First studies on time resolution for SciTil

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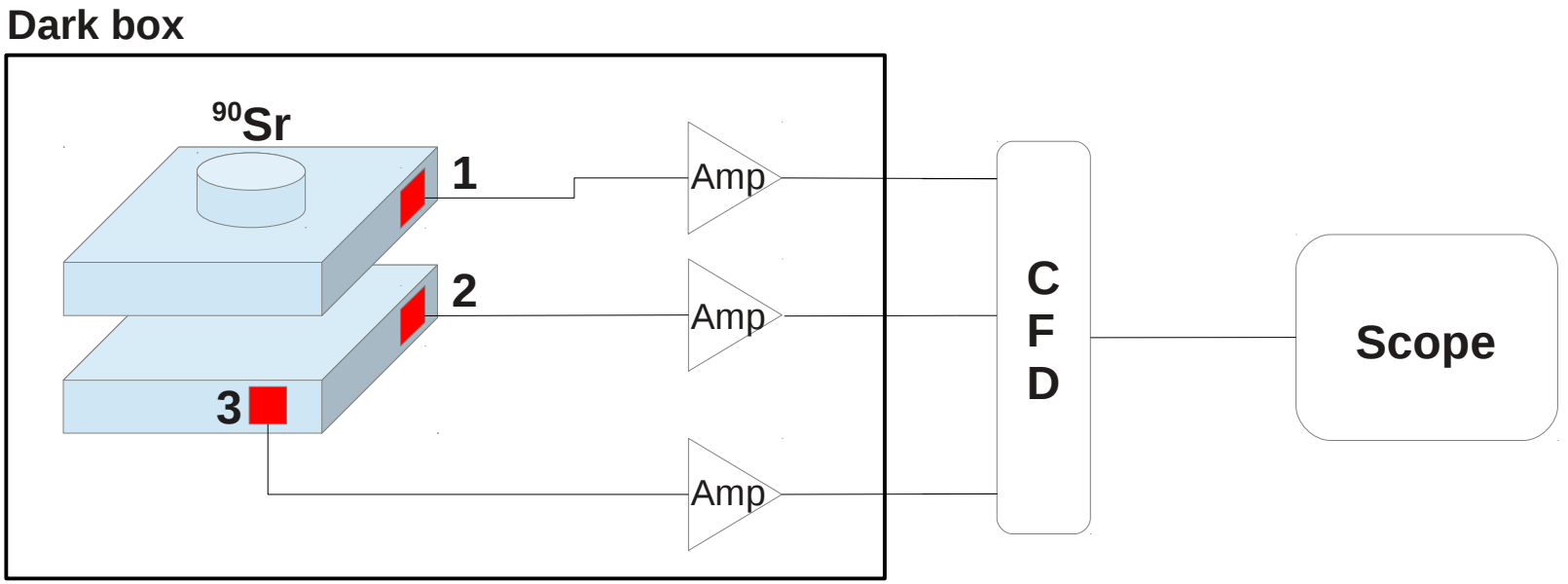
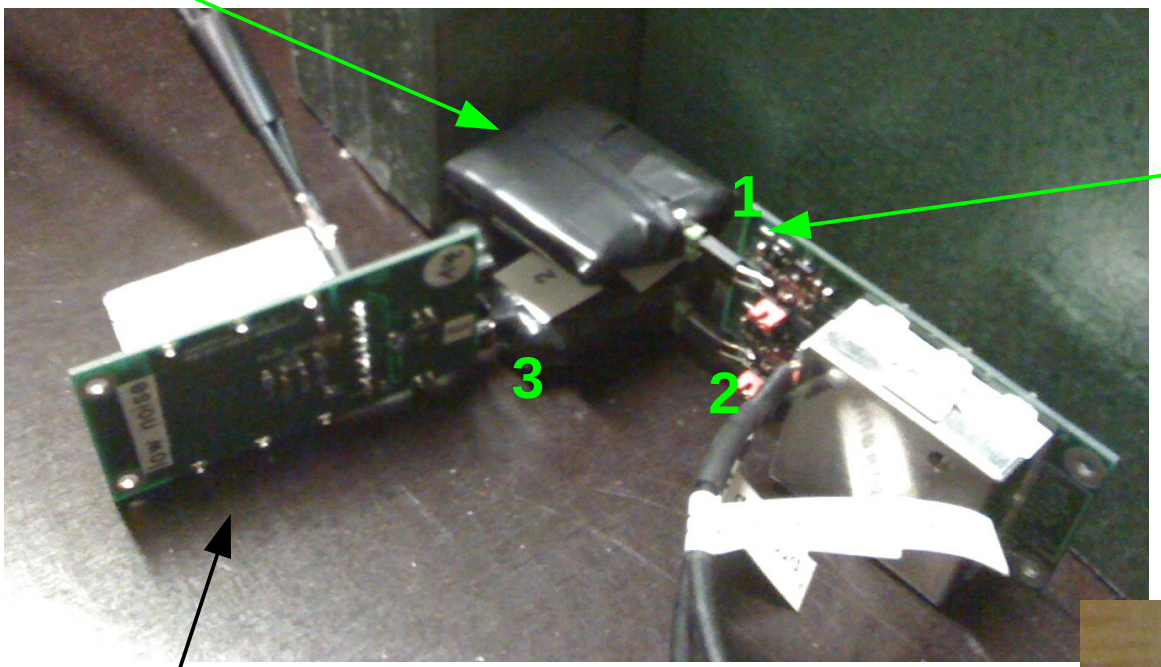
First experimental setup



2x BC408 30 x 30 x 4 mm^3 wrapped with Teflon and black tape
3x Hamamatsu SiPM: MPPC S10931-100P
2x Amplifier (“current controlled” preamp with 2 channels each)
Strontium source
Constant Fraction Discriminator (CFD)
LeCroy Oscilloscope (WavePro 735Zi)

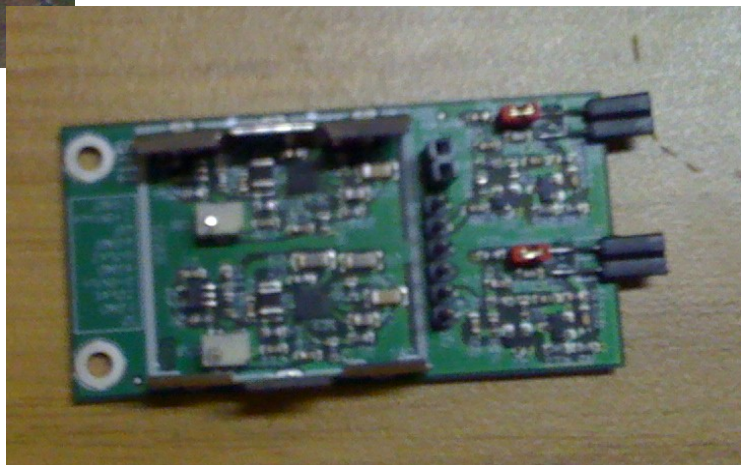
Experimental setup

Scintillator



SiPMs

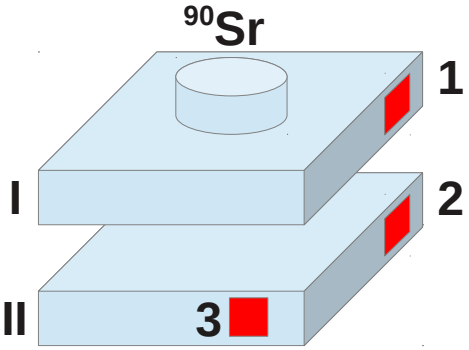
2 channel preamp:
5V supply voltage
Current controlled: constant current to correct for temperature variations



Time resolution

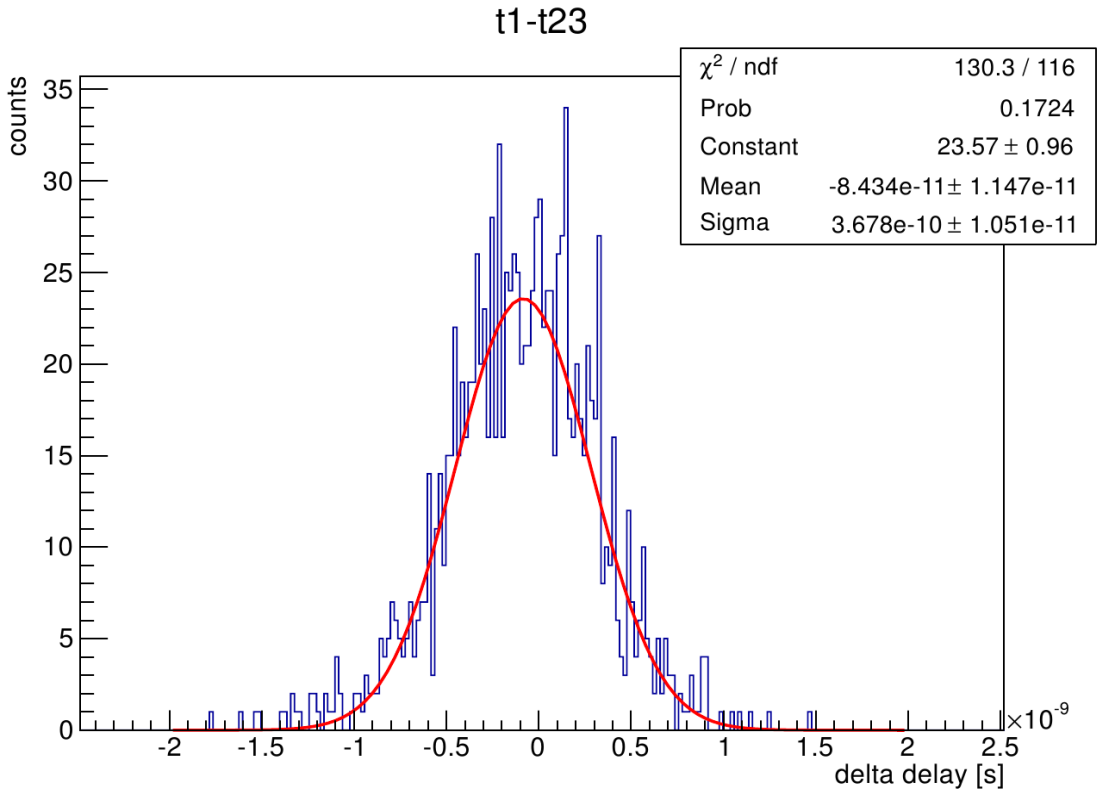
Use scintillator on top as start

Measure t_1-t_{23}



TOF resolution: 368 ± 10 ps

Time resolution of single layer: ~ 260 ps
(including scintillator, SiPMs, electronics.
Assuming two identical layers)

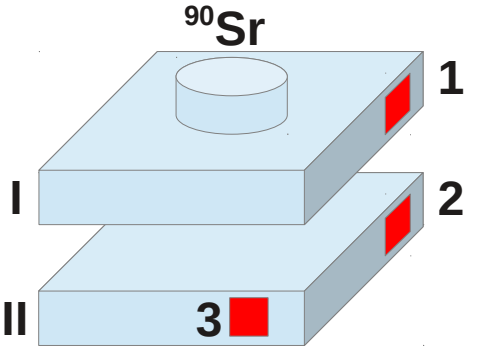


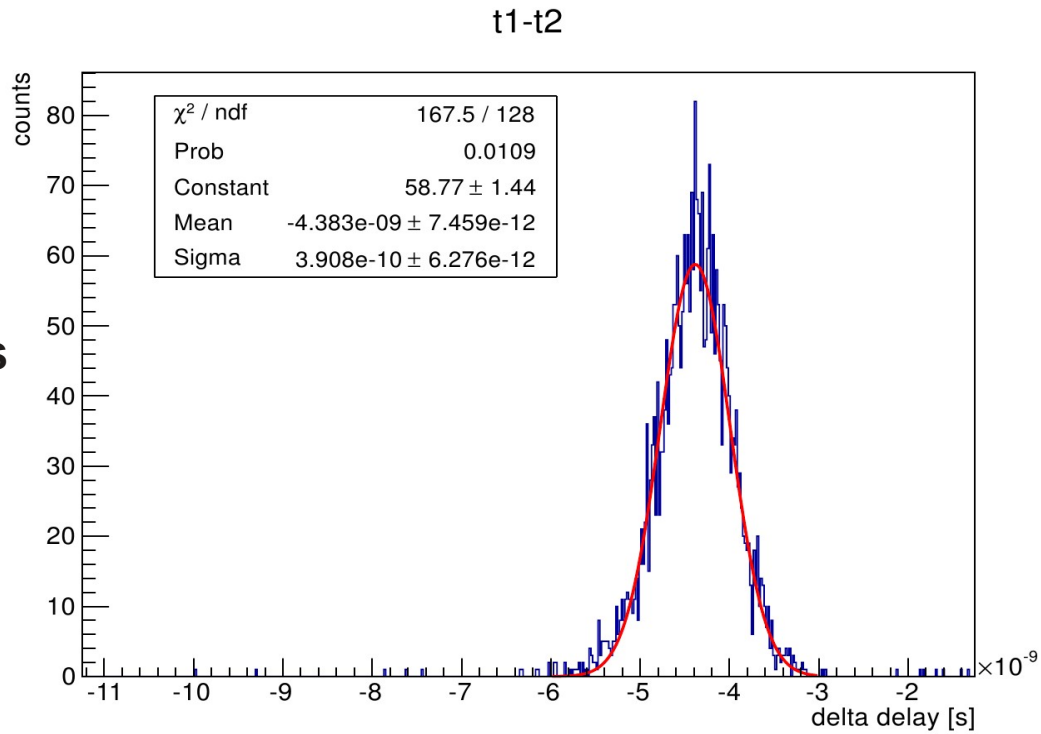
Electronics time jitter still included
Problems with SiPM 3
Used high threshold (~ 30 photons)
Just a starting point

Time resolution

Use scintillator on top as start

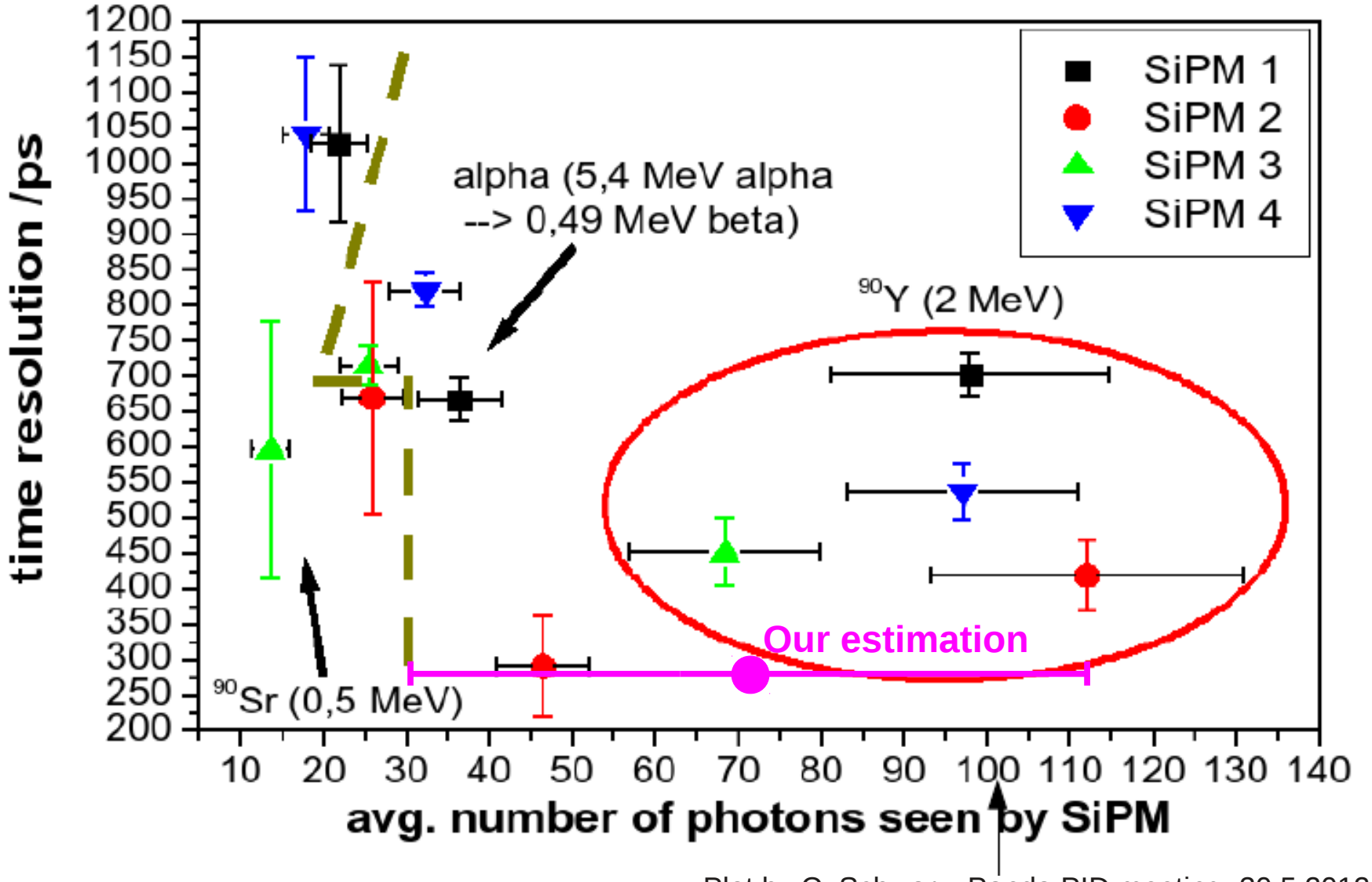
Measure t_1-t_2





TOF resolution: 391 ± 6 ps

Time resolution of single channel: ~ 280 ps
(Scintillator, SiPMs and electronics.
Assuming two identical layers/channels)



Plot by C. Schwarz, Panda PID meeting, 30.5.2012

Summary & Outlook

- First measurements on the time resolution of a scintillator tile have been performed
- First estimation results in σ ~ 280 ps for a single channel

Next steps

- Optimization of the experimental setup
- Lower the threshold
- Evaluate electronics jitter
- Test other SiPMs (different pixel size, different vendors,...), preamps, scintillators,...
- Compare measurements with simulation (SLitrani)