Update on Scintillator studies @ MPP Munich

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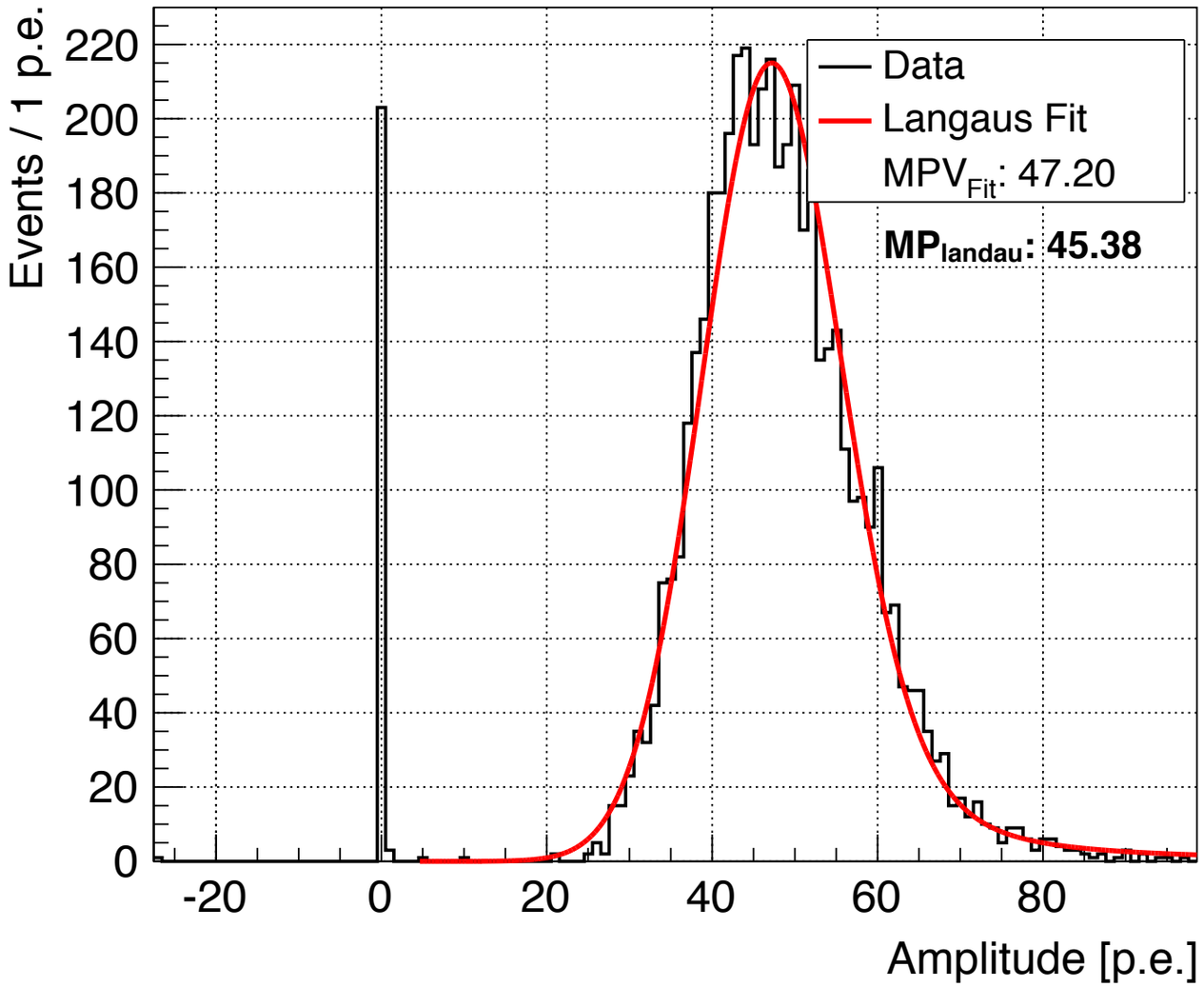
Light Yield

- Implemented light yield determination with Langau fit MPV (before gaussian mean was used)
- Still optimising the fit parameter settings for the uniformity scan as not all fits (at each position) converge
- Comparison of light yield to setups at Mainz and Hamburg ongoing



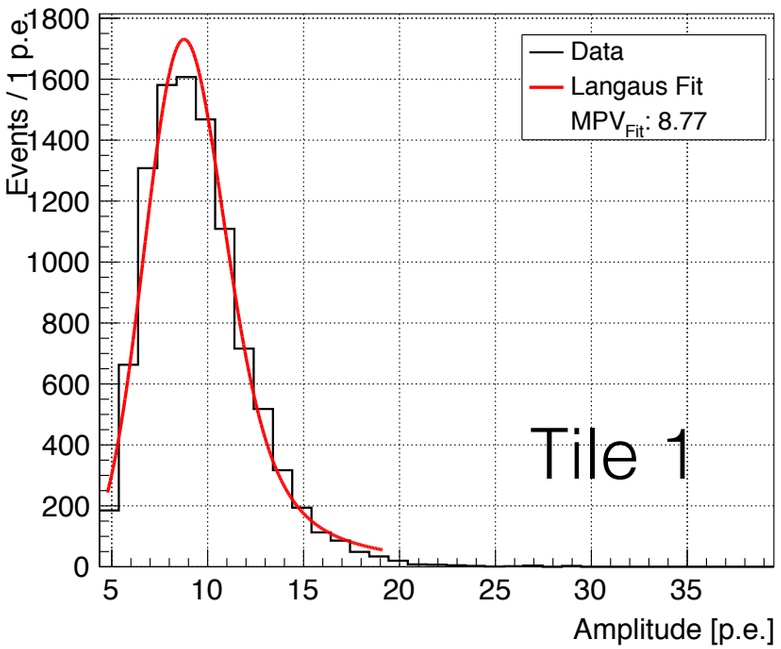
PEN Update

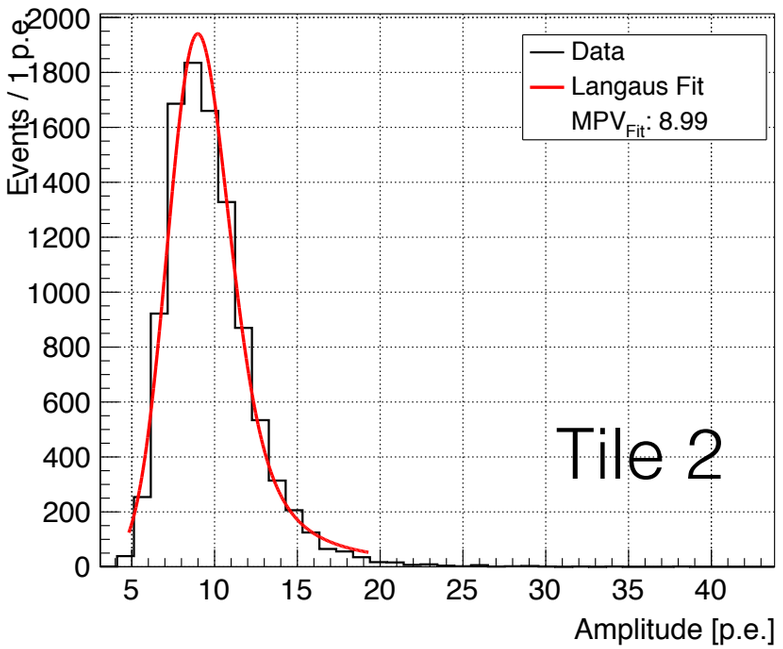
- Test if PEN is indeed a cheap alternative to BC408
- Up to now no positive results, production process delicate
- Second production batch at Fraunhofer institute
  - Systematically test machine settings/parameters
  - Work on a clean machine, mould 150x150x5mm^3
  - Difficulties with the machine prevented producing useful samples
  - Second round ongoing with smaller mould (50x50x3mm^3)
  - Next step is to make a 30x30x3mm^3 mould to match directly our standard tiles (like was done for production at TU Dortmund)

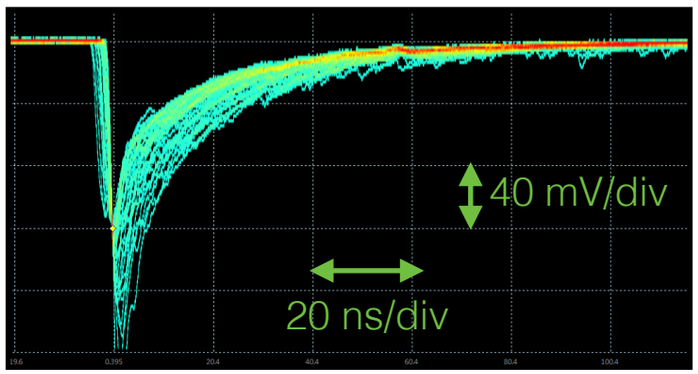
PS from Dortmund

- PS tiles from the same mould at TU Dortmund to compare their production process to PEN
- Mixing small amounts of fluors difficult
- Quality optically not so good yet
- Light yield (after polishing sides, ESR foil)
- Light yield ~factor 2 lower than expected for PS

- Production process scintillators indeed delicate







Reflective foil

- Comparison of light yield with different reflective foils (with Sr90 source)

- Previous result with ITEP tiles: ESR foil factor 1.4 - 1.6 better than adhesive foil

- Revisited with BC408 tile: ESR foil factor 1.8 - 2 better than adhesive side of adhesive foil

- Non-adhesive side just as good as ESR

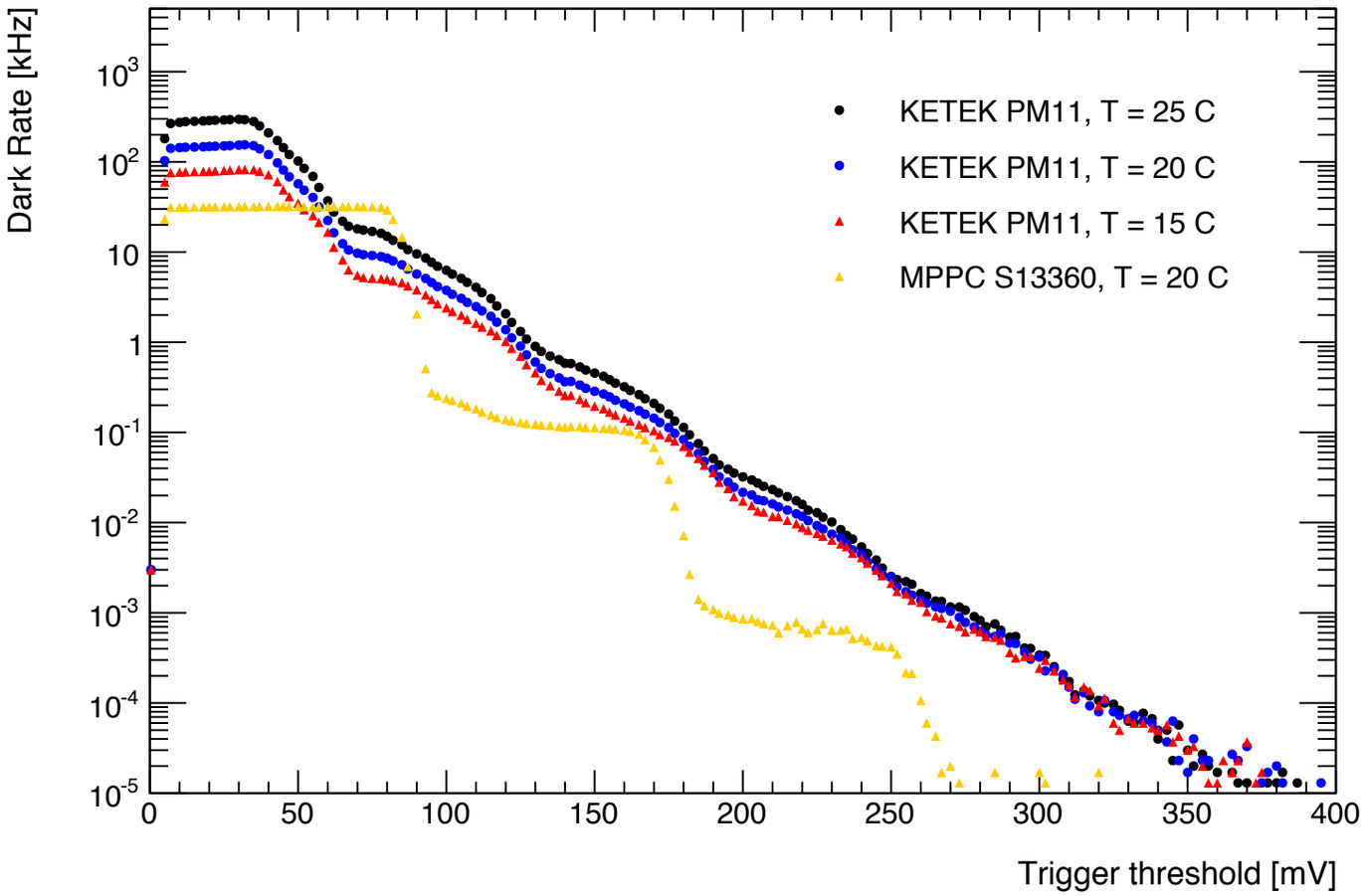
Foil	**Light yield***				
ESR	25.0	25.7	28.0	25.6	23.2
Non-adhesive side	25.6	25.0	26.8	25.5	24.4
Adhesive side	13.1	13.9	14.4	12.5	12.3

* MPV of Langau fit

Tile	Adhesive foil	Adhesive foil also on sides	Hamburg packaging
2	9.975	-	16.067
M3	7.878	-	13.154
M2	9.145	10,371	13.160

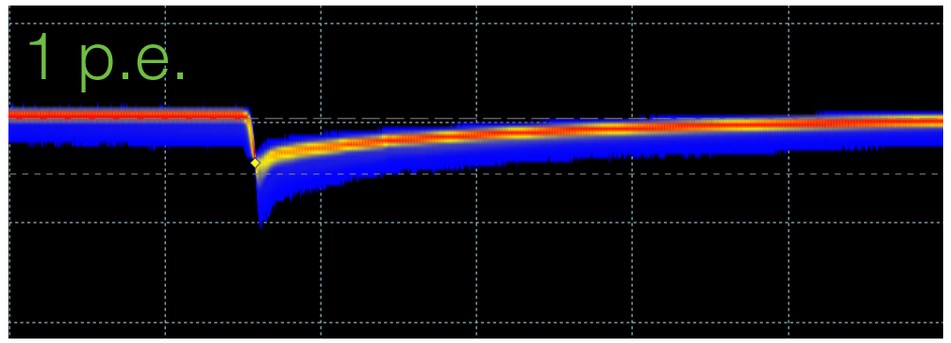
KETEK SiPM

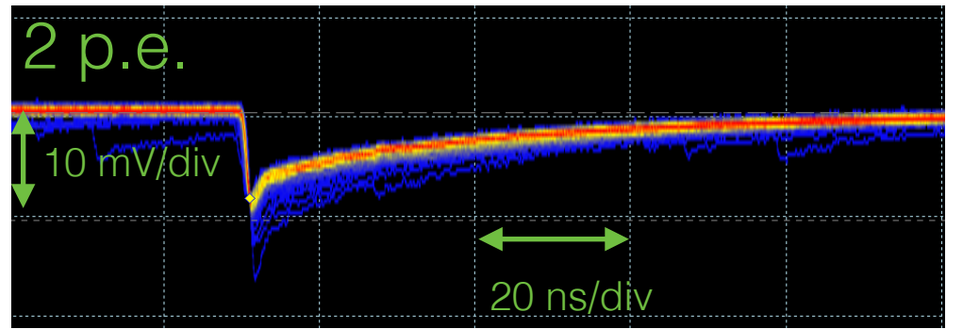
- Performance of KETEK SiPM in terms of DCR and crosstalk inferior to MPPC



MPPC:
DCR ~30 kHz
CT ~0.3%

Ketek:
DCR ~150 kHz
CT ~6%

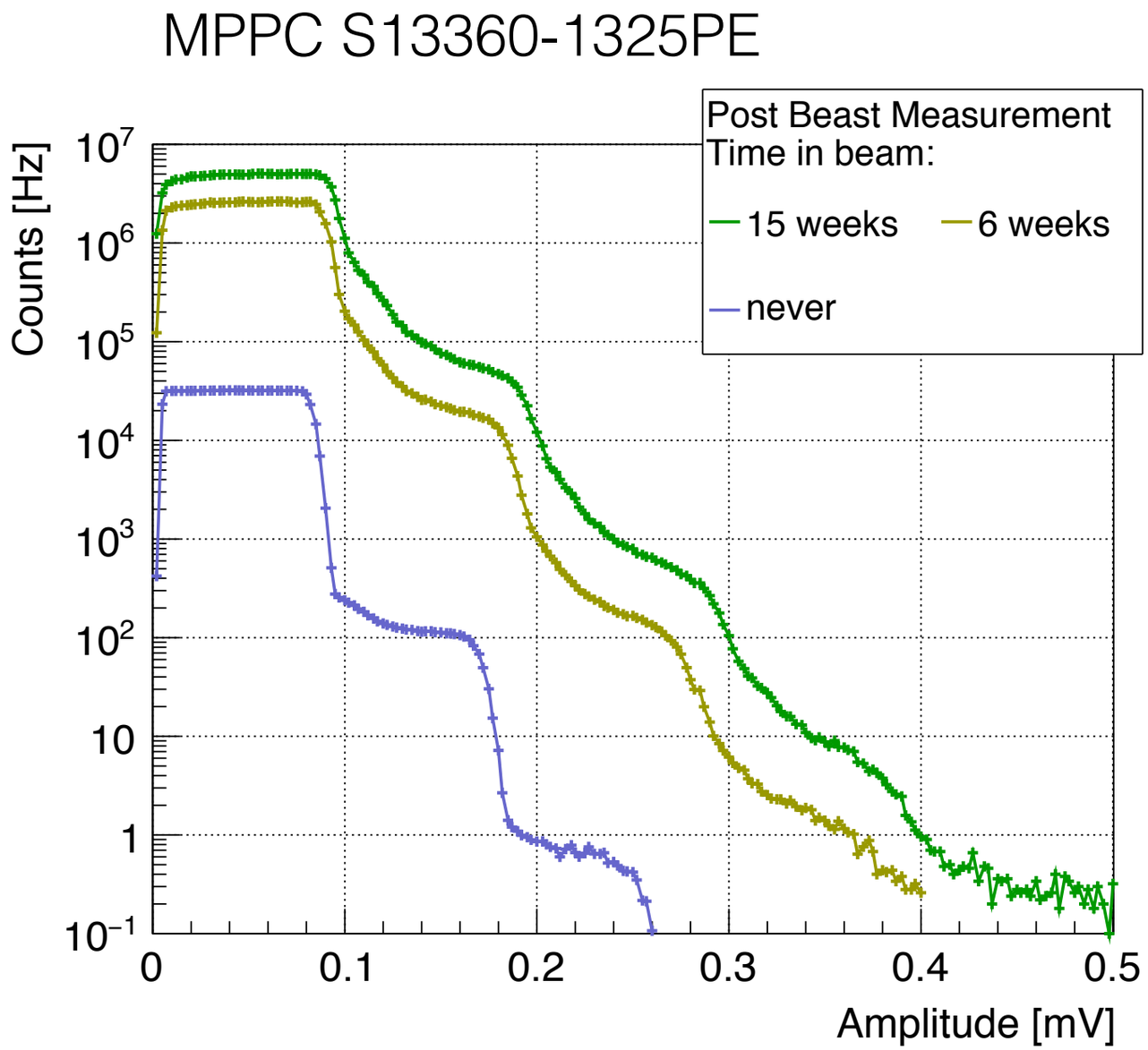




	MPPC	Ketek
Sensitive area	1.3x1.3 mm^2	1.2x1.2 mm^2
Cell size	25 µm	25 µm
Vbd	~53 V	~ 26 V
DCR	70 kHz	280 kHz
Crosstalk	1%	16%

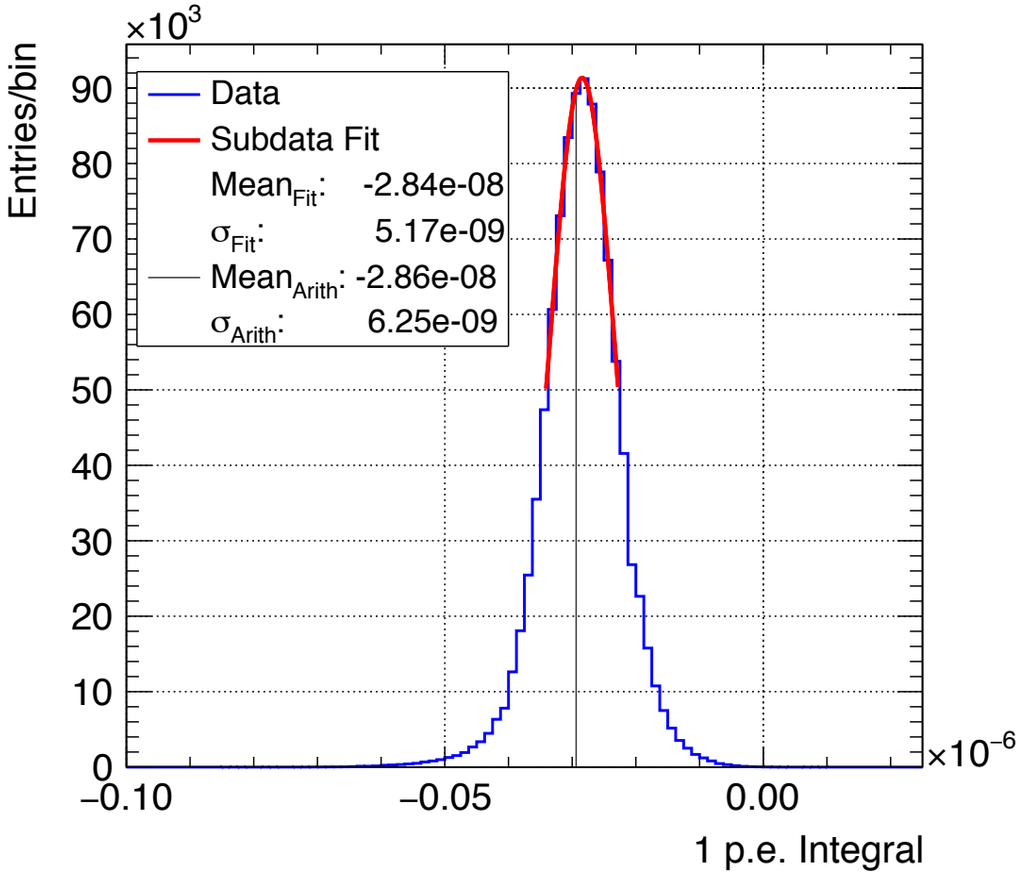
MPPC RADIATION DAMAGE

- AHCAL style SiPMs + scintillator tiles used in Belle II commissioning
- Unfocused beams, no collisions
- Observed radiation damage in SiPMs
- Dose ~tens of Gy
- Gamma, MIPs, neutrons

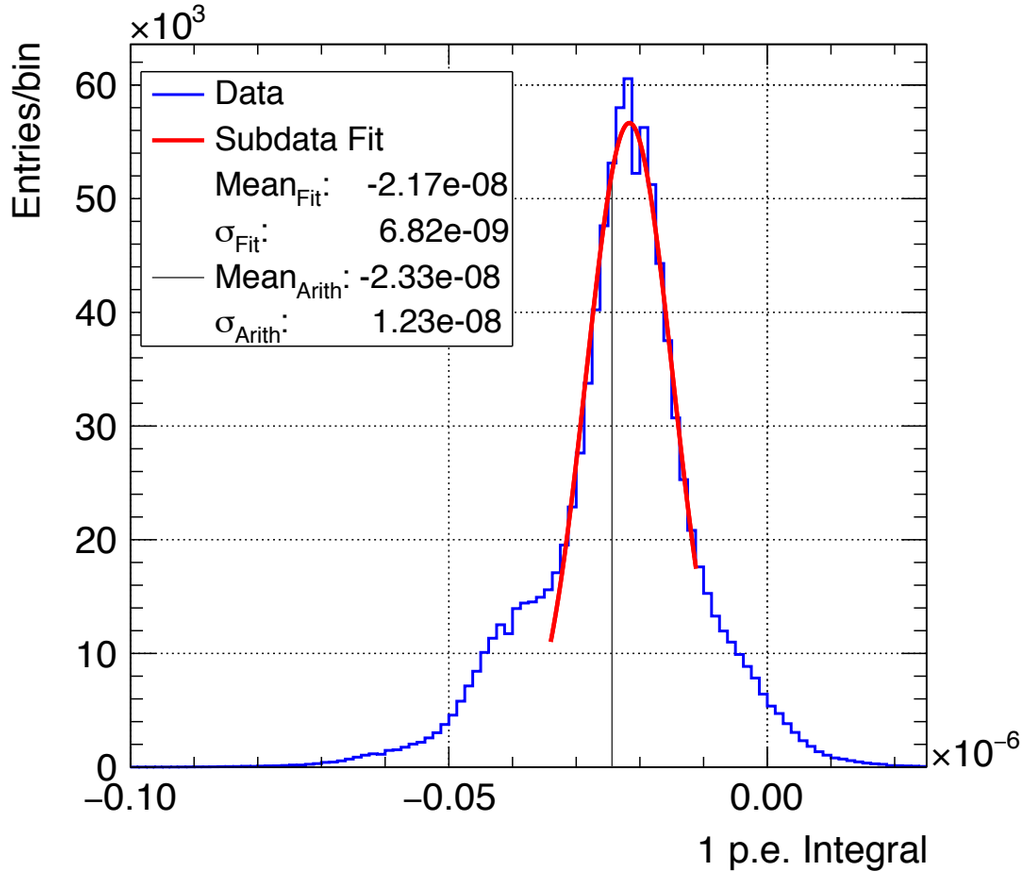


MPPC RADIATION DAMAGE

No irradiation



after 15 weeks



- 1 p.e. signal contaminated after irradiation

Summary

- PEN effort ongoing
  - First PS results promising
  - Scintillator manufacturing process delicate
- Adhesive side reflective foil lower light yield than non-adhesive side
- KETEK SiPM inferior to MPPC
- Radiation damage observed in MPPC after Belle II commissioning