

Panda Barrel DIRC Prototype

Beam Test 2009

Outline:

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for the
GSI Panda Barrel DIRC group
(Alex, Bidyut, Carsten, Doro,
Georg, Jochen, Klaus, Roland)



- Prototype Description
- First Impressions from the
Beam Test 2009

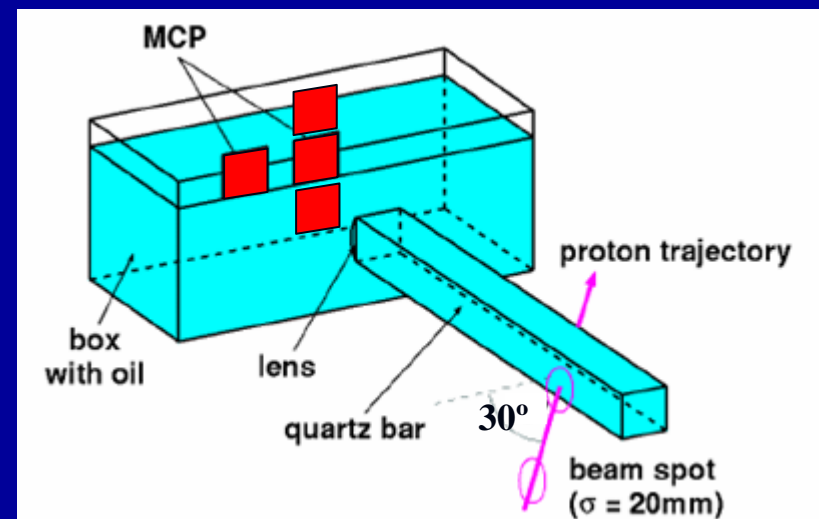
thanks also to Marek Palka and Jerzy Pietraszko

Prototype Layout

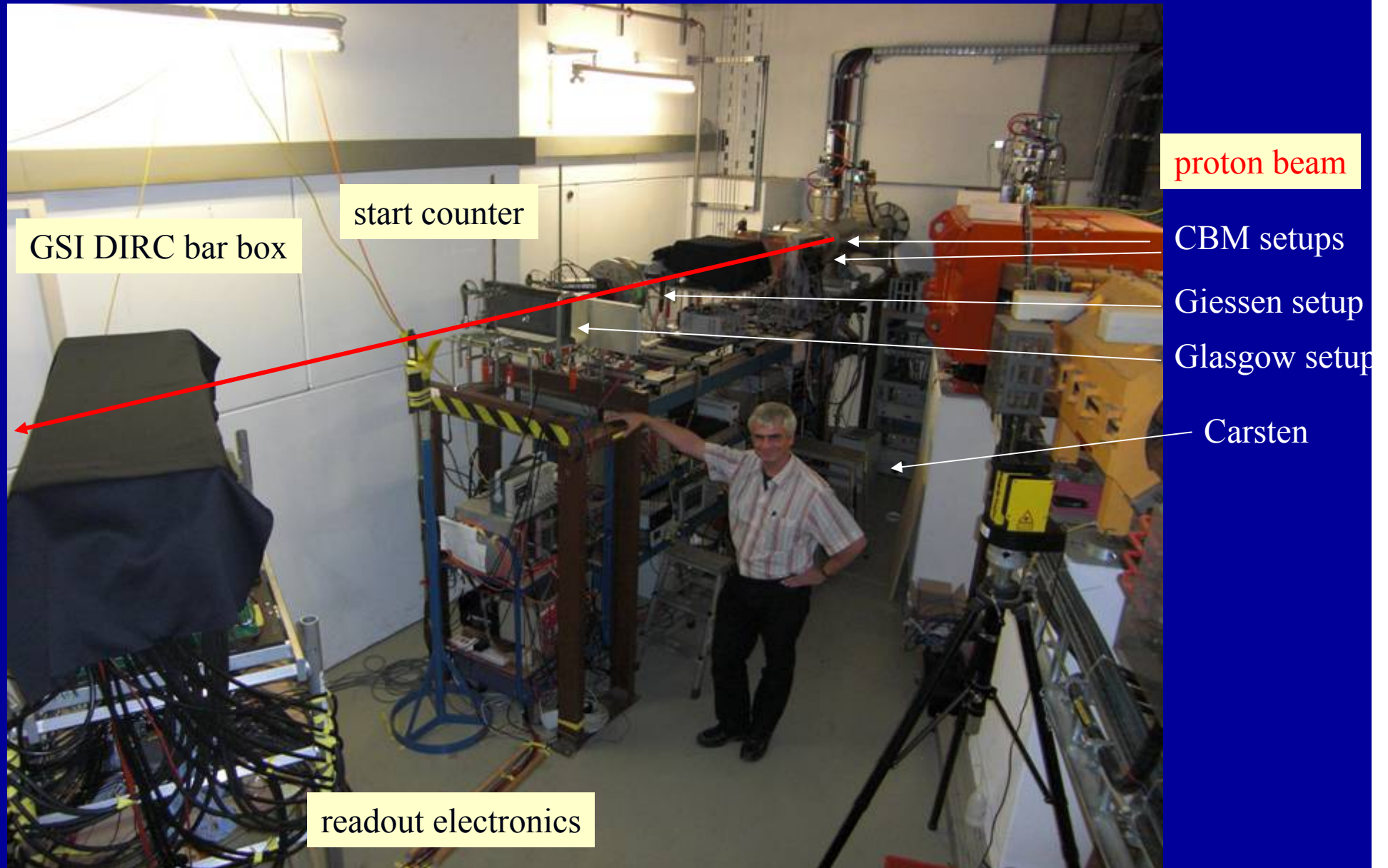
Main components:

- fused silica bar (17 x 35 x 800 mm, Lithotec)
- focusing lens
- standoff region (200 x 300 x 200 mm, filled with Marcol82 oil)
- 4 MCP PMTs (Burle/Photonis 85011 and XP85013)
- 10x amplifiers mounted on MCP PMT backplane
- light-tight box
- Hades TRB boards with NINO add-on, trigger distribution board
- picosecond laser calibration system
- two scintillator beam counters as start counter
- Hades DAQ software

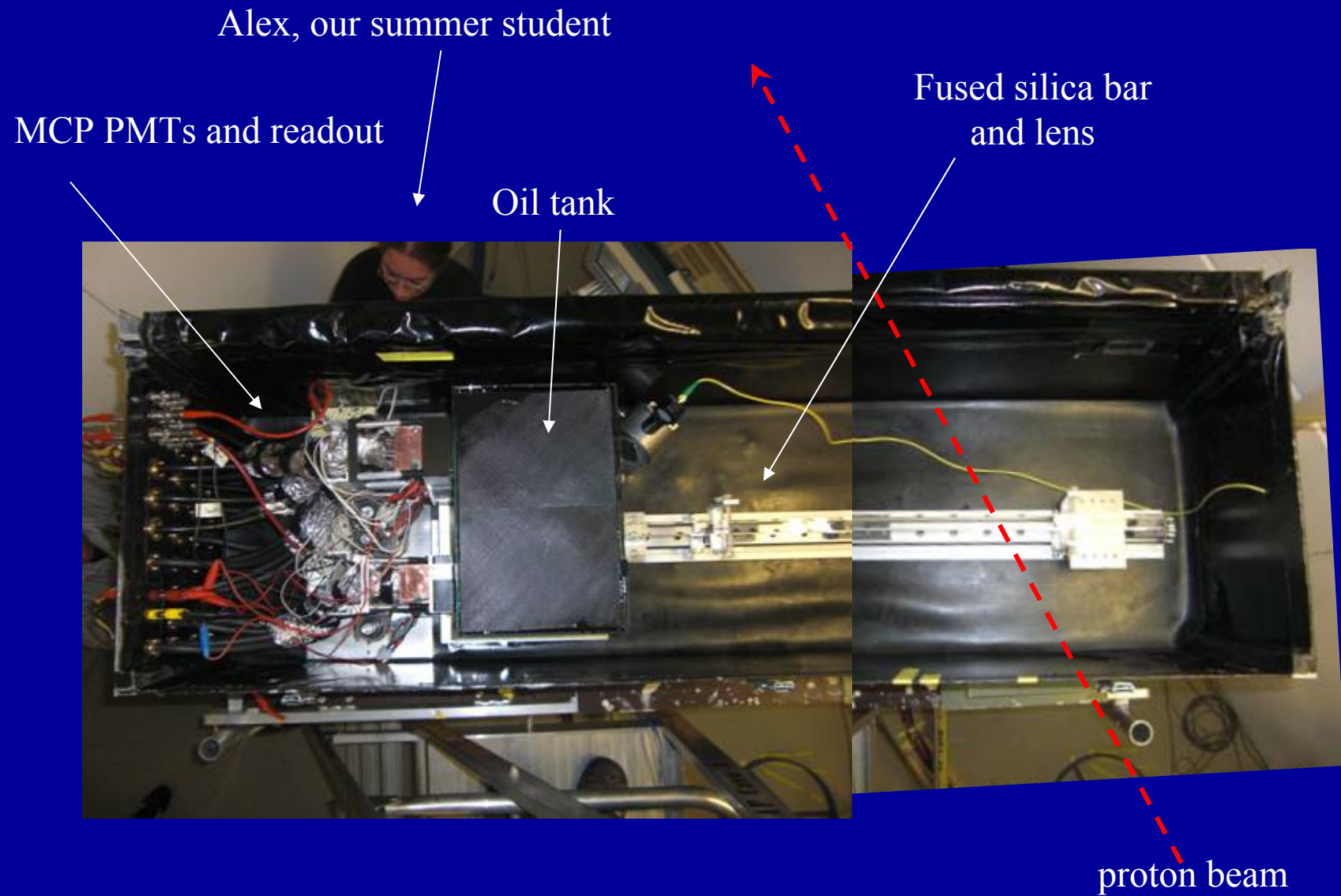
Roland already discussed the layout and the expected hit distributions from simulation



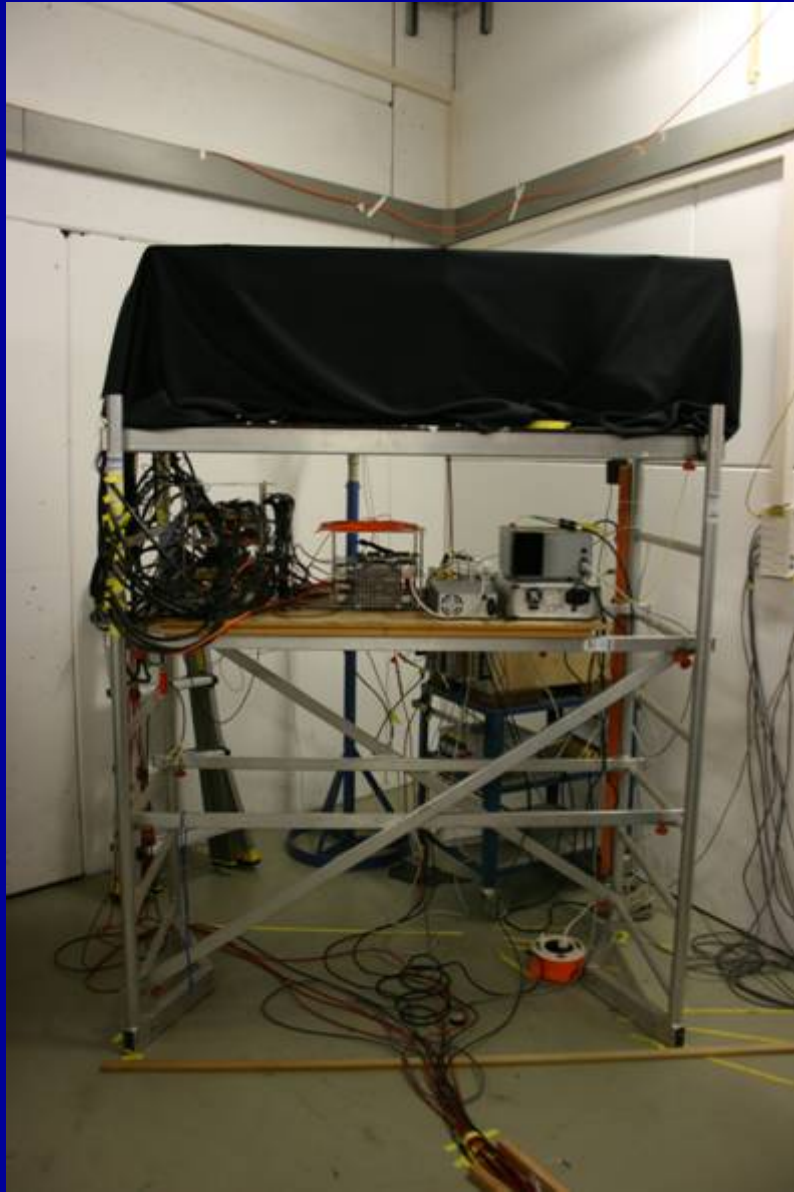
Prototype Layout



Prototype Layout



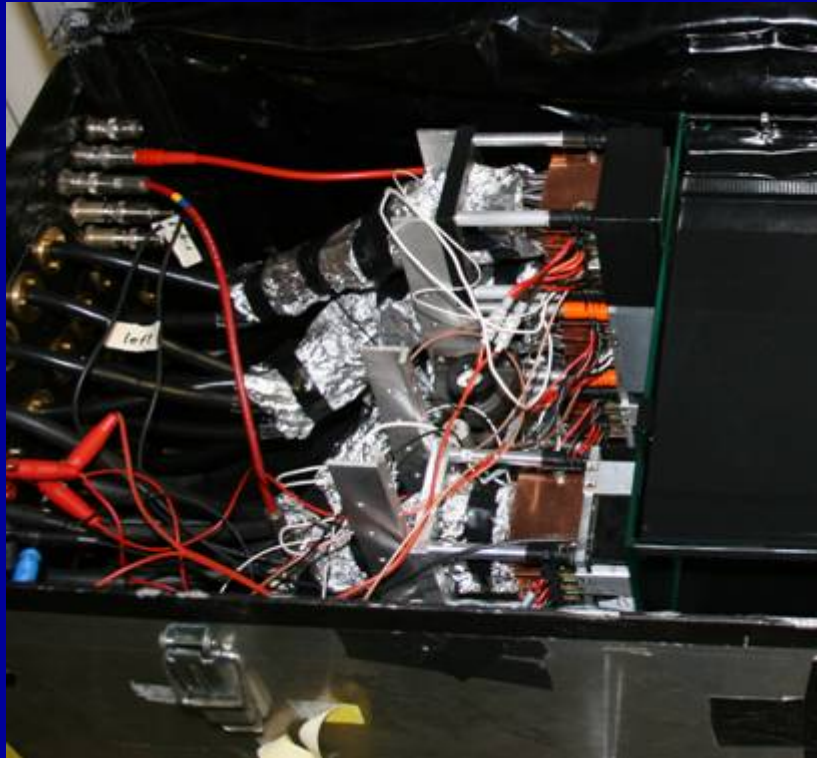
Prototype Layout



Pilas system

Hades boards

Prototype Layout

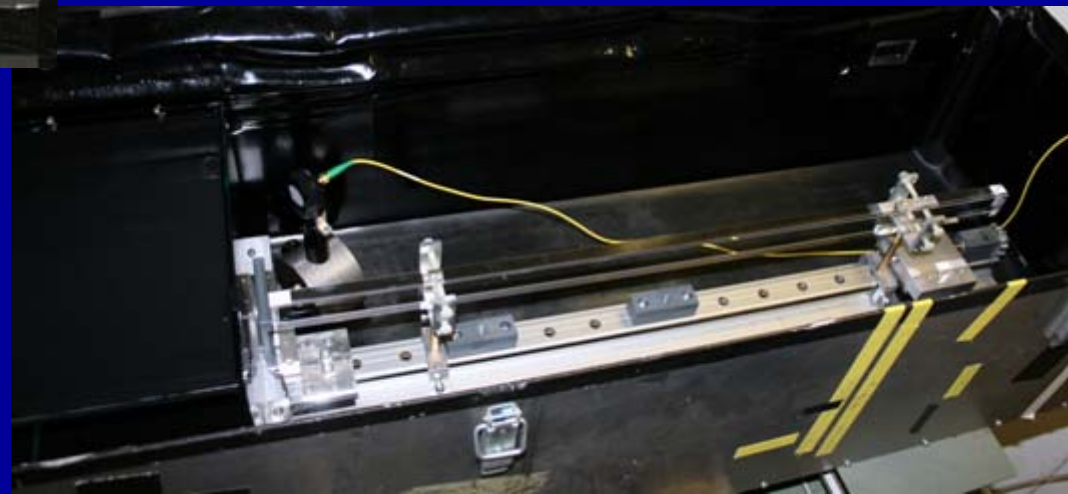


Readout-end

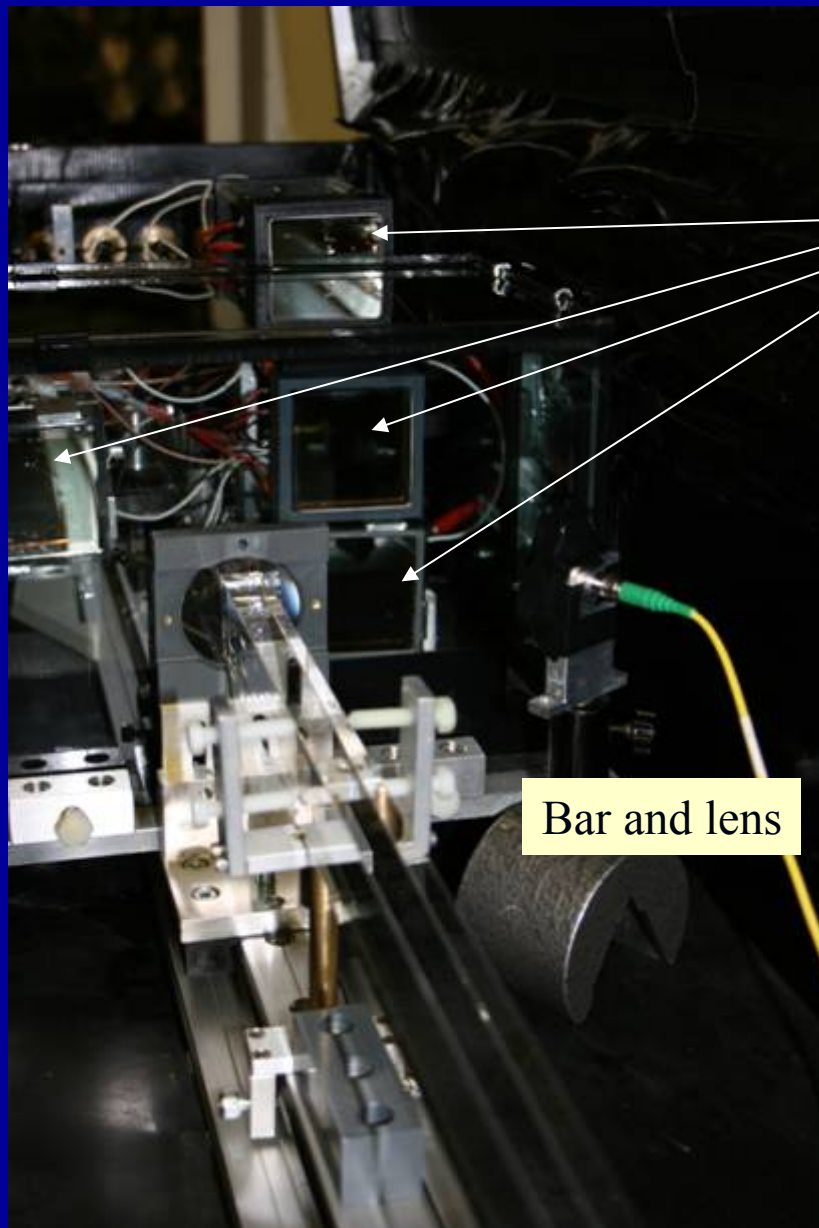
- HV and signal cable feed-through (signal cables shielded with aluminum foil)
- amplifiers with copper shielding
- MCP PMTs pressed against oil tank
- Oil tank with Marcol82, ABS plastic sheet to prevent top/bottom reflections

Bar-end

- 800mm bar
- focusing lens
- PiLas with diffuser



Prototype Layout



MCP PMTs

(One half of top PMT above oil surface)

Bar and lens

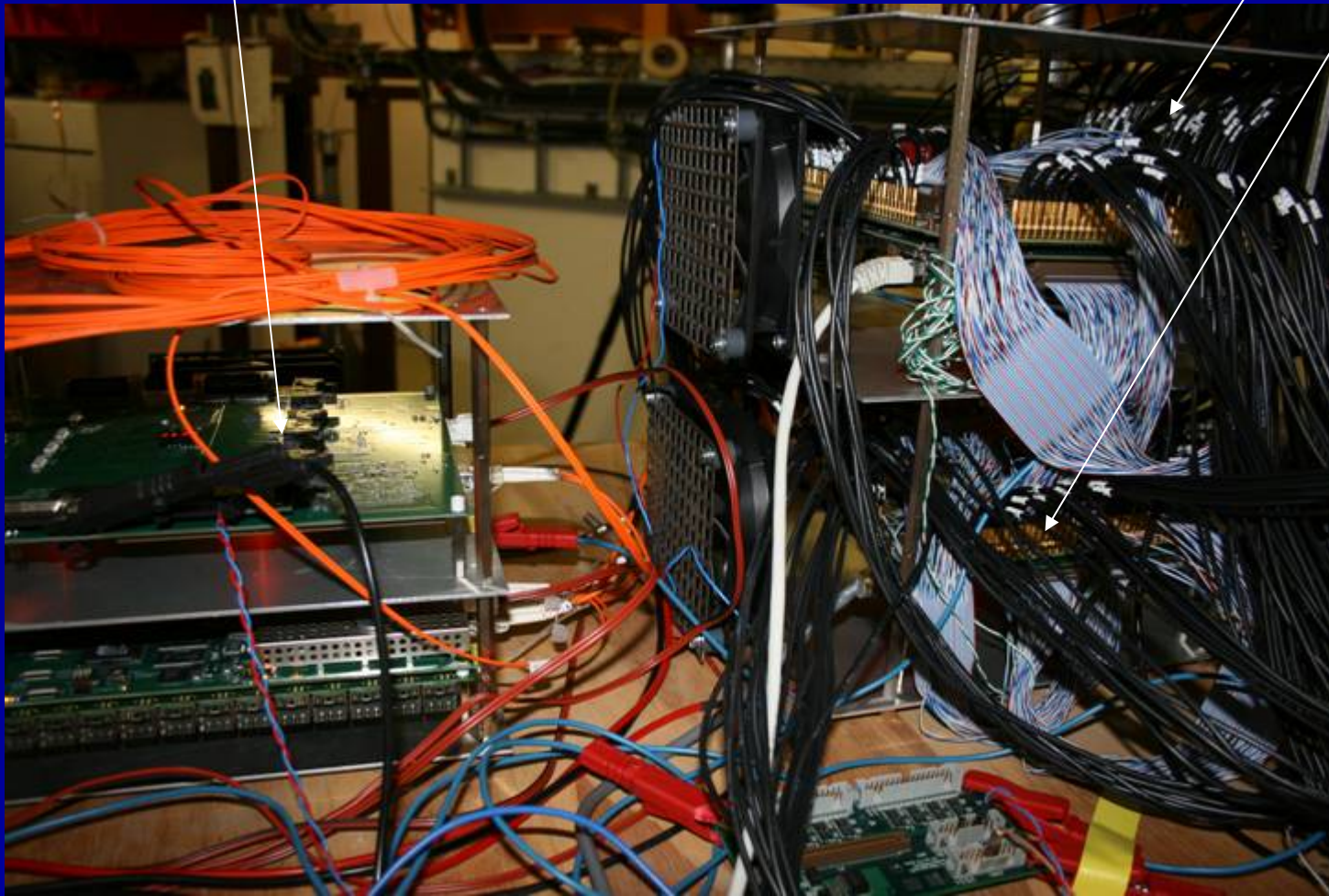


newer XP85013 MCPs

Readout Electronics

Trigger distribution board
(sync the two TRBs)

Two Hades trigger boards (TRB) with TOF add-on (NINO)
8*32 channels CERN HPTDC



Prototype Layout

Beam: 2 GeV protons, joint venture with CBM,
parasitic running (10% of beam time), main user FOPI
10 second spills, approx 10^4 - 10^5 protons per spill
(typically 40-50k triggers per spill from start counter)
beam spot 2-4cm diameter

Read out a total of 256 detector channels, record up to 4 hits per channel

- TDC: 98ps/count
- ADC: time over threshold

DAQ: modified Hades DAQ software

format: hld - Hades List Mode Data, converted off-line to ROOT

Typical running: 3-3.5kHz DAQ rate (incl. acceleration phase)
typical event: 250-300B

10 shift blocks, typically 2 hours per day since Sat Aug 29 – will end approx. 22:30 tonight

Collected more than 100M triggers so far.

Prototype Data (preliminary)

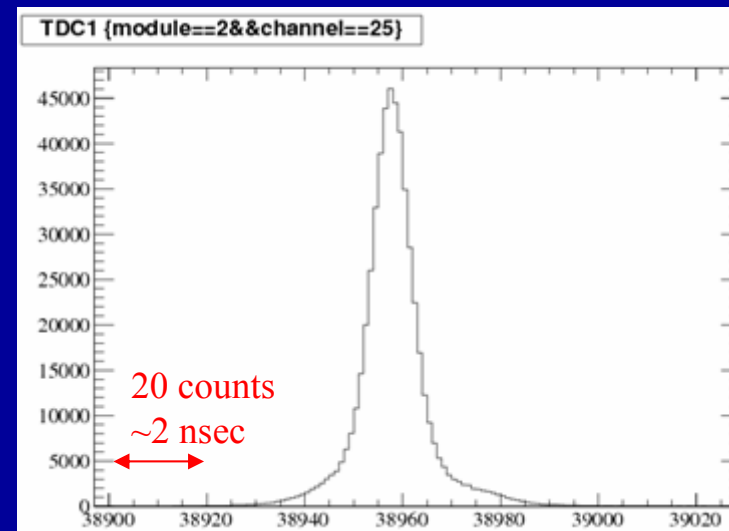
First look at TDC and ADC data

Example: one pixel on ring image
in single MCP on right

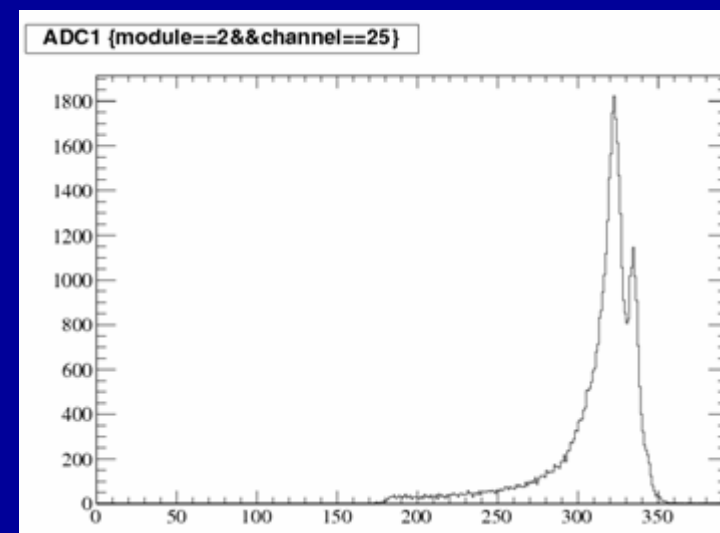
Reasonable distributions
details to be studied

Cut on TDC peak ± 50 counts for occupancy plots

All data plots shown today
are, of course,
extremely preliminary



TDC counts



ToT/ADC counts

Prototype Data (preliminary)

First priority: see Cherenkov ring

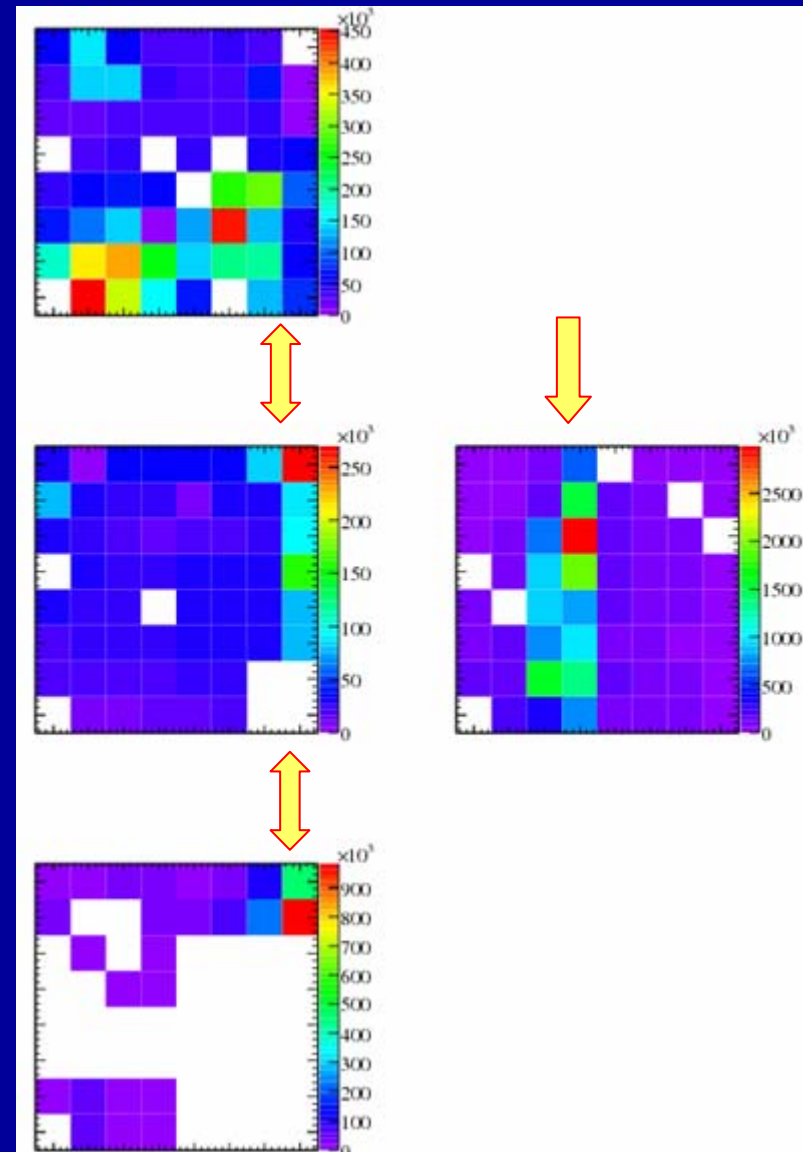
Start with 30 degree angle of beam to box,
place MCP PMTs into positions
determined by simulation

First data from Sunday evening

We see (parts of) a ring!

(Note that amplifier and TDC artifacts are
horizontal structures.)

Ring almost misses MCP PMT on left side,
well-placed on right side
-> alignment issue?



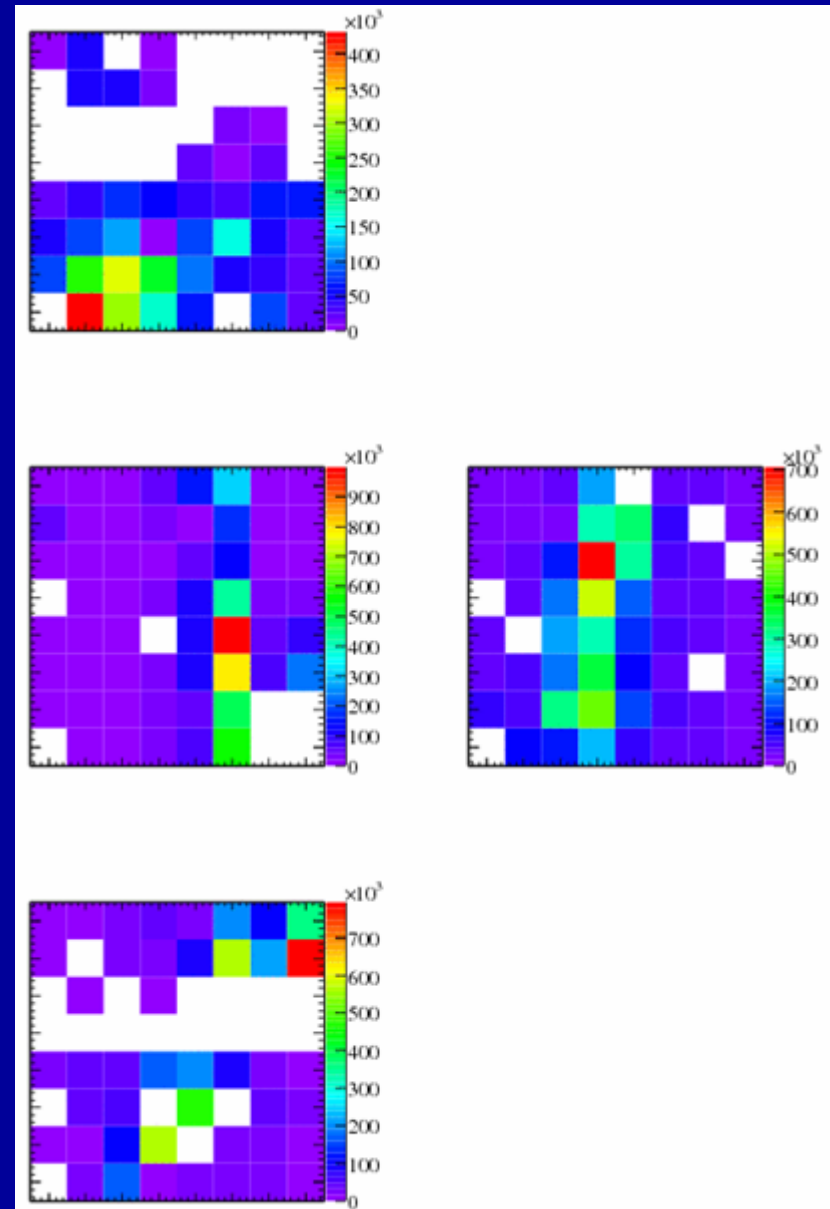
Prototype Data (preliminary)

Next: improve ring image

At next access noticed that bar was shifted
from center line and slightly angled

Nice ring image, close to center of MCP PMTs

Good qualitative agreement with simulation.

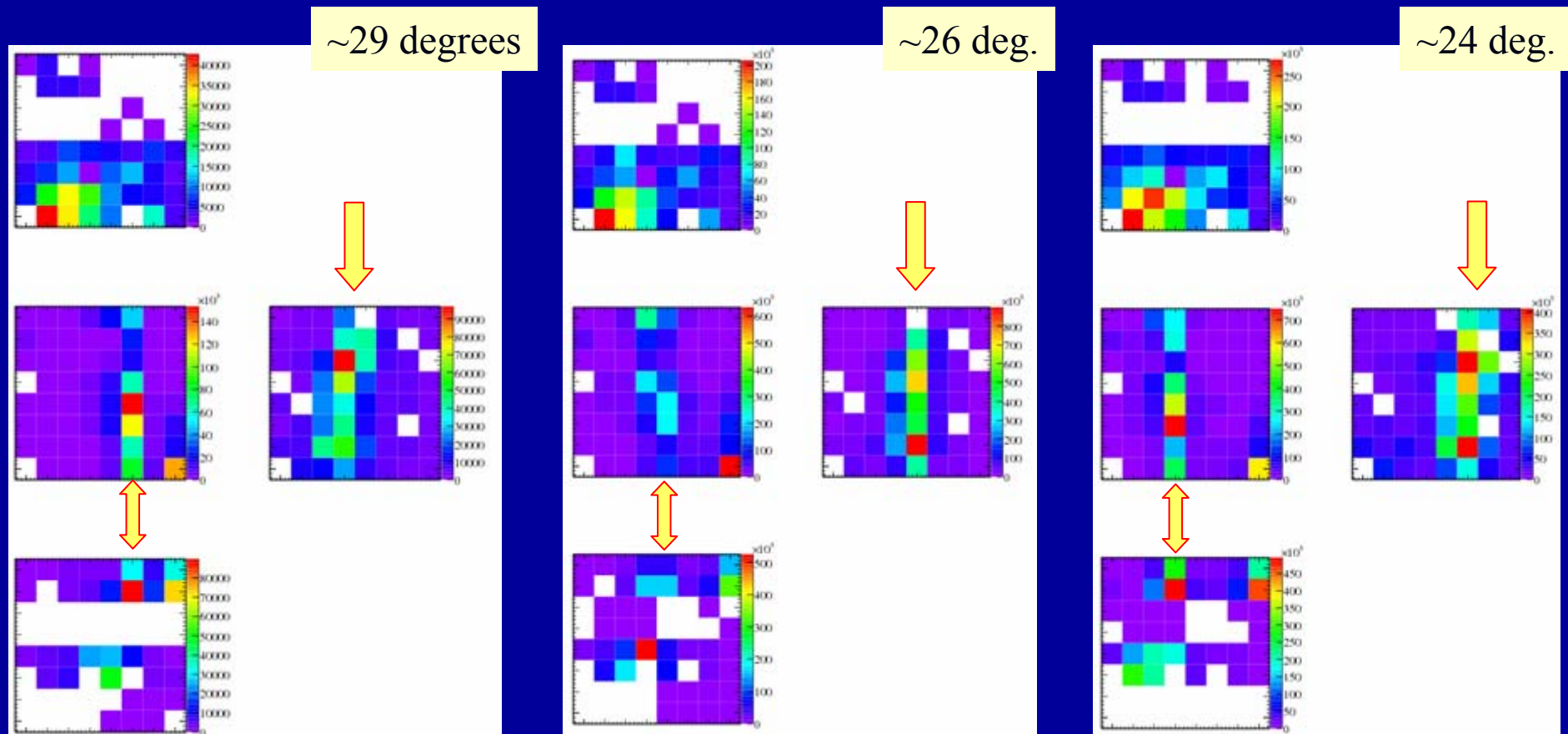


Prototype Data (preliminary)

Next: prove that this is a real effect

→ does it move as expected if we change the angle of the beam?

It does.

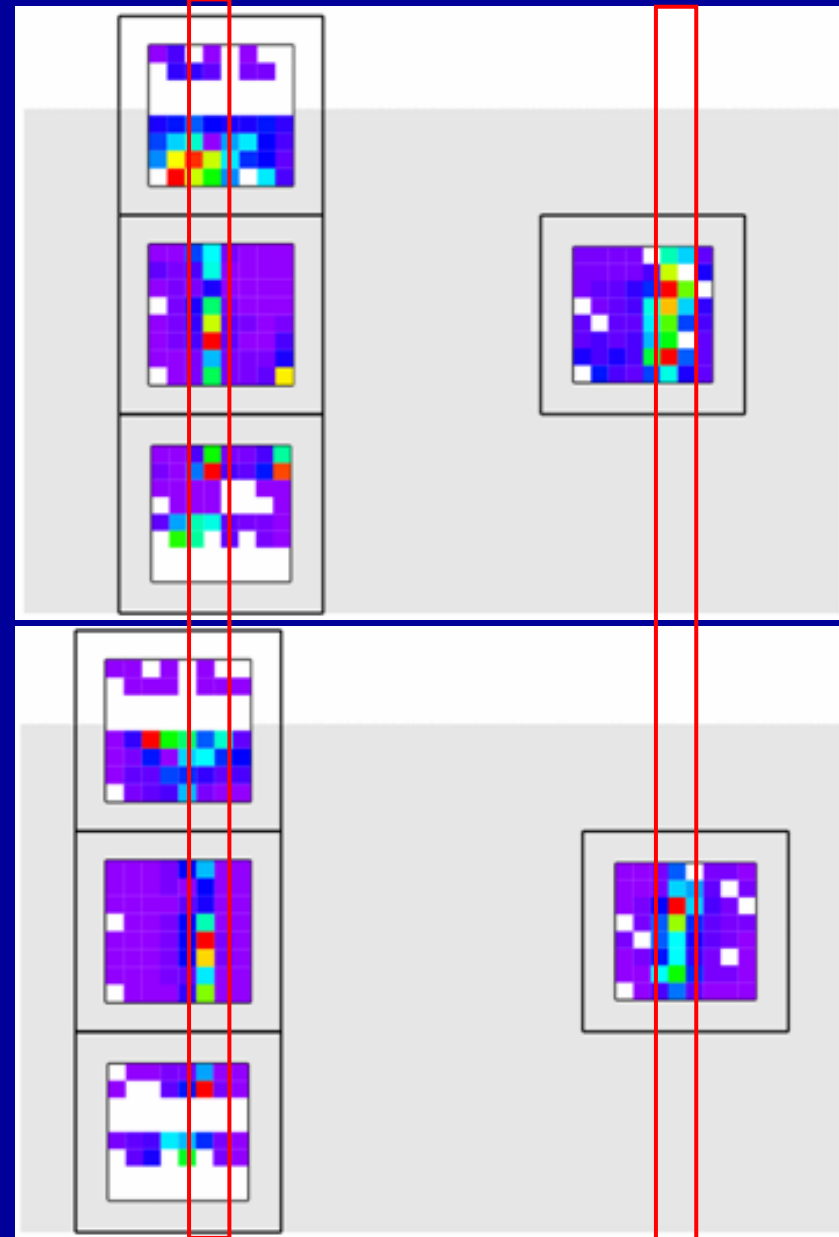


Prototype Data (preliminary)

Another test:

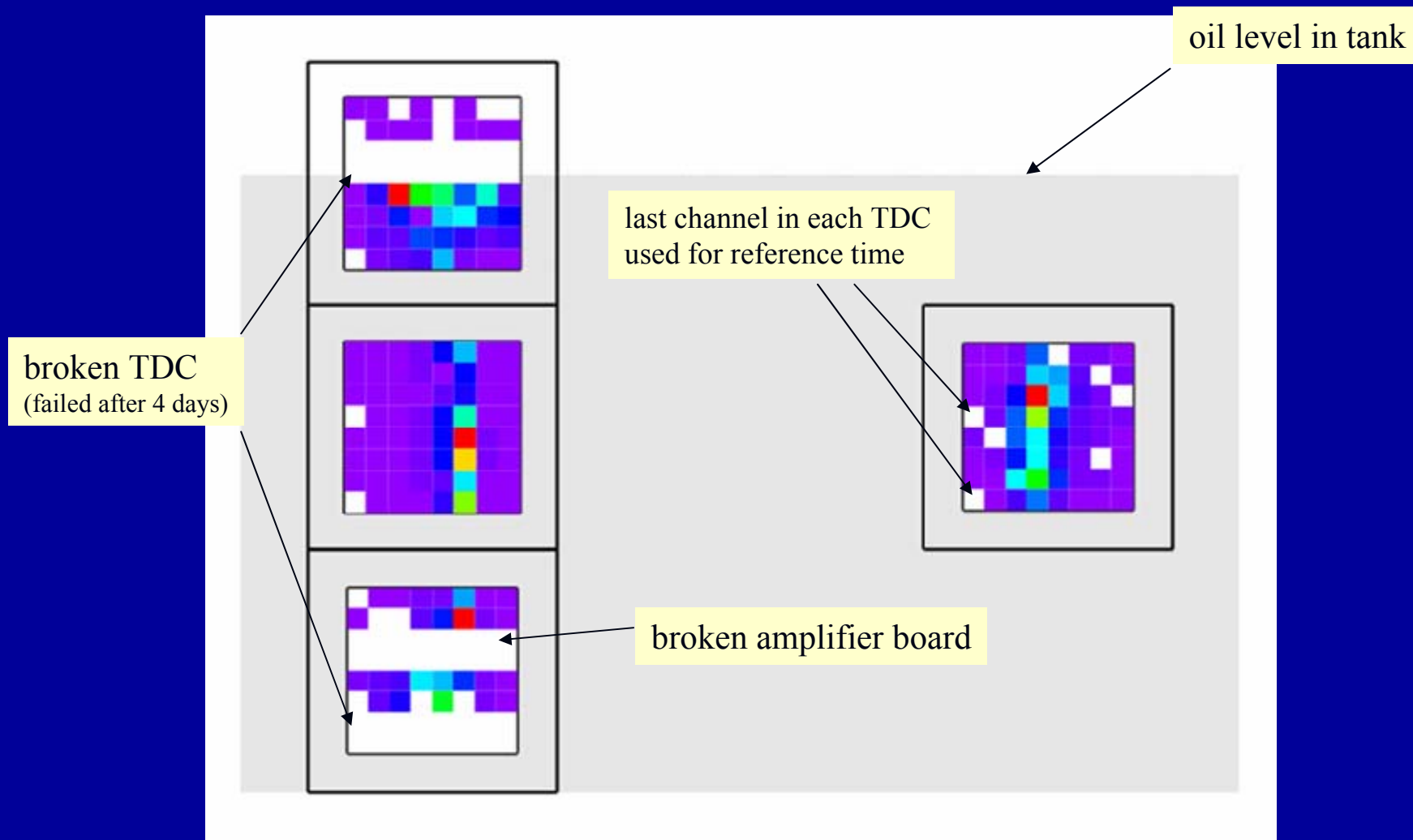
move MCP PMTs by 15mm each
→ does the ring stay in place?
(in box coordinates)

It does.



Prototype Data (preliminary)

We're very picky people – what can we complain about in the ring image?



Prototype Beam Test Summary

- Had a very productive beam test so far, enjoyed good cooperation in cave with Glasgow/Giessen and CBM colleagues as well as with FOPI

- **We see rings!**

And they behave as Cherenkov rings should.

- Rich data set, analysis will take us a while.

Timing as function of Z, image w/o lens, etc

- One more shift to go.

- Already have some ideas for the next test beam

what worked, what can be added, improved, etc

- We purchased total of 10 new MCP PMTs (XP85012)

and 4 high-quality polished bars (~ BABAR-DIRC specs) from InSync Inc.

better PMT coverage next time, maybe glue two bars

- Last but not least, I'll have some nice plots to show in IEEE poster next month.

