

Barrel slice assembly

-Present status and ongoing preparations-

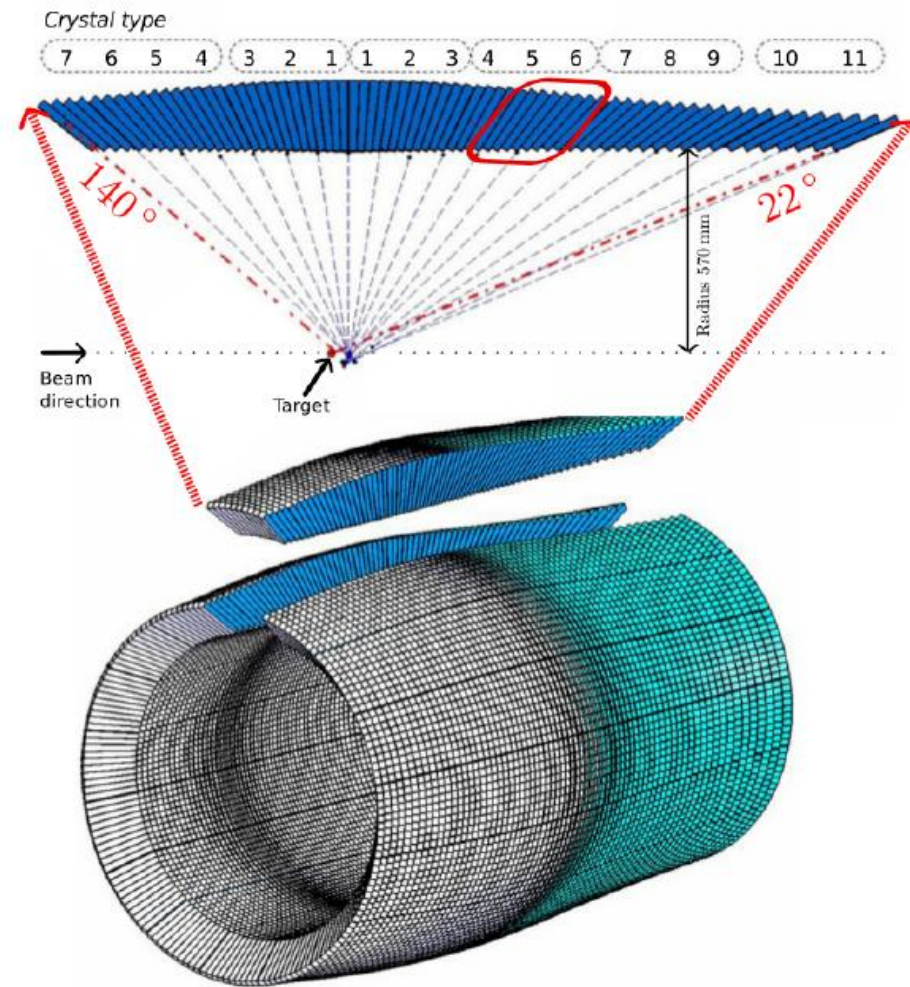
Markus Moritz, 2nd Physics Institute

PANDA CM, June 2017

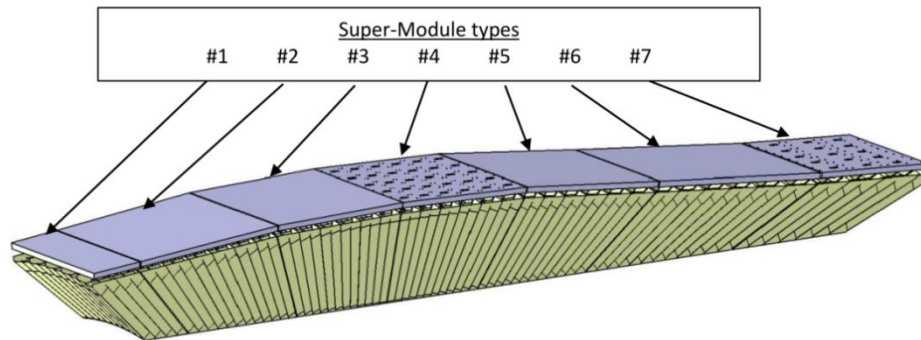


•Envisaged milestone:**Assembly of 1st full Barrel EMC Slice**

- 710 crystals in 11 different geometries.
- 1420 matched APDs after 1st screening, irradiation, 2nd screening.
- 710 APFEL ASICs
- 360 left and 360 right handed APFEL-ASIC flex PCBs
- 4500 m of signal cables.
- Cooling
- Capsules, Foils, ...

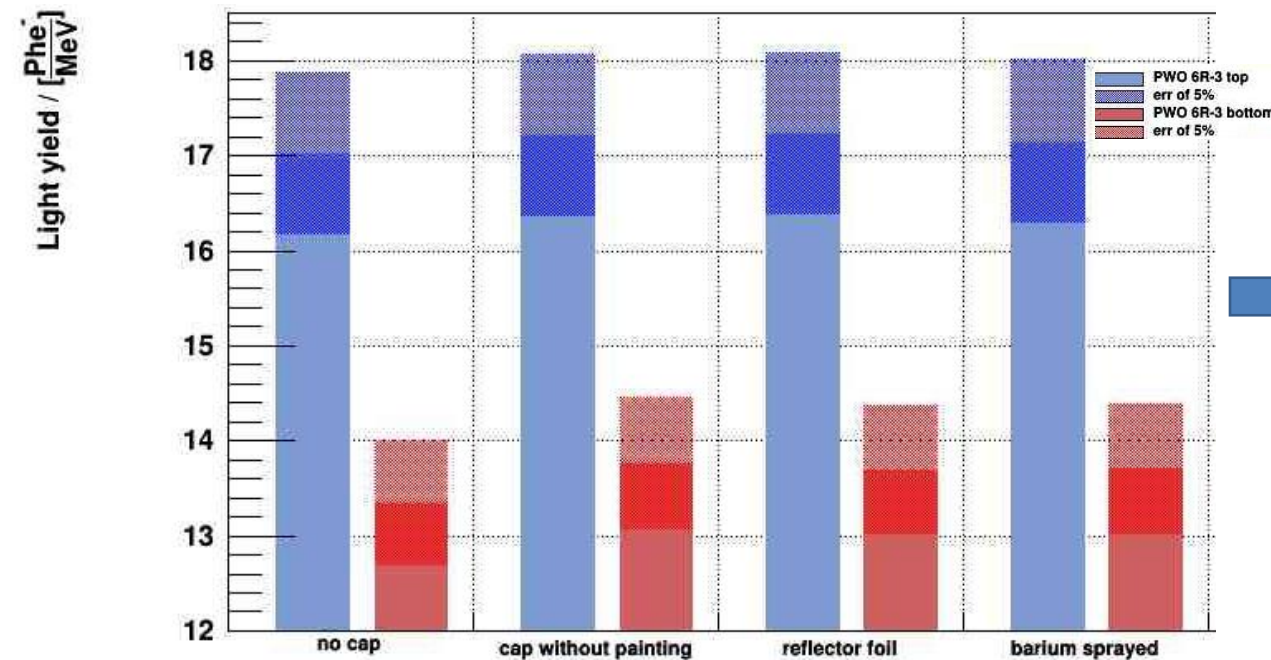
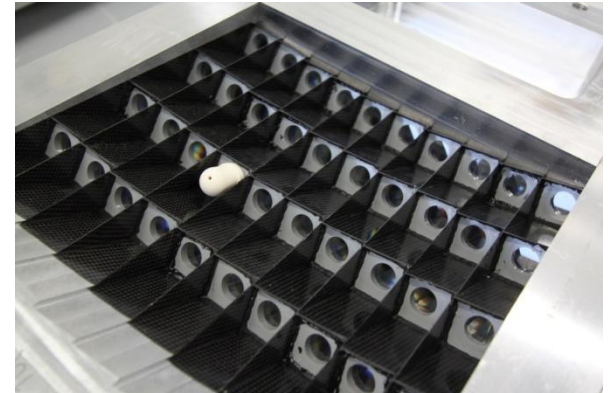
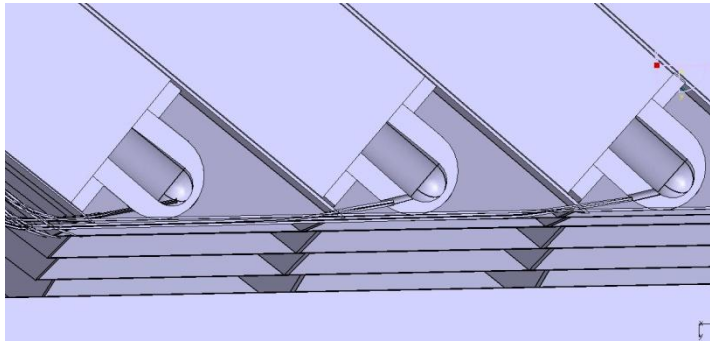


- Module assembly finished
- As soon as all Flex-PCBs are available Supermodule & Slice assembly can start.
- Afterwards: evaluation of mechanical design can be carried out
- Delivery Flex-PCBs to Gießen approximately in July



Major open Tasks:

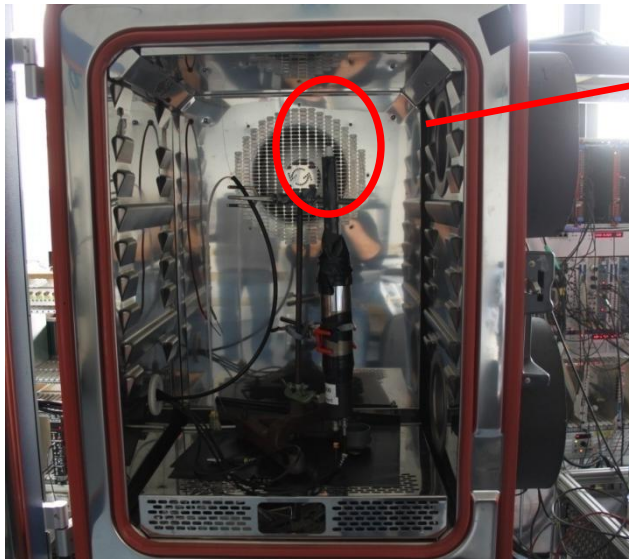
- Fiber coupling
- Cooling
- Electronic Shielding



No negative
impact on
the light
yield



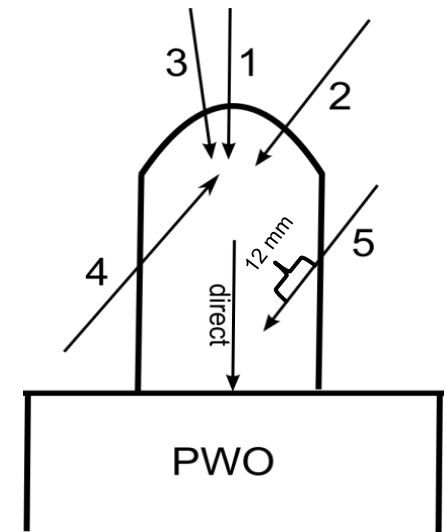
- How much light reach the APDs?
 - Setup:
 - Type 6 crystal with reflector foil
 - PMT
 - Old PROTO60 light pulser
 - Reflector for fiber coupling



pos	1	2	3	4	5	direct
	PMT signal / a.u.					
no coating	12368	9661	7543	6475	20713	2751388
reflective coating	22614	19193	15276	12325	30334	

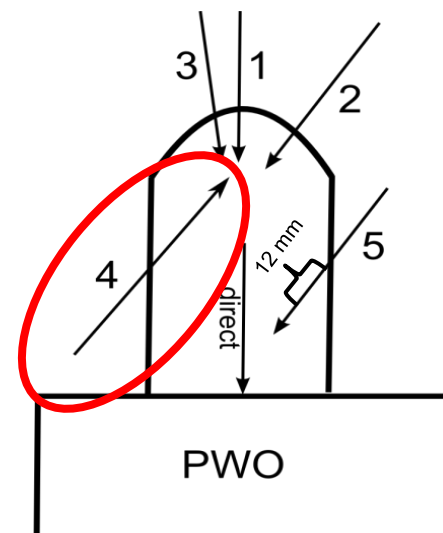
Measurements by Benjamin Wolfahrt

- Reflective coating ($BaSO_4$) increases efficiency by a factor of two.



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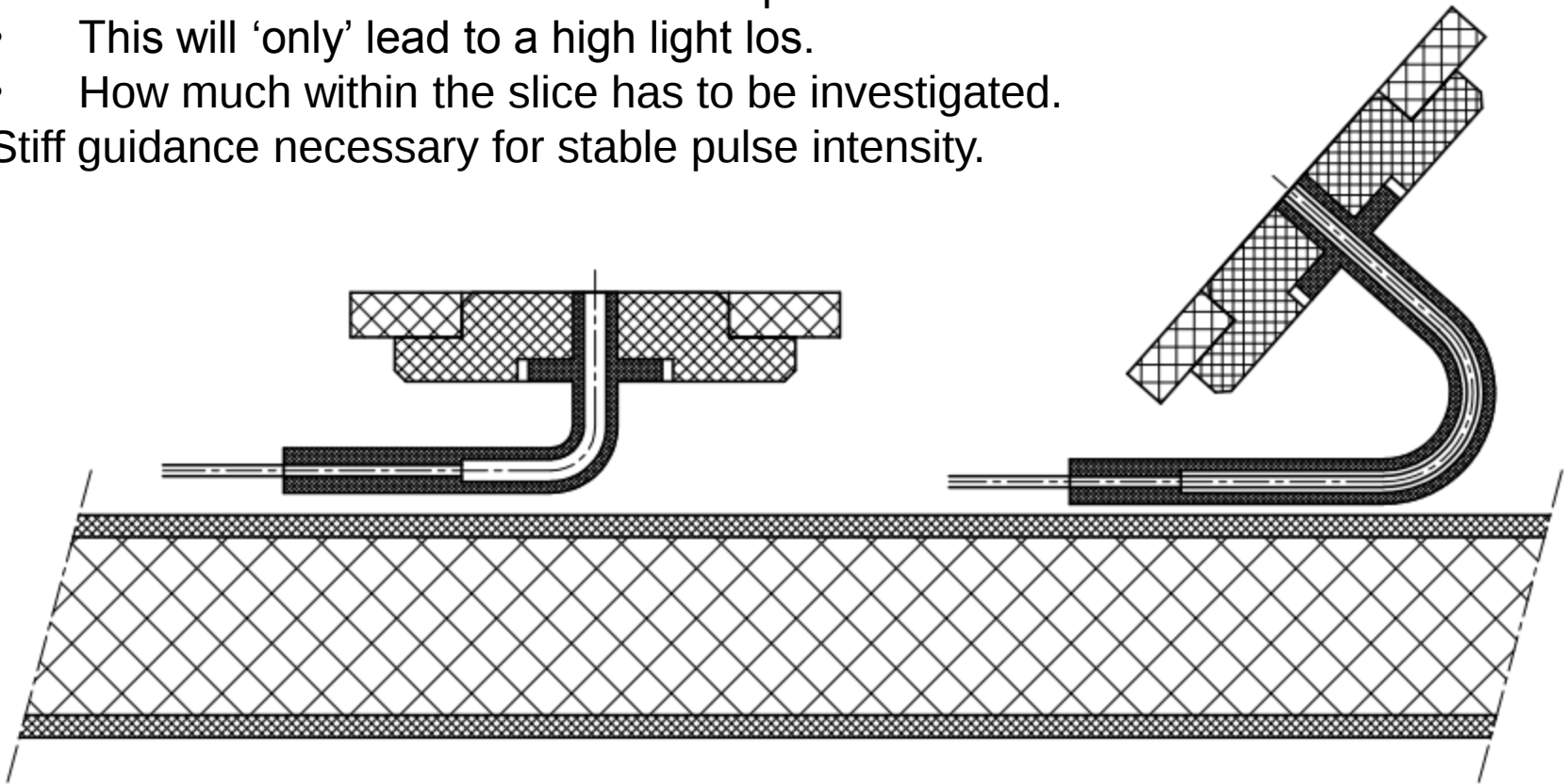
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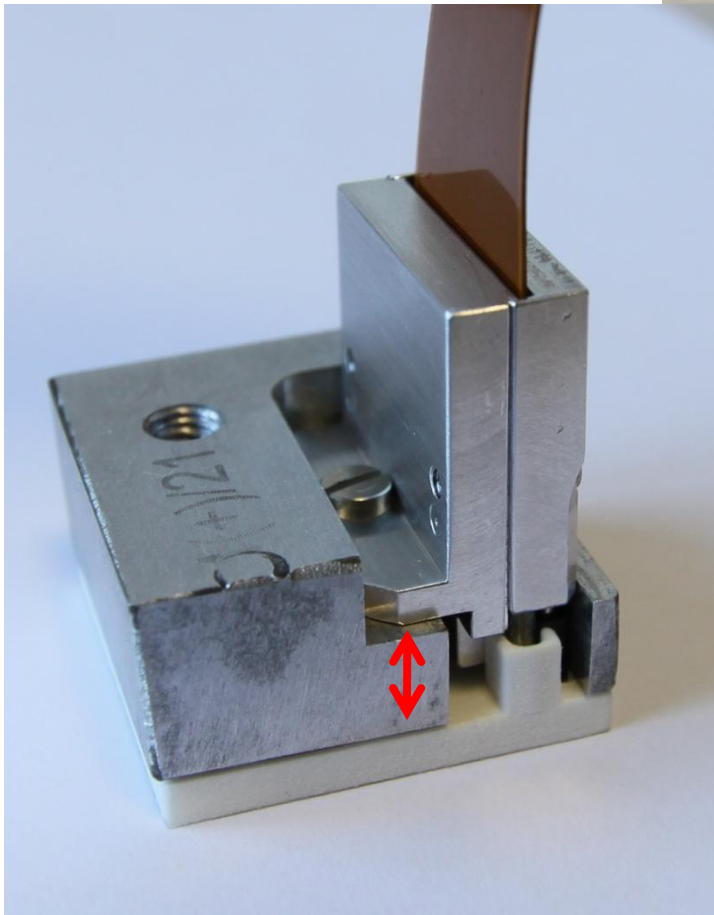


- Reflective coating ($BaSO_4$) increases efficiency by a factor of two.
- Worst case efficiency: 0,24% / 0,45 %
- Next steps:
 - Repeat with Bochum light pulser, determine energy equivalent of the signals, maybe 0,5 % will be sufficient.
 - Further optimisations

Alternative: bend fibers far above limit

- Fibers can bend much more than the specification allows.
 - This will 'only' lead to a high light loss.
 - How much within the slice has to be investigated.
- Stiff guidance necessary for stable pulse intensity.

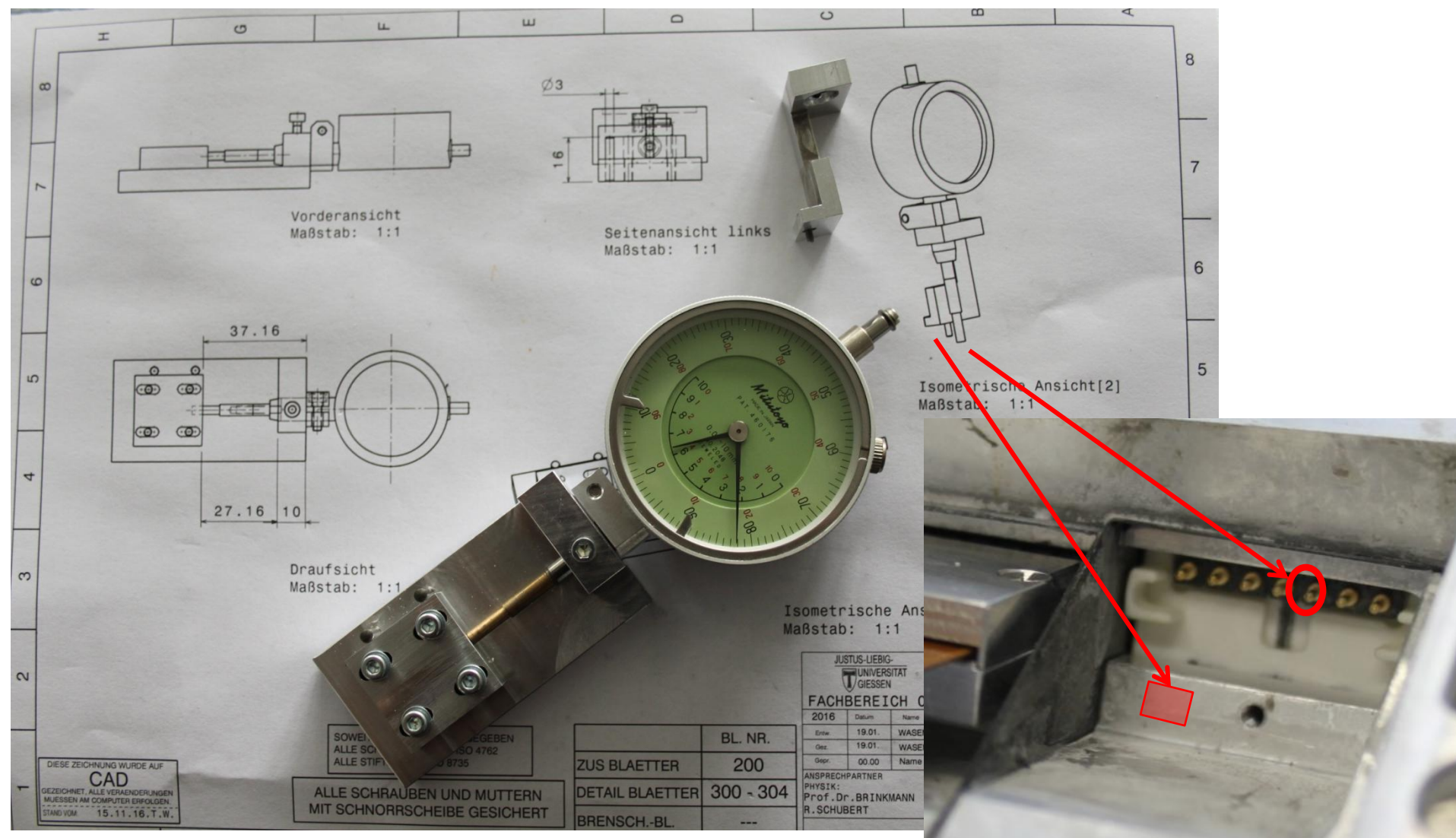




Large variation in
PROTO120



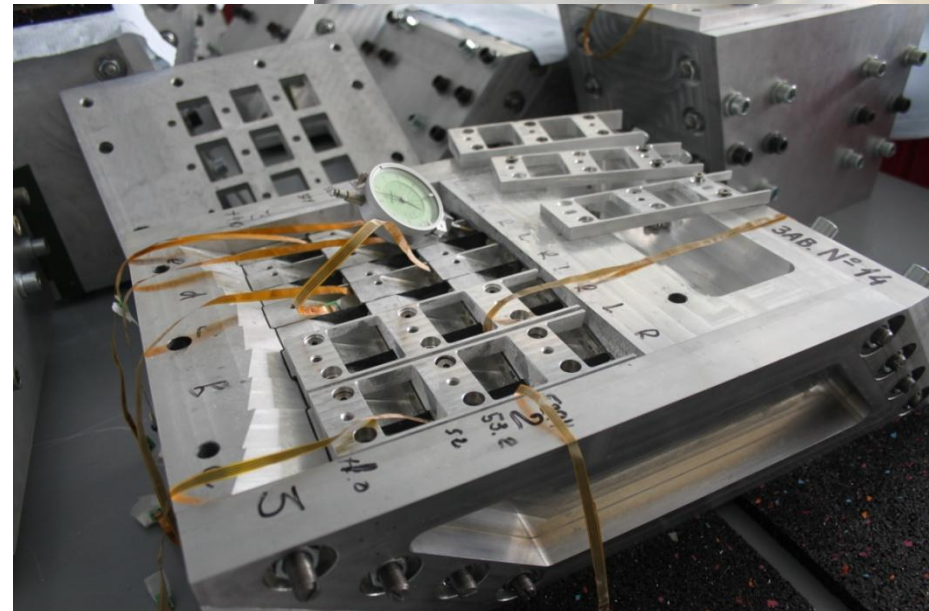
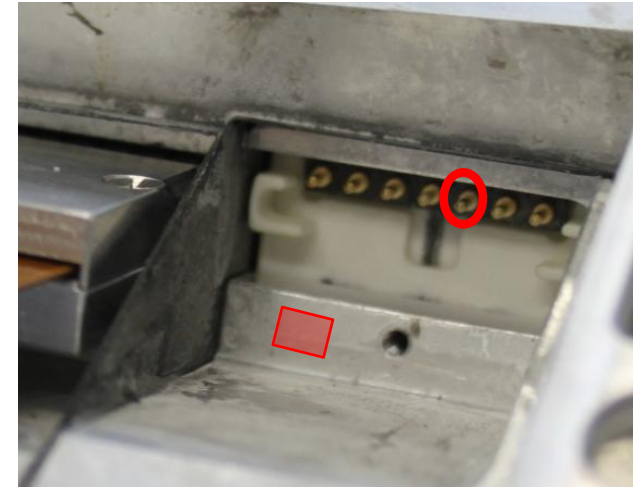
New Parts for first slice?

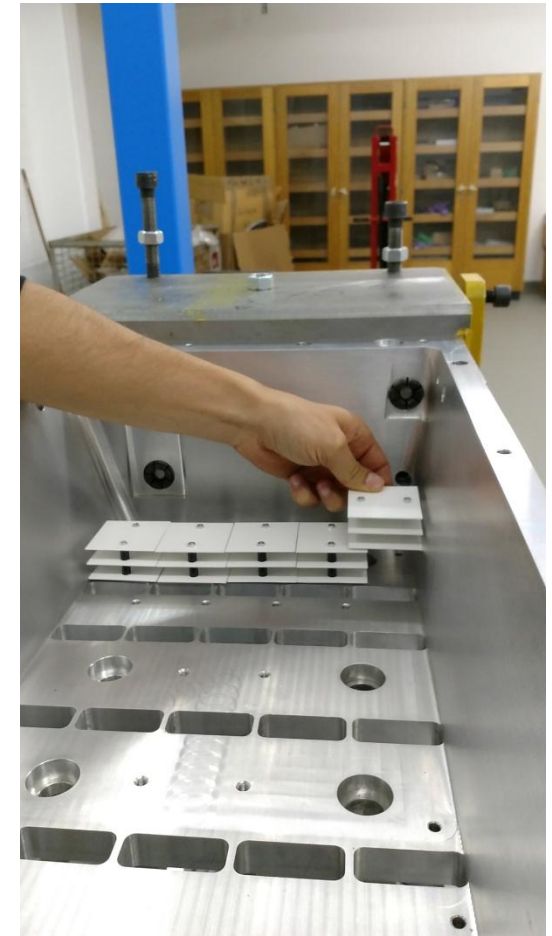
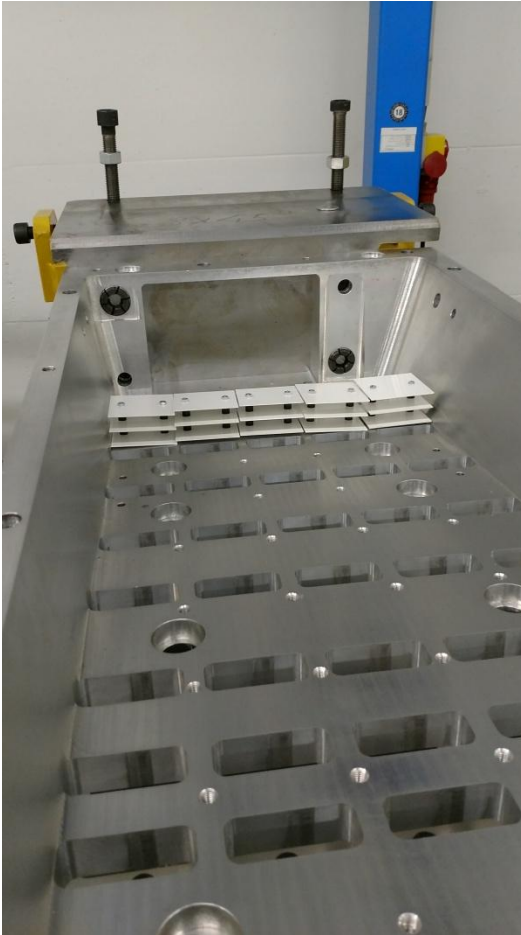


- Outcome so far:

- Modul 1m
0,31 mm to -0,88 mm variation
(insert-step to end of pins)
- Modul 11P (lower right pic.)
+0,4 mm to -0,75 mm variation
(insert-step to end of pins)

→ Contact problems ASIC-APDs
→ Has to be equalized by ASIC fixtures.



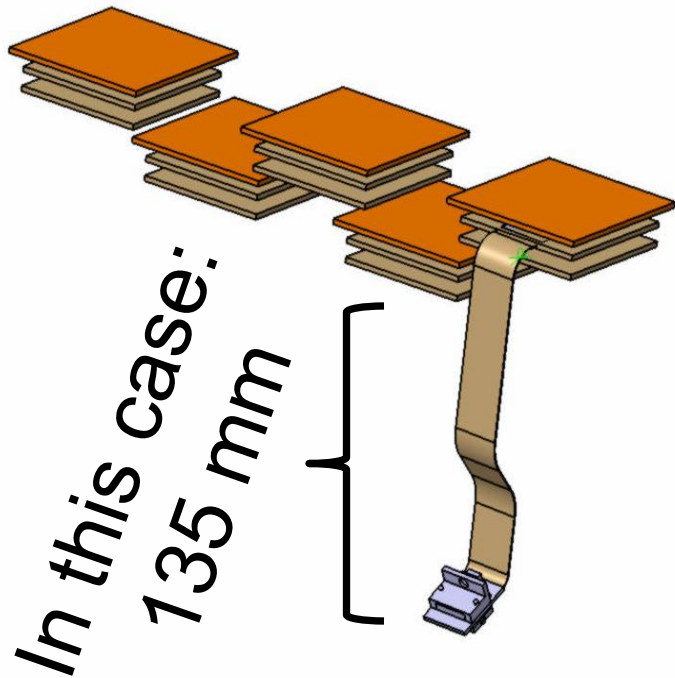


Not enough space near the bottom in forward direction due to the tapered shape

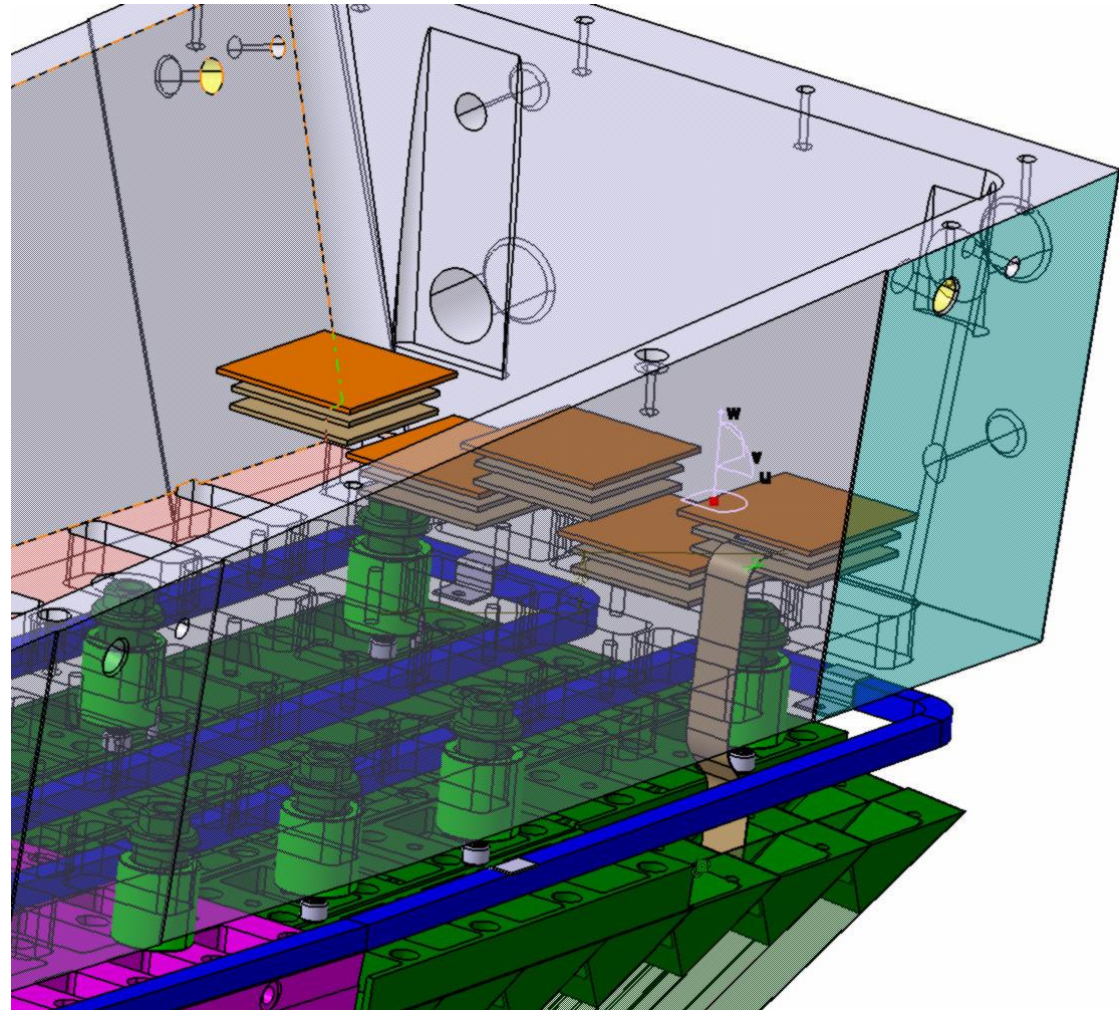


A few longer FLEX-PCBs needed

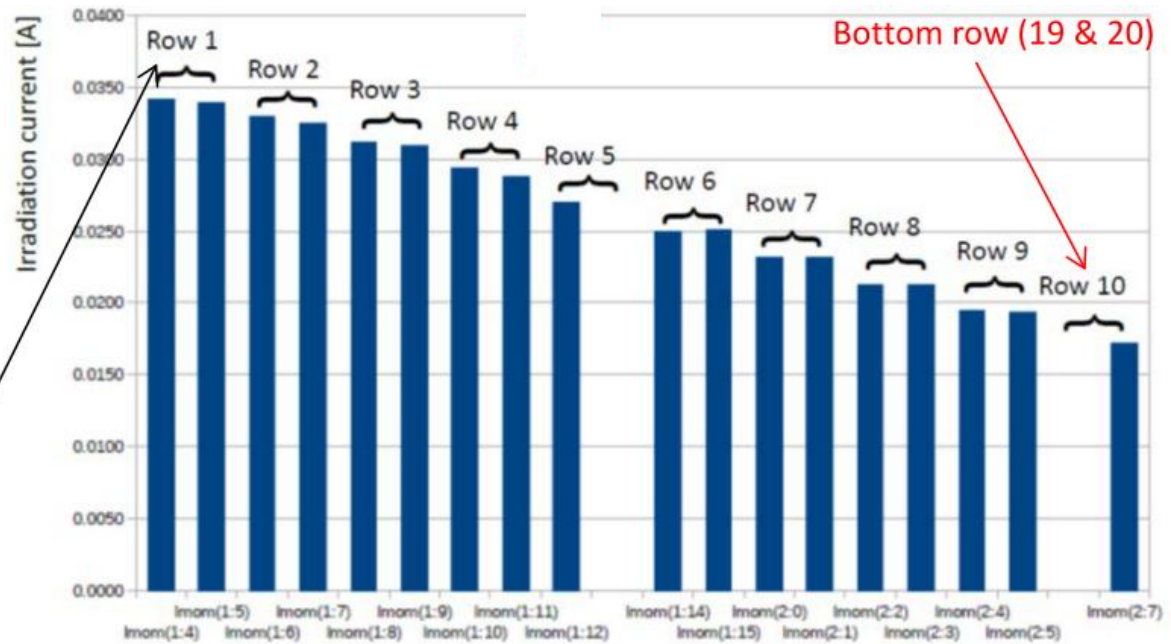
- To keep length short



Not available for slice assembly
this summer



irradiation current distribution within one grid @ 0 V

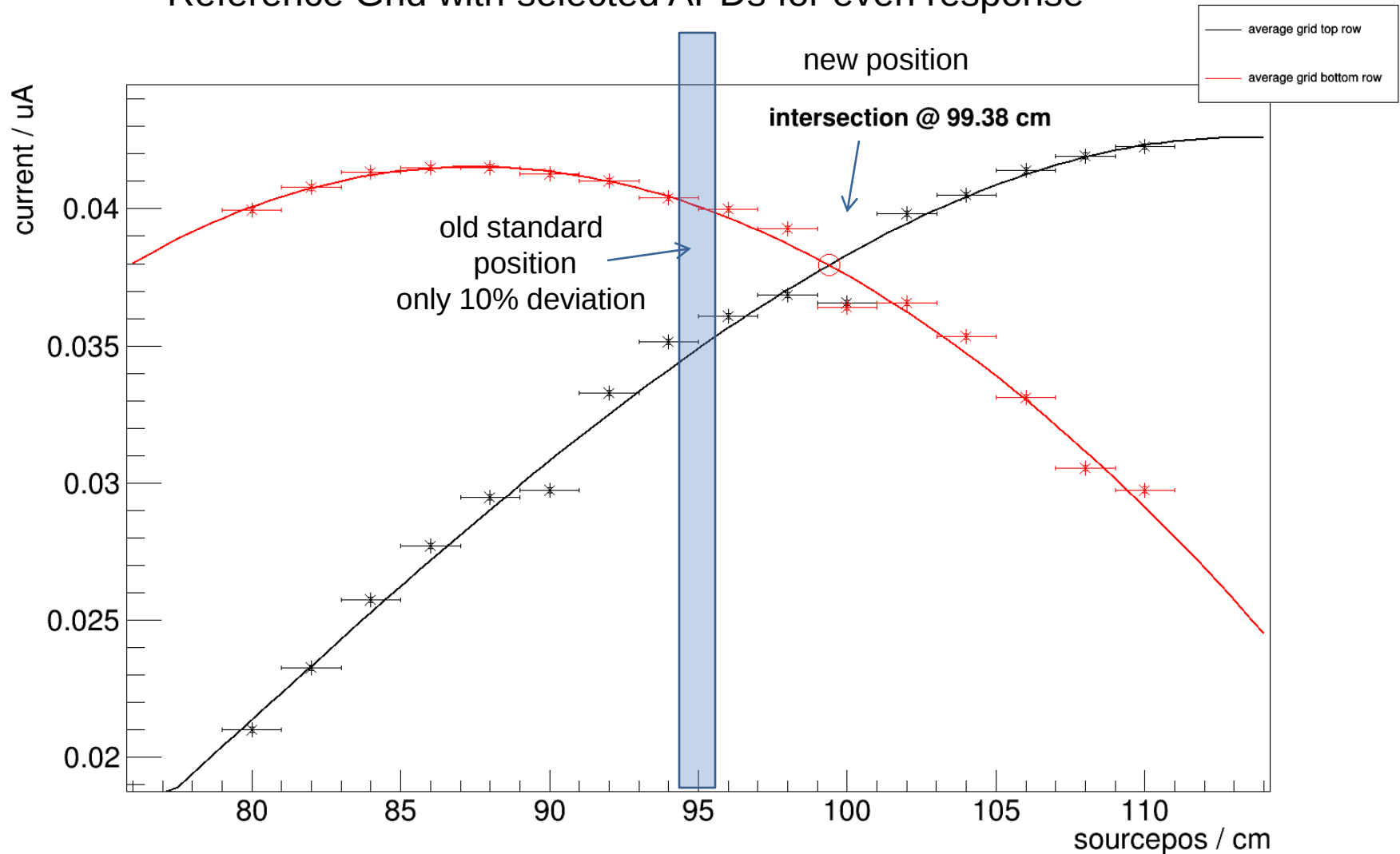


picture by Andrea

Top row (1 & 2)

➔ Inhomogeneous irradiation up to a factor of two ?

Reference Grid with selected APDs for even response

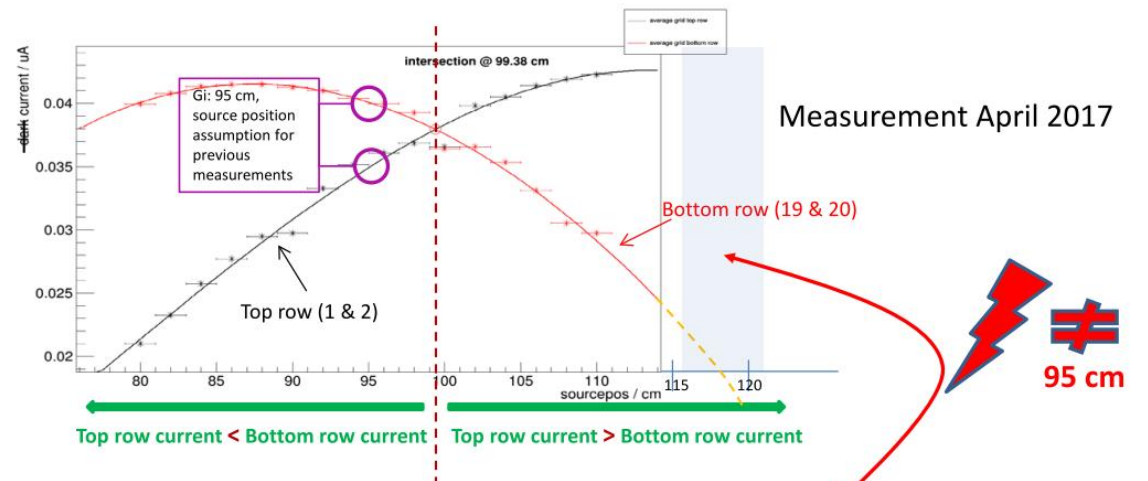


- How does that fit together?

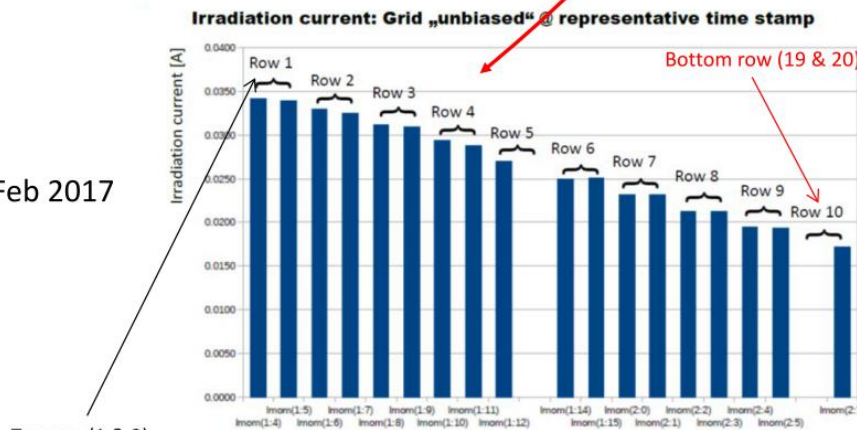
Radiation protection: higher source position was used by other experiments right before.



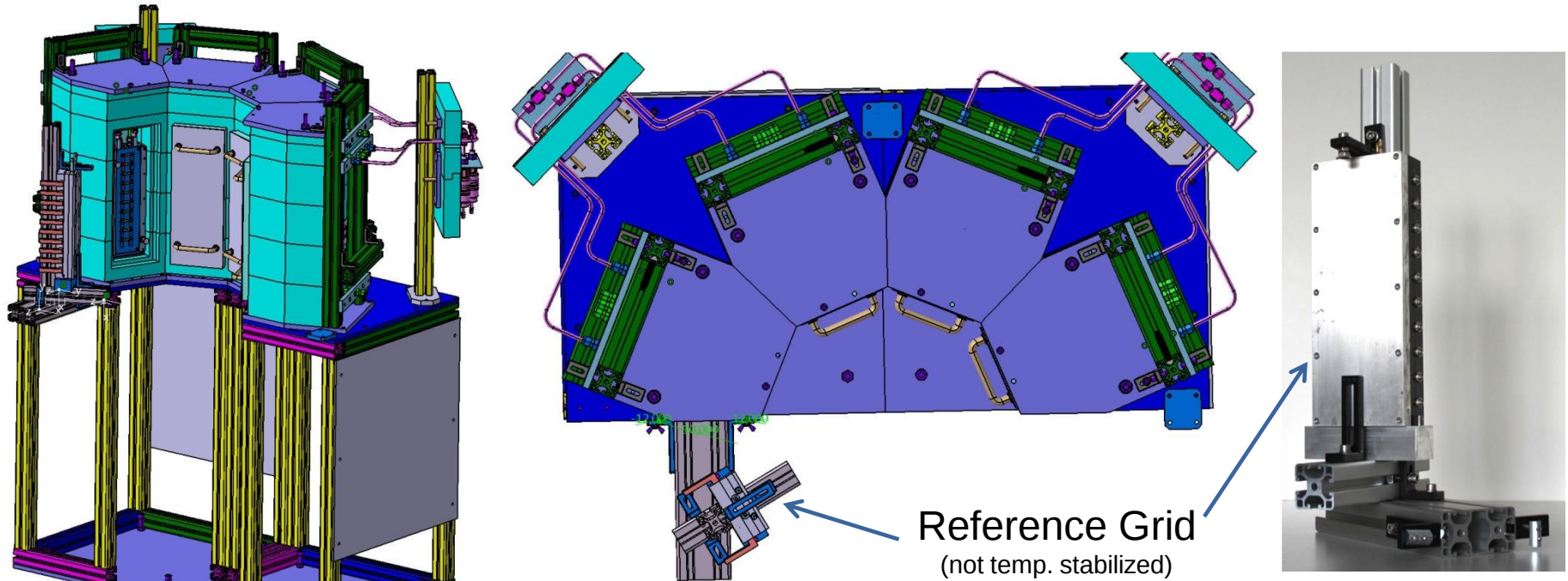
Initiated by Andrea:
Irradiation setup upgrade
for source monitoring



Measurement Jan/Feb 2017

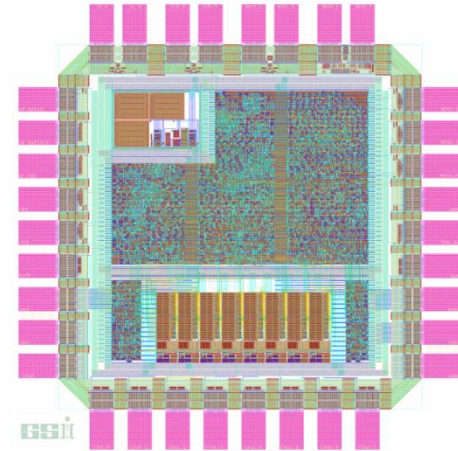


picture by Andrea

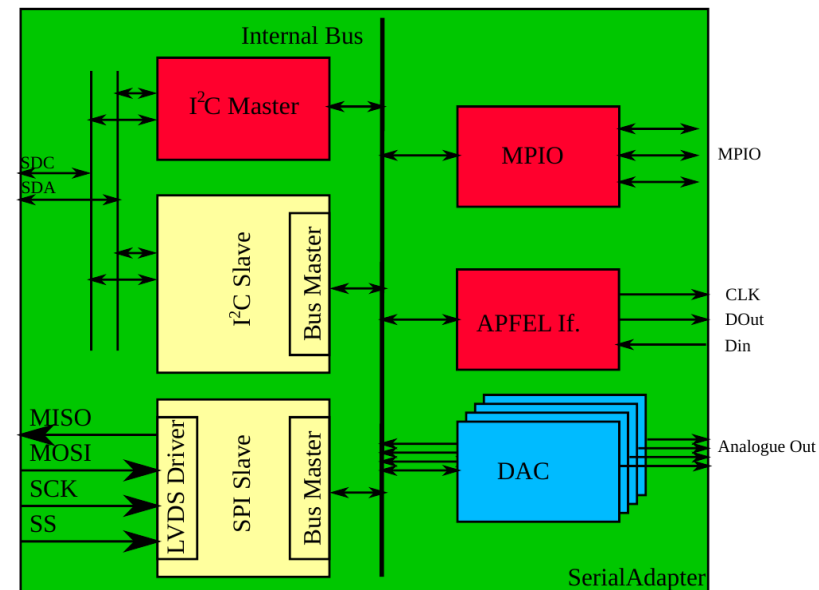
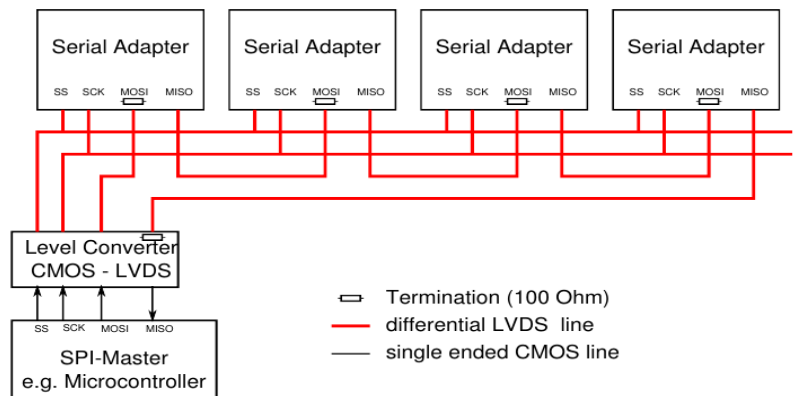


will be mounted right after this CM

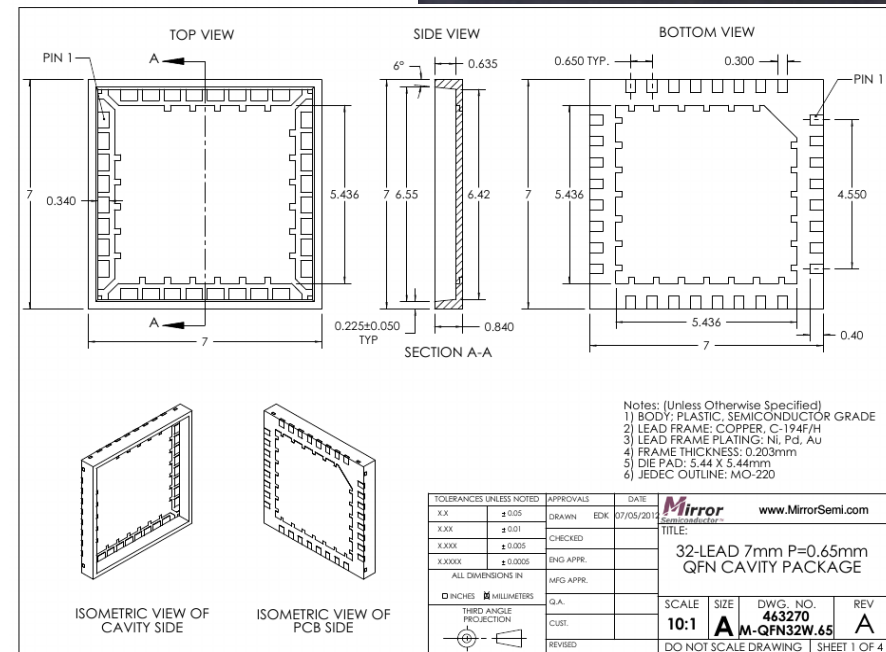
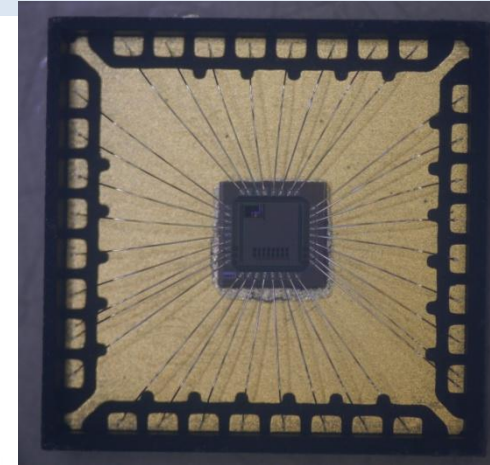
- Present design: two different buses for FE and HV regulators
- Idea: integrated Slow Control ASIC with common bus (H. Flemming, GSI, Mar 2016)
- Daisy chaining of Backend-Interface for 5 (10) Backplane PCBs → Saves 4/5 of Slow Control Cables (36 vs. 180)



Using a daisy chained SPI interface



- Begin 2017: first UMC180 MPW prototypes available (Bonn).
- Last week:
 - Mounting in OpenFrame package QFN32W0.65 (Bonn).
 - Basic functionality verified (Christoph).
- Thorough evaluation pending (JLU)
 - Packaged ASICs available this week.
- Funding of full size production (> 4000 pcs) submitted.



- **Fiber coupling concept**
 - LY loses / gains within Error bars
 - Efficiency for light pulses down to 0,5 %
 - Alternative: Fibers bend far above limit. Efficiency has to be tested.
- **ASICS with Flex-PCBs**
 - Still expected in July ?
 - Not all Crystals can be read out with these Flex-PCBs
 - Corresponding crystals will be upgraded later.
- **Inserts / ASIC mounting**
 - Sample inspection indicates possible contact problems ASIC-APDs.
 - ASCI fixture has to be adjustable in order to compensate differences.
- **APD irradiation setup**
 - Source position optimised.
 - New position eliminates dose inhomogeneity of 10 % within a grid.
 - Upgrade source monitoring with reference grid soon.
- **Serial Adapter ASIC**
 - Reduces number of Slow Control cables significant.
 - First prototypes available.
 - Detailed tests soon.

