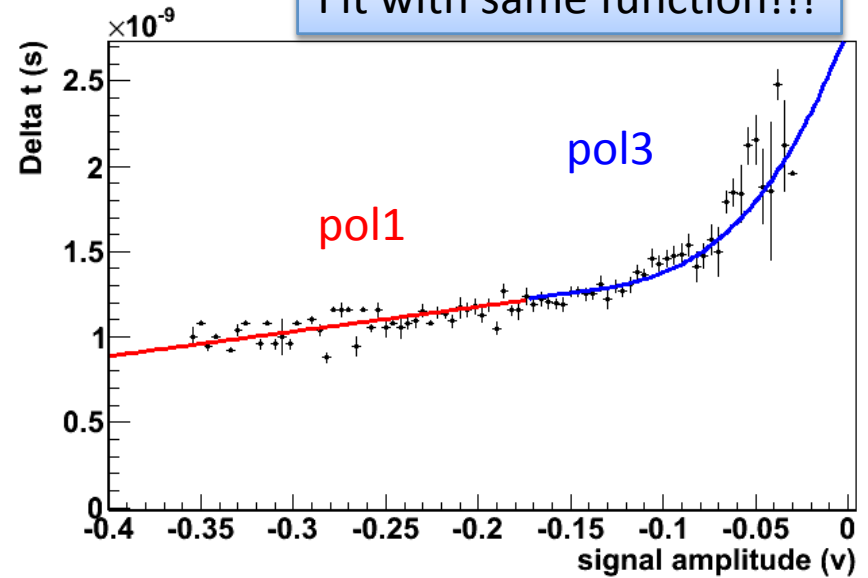
Pixel 45: 1.95 kV

Fit with same function!!!



Pixel 45: 1.95 kV

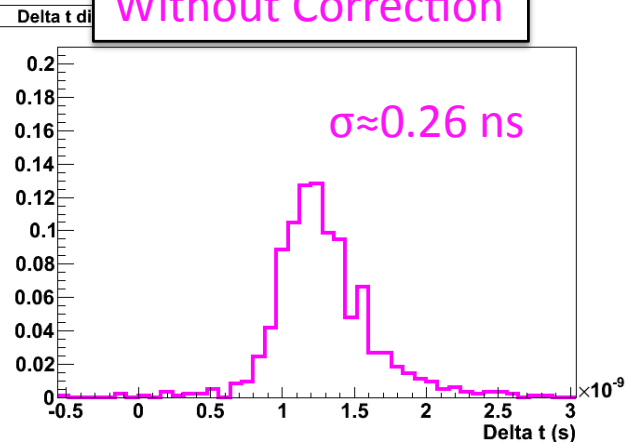
Fit with same function!!!



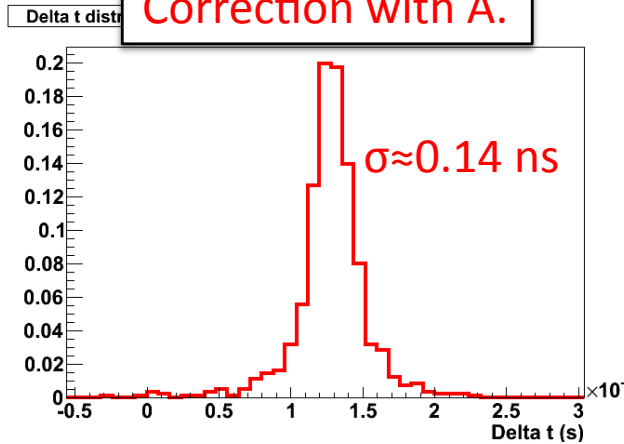
Time-Walk distribution

1900 V

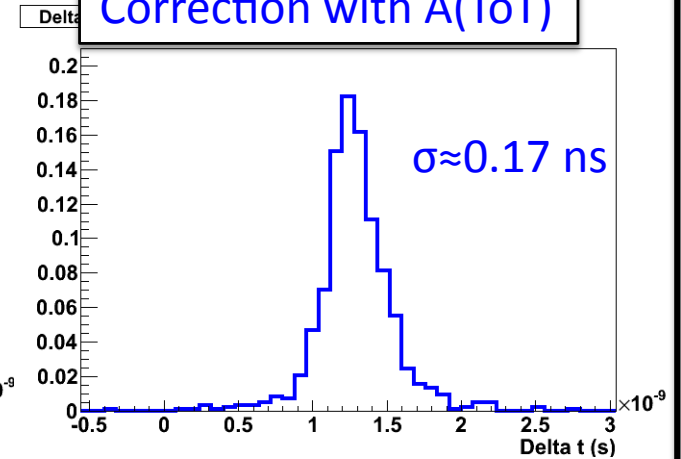
Without Correction



Correction with A.

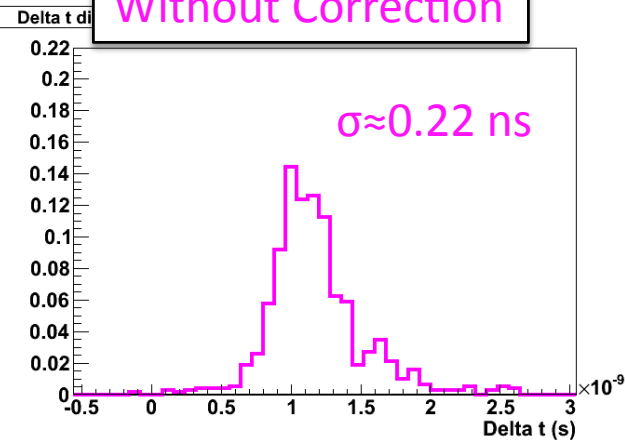


Correction with A(ToT)

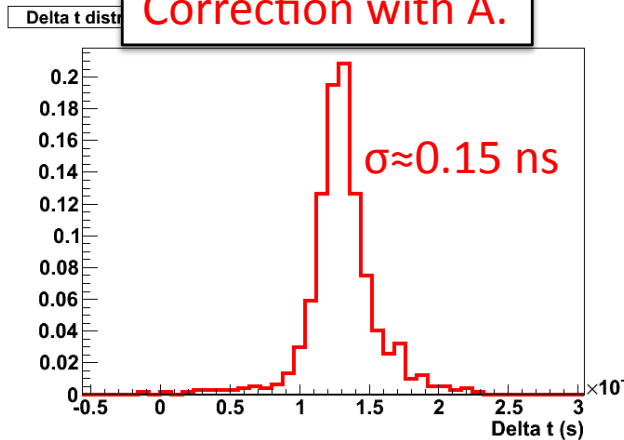


1950 V

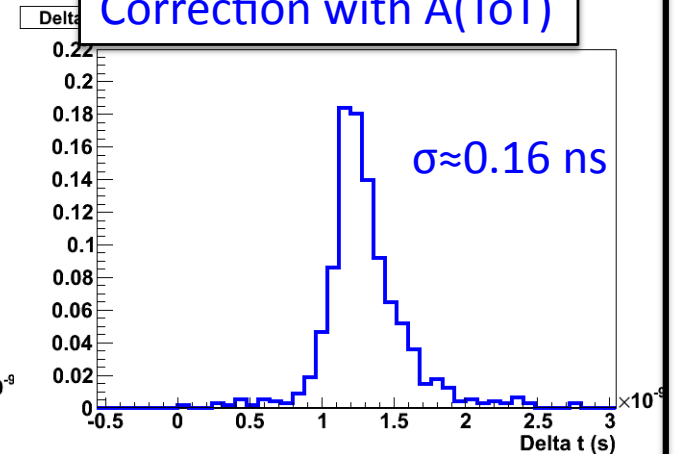
Without Correction



Correction with A.



Correction with A(ToT)



Conclusion

- Time-over-Threshold
 - ✓ Stable relations between ToT and Amplitude (easy fit functions)
 - ✓ Possibility of Time-Walk correction (different bias & pixel)
 - ✓ Similar result between dark noise and beam test analysis

Outlooks

- Cherenkov spectrum with ToT (Maria's talk)
- Systematic study of ToT with new NINO board
 - Laser test for each pixel

$$\Delta t_{8 \times 8}(\text{ToT}) = \left\{ \begin{array}{ccc} \Delta t_{11}(\text{ToT}_{11}) & \cdots & \Delta t_{18}(\text{ToT}_{18}) \\ \vdots & & \vdots \\ \Delta t_{81}(\text{ToT}_{81}) & \cdots & \Delta t_{88}(\text{ToT}_{88}) \end{array} \right\} \quad A_{8 \times 8}(\text{ToT}) = \left\{ \begin{array}{ccc} A_{11}(\text{ToT}_{11}) & \cdots & A_{18}(\text{ToT}_{18}) \\ \vdots & & \vdots \\ A_{81}(\text{ToT}_{81}) & \cdots & A_{88}(\text{ToT}_{88}) \end{array} \right\}$$

- Test with TRBV3
- New test with muons and beam (June)

backup slides

88	87	86	85	84	83	82	81
78	77	76	75	74	73	72	71
68	67	66	65	64	63	62	61
58	57	56	55	54	53	52	51
48	47	46	45	44	43	42	41
38	37	36	35	34	33	32	31
28	27	26	25	24	23	22	21
18	17	16	15	14	13	12	11

TOP VIEW