



PANDA DIRC - T9 TEST BEAM

MAY 4-26, JUNE 24-JULY 8 2015

FIRST IMPRESSIONS FROM THE BARREL DIRC POINT OF VIEW



PANDA@T9 in May 2015



JOHANNES GUTENBERG
UNIVERSITÄT MAINZ



Two test beam runs this year – completed first run two weeks ago, starting next run in two weeks.

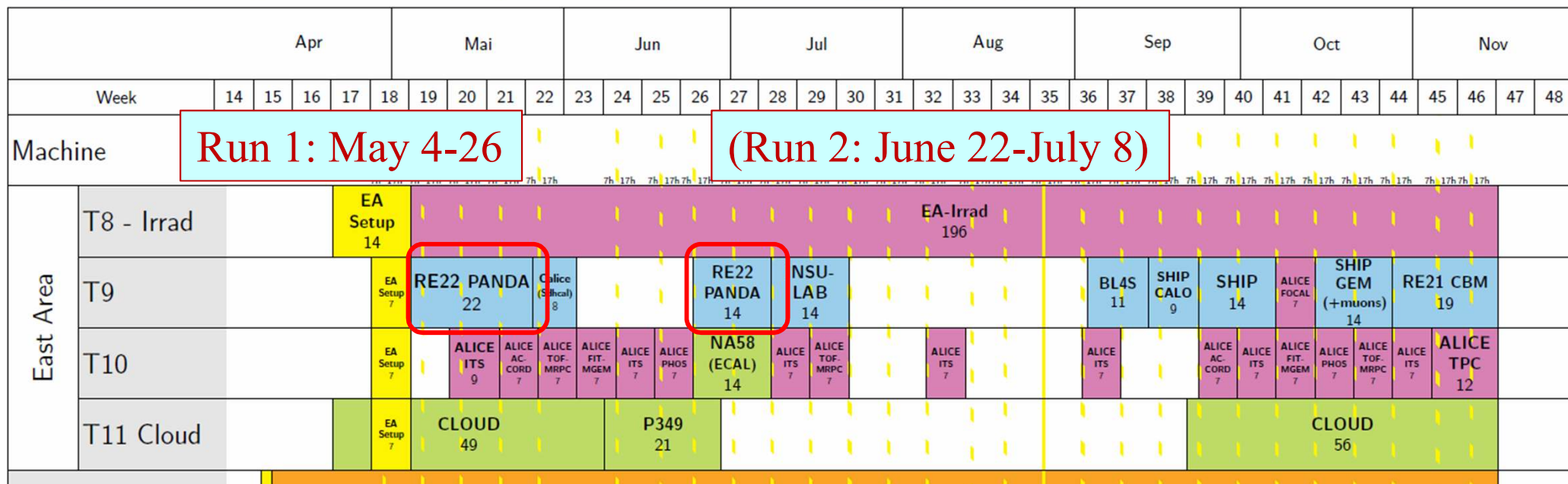
Complex setup with two DIRC prototypes plus timing detectors and beam instrumentation.

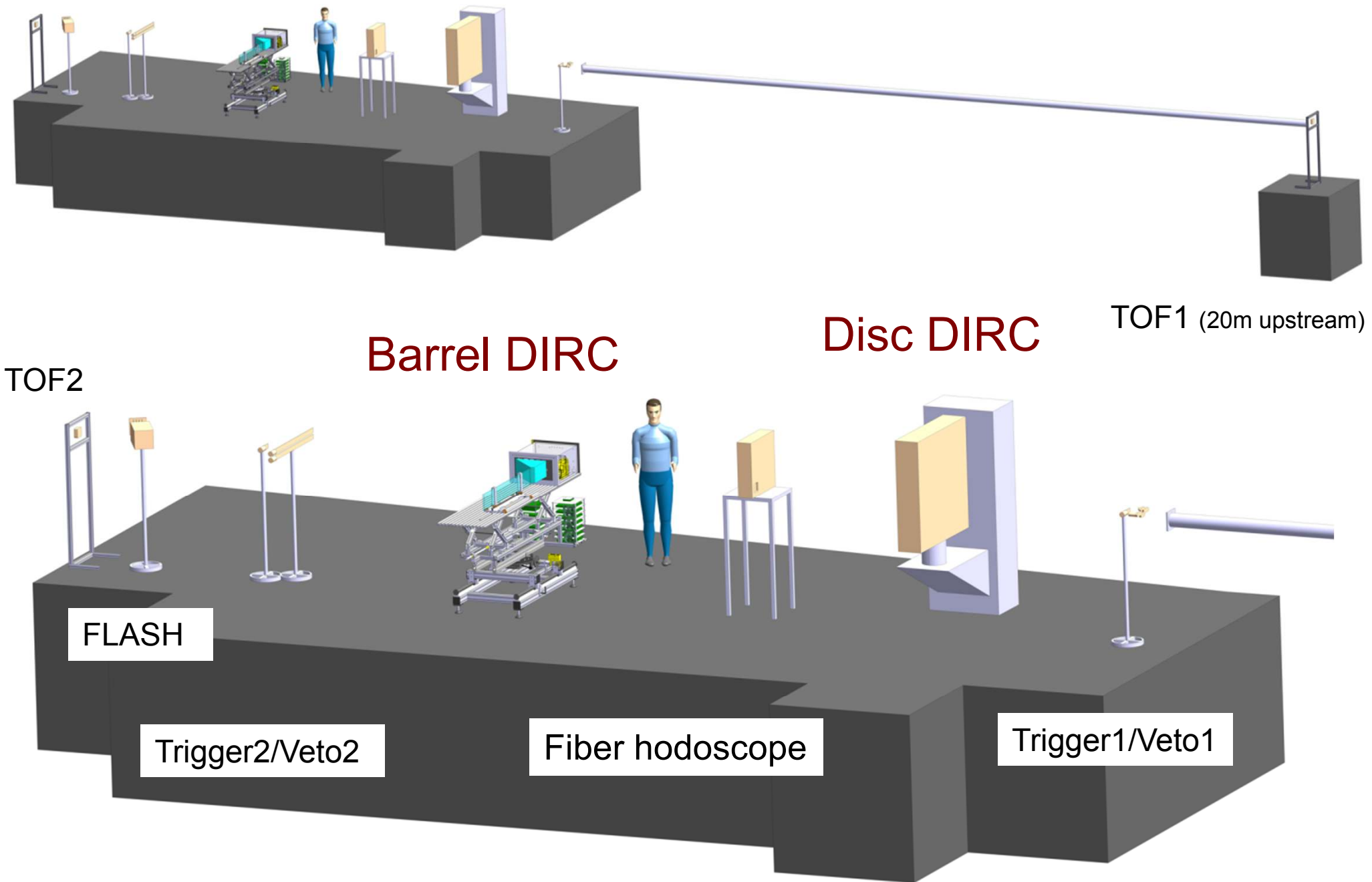
Common TRB3-based DAQ for all detectors.

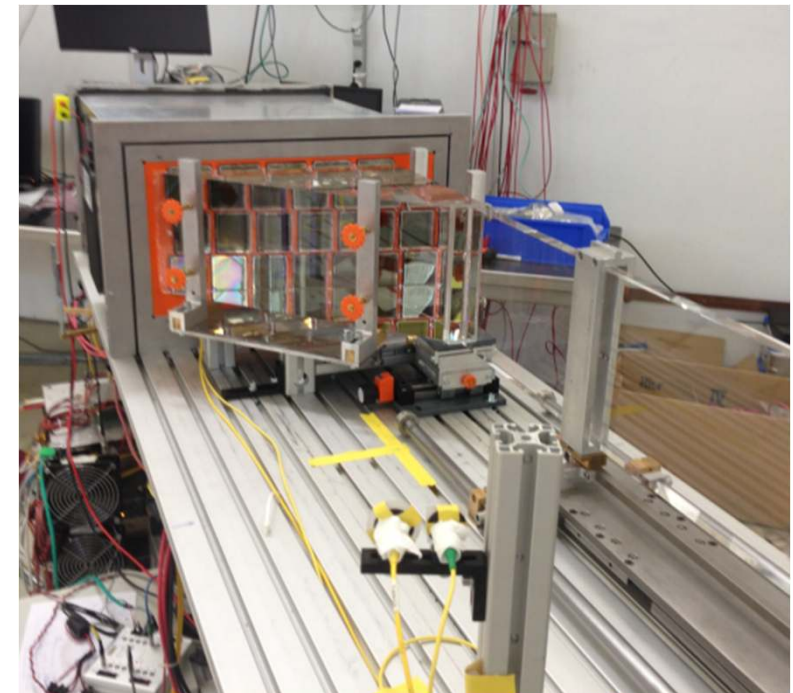
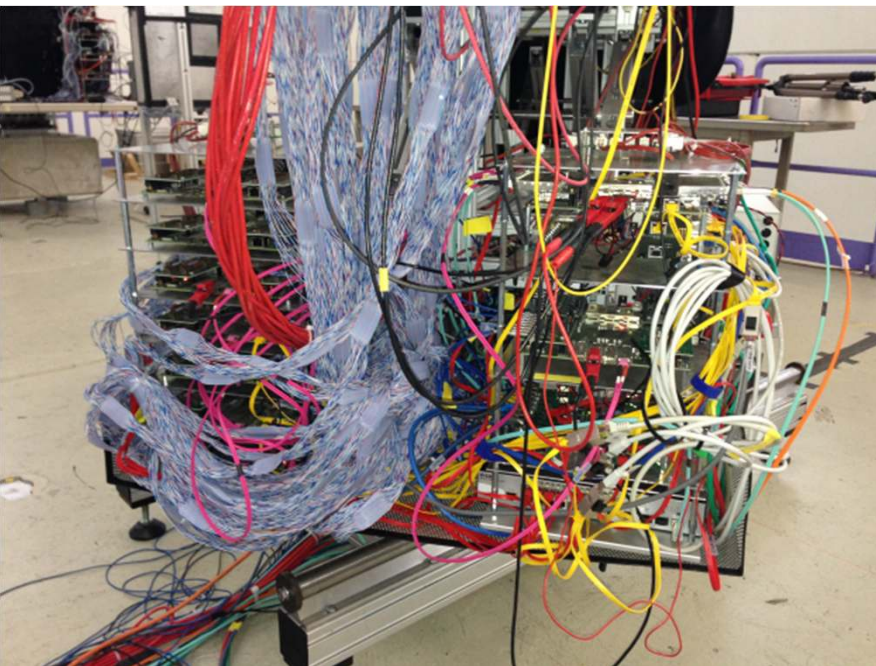
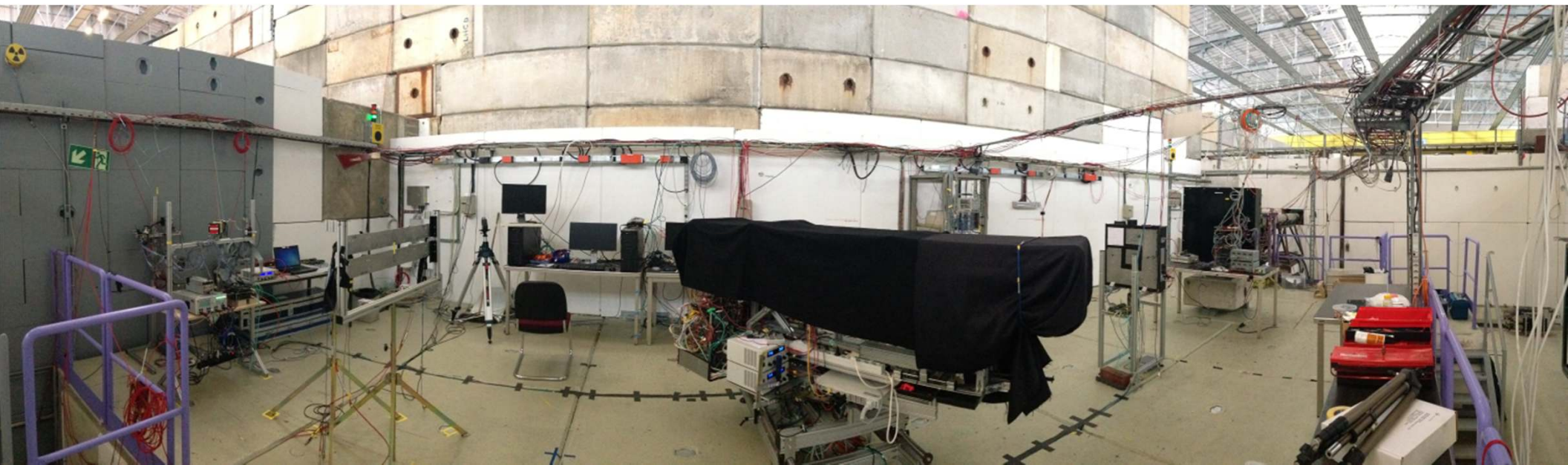
schedule issue date: 23-Feb-2015

Version: 1.0

■ LHC Exp.
 ■ PS/SPS Exp.
 ■ INT Exp.
 ■ Other Exp.





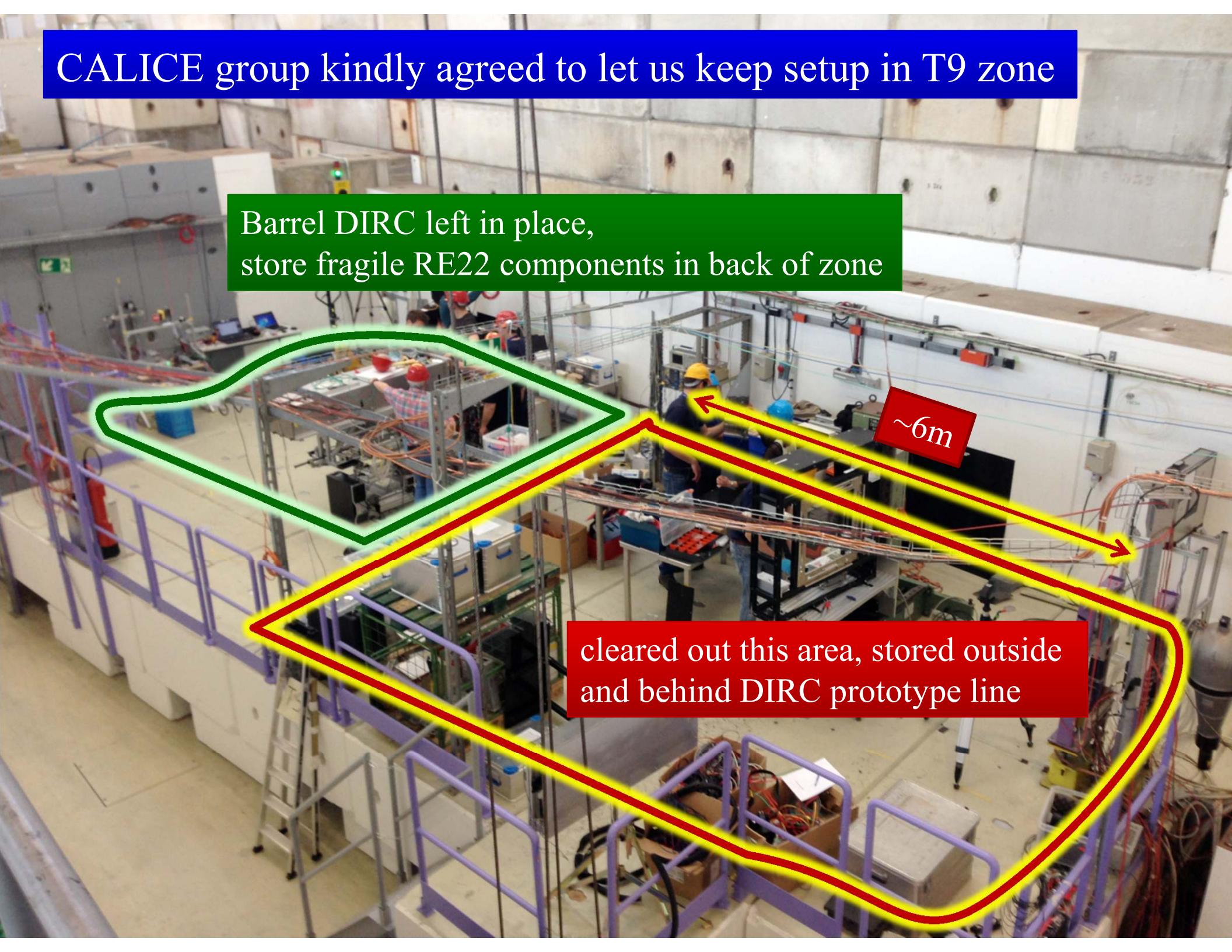


CALICE group kindly agreed to let us keep setup in T9 zone

Barrel DIRC left in place,
store fragile RE22 components in back of zone

~6m

cleared out this area, stored outside
and behind DIRC prototype line



Prototypes in safe mode after end of May beam time.



DAQ systems in LHCb computing barrack.

Some things went very well.

Stable mechanics, smooth rotation with remote control, no angular deviations.

Optical coupling MCP-PMTs/prism and prism/lens/bar without bubbles.



PADIWA modification effective against noise.

PADIWAs and cables held rock-solid in cages.

Combined DAQ ran smoothly (*firmware issues*)

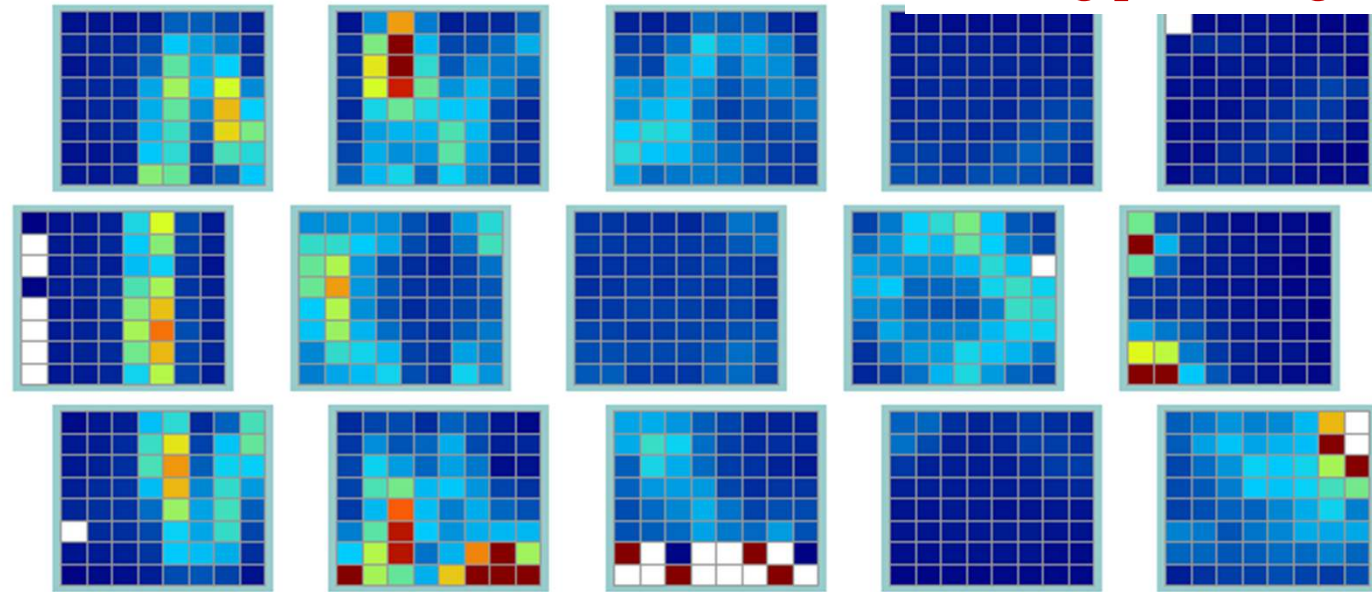
New slow control extremely helpful.

... and quite a few more...

tdisplay /d/may2015/ce15145205719.hld.root

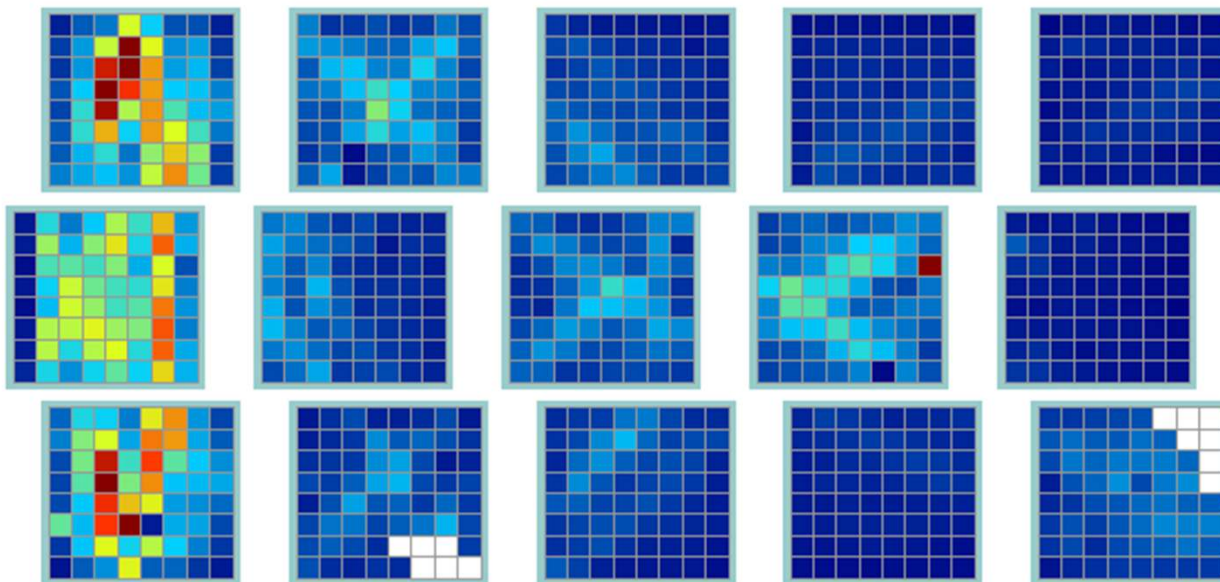
124deg polar angle

Hit pattern for narrow bar
with spherical $\text{SiO}_2/\text{N-LAK}$
compound lens with two
curved surfaces.



135deg polar angle

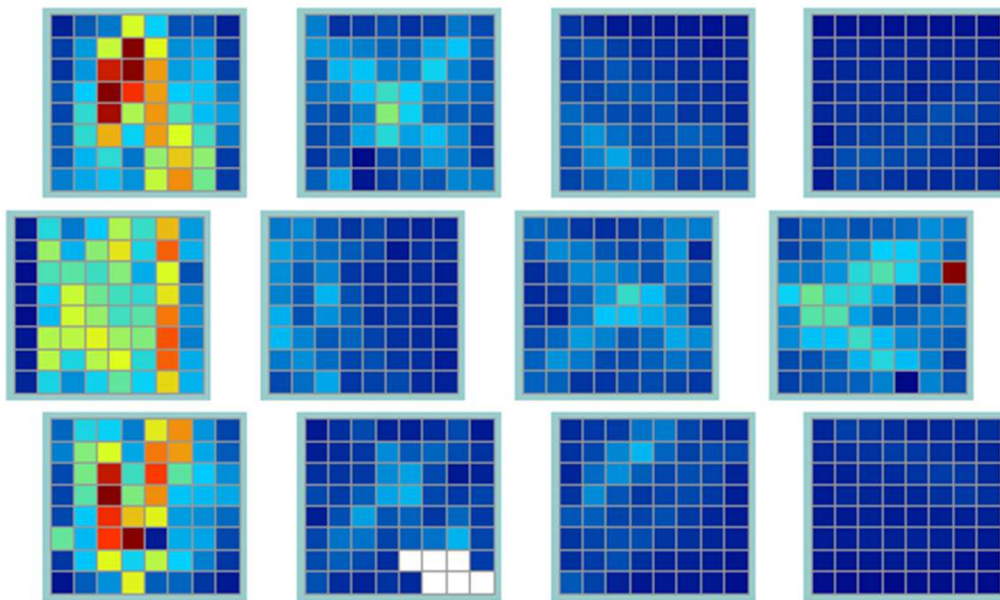
2015/ce15144113450C0.root



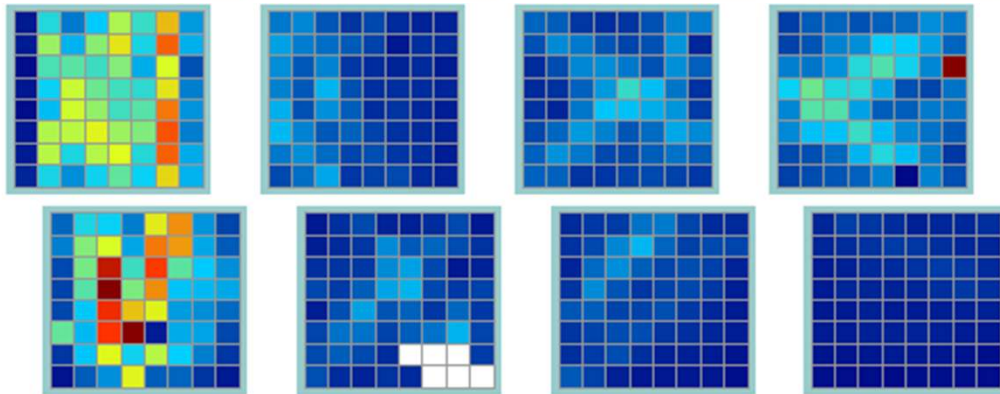
Sharp image even for steep
photon angles, very promising.

Analysis just starting, exercising
and improving offline software
for June/July run.

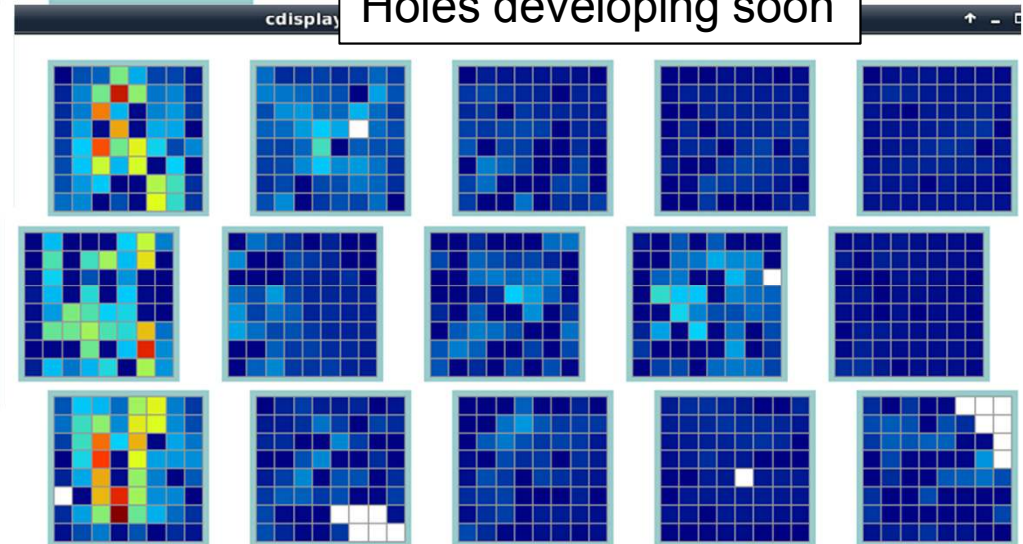
cdisplay /d/may2015/ce15144113450C0.root



Good hit pattern at start of run



Holes developing soon

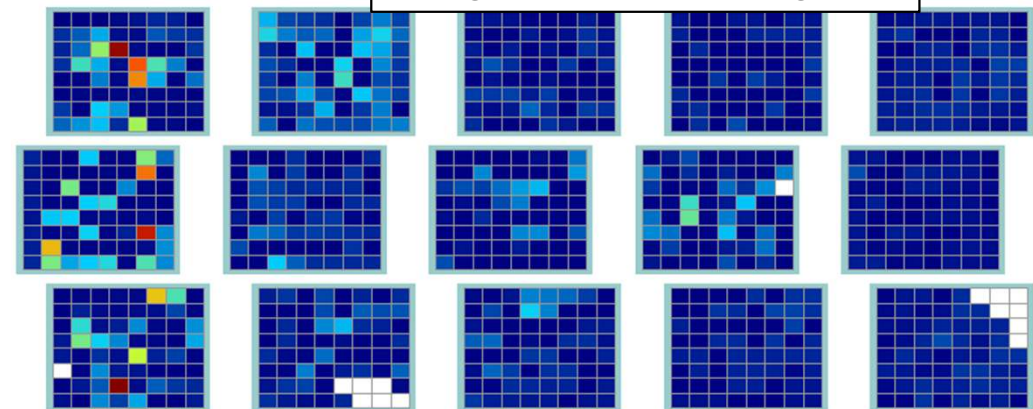


Ring/fishes almost gone

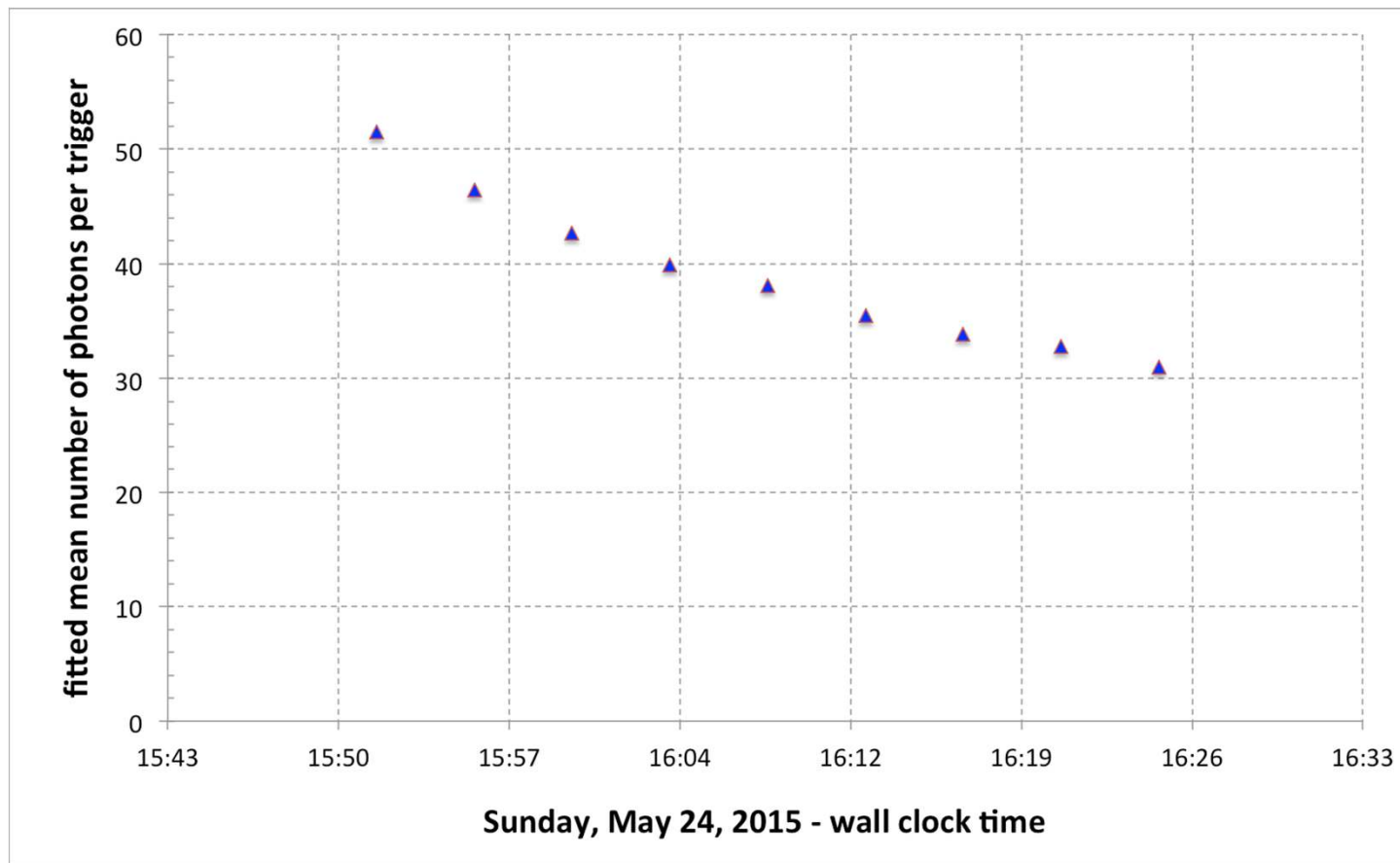
Some things did not go so well...

Main concern for data quality:

loss of hits during run, almost certainly
due to TDC FPGA firmware problem.

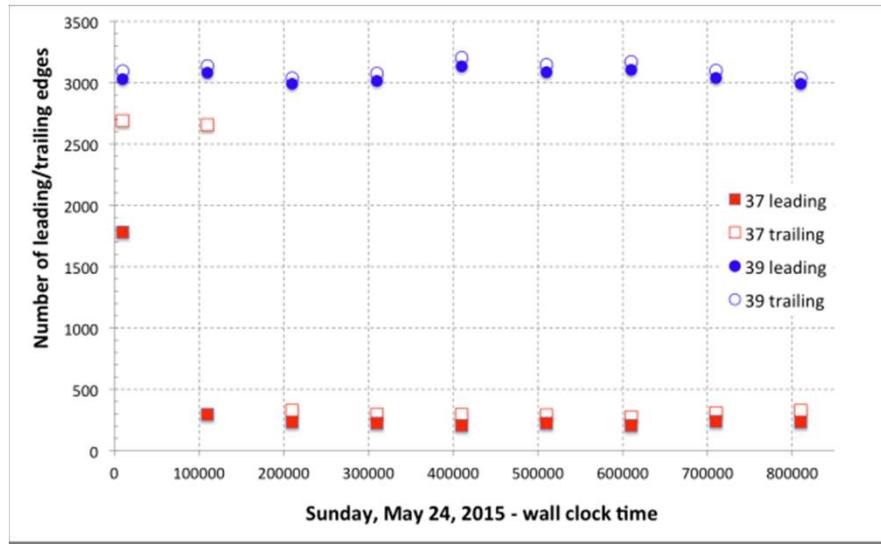


Apparent photon yield per trigger dropped quickly after DAQ reset and start of run.
Example from May 24: 20% loss after 15 minutes.



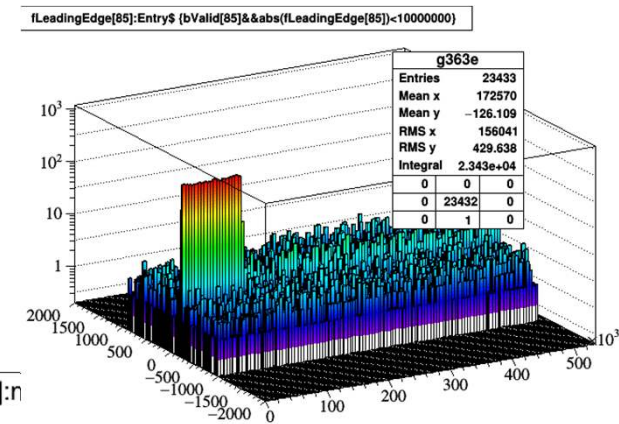
Cannot perform meaningful photon yield measurement or time-based likelihood analysis with these data. May be OK to study SPR in bar/lens data.

Example of photon yield of **good channel** and **bad channel** in same TDC



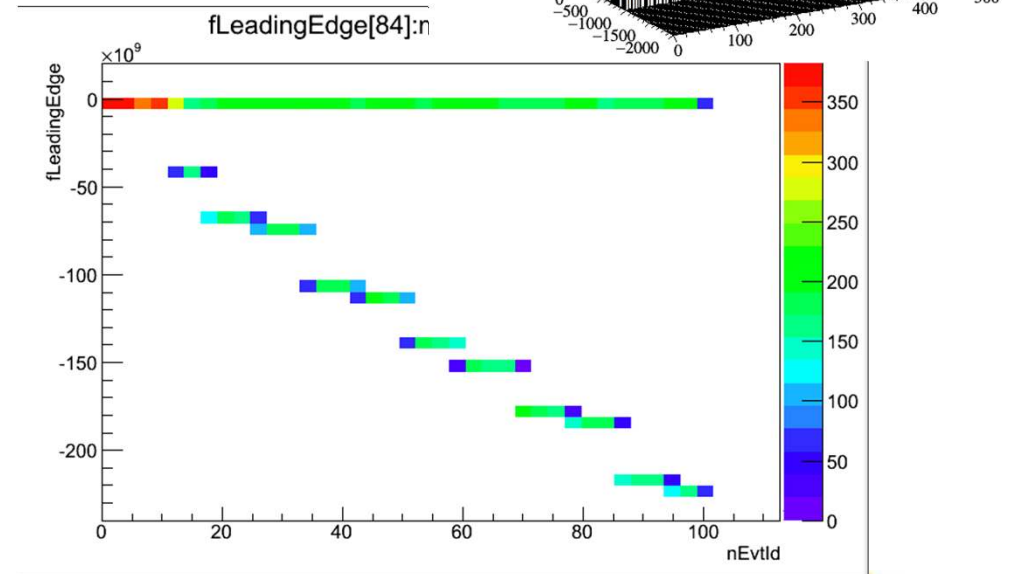
Bad channel “loses” first trailing edges, then leading edges

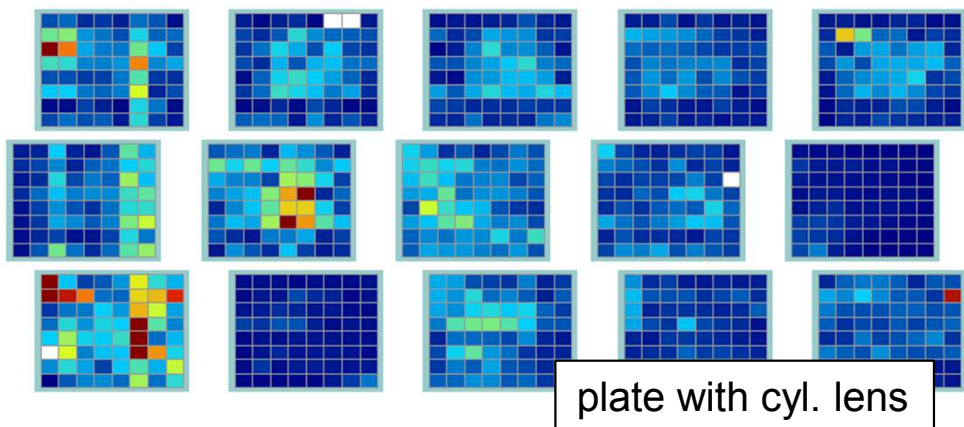
Hit times become shifted by seconds.



Lots of support from TRB/FPGA experts via shifts, phone calls, vnc, skype, mumble, ...

Thank you: Cahit, Jan, Matthias, Michael.





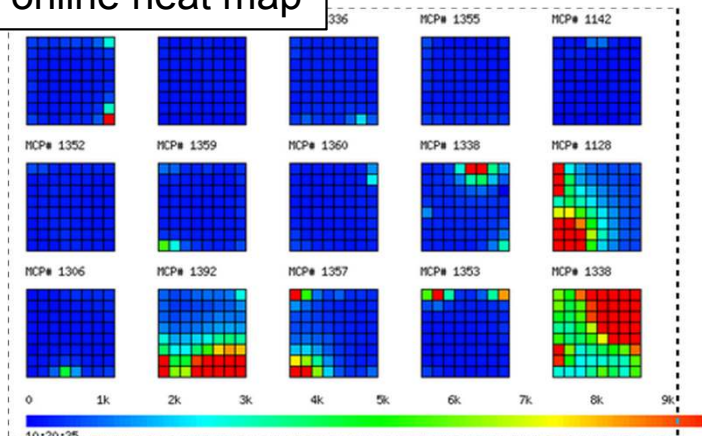
Some other issues:

started with nominal 10^6 gain HV settings,
occupancies were not nice (partly due to
hit inefficiency/firmware troubles).

→ raised HV, improved hit patterns.

(but signals still quite small due to low-pass filter)

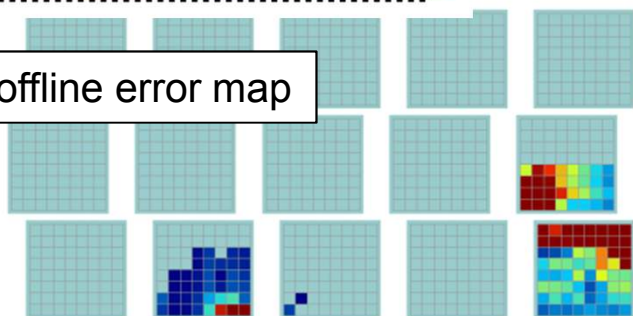
online heat map



Observed “blobs” in slow control heat map (10kHz-20MHz),
correlated with TDC errors (ring buffer full)

Most likely cross-talk – need to check cables/PADIWAs.

offline error map

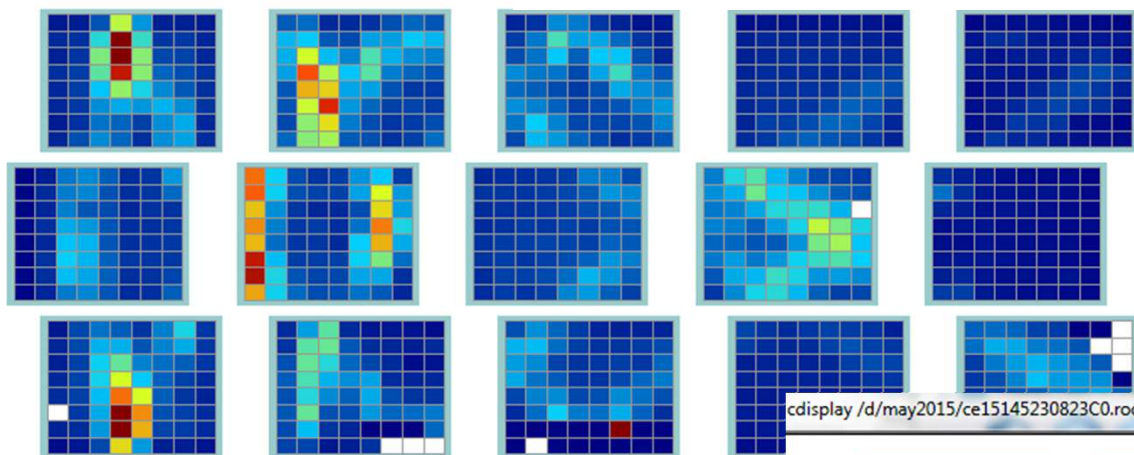


Timing resolution quite poor
($\sigma \sim 500-700$ ps), both in
beam and laser data.

Signals are very small, may really need
time walk correction – to be studied.

cdisplay /d/may2015/ce15145214839C0.root

5GeV/c, 126deg polar angle



Fallback solution:

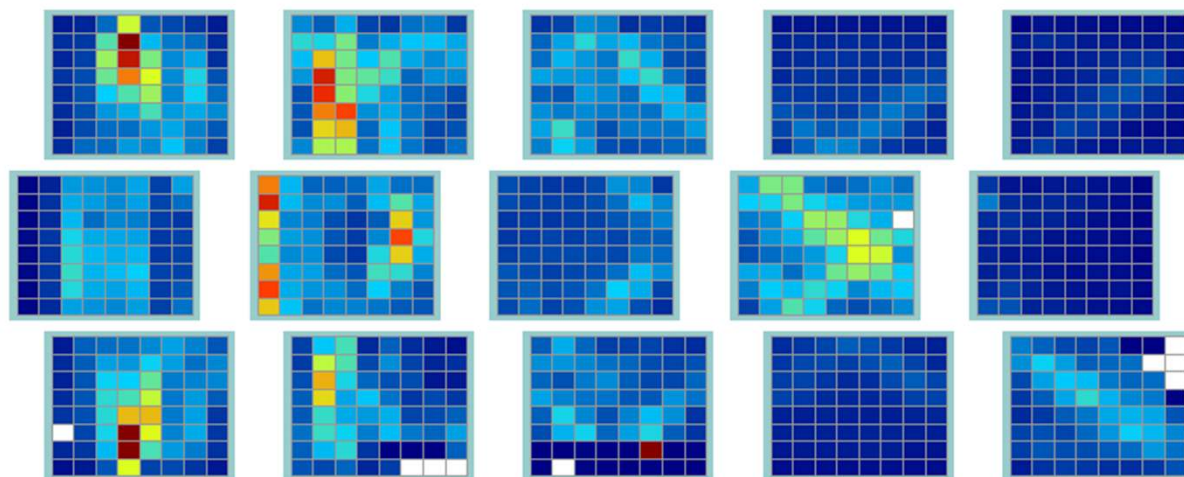
run with older single-edge design

Tested on last day, see no hit loss over several hours of running

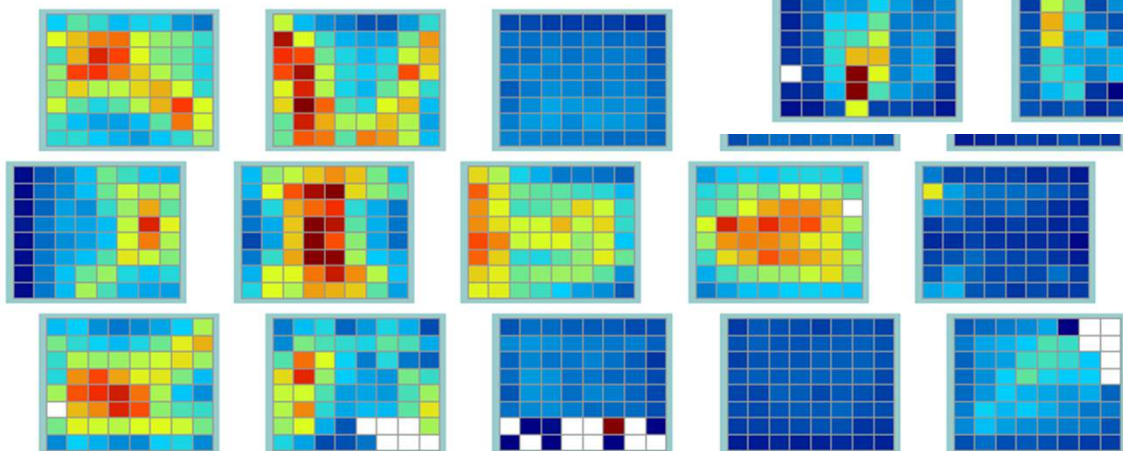
(but lose ToT info, no timewalk corr.)

cdisplay /d/may2015/ce15145230823C0.root

3GeV/c, 126deg polar angle



1GeV/c, 126deg polar angle



Major team effort – up to 17 people at a time at CERN for PANDA test beam.



Plus many more at Erlangen, Frankfurt, Giessen, GSI, Mainz – **thanks to all of you...**

... and we'll see many of you soon for the next run.