Disc DIRC Giessen activities, results from Test beam measurements and Plans

Avetik Hayrapetyan on behalf of AG Düren

PANDA COLL. Meeting Groningen

Aug.29-Sep.3 2010

JUSTUS-LIEBIG-
UNIVERSITÄT
GIESSEN

AG Düren activities related to DISC

Design,MC,Implementation into PANDAROOT

PID scheme optimisation and inclusion of DIRC PID into general PID of PANDA

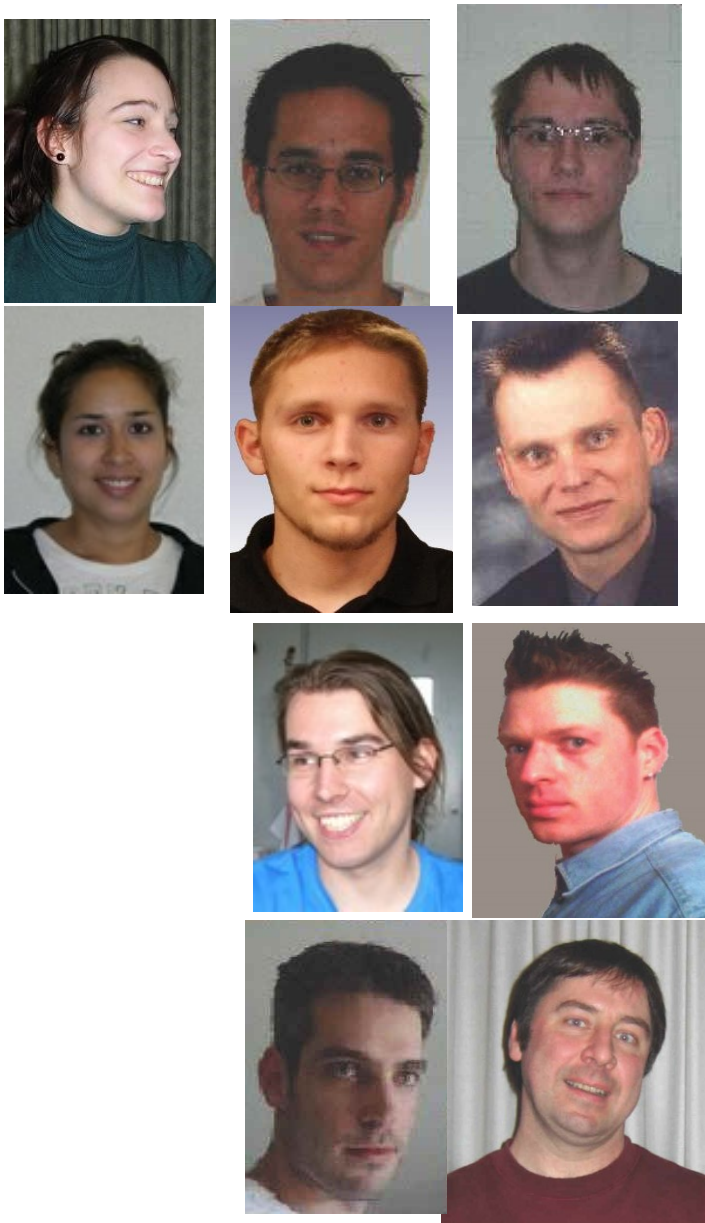
Detalization of Design, projection of it for prototypes

Parts search and LAB measurements of possible candidates (like mirrors,materials for FLG,photon detectors,electronics)

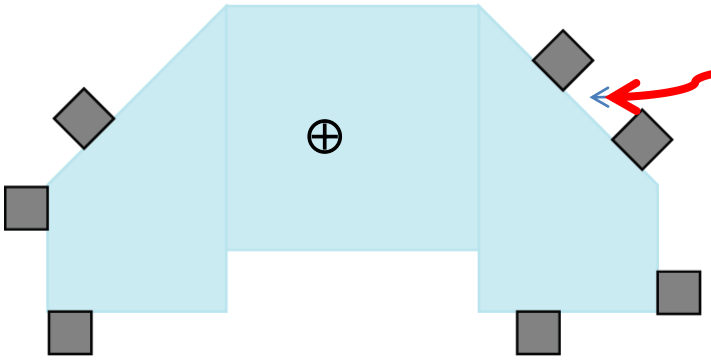
Building of prototypes

Planning and carring out of test beam measurements for prototypes

Analysis of accumulated Data, to finalize PANDA Design

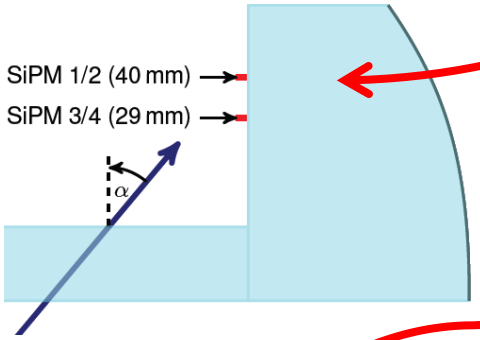


Prototypes we build so far



780mmX390mm Glas coupled with BINP MCPs

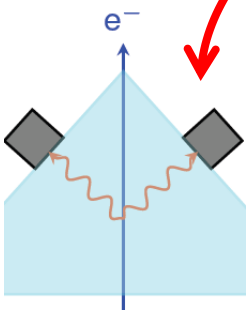
Small Plexiglas radiator with FLG coupled with SiPMs

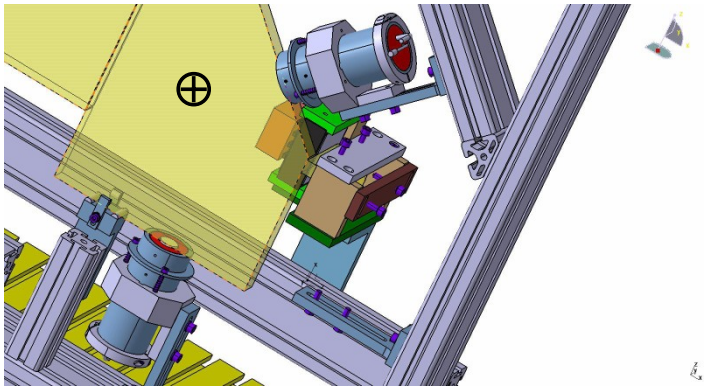


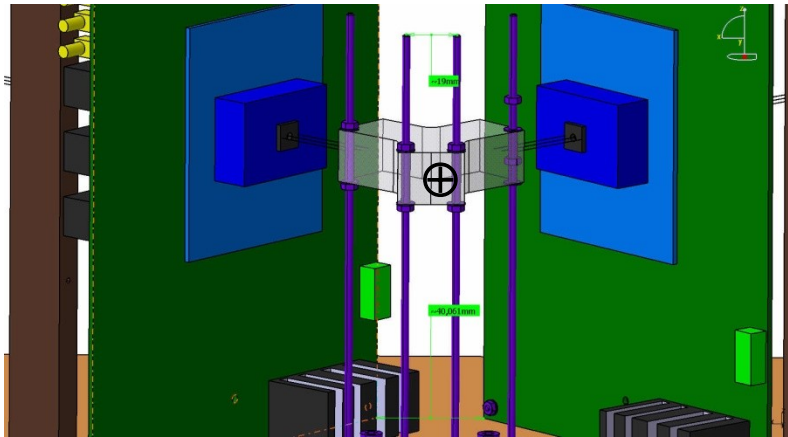
Small Plexiglas radiator coupled with SiPMs looking under Cherenkov angle for Coincidence

780mmX390mm Glas coupled with BINP MCPs and with FLG coupled with Photonis MCP too

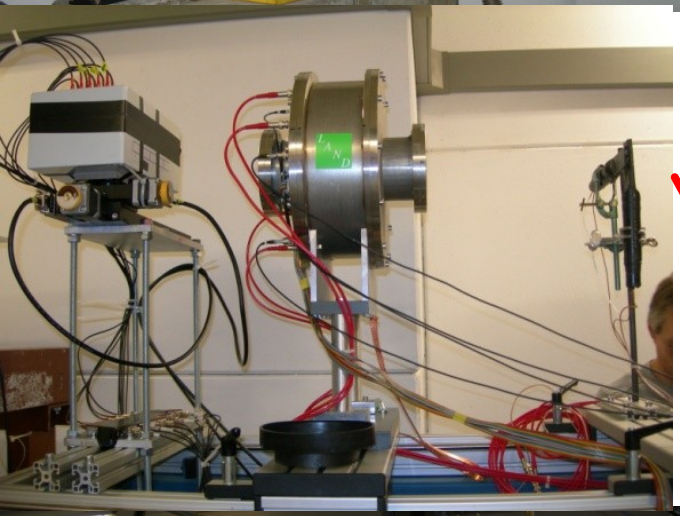
Current one, small Plexiglas radiator coupled with dSiPM and PCB board from Philips

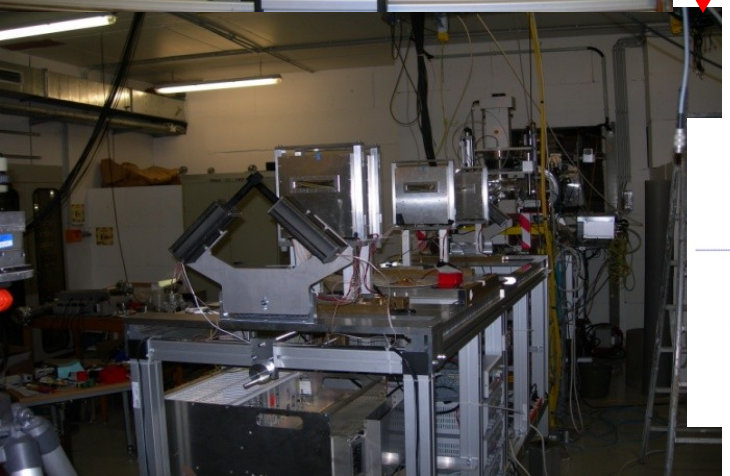






Our TestBeams



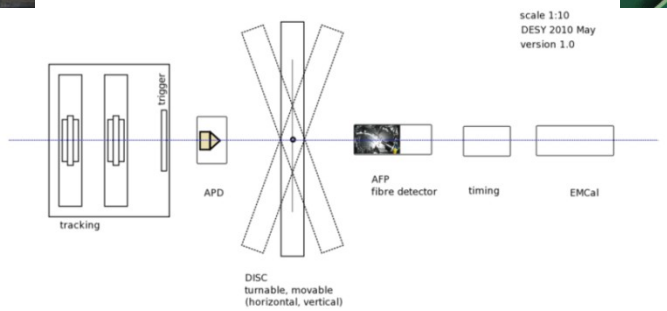


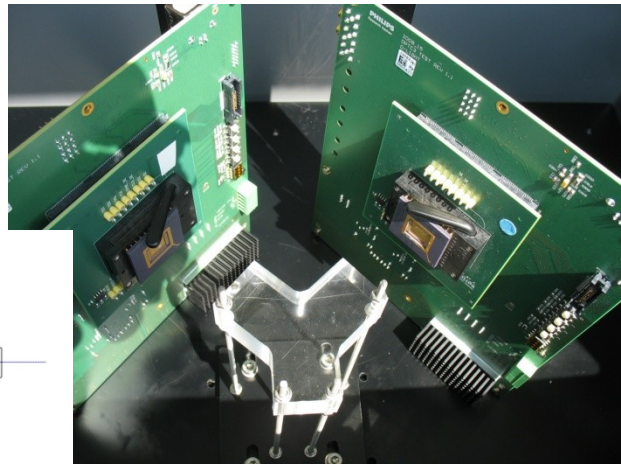
DESY(2008,2010,2010) e +- E=1-6 GeV

GSI (2009) Protons P=2.95 GeV/c

Jülich (2010,2010) Protons T=2.9 GeV

CERN(2010) Protons120 GeV

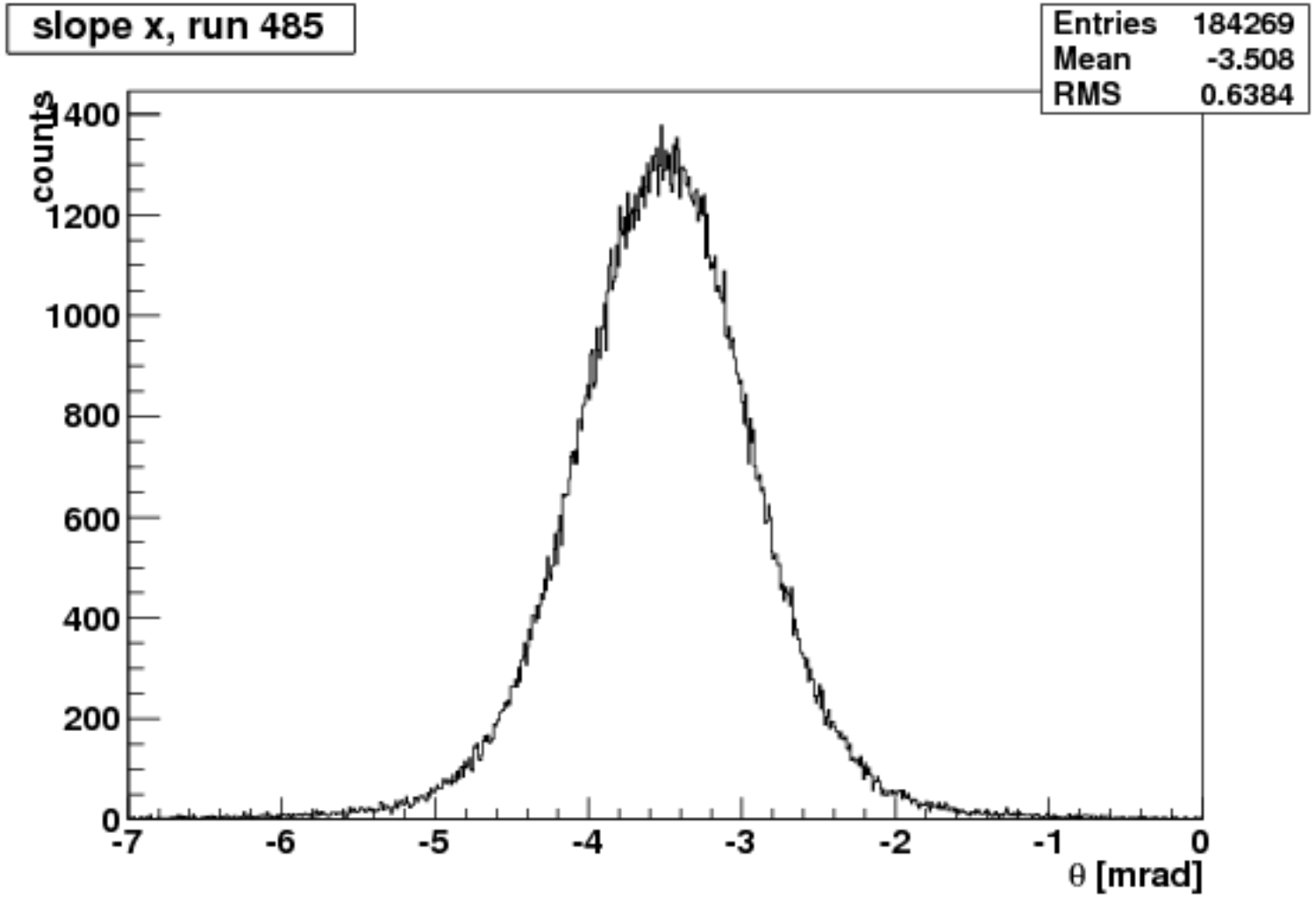




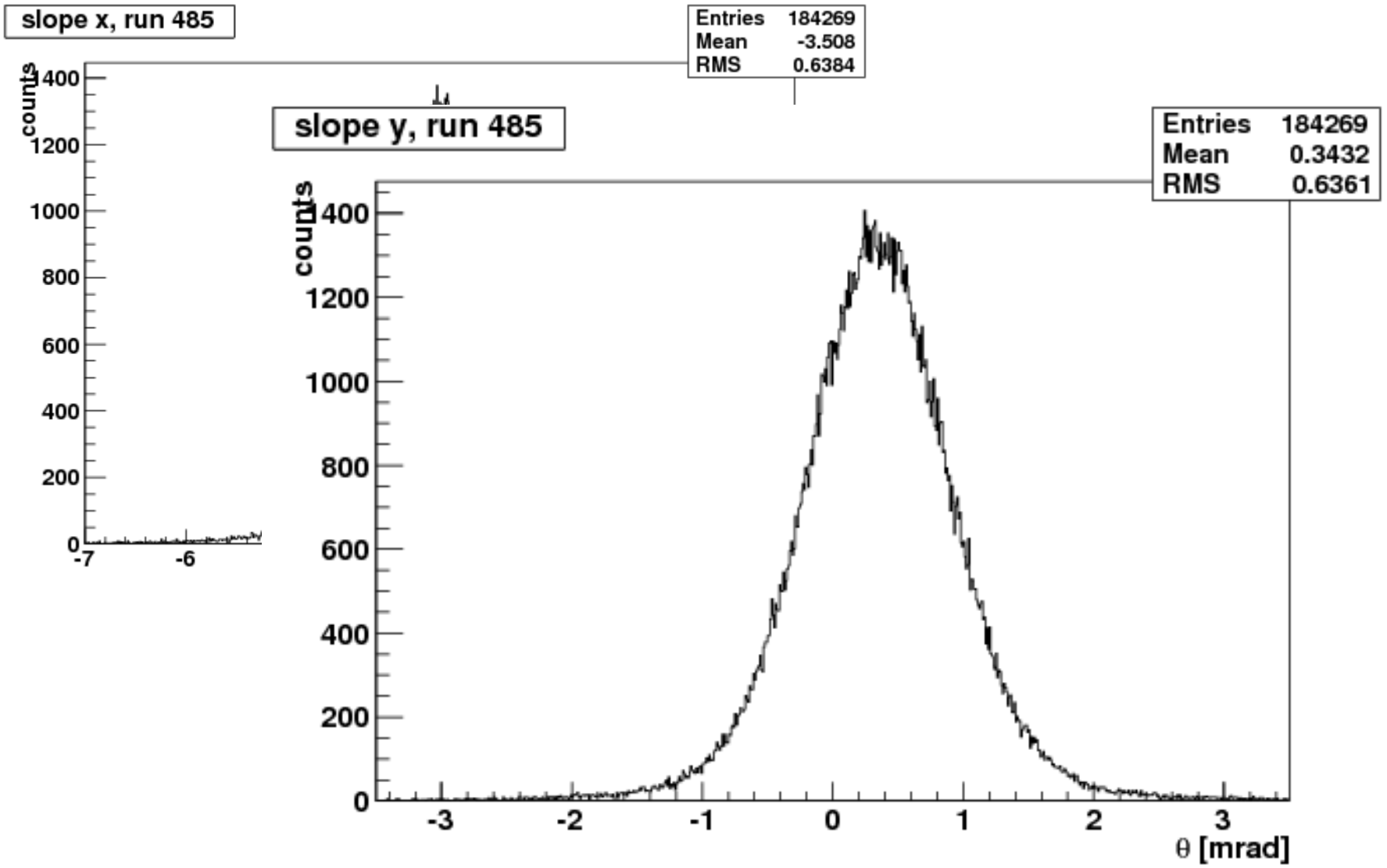
TestBeam DATA analysis

- The Jülich and DESY-II measurements were done with Bonn Tracking station(***Special THANKS for nice Collaboration***),allowing us to get tracks...but
- its increases the volume of the job and currently we are busy with this,
- so the plots I‘ll show next will be ‚Preliminary‘
- our aim is to get first time resolutions and focusing working properly and
- a better understanding of Prototypes

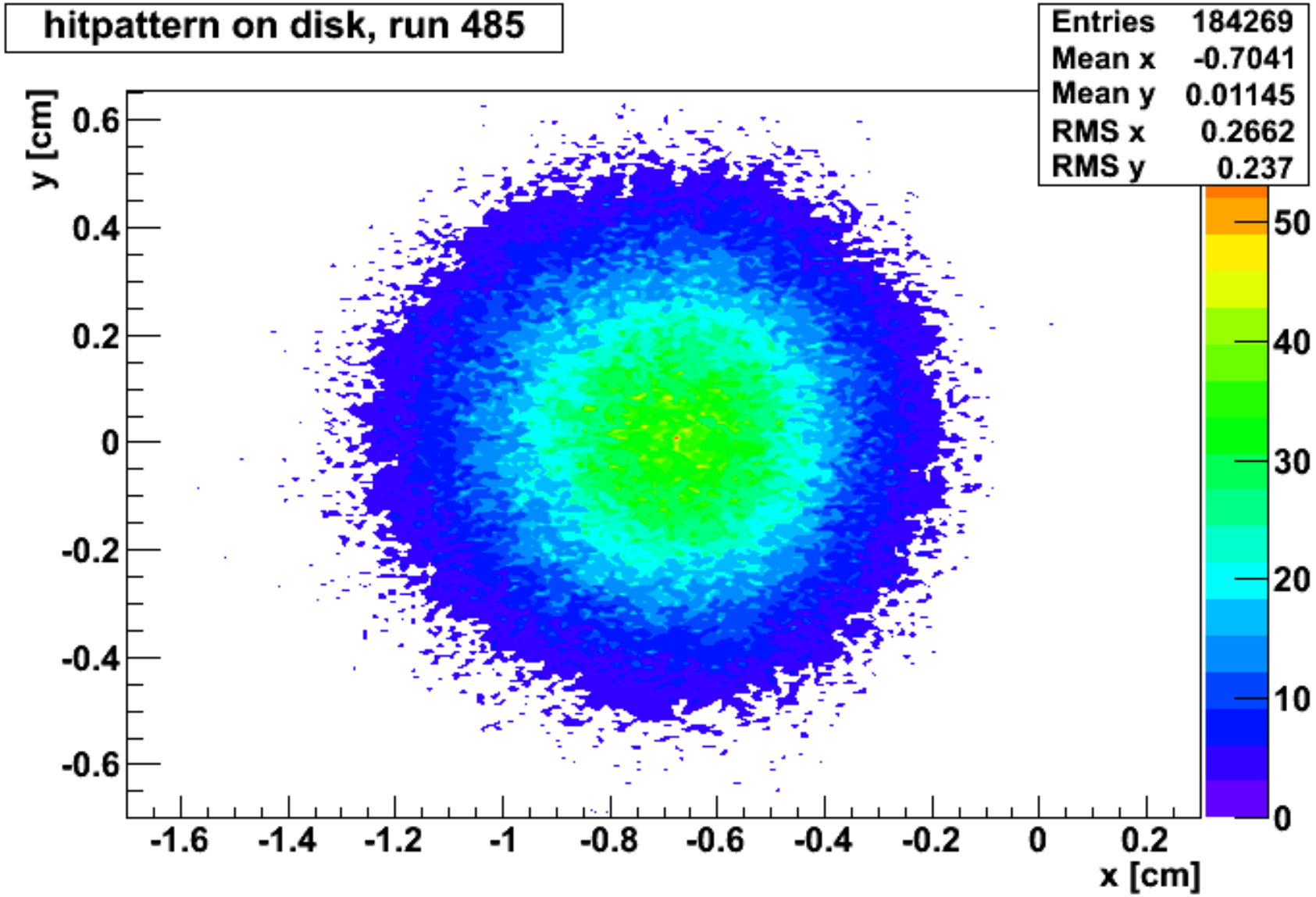
The angular distribution of beam on DISC(DESY II)



The angular distribution of beam on DISC(DESY II)

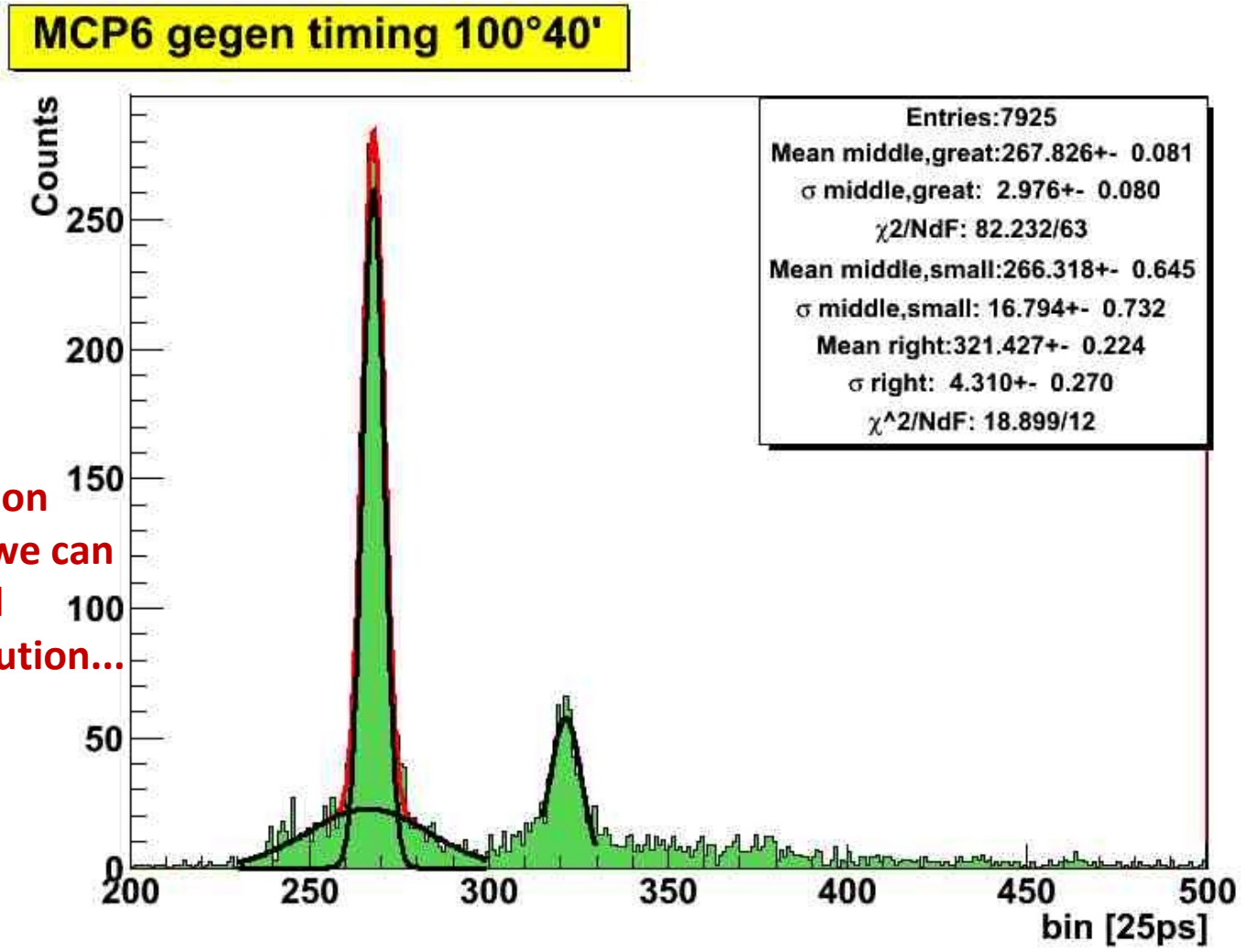


The Coordinate distribution of beam on DISC(DESY II)



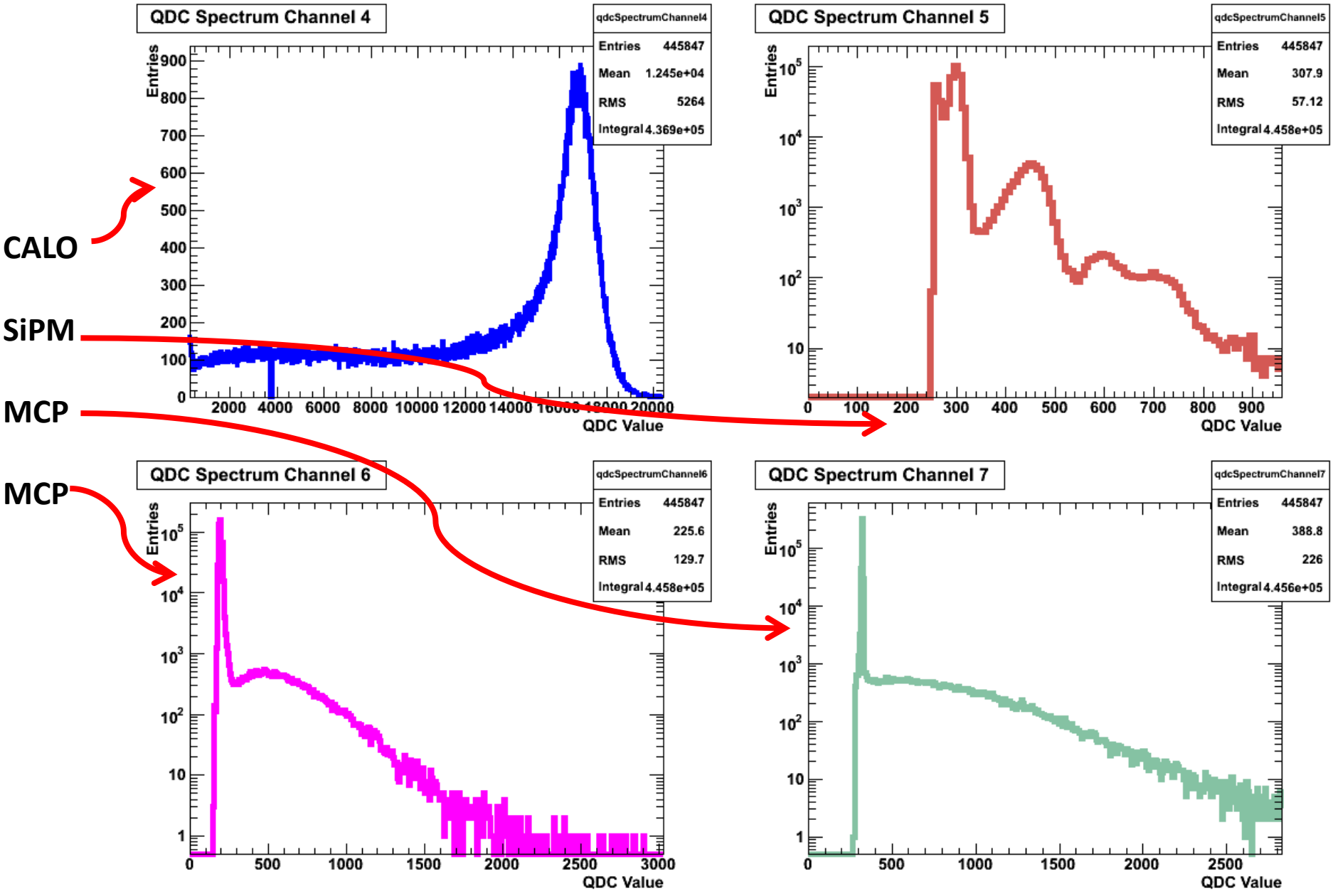
DATA analysis, Jülich measurements..sure she can smile

Ann-Kathrin got so far the best time resolution,<75ps,
Plot which might go into her thesis

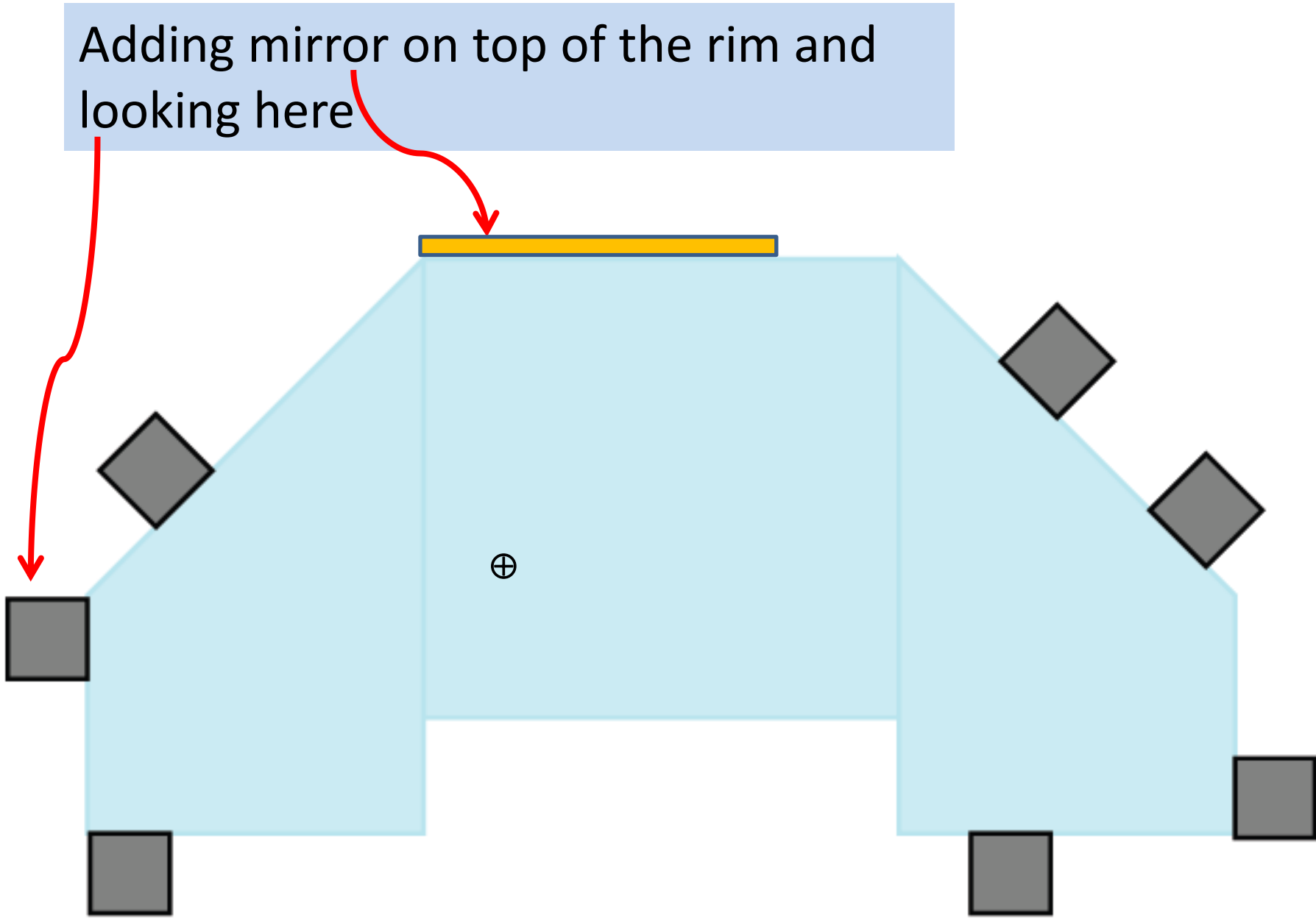


Hope that with inclusion of track information we can clean the background and improve in Resolution... work in Progress

DATA Analysis,DESYII...Understanding Amplitudes



DATA analysis DESYII...understanding Refelections



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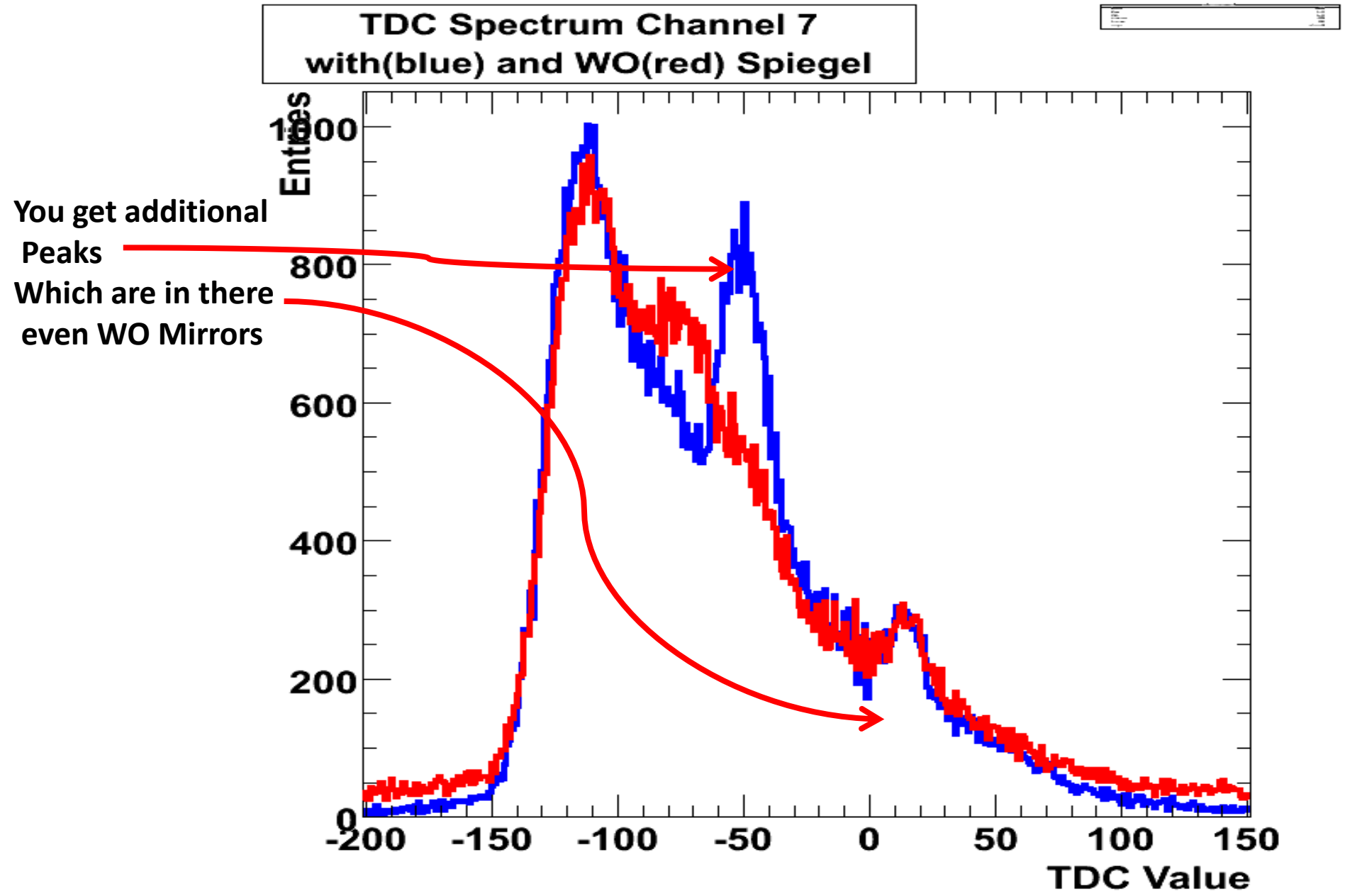
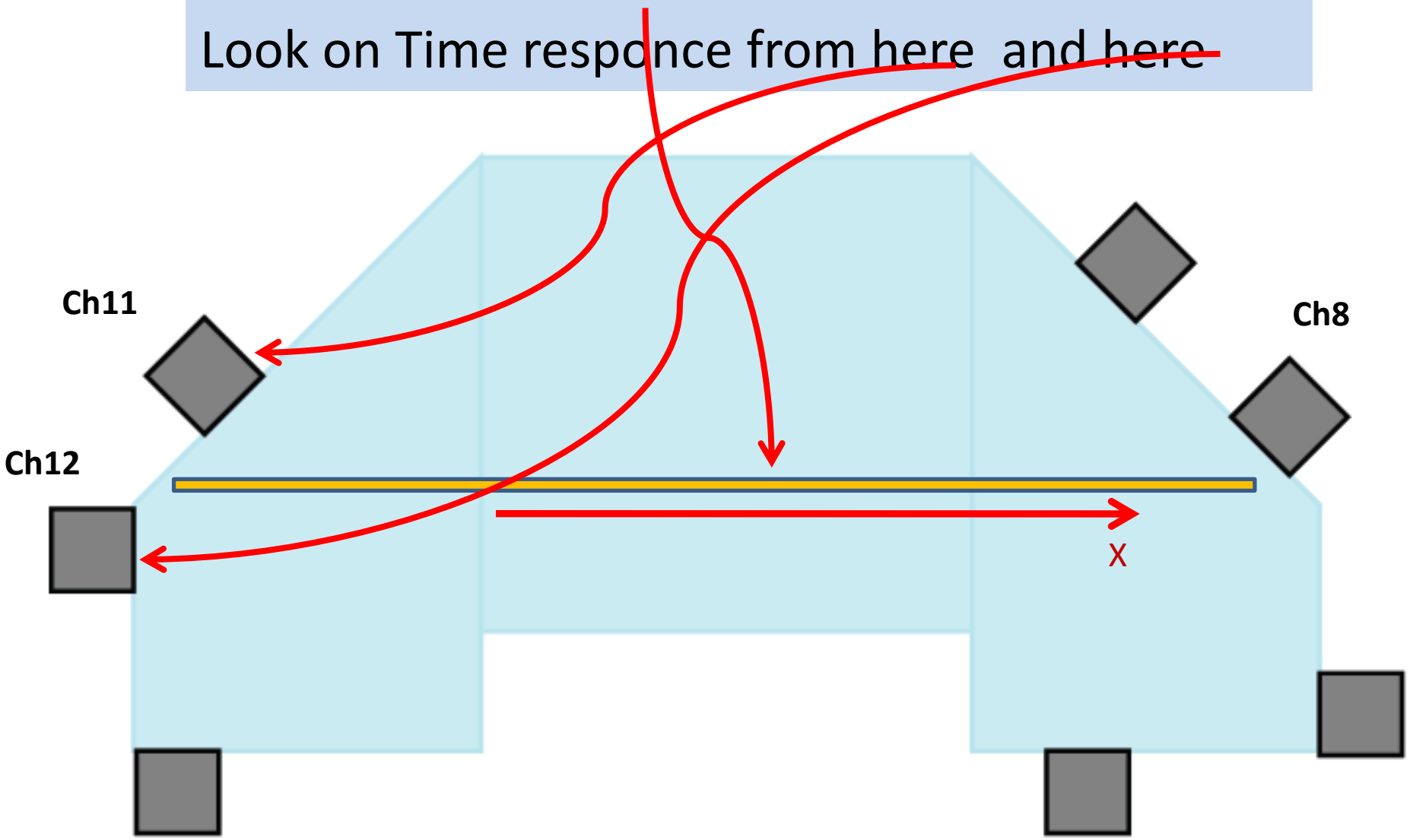
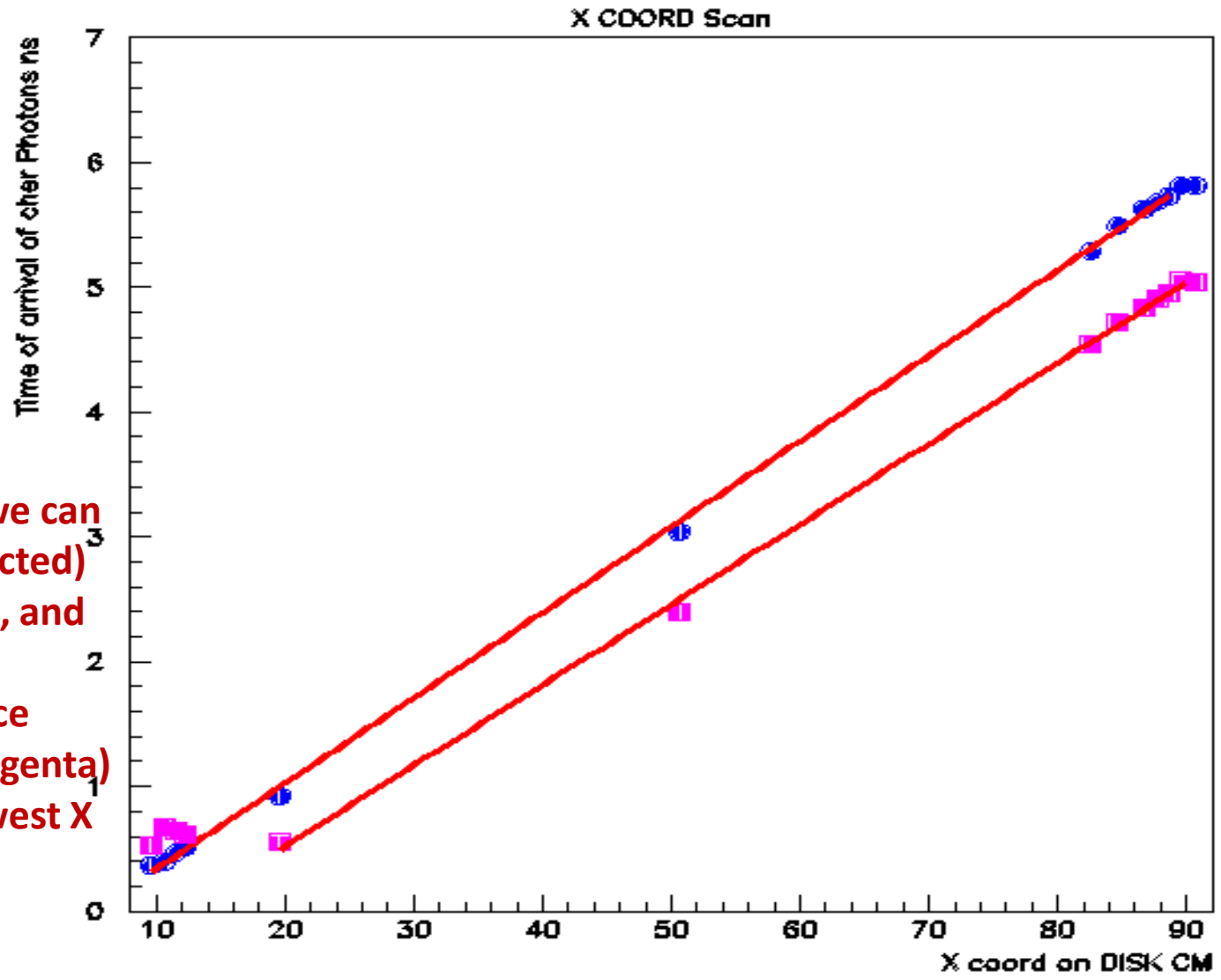


DATA analysis DESYII...trying to understand by simplifying

Do 1 D Coordinate X scan and
Look on Time responce from here and here

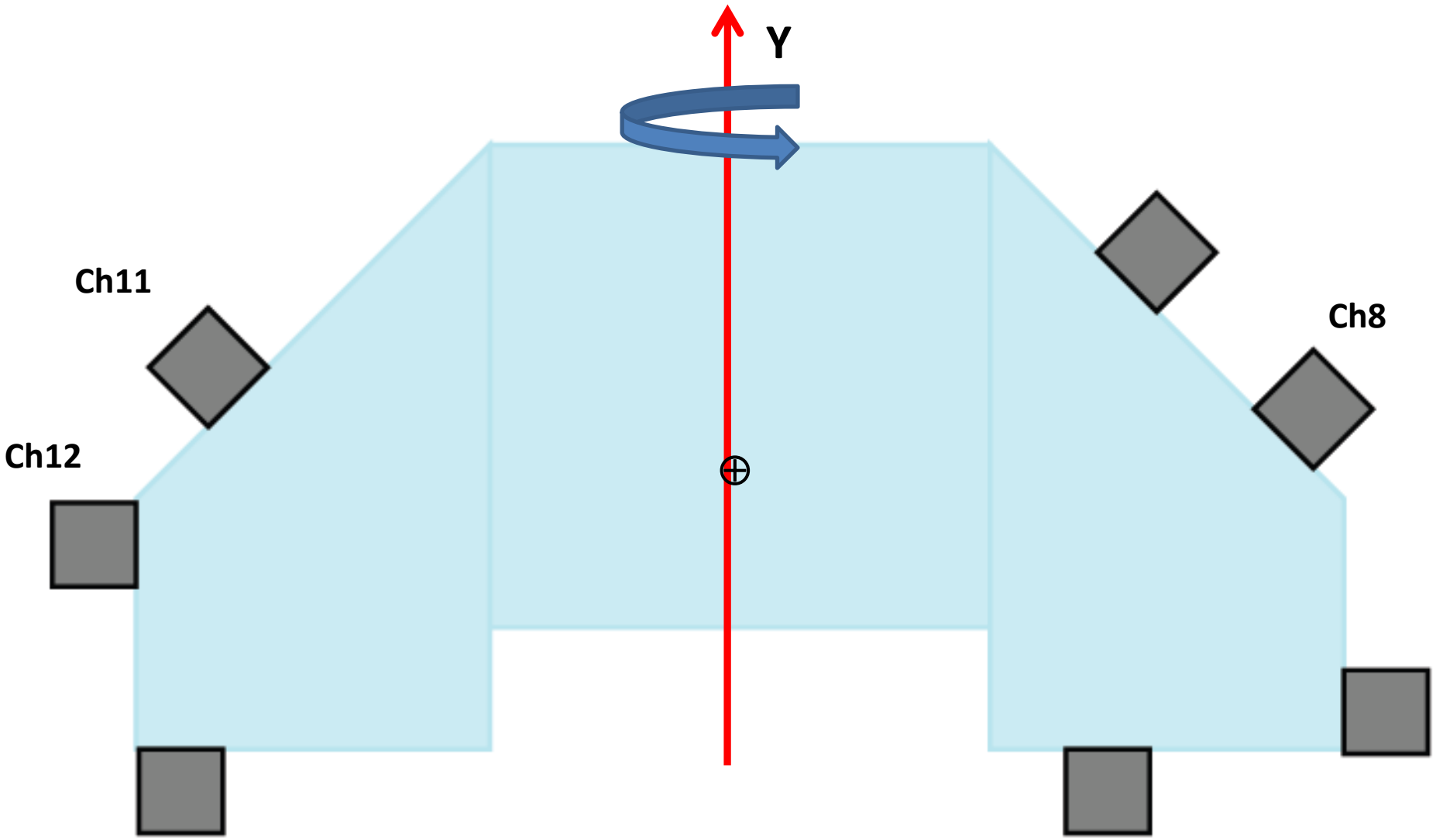


DATA analysis DESYII...trying to understand by simplifying



In both Channels we can extract clear(expected) linear dependence, and can observe small geometry difference Between(Ch11(magenta) became flat at lowest X

DATA analysis DESYII...trying to understand 1D angle scan around Y axes

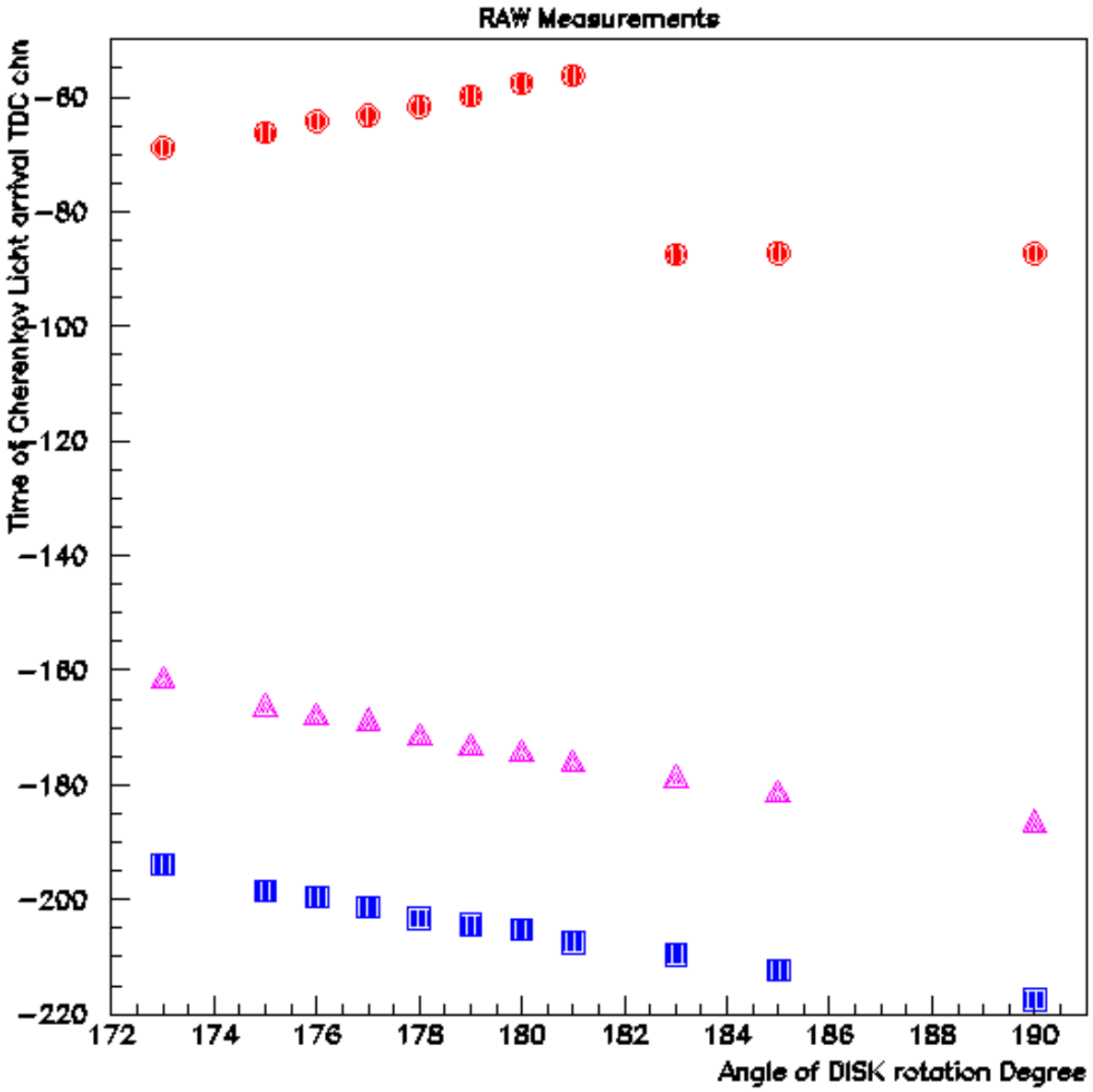


DATA analysis DESYII...trying to understand 1D angle scan

Ch8 is red

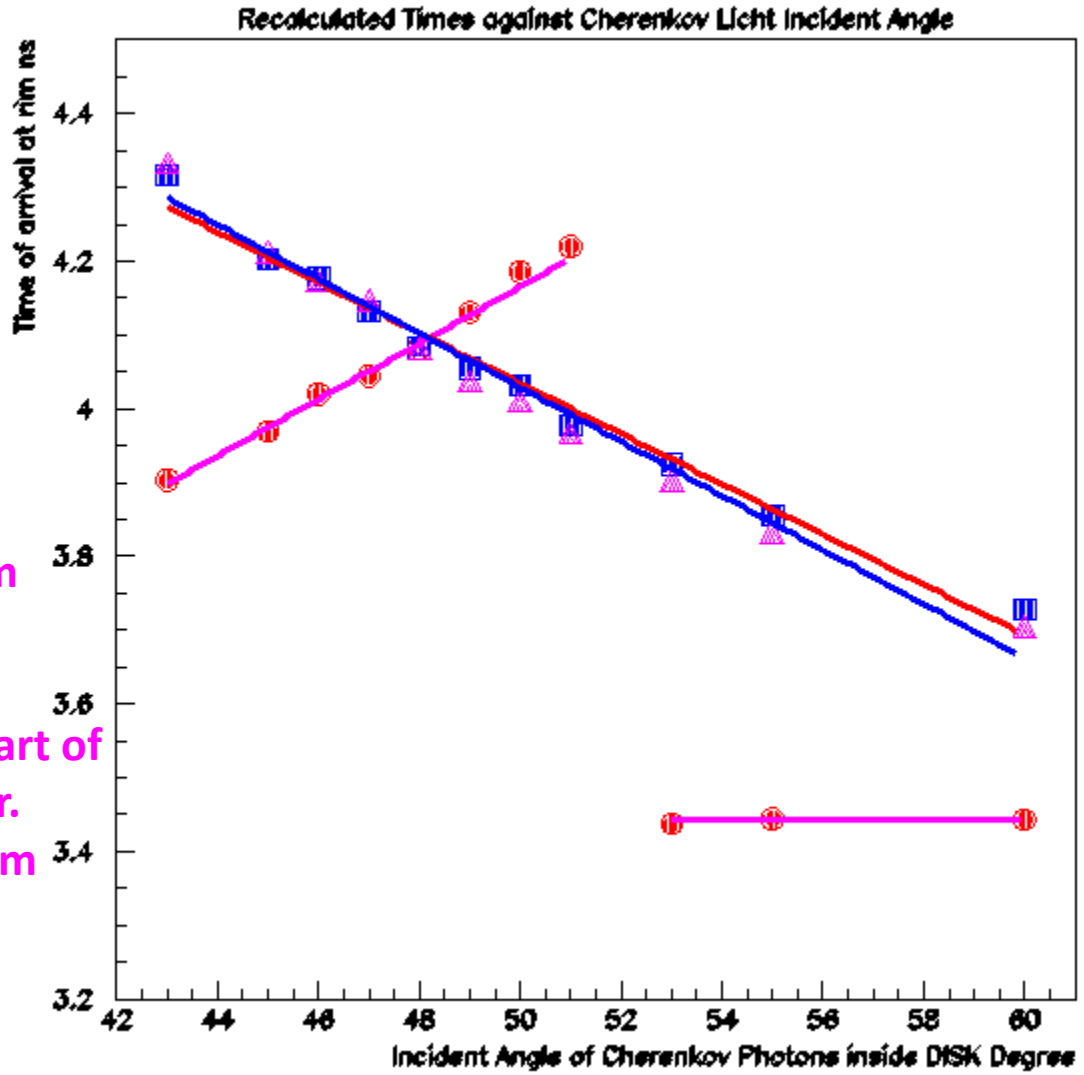
Ch11 is magenta

Ch12 is blue



DATA DESYII...trying to understand 1Dangle scan

Detection of Total Internal Reflection Angle



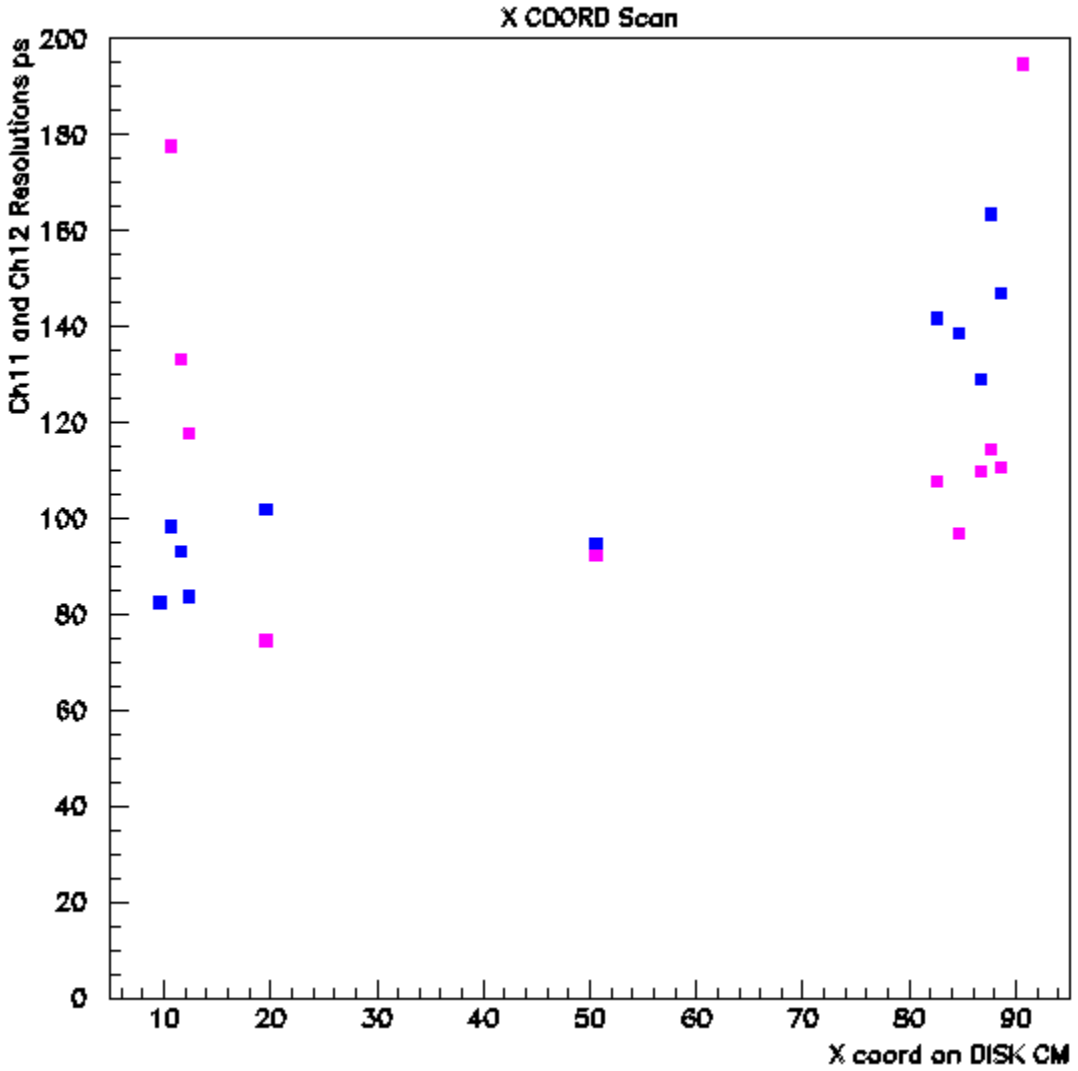
For Ch11(blue) and Ch12 (magenta points) X axes runs from left to right

For Ch8(red points) X axes runs from right to left, a few steps brings AOI smaller than Total Internal Reflection Angle and at ~43 that part of Cherenkov Cone leaves the radiator. What we see there a direct light from showered electrons

DATA DESYII...trying to understand Time Resolutions from X scan

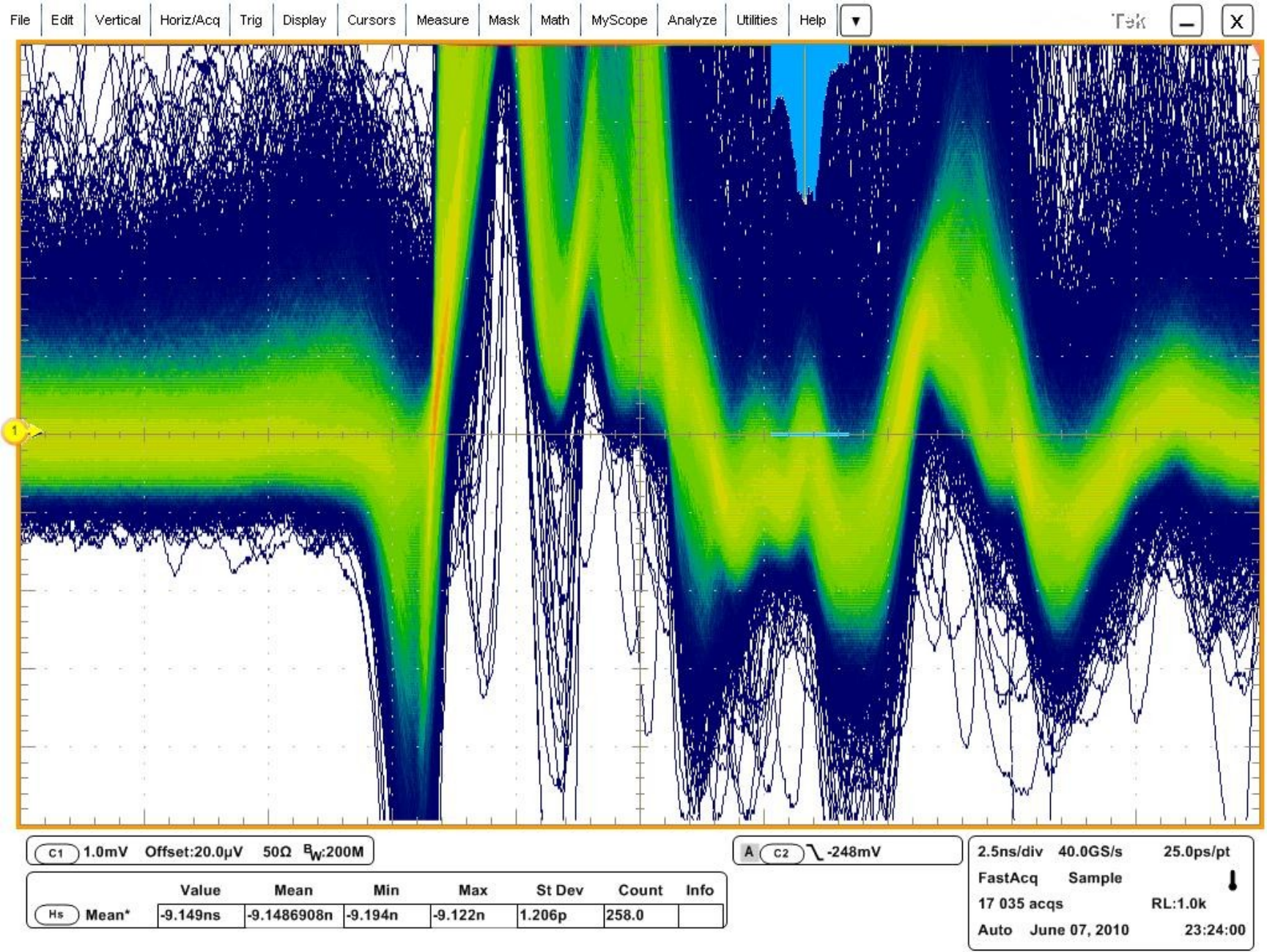
$\sigma(t)$ ps

Preliminary Time Resolutions from Ch11 and Ch12 During Coord X scan
As soon as our signals get clean (close to detectors) we reach time resolutions of ~75ps, where Lowenanteil comes from CFDs, this is our bottleneck now and we like to try other than ORTECs LCFD is coming,currently under Tests at CERN, designed in UAlberta For ATLAS AFP , where time measurement is equally important as for us, TOP DIRC



X(cm)

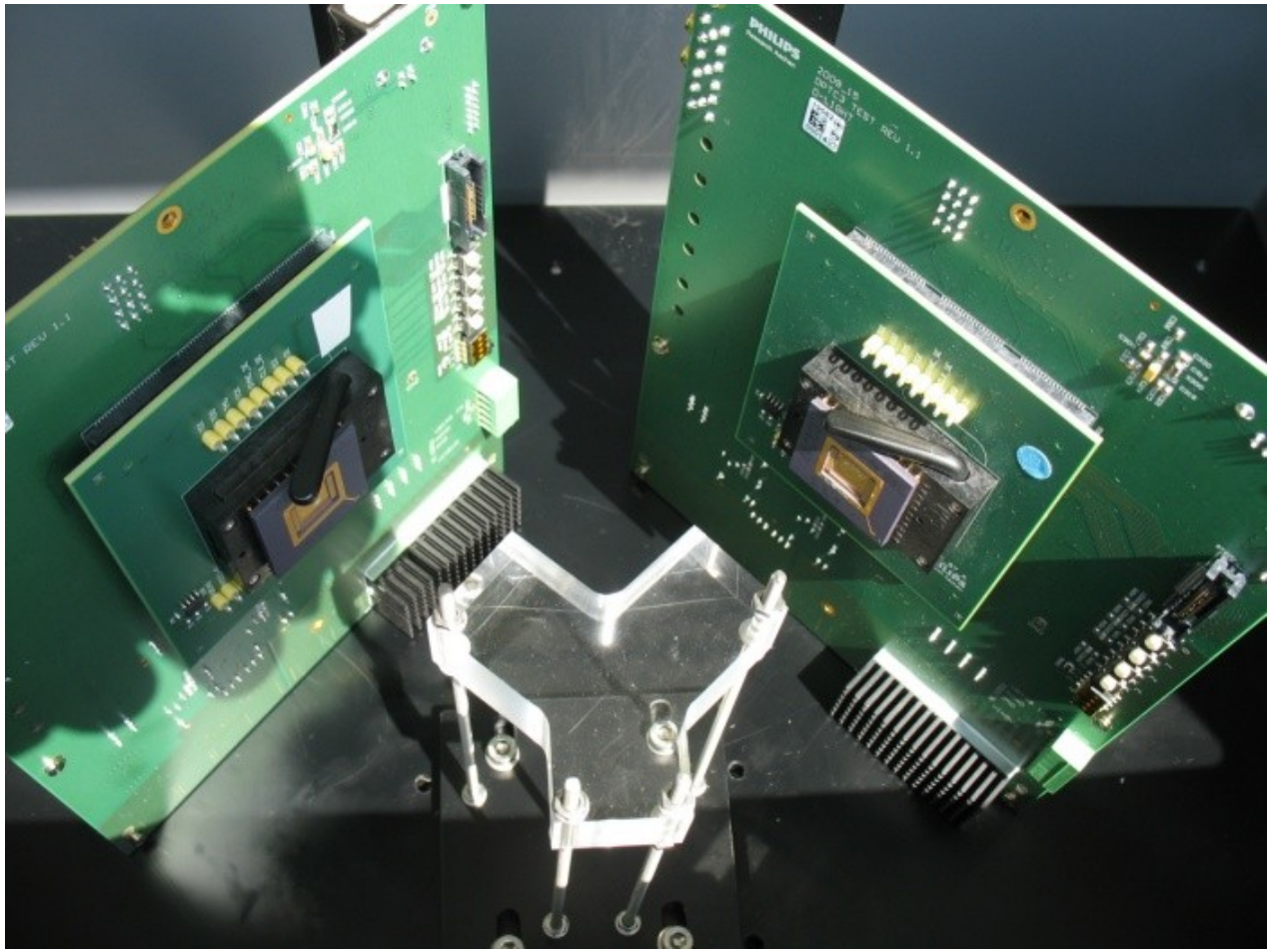
Der Engpass


File
Edit
Vertical
Horiz/Acq
Trig
Display
Cursors
Measure
Mask
Math
MyScope
Analyze
Utilities
Help
Tek
C1 1.0mV Offset:20.0µV 50Ω BW:200M
A C2 -248mV
2.5ns/div 40.0GS/s 25.0ps/pt
FastAcq Sample
17 035 acqs RL:1.0k
Auto June 07, 2010 23:24:00
Value Mean Min Max St Dev Count Info
Hs Mean* -9.149ns -9.1486908n -9.194n -9.122n 1.206p 258.0

Our Plans for near future

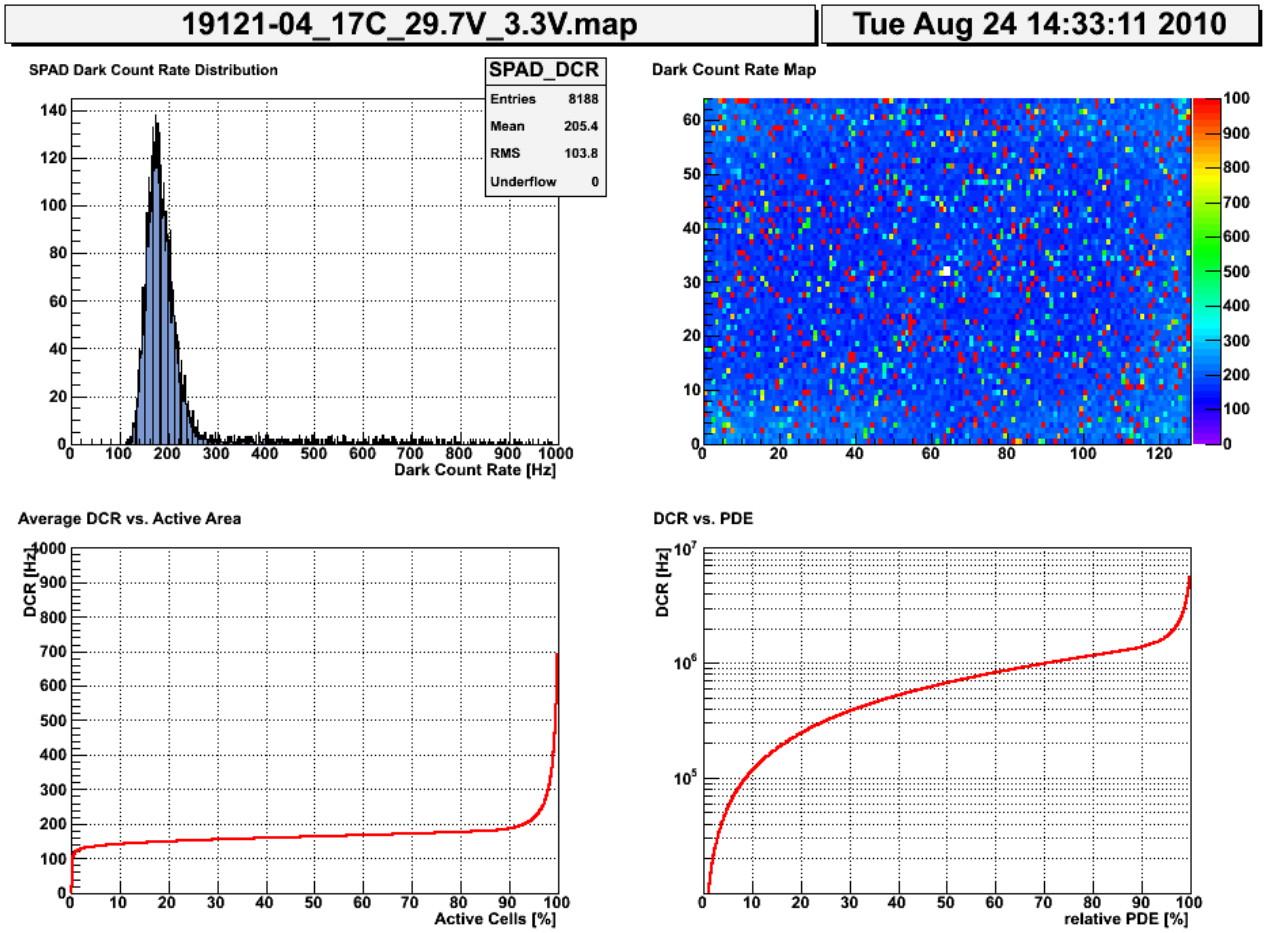
- Analyse completely the Jülich II and DESY II data, by ammount they are sufficient to understood how 3D TOP DIRC should be build, or at least 1 Quarter of WASA DIRC will be build to decide about PANDA DIRC Design and Components
- In Parallel continue our efforts in R&D area of small Prototypes to make every possible improvements in there(one of them is dSiPM)

Philips dSiPM and our Prototype 3

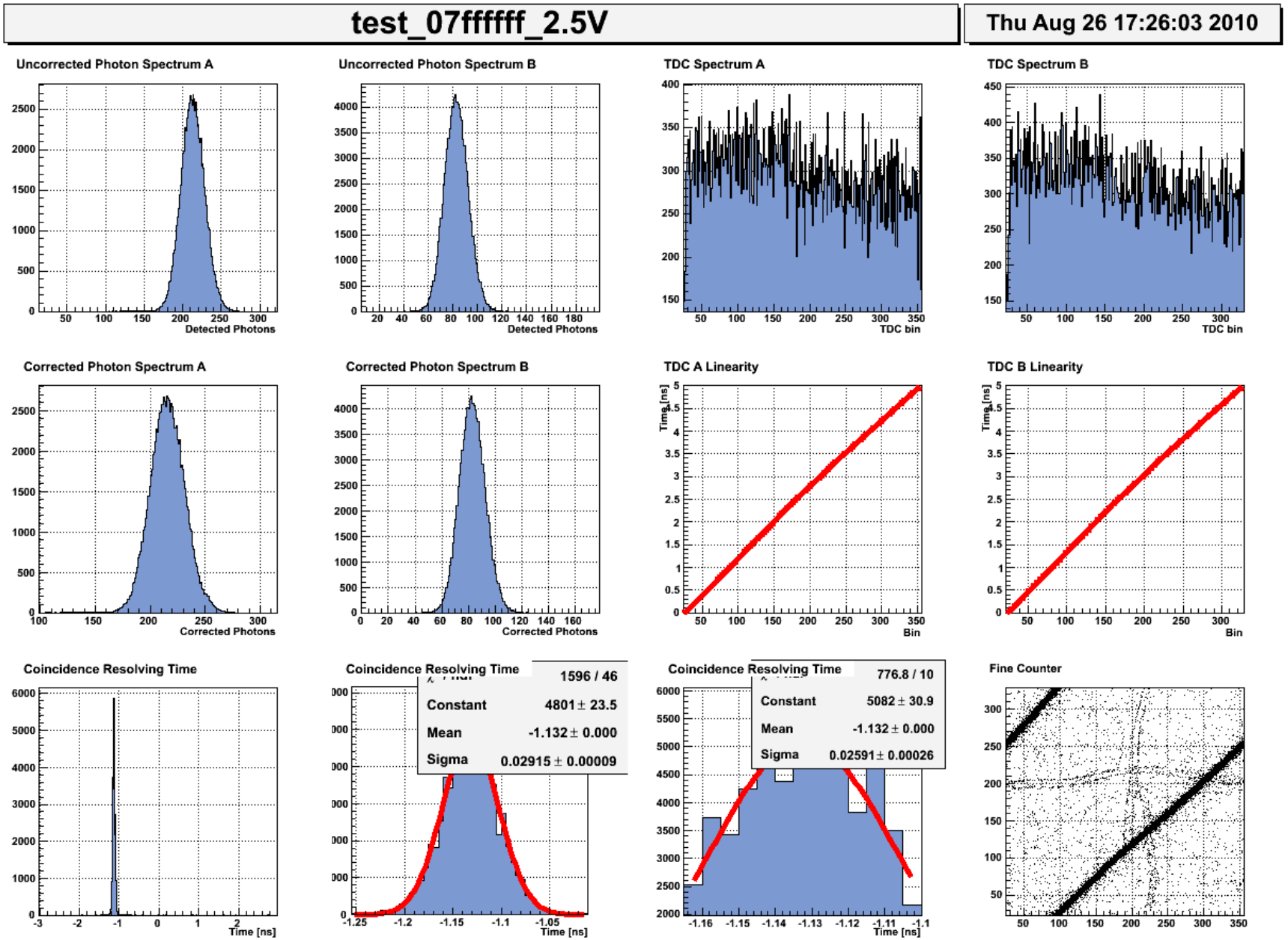


Currently going to CERN for Beam Tests, but before we had Laser tests with

Every SiPM Pixel has dark counts of ~200Hz



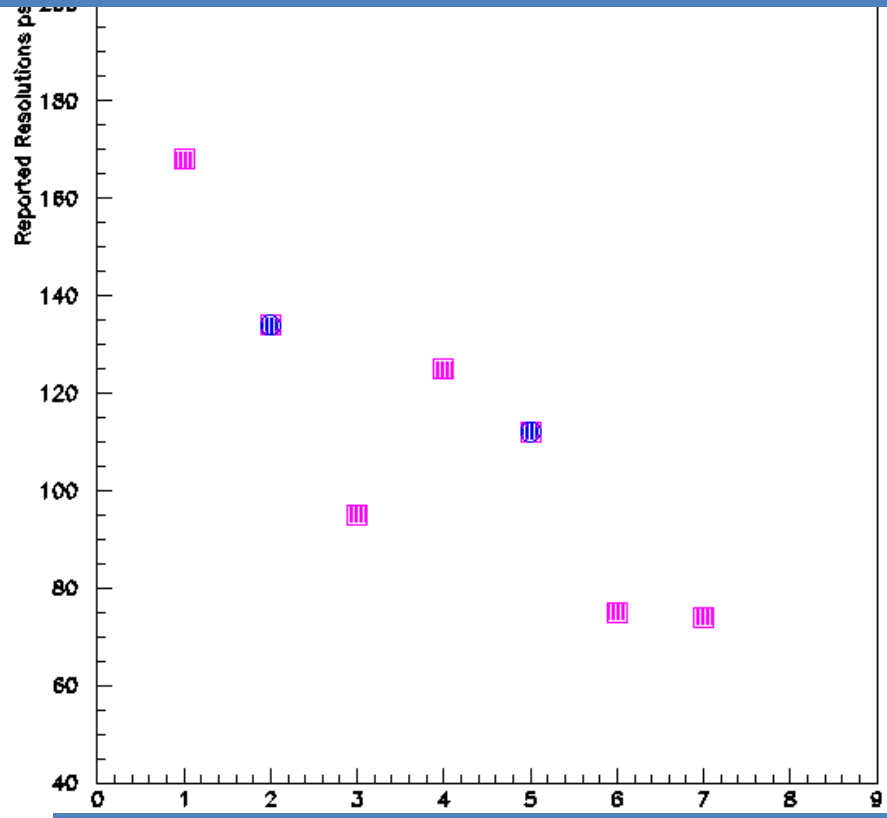
But it also offers very good Time Resolutions



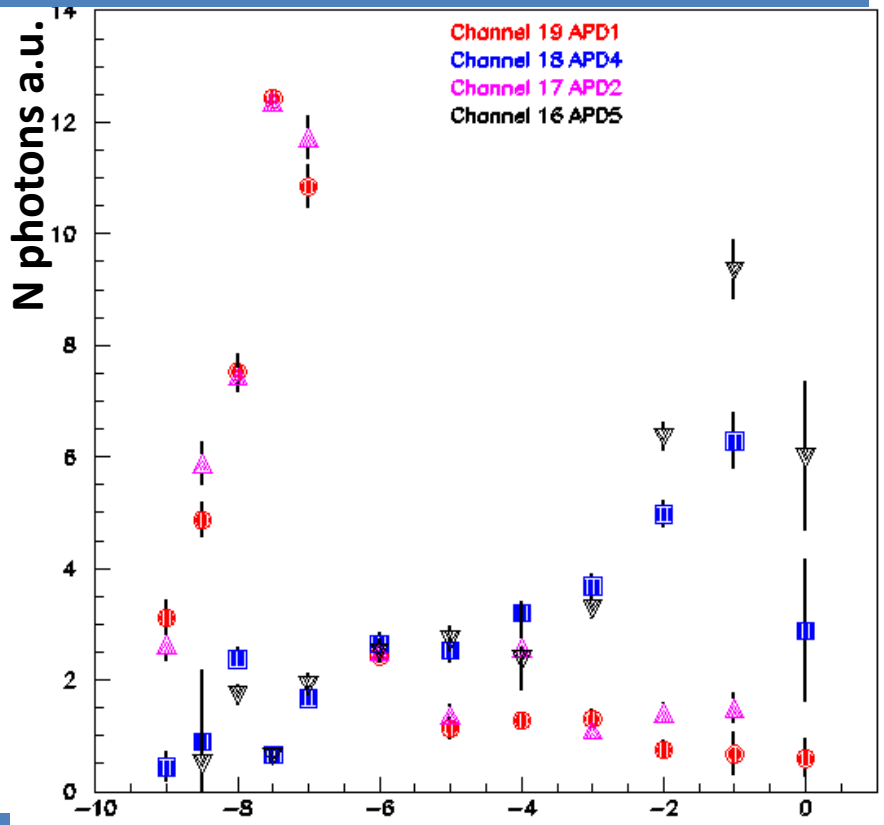

On our way to the 3D TOP

On our way to the 3D TOP

Our Reported Time Resolutions in ps **and** **angular Resolution from Prototypes**



Measurement(blue APDs, magenta MCPs)



Conclusions

- We are making progress in DISC Prototype time resolutions measurements and its understanding
- Next half year our attention will be on Analysis, the Data are worth for Publication
- Digital SiPM from Philips or only Philips ASIC might be Solution in our Electronics bottleneck
- ongoing Tests will show