

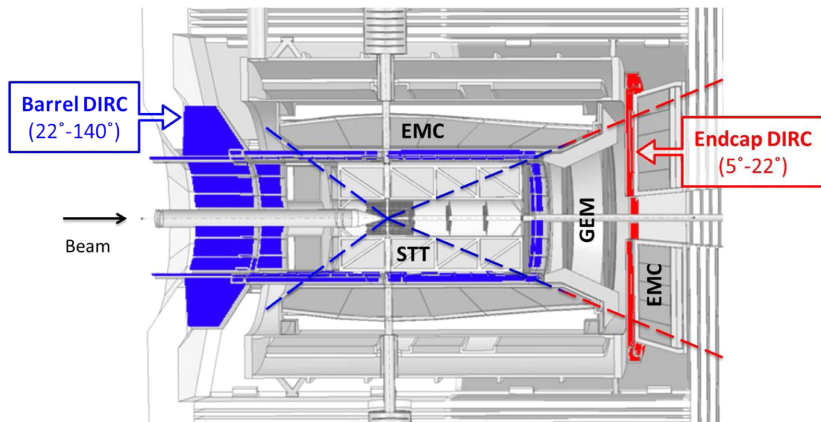
Discussion about Comments regarding EDD-TDR

Mustafa Schmidt

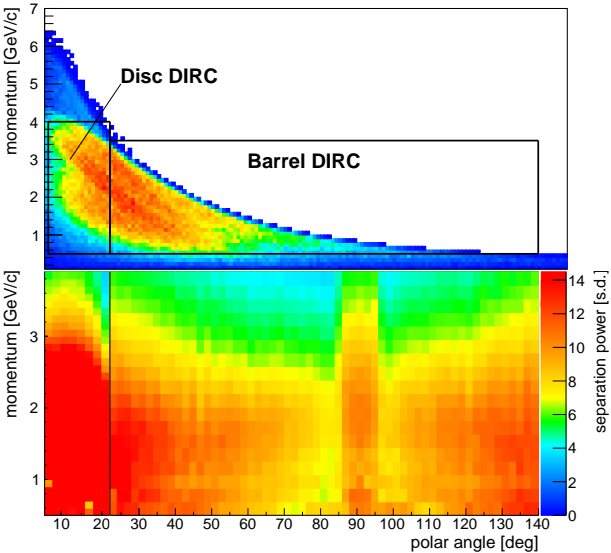
on behalf of the PANDA Cherenkov Group

PANDA-Meeting 19/2

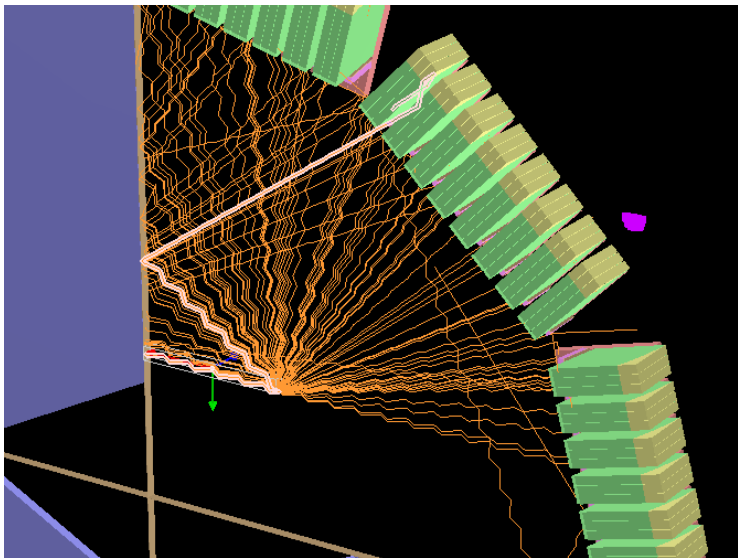
Q1: Is there an overlap at 22° between Disc and Barrel DIRC?



Combined phase space plot for Disc and Barrel DIRC



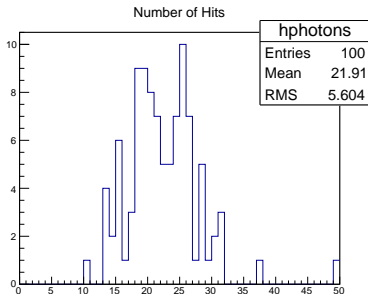
Q2: No mirror coating on radiator edges?



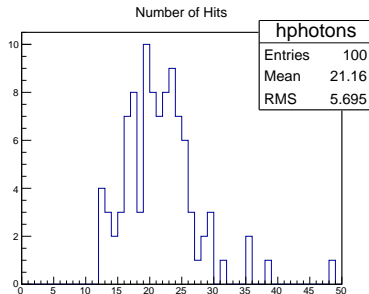
Internal reflection sufficient

Number of hits for 1000 π^+ with 4 GeV/c ($\theta = 16^\circ$, $\phi = 60^\circ$)

With mirror coating

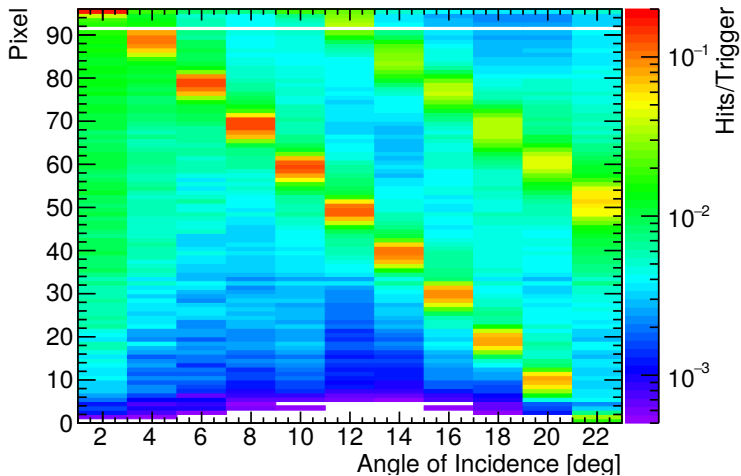


Without mirror coating



Photon losses in the order of a few percent
(further plots can be created)

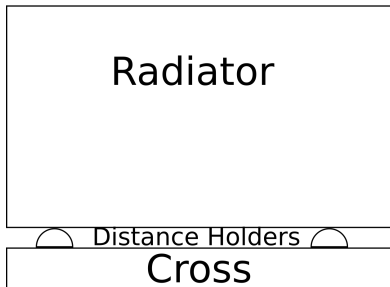
Reflections clearly visible at DESY testbeam without mirror coating



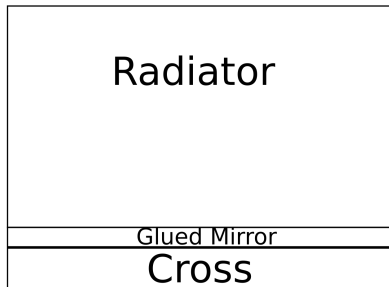
No optical issues but maybe mechanical ones

Side View

Without mirror



With mirror



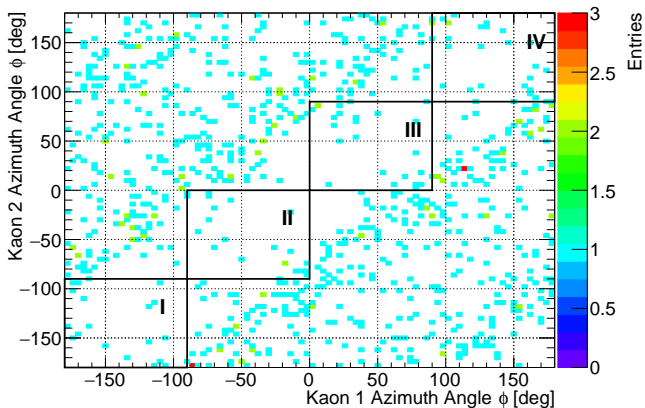
Solution without mirror: no contact between cross and radiator allowed \Rightarrow placeholders required \Rightarrow pressure on fused silica non-uniformly distributed

Suggestion of Avetik: Gluing a 2–3 mm mirror to the radiator side

Q3: Occupancy at high luminosity?

- Maximum interaction rate in PANDA: 20 MHz
- In average 1 track per quadrant @15 GeV/c
- 22 number of hits (mean value) per track
- ⇒ 440 Mio. hits per second per quadrant
- Actual design: $3 \times 8 = 24$ ROMs per quadrant
- Around 300 pixel per ROM
- ⇒ Hit rate: 60 kHz per channel
- Maximum rate of FEE: 100 kHz
- Data size: 30 bytes per hit
- ⇒ 700 MB/s per ROM
- No problem for optical link and data concentrator

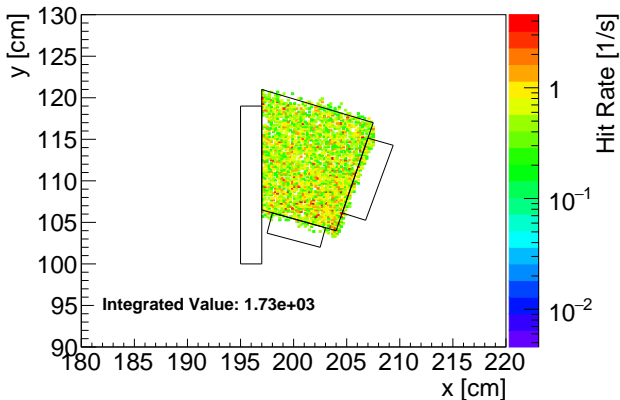
Sample decay of resonance into two kaons



Most of the particles enter different quadrants

Q4: Significant background from tracks in FELs?

FELs mainly shielded by Barrel EMC (high reduction of rate)



Hit rate per FEL 50 to 100 times smaller than for radiator quadrant

Q5: Gain and threshold if MCP-PMTs?

- Currently gain requirement for TOFPET ASIC: approx. 10^6
- Should be easily achievable with all possible MCP-PMTs
- Further analysis to be done with MCP-PMT test box and GCS (see talk by Simon)

Q6: Adjusting the amplifier gain setting?

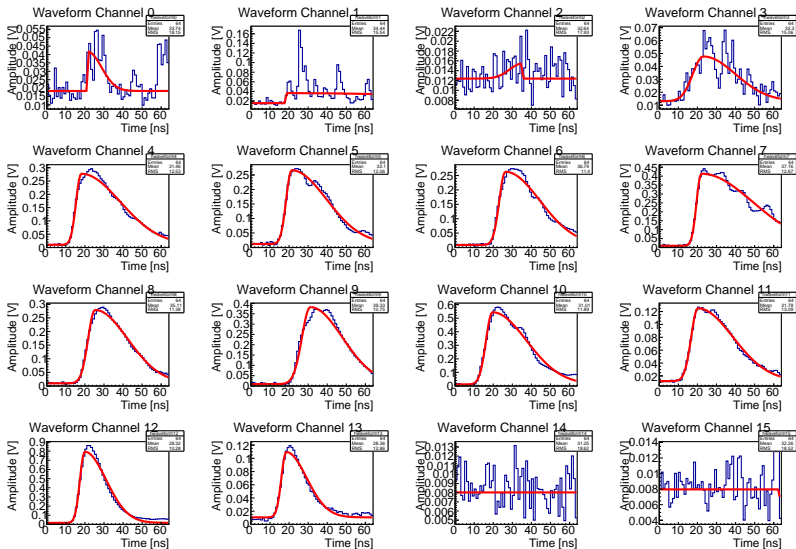
- Next iteration of TOFPET in preparation (suitable for MCP-PMT signals)
- Tests in GCS will help to fix the operating conditions
- Current version: (TOFPET 2C) splits input signal into two chains (time=T and TOT=E) measurement with separate possible settings of transimpedance amplifier
- For chain T one can set the gain in these settings: 375,750,1500,3000 Ω , and for the chain E 38,75,150,300 Ω

Q7: Waveform-Analyzer in final detector?

- Waveform analyzer currently not foreseen in final detector
- Possibility to use Sompic waveform digitizer with 16 or more channels for specific MCP-PMTs channels
- Is anything similar planned for the Barrel DIRC?



Waveform samples of PMTs in old cosmics test stand

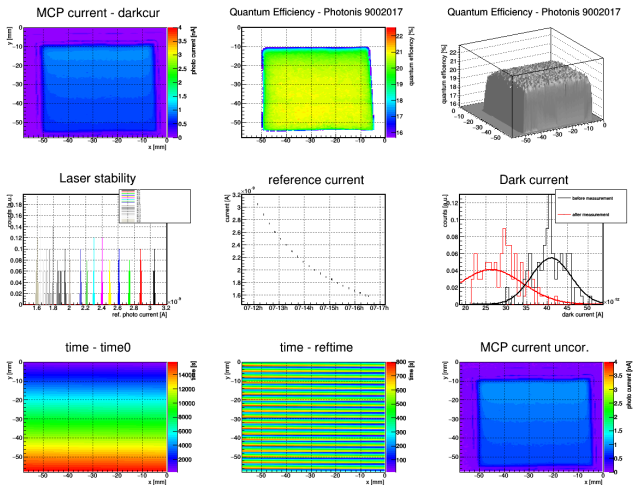


Q8: Threshold of 150 mV for Hamamatsu and 15 mV for Photonis?

- First idea: typing mistake
- Scans repeated in near future with new TOFPET ASIC version and all existing MCP-PMTs
- Any further ideas?

Q9: QE Scan for MCP-PMT surface?

QE scan from Albert available for all existing MCP-PMTs



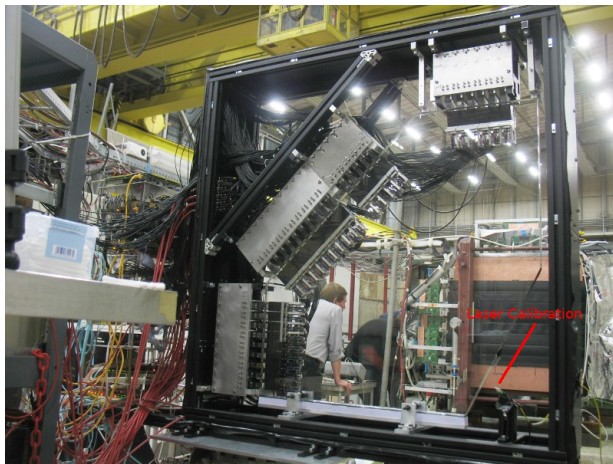
Values implemented in MC simulation framework

Q10: More extensive test of MCP-PMTs in combination with new FEE chips?

- If PETsys ASIC V5 reaches 600 kHz it is fully sufficient for our purpose
- Actual version of ASICs run stable with one QDC/TDC calibration
- Threshold calibration: once per day (10–15 minutes for 250 channels)
- 40 ns dead time per channel does not affect our measurements
- Further will be performed in GCS

Q11: Time scale in figure and laser injection point?

- Problem in creation of canvases (already corrected)
- Laser injection point shown in Figure 5.3 (TDR)
- For final quadrant: 1 injection point and 2 gas inlets



Q12: Gas and light sealing of ROMs?

- See next talk by Ilknur
- ROMs are completely inside EDD in a single light tight volume
- Gas flow: two inlets for each quadrant from beam pipe side and 3 outlets close to the corners of plate holding structures
- Gas flow is radially distributed, hopefully equally over whole surface
- Exchanging of faulty MCP-PMTs: must take out complete EDD out of magnet and open it

Q13: Coupling of FELs to radiator?

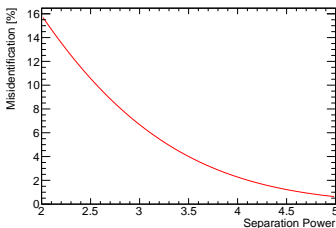
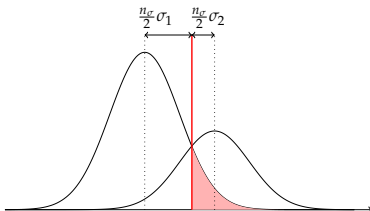
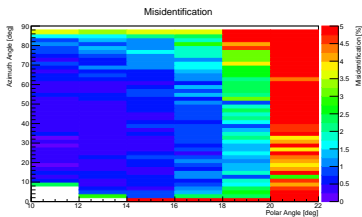
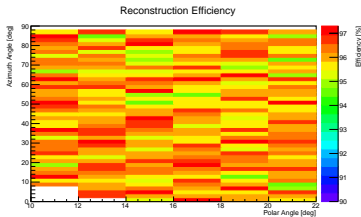
- FEL coupling to the bar is done by company by optical bonding (bar and FEL as one single piece) Bar is glued to plate (glue joint holds bar, MCP-PMT and FEL)
- Ongoing tests with different glues to find best one for given parameters (substitutue for FEA)
- Preliminary results encouraging especially for EPOTEK for foreseen movement from horizontal (when building) to vertical (installation time) position

Q14: Study of thermal environment?

- Difficult to estimate how the final thermal environment will be in PANDA
- The mentioned -25°C will be at the back side of EMC so
- EDD side maybe close to room temperature because of insulation
- Separate cooling for our FEE
- Prototype successfully tested (based on alcohol cooling from HUBER)
- Allows variation of temperature in a 10 degree range on ASICS surface

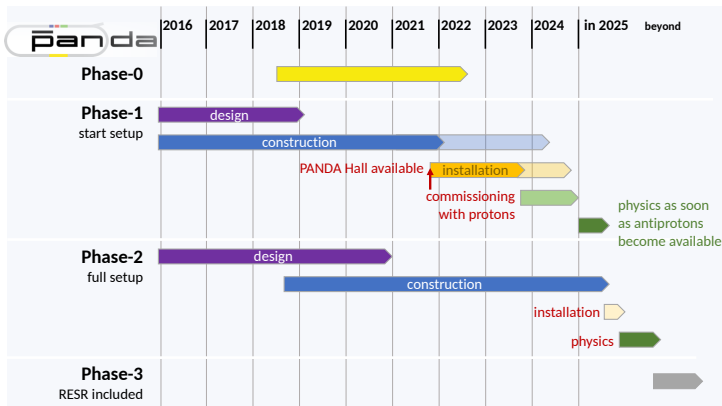
Q15: Is misidentification equal to efficiency?

- Reconstruction efficiency close to 1
- ⇒ Misidentification indicates efficiency



Q16: Schedule is out of date

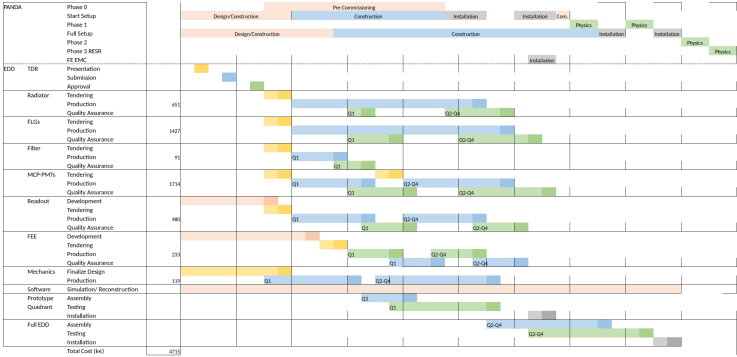
New PANDA schedule available



- Phase 0: Subdetectors are under construction. They will be used in other excellent HEP experiments until the PANDA hall is available.
- Phase 1: The first physics experiments can be done with the initial setup.
- Phase 2: The full setup of PANDA will be available.
- Phase 3: Physics beyond Phase 2 (RESR required).

Q17: Mismatch in Schedule

Updated schedule including risk management available



Q18: Outsourcing and specification of manpower?

- Outsourcing difficult
- FEE PCB design with PETsys company
- MCP-PMT measurements with Erlangen group
- Estimated costs depend on company offers
- Only valid for limited time (updates required)

Q19: Expected irradiation cool-down period before access?

- Radiation dose comparable or less to endcap EMC
 - Endcap EMC to be taken out first
- ⇒ Dose most likely sufficiently low after that procedure

Conclusion

- All questions answerable and analyzed before
- More detailed plots producible if required
- Waiting for new TOFPET version (further measurements in September)
- PANDA Phase 2 not before 2027 according to official plan