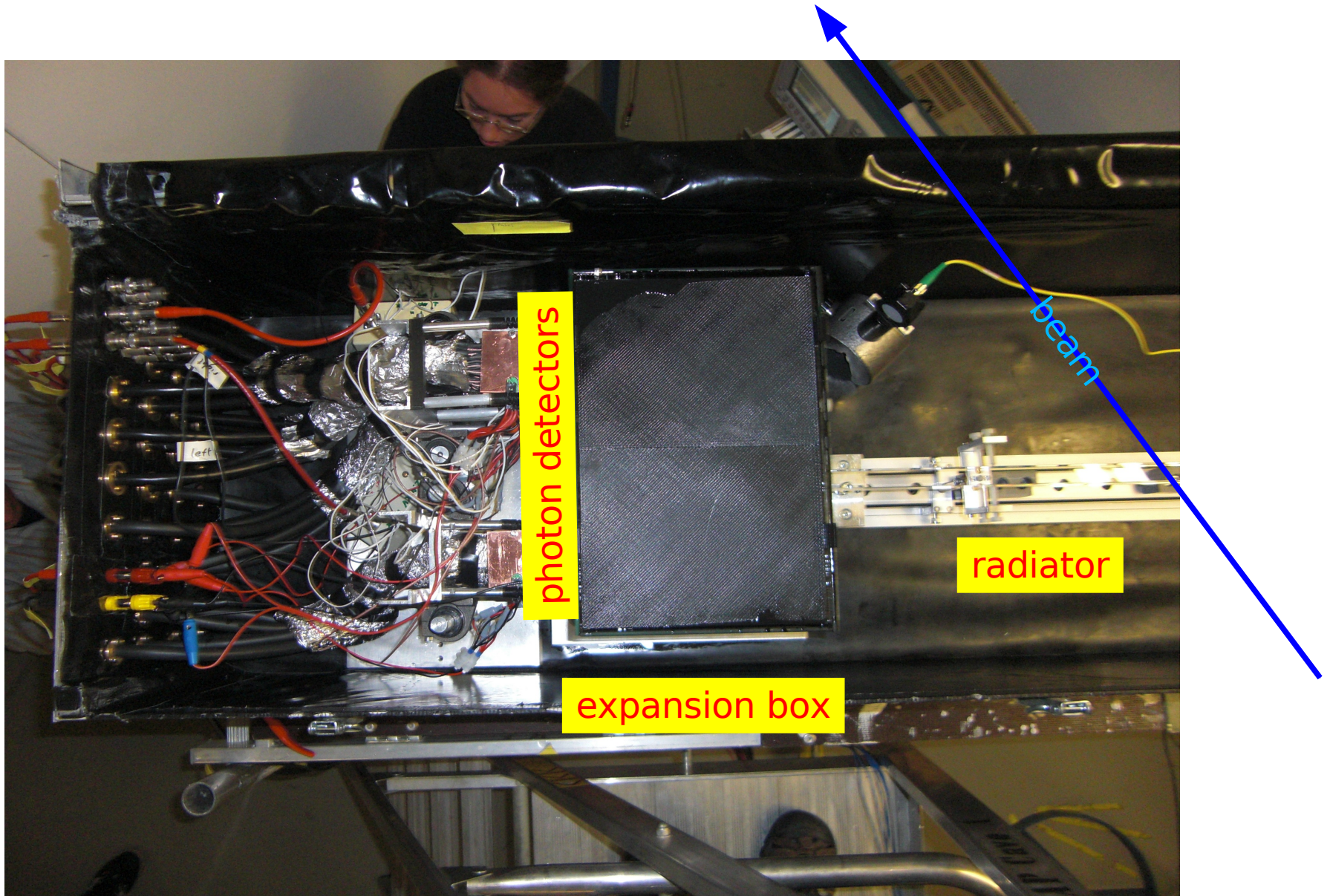


Present Read Out Chain for the PANDA Barrel DIRC

Carsten Schwarz, 

- Setup
- Experiments
- Experiences

Setup



Burle-MCP-PMT

64 anodes

25 μ m channels

work in high

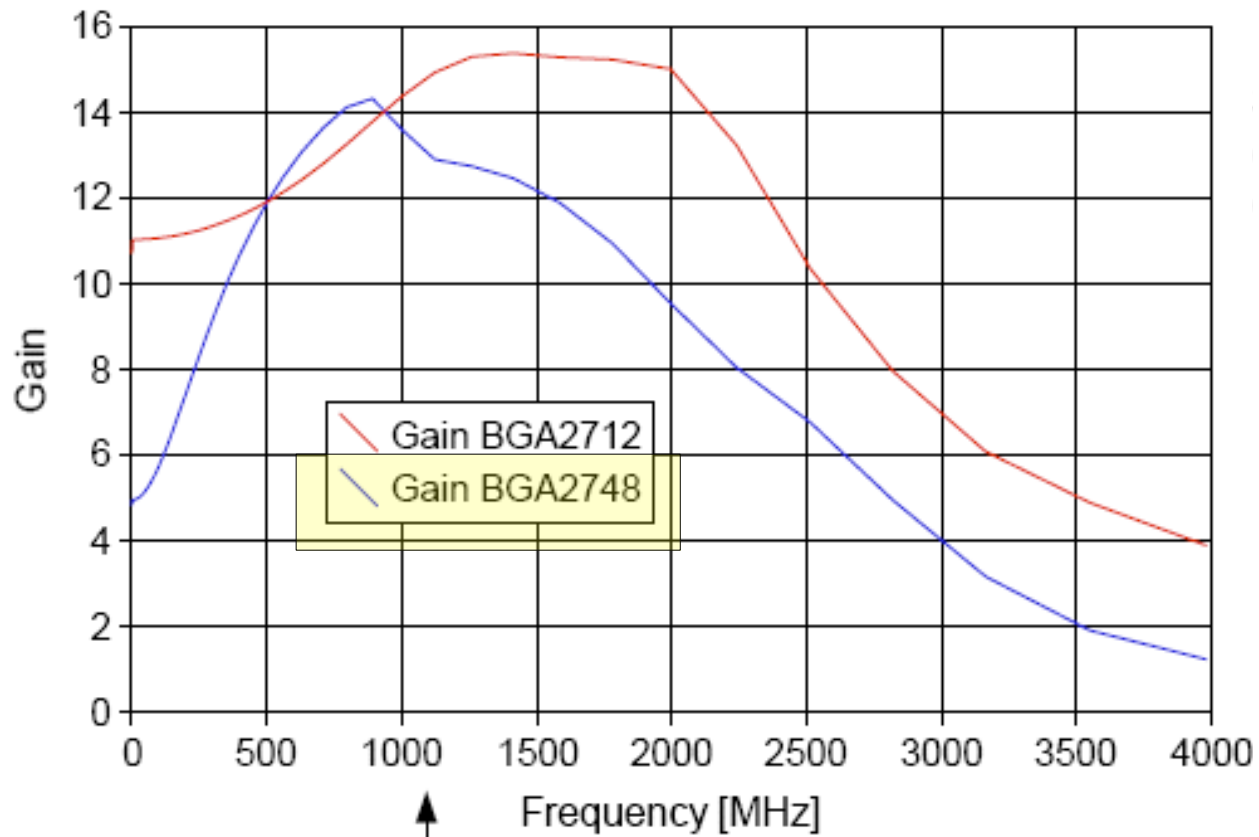
magnetic field (signal reduced to 30% @ 1Tesla, 10 μ m better)

Setup



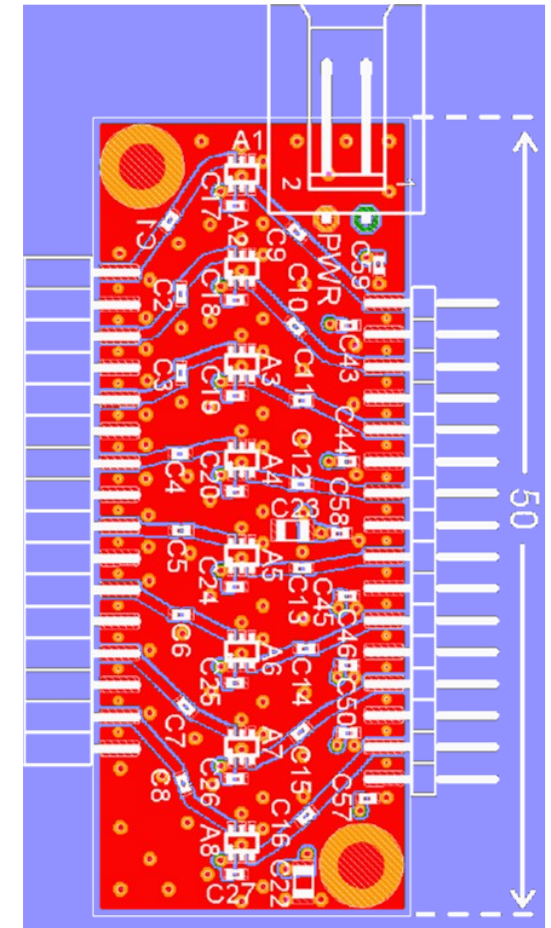
Signal $\approx$ 5mV

Setup



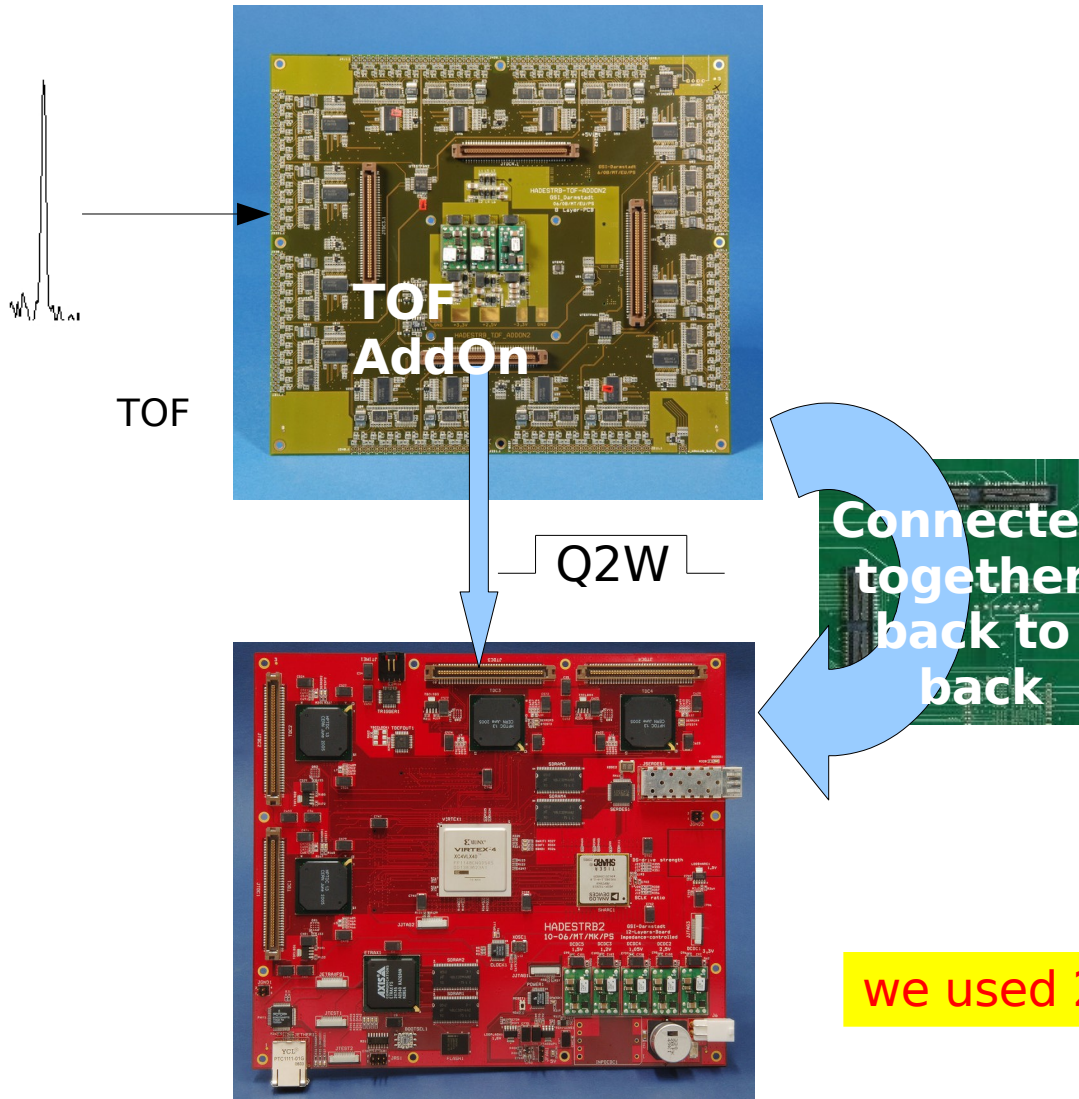
300 ps rise time

gain ≈ 10



Setup

HADES readout electronics with NINO add on board



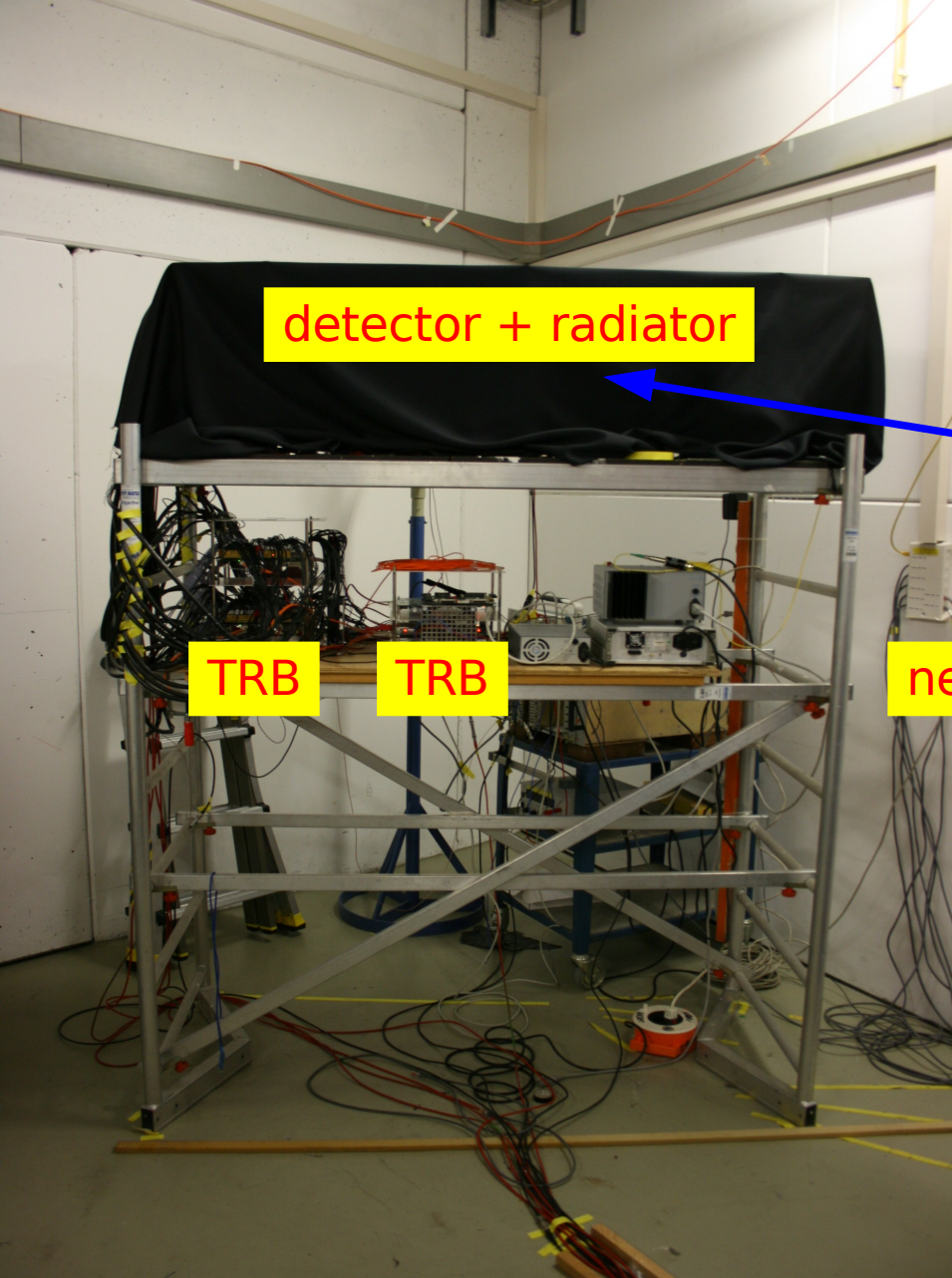
The TRB gives a power supply and a slow control

128 Q2W channels

Marek Palka IEEE Dresden

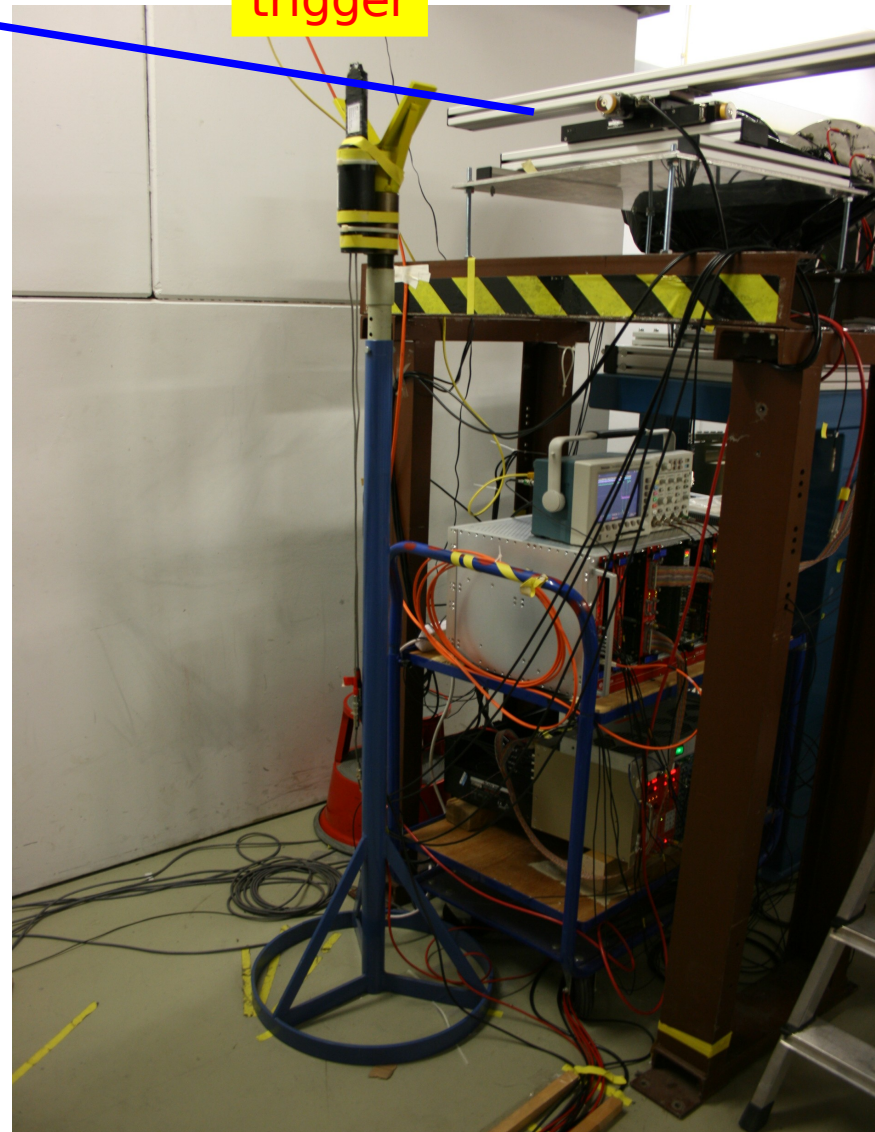
we used 2 double boards a 128 ch. = 256 ch.

Setup

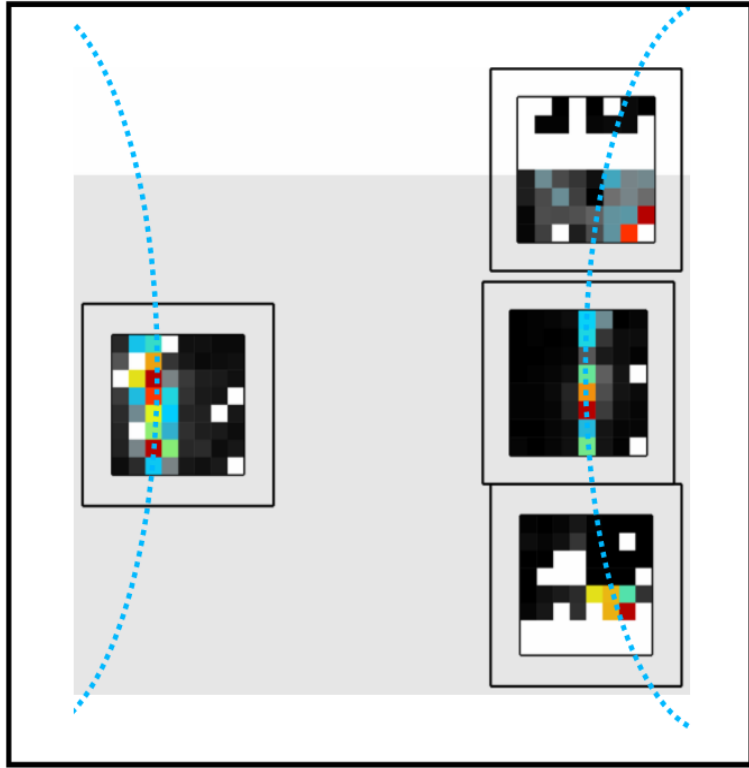


beam

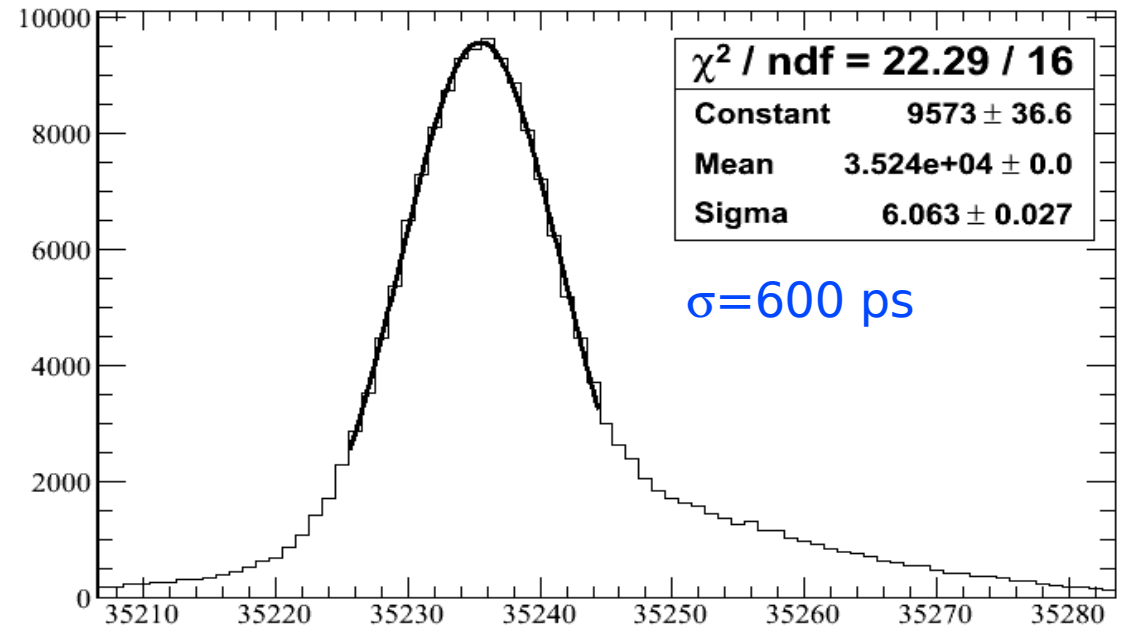
trigger



Experiment



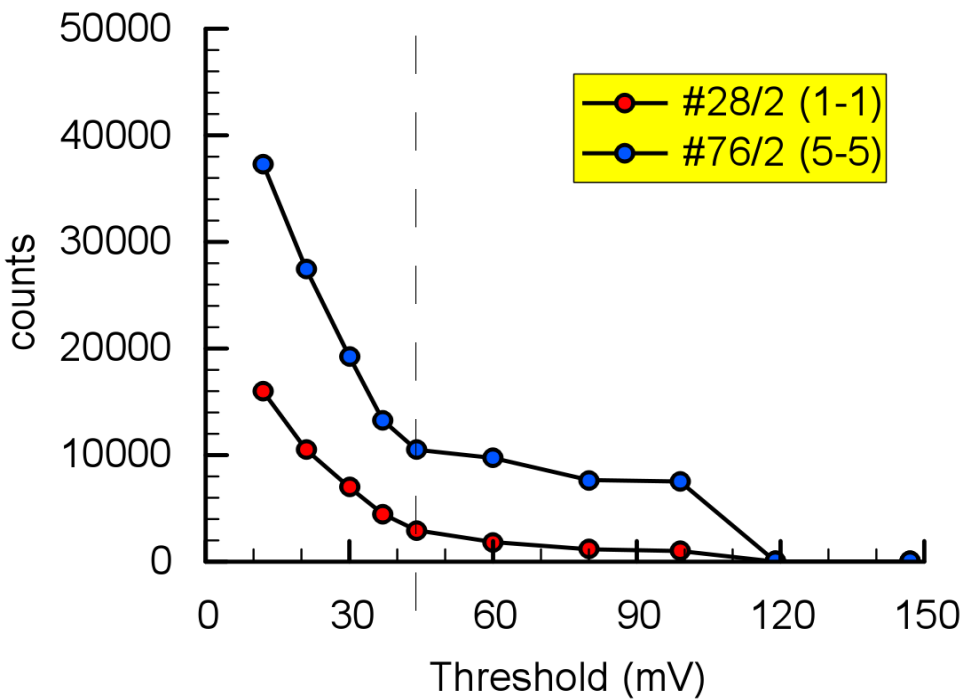
Rings are observed
-move with beam angle
in right direction



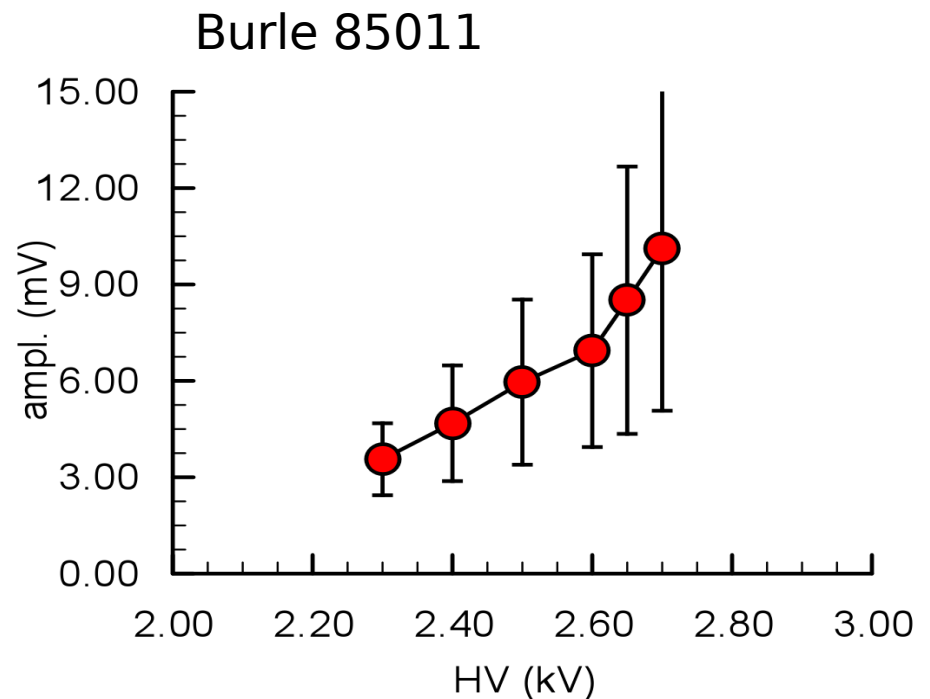
time resolution determined by scintillator trigger

- Photon detection with MCP-PMT
 - Signal height
- Preamplifiers
 - Oscillations
- NINO Discriminator
 - Effective threshold
 - Working fraction / Housing
 - Vibration hardness / Board
- TRB
 - TOT
 - Rate

Photon detection with MCP-PMT



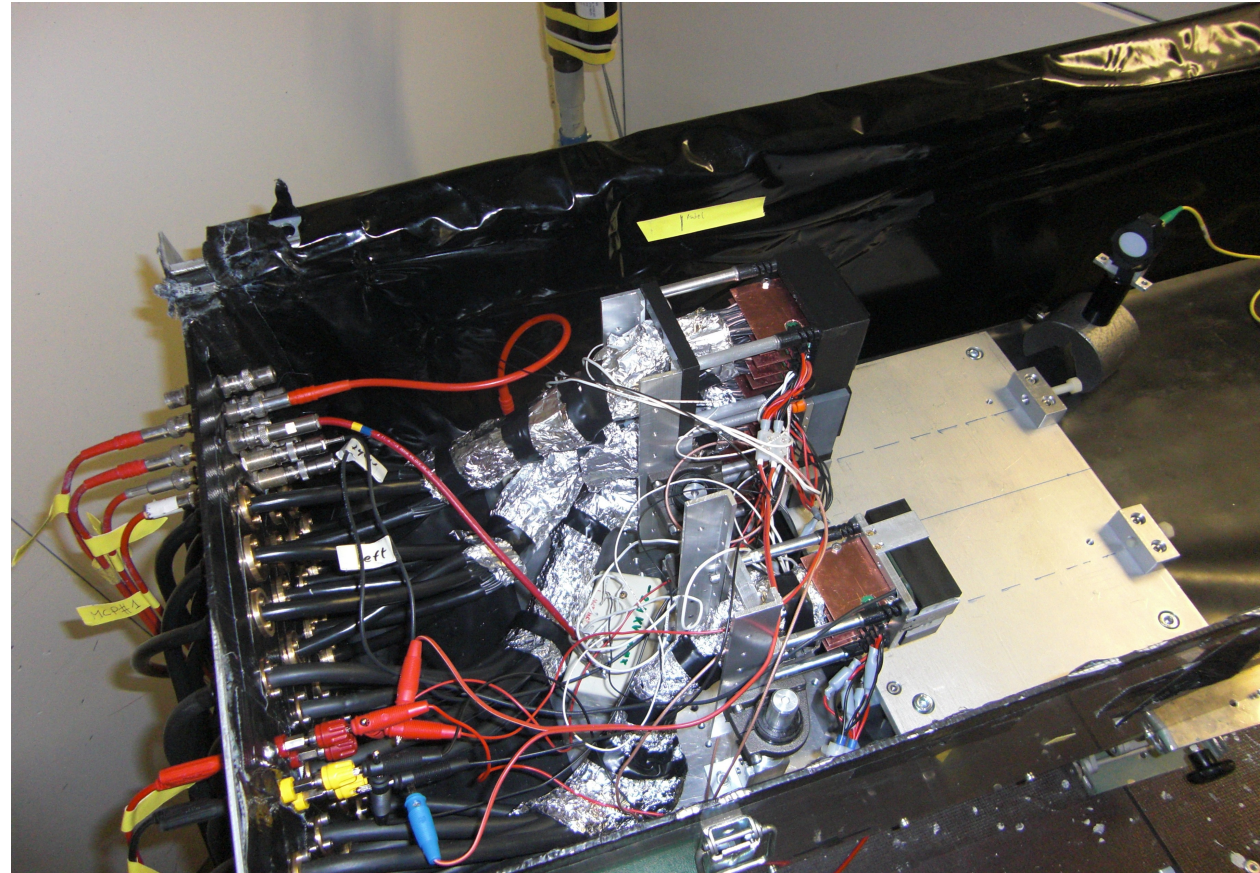
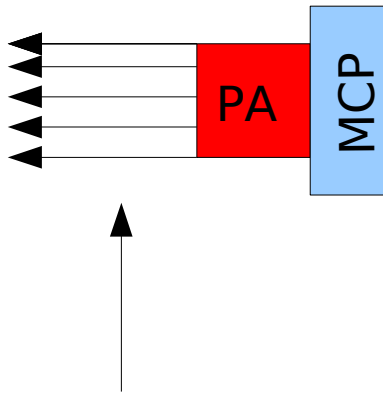
signal 6mV
ampl. 60mV
Nino: 10-110mV



Preamplifier - Oscillations

Preamps oscillate dependig on how far you open the metal box

Standing wave within the box
-> input and output coupling



shield output cables
(Aluminum foils not connected to mass)

NINO-Discriminator

Threshold

A discriminator needs a certain charge over threshold to switch

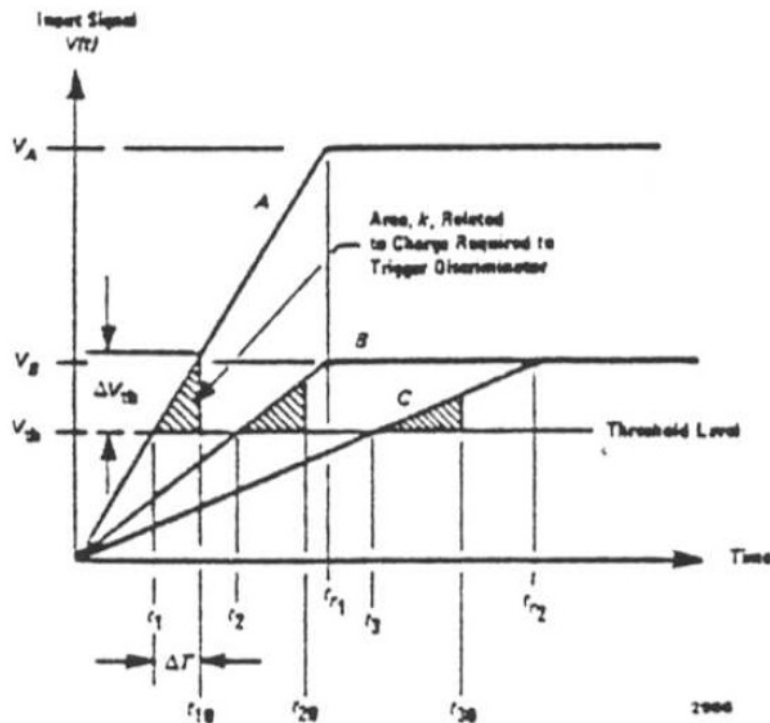
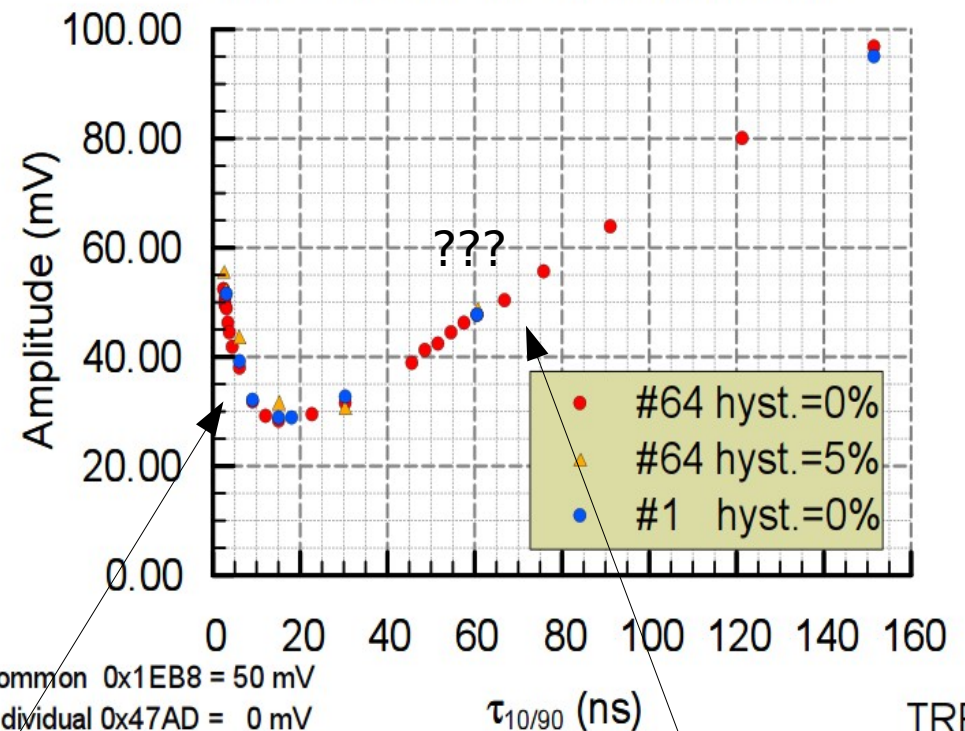


Fig 3. Walk in a Leading-Edge Discriminator Due to Amplitude and Rise Time Variations and Charge Sensitivity.

T.J. Paulus EG&G Ortec, IEEE NS32 (1985) 1242

50 mV adjusted:

NINO effective threshold vs risetime

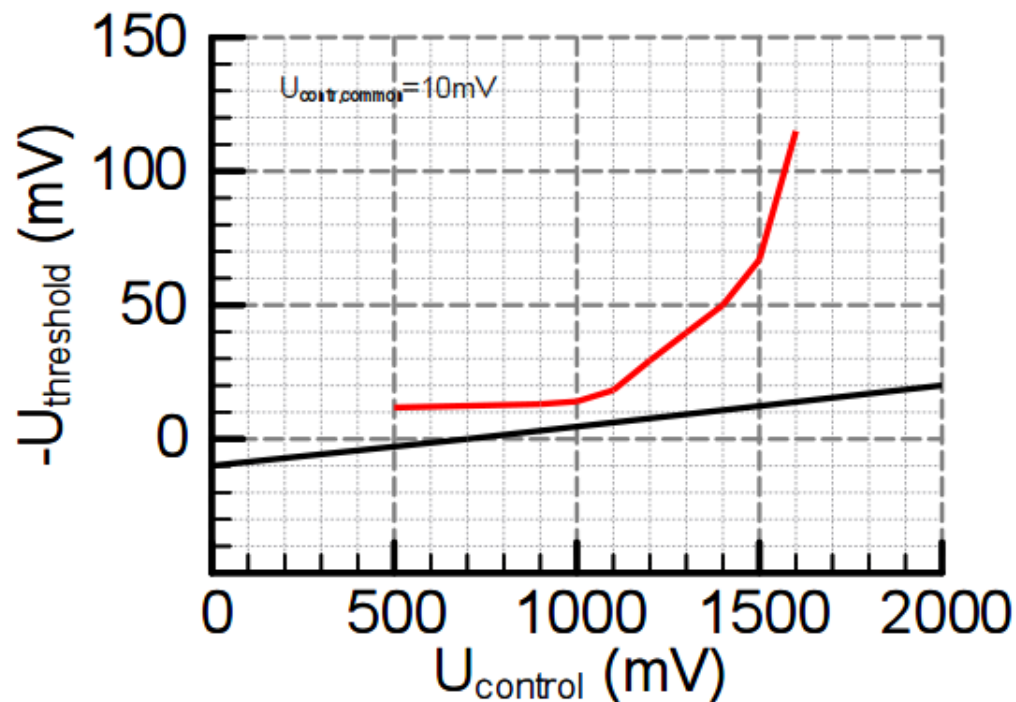
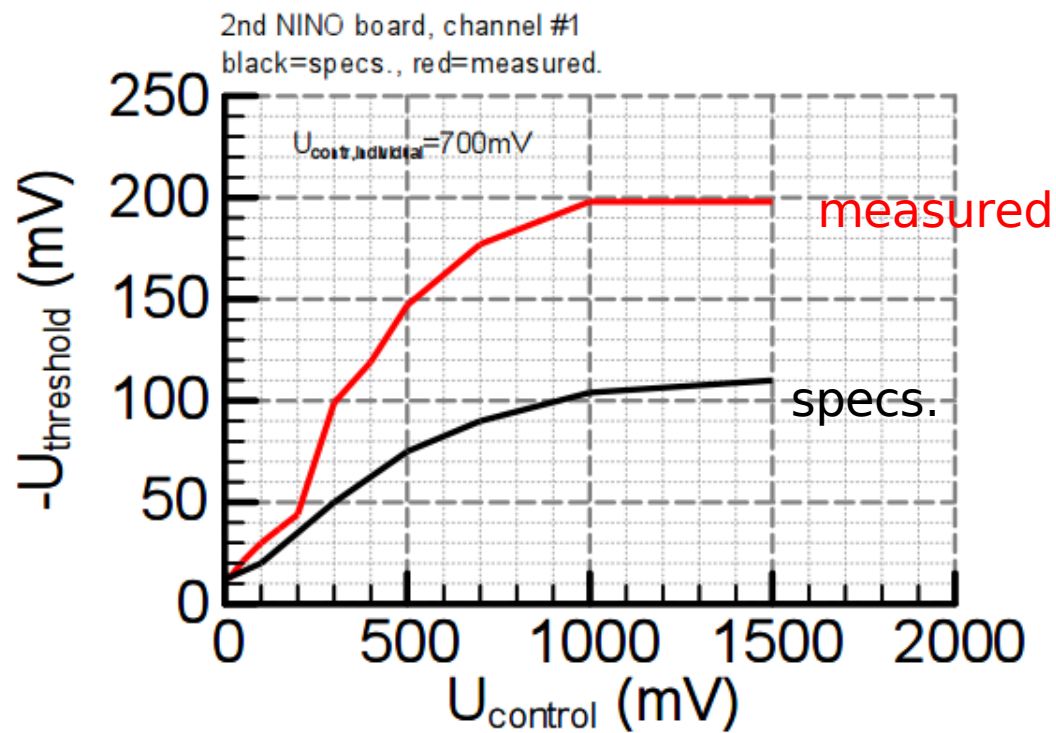


TRB65

charge over threshold effect

raise not understood

NINO Discriminator

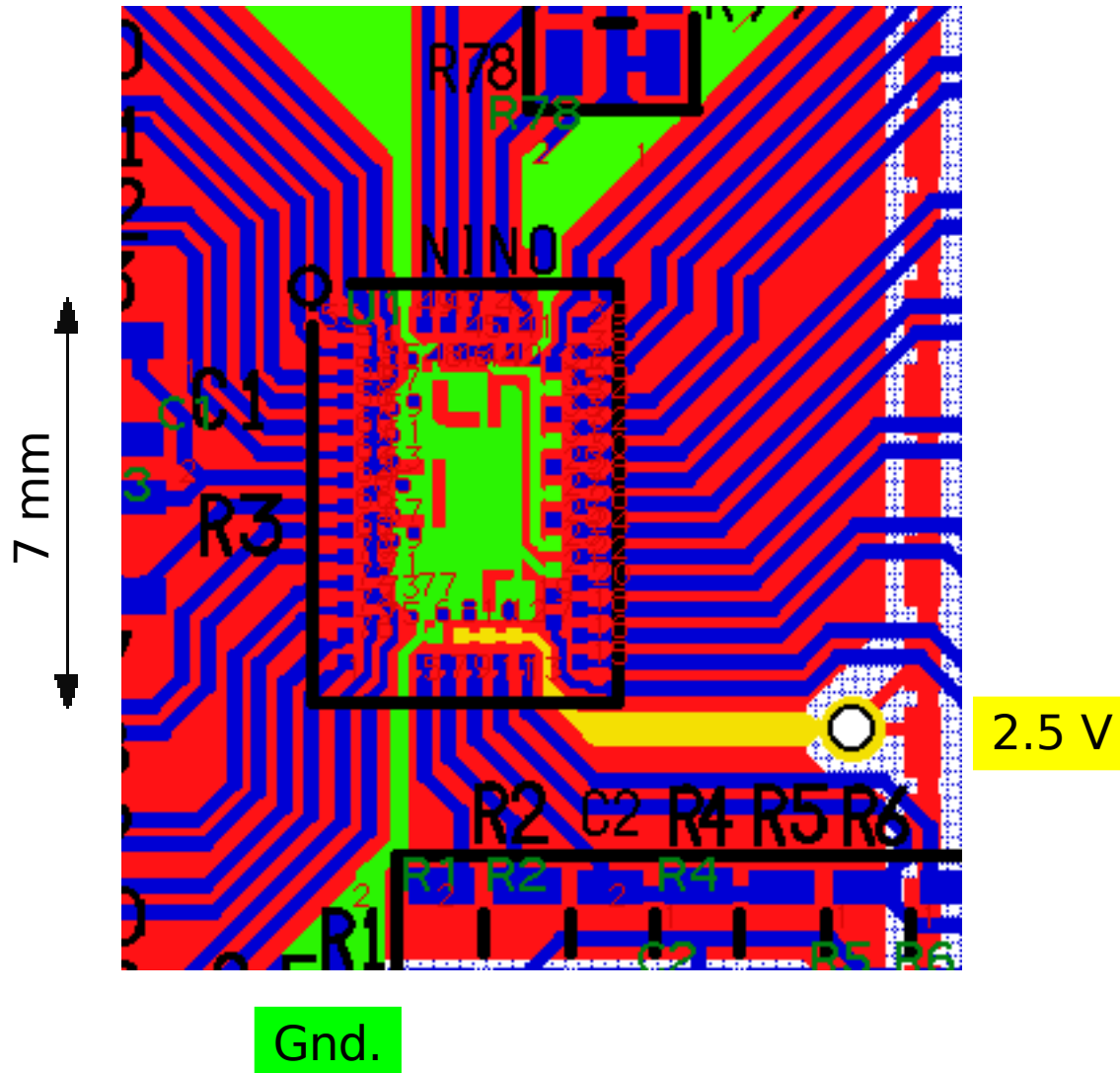


Threshold depends on
rise time of signal

NINO-Discriminator Housing

working fraction

demonstration board



Serious design needs vias underneath the chip to

- ground plane
- power plane

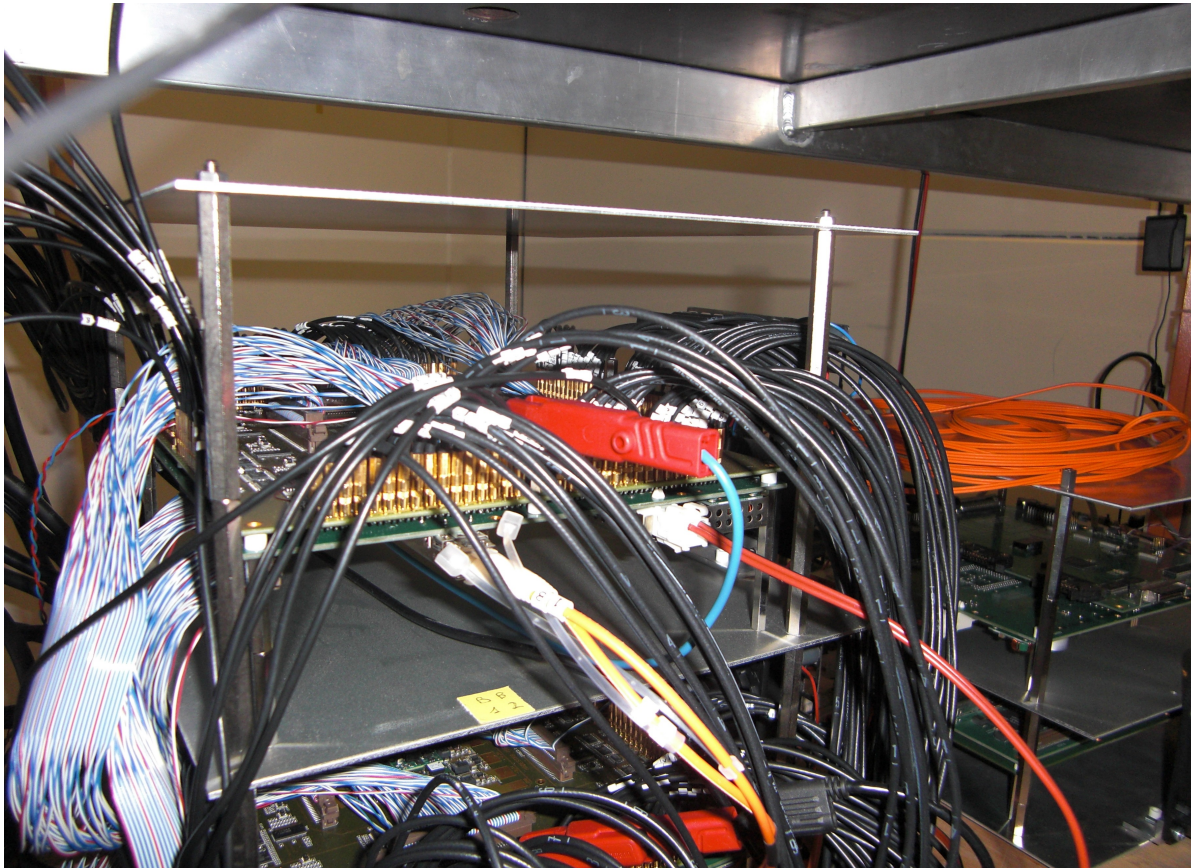
HADES NINO add ons:

--> 3D problem to contact all pads reliably

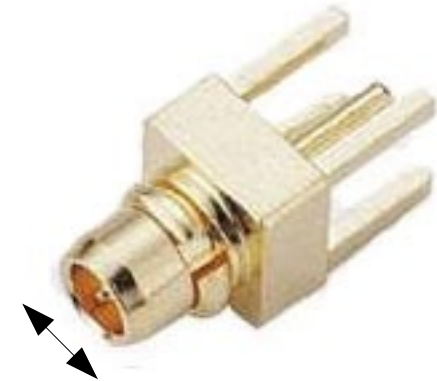
--> 10% not working

Small housing of NINO causes problems for HADES NINO add-ons

NINO Discriminator Board



MMCX =
micro miniature coaxial



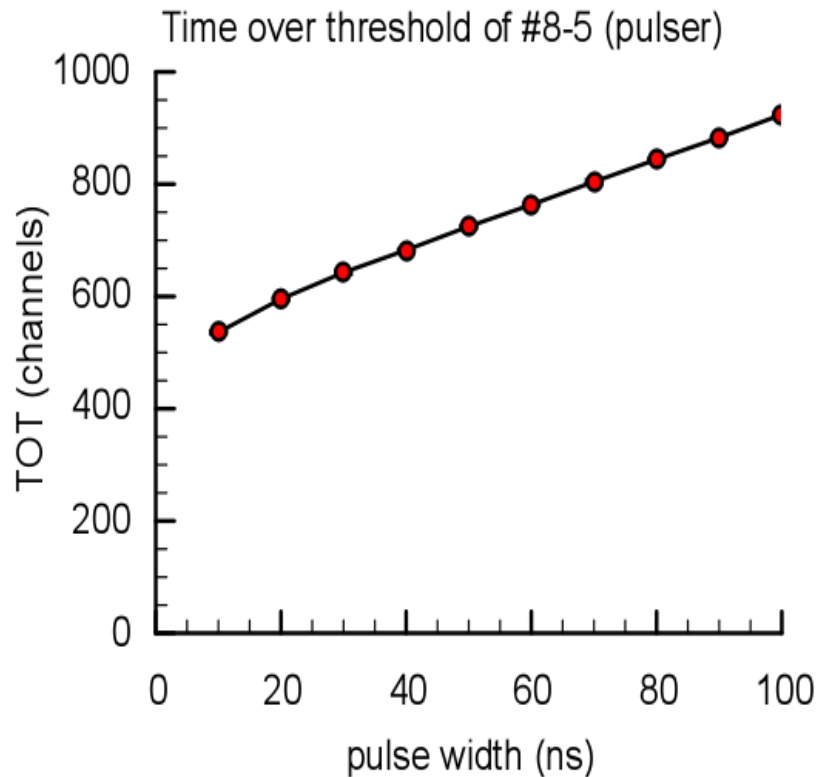
2.4 mm

MMCX plugs are
good for rare usage

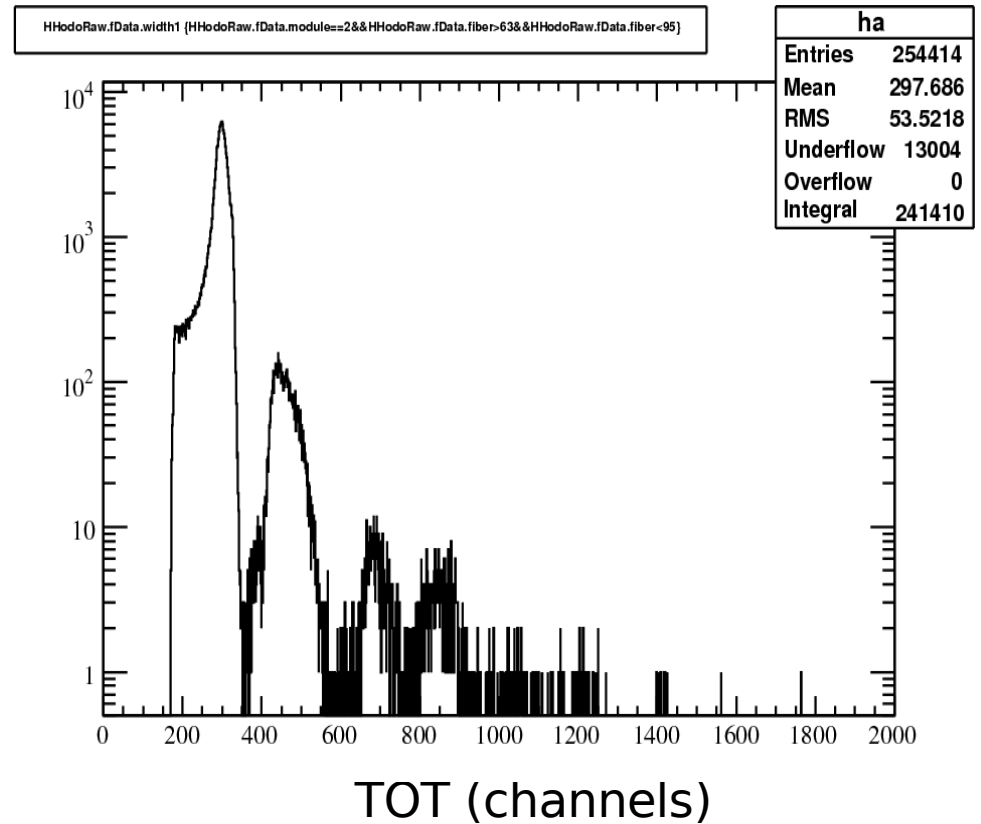
MMCX plugs need some force to connect/disconnect
--> mechanical bending of boards (TRB + add on)

at end of beam time a block of 32 channels were missing
(TRB problem)

TRB: Time over threshold

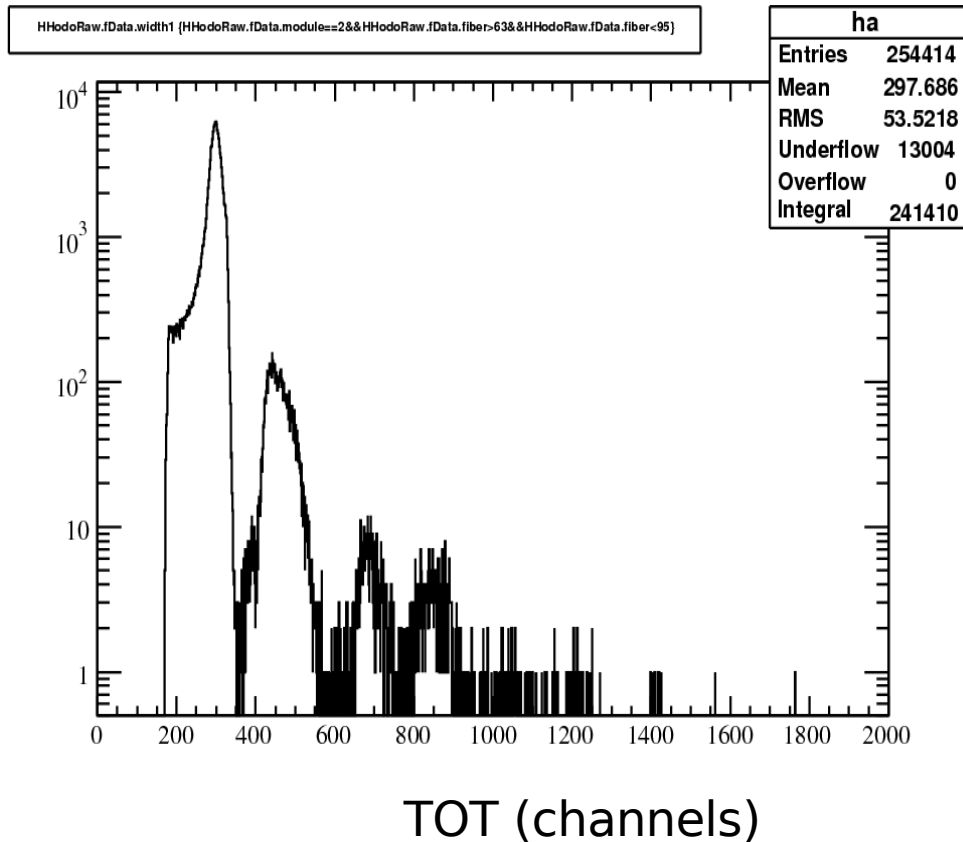


pulser test before beam time

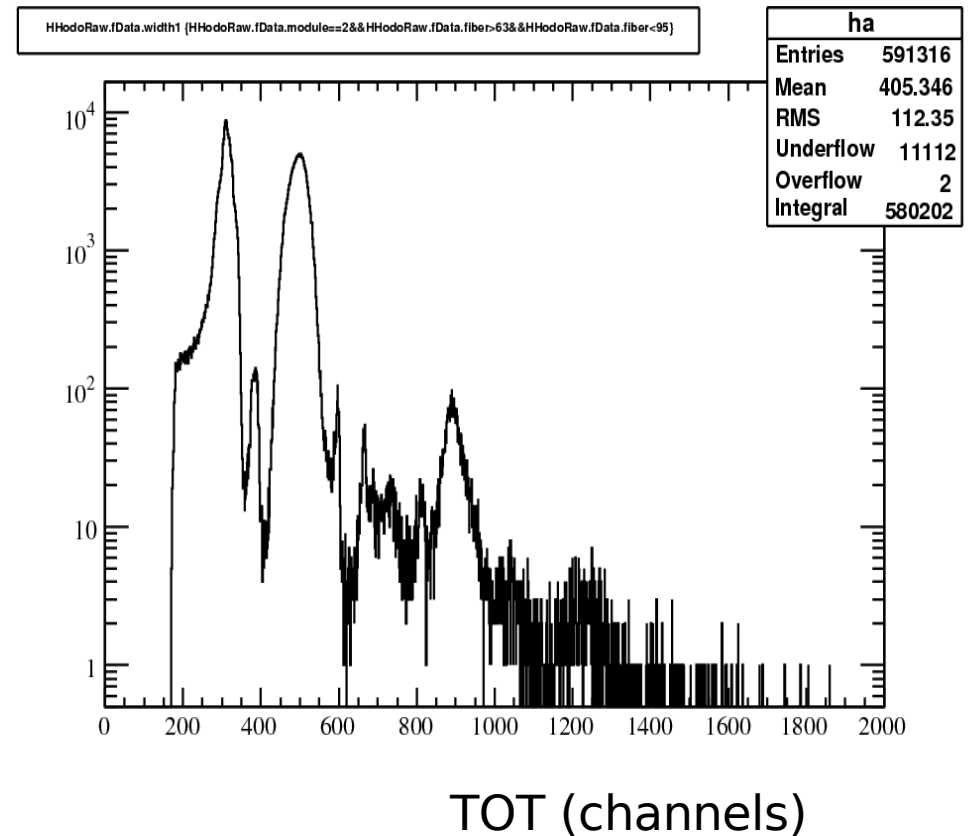


TOT in beam time

TRB: Time over threshold



threshold -44mV



threshold -12mV

TOT not understood

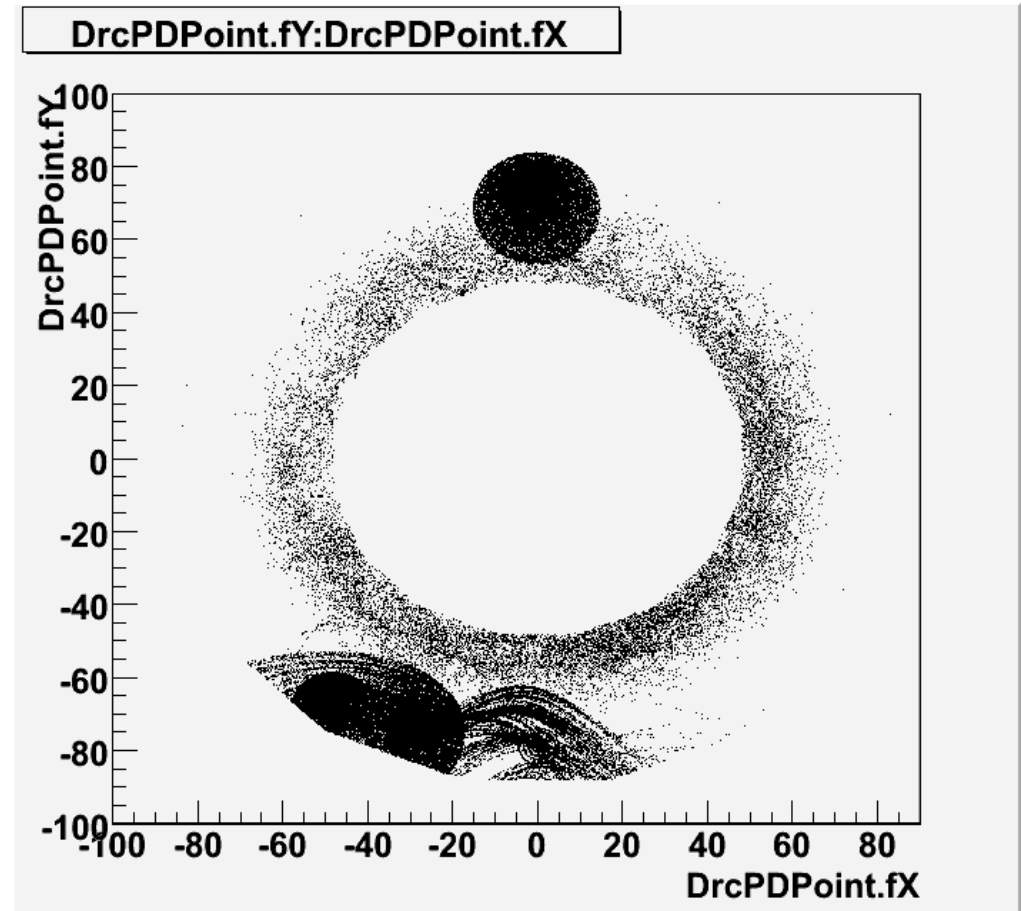
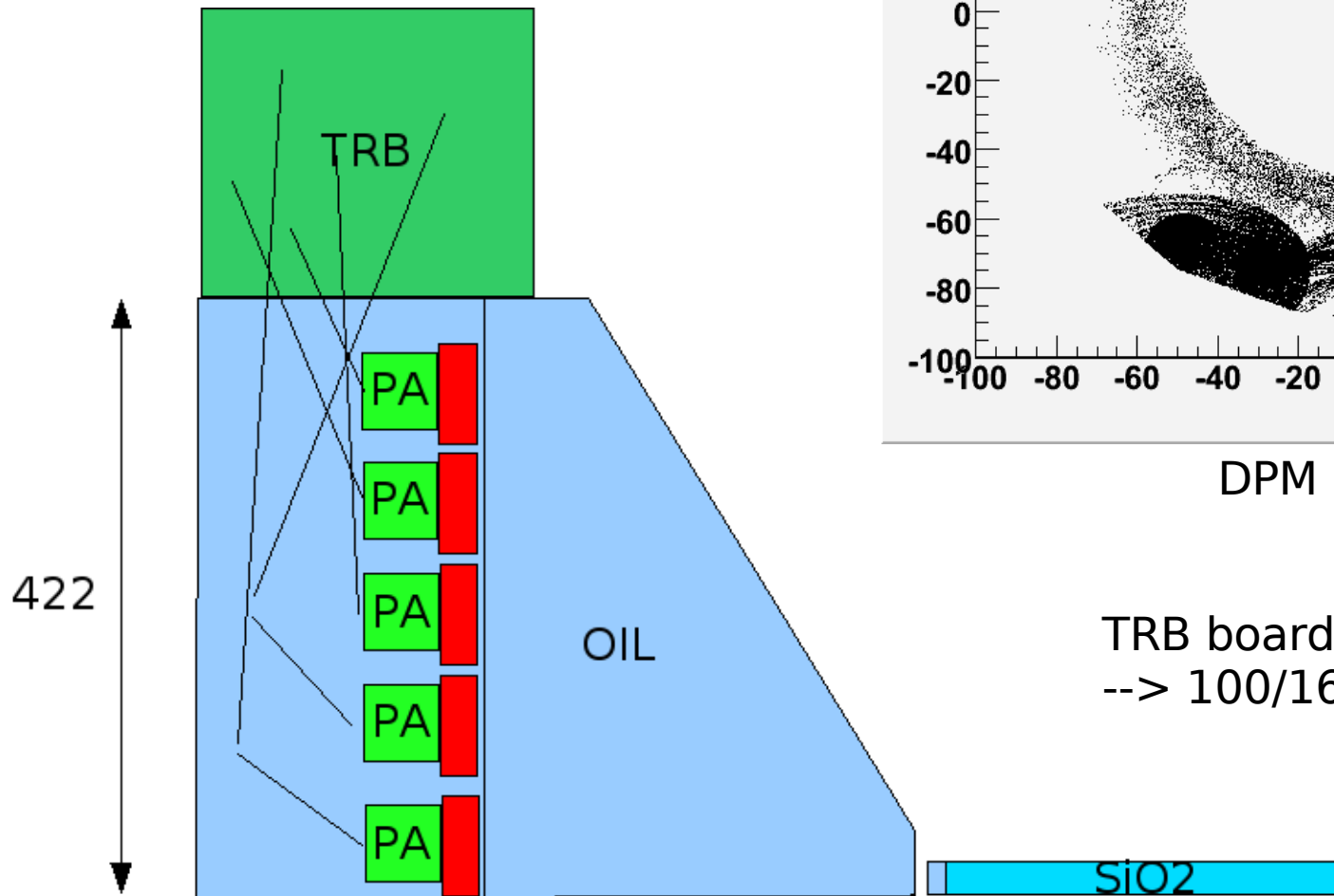
TRB: Rate

due to a wrong capacitor on the
NINO add on board for the reference time
--> limitation to 30 kHz in beam time

--> upper limit of TRB: 100kHz

20 MHz interaction rate
barrel multiplicity 2
20 photons per ring
~ 5000 channels (inside region)

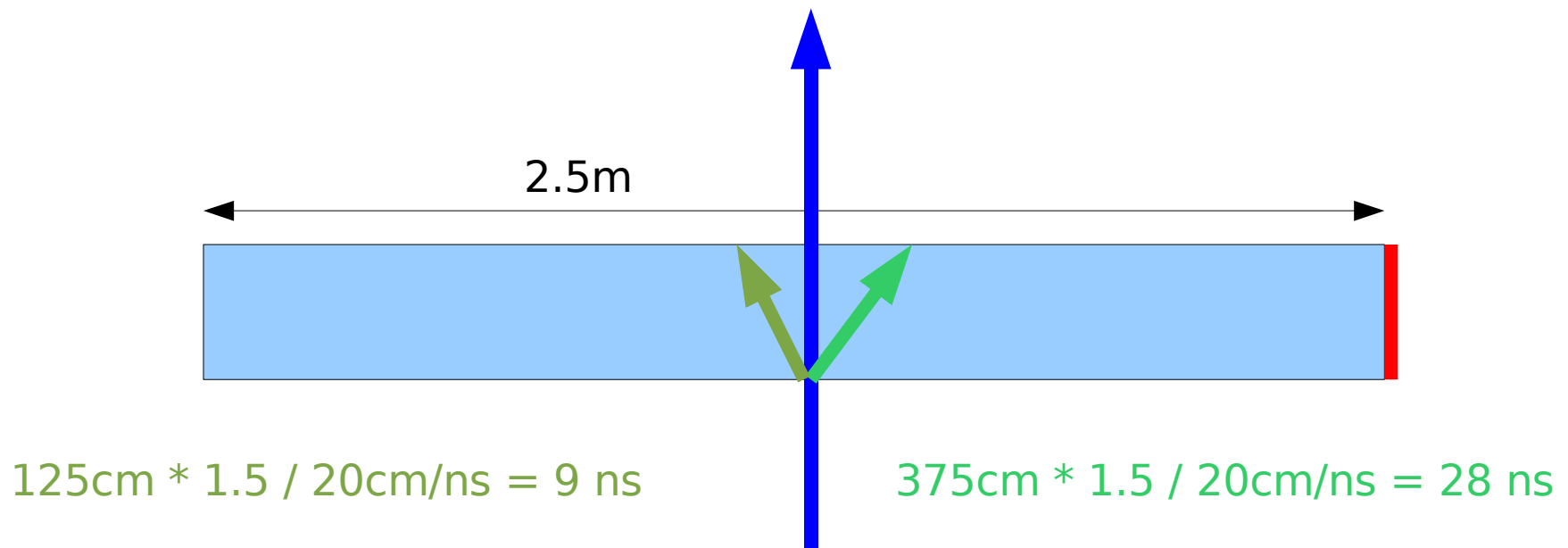
Rate: 160kHz (inside region)



DPM background generator

TRB board: 100kHz
--> $100/160 \times 20\text{MHz} = 12.5\text{MHz}$

limit due to board



Delta time = $19\text{ns} * 1.5$ (geometry) = 28.5 ns
==> **35MHz**

physical limit due to bar length

Summary

- Read out chain from HADES works fine for PANDA DIRC tests
- There is space for improvements
 - rate capability
 - mechanical stability
 - preamplifier shielding