Forward Endcap EMC Status

Thomas Held

Ruhr-Universität Bochum
Institut für Experimentalphysik I

PANDA Collaboration Meeting 17/2, GSI
June 8th, 2017

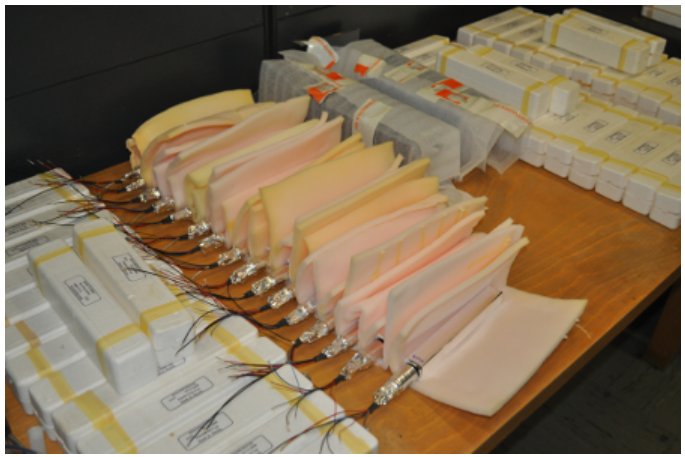
RUHR UNIVERSITÄT BOCHUM RUB

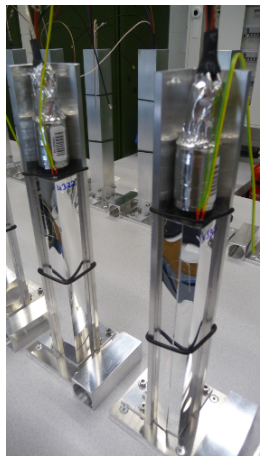
Outline

- VPTT subunit production started
- Aluminum back cover and electronics frame finished
- Coolant feeding/draining pipes (through magnet) finished
- Insertion of forward endcap into Panda magnet
- Light pulser (paper)
- Summary/Outlook

Subunit Production

- VPTT subunit production started
- Crystal-detector units for 5 subunits finished
- Production rate currently about 1 subunit per week
- Rate will be increased to about 2 1/2 units per week
- 5 (out of 80) glueings redone, no electrical rejects so far

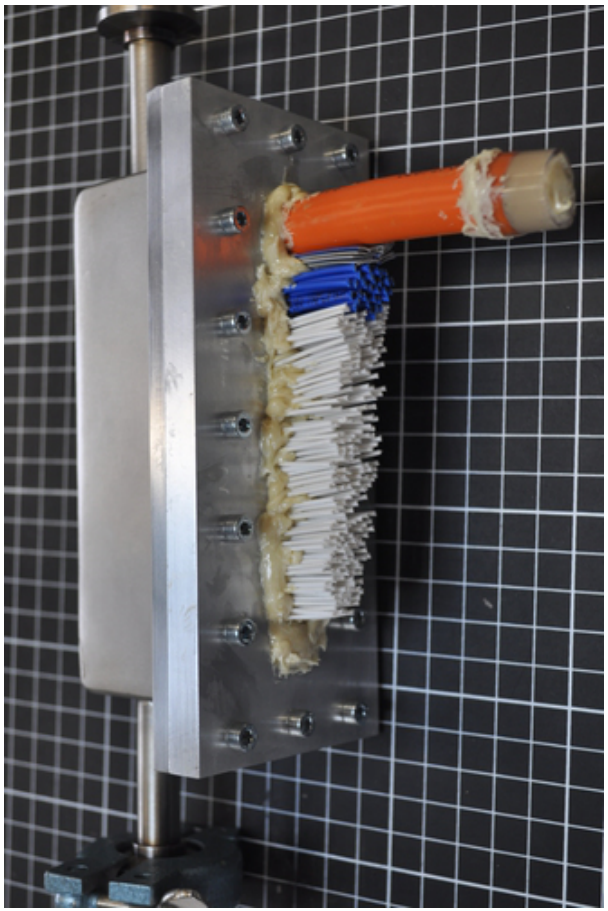




Aluminum Back Lid and Electronics Frame

- Back lid flattened by welding company
- Still some distortion but expected to be manageable

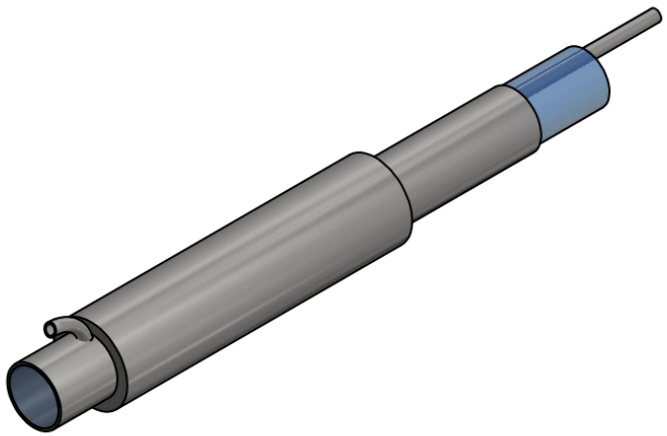




- All parts of "electronics frame" finished

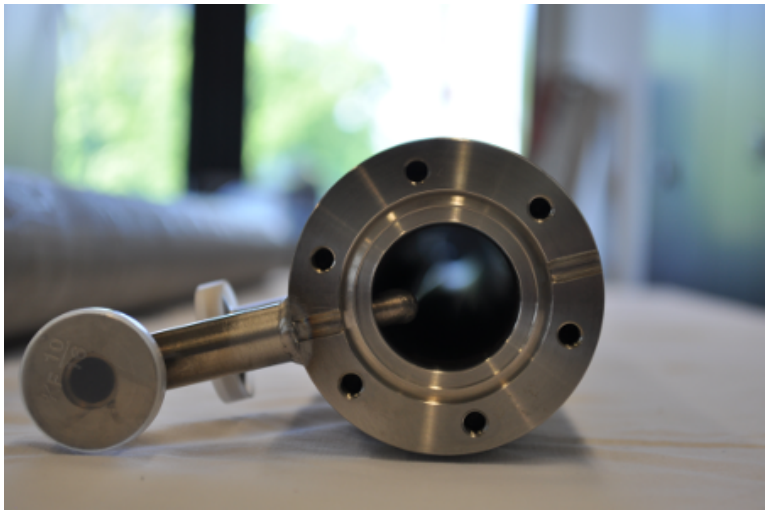
Coolant Feeding/Draining Pipes

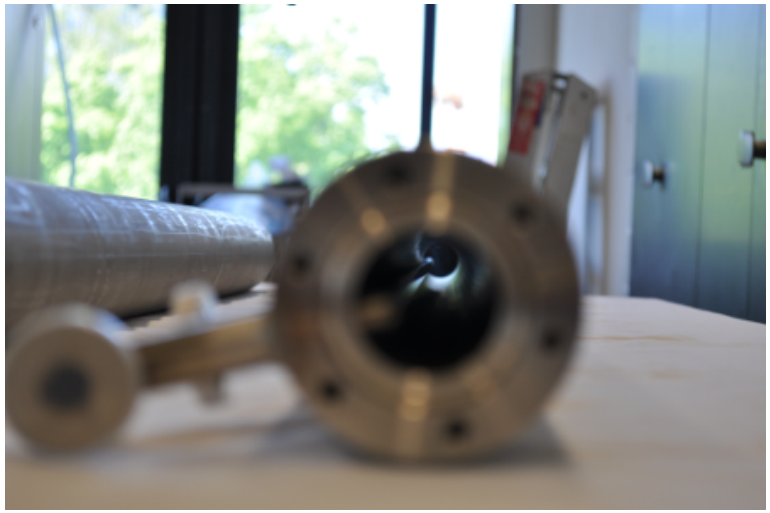
- All coolant supply lines of magnet feed throughs delivered
- Vacuum isolation with Oerlikon Leybold KF gas lock valve
- Three types of pipes: front/side cooling, backplate cooling w/ and w/o dry air pipe inside



Coolant Feeding/Draining Pipes

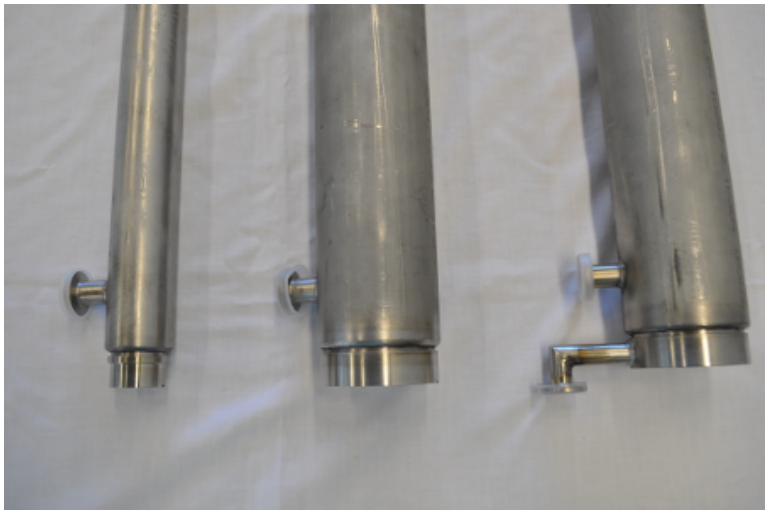
- Dry air supply line running inside coolant supply line in order to cool down/keep cool

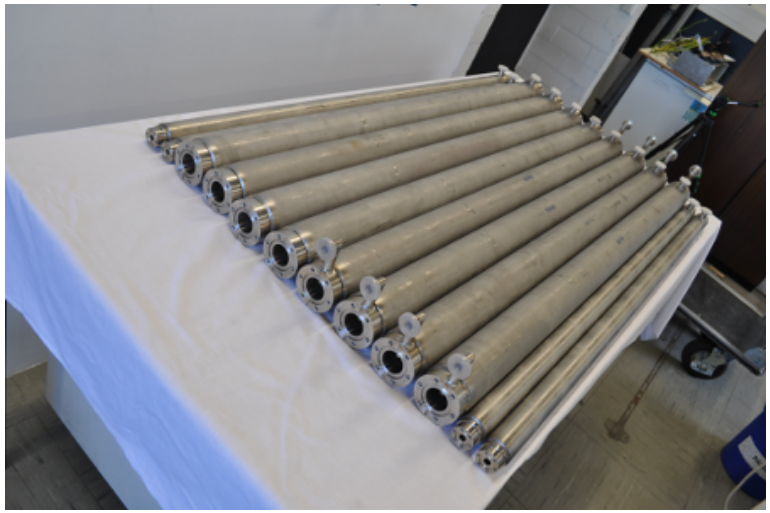


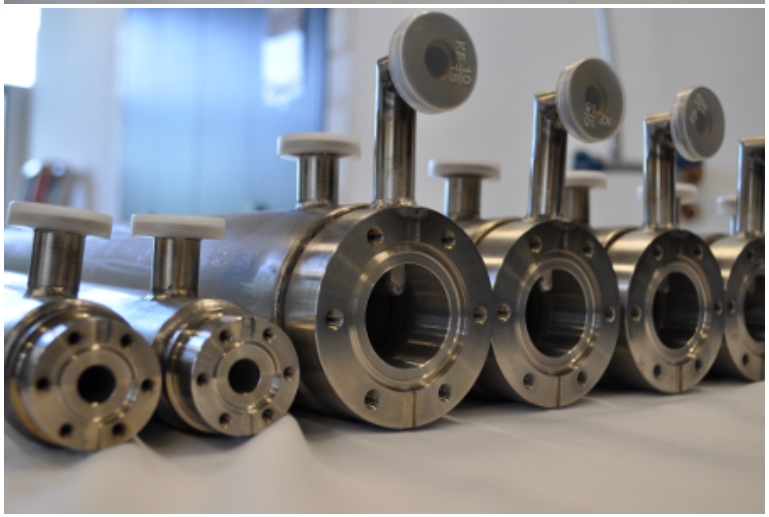


Coolant Feeding/Draining Pipes

- All pipe types with evacuation valve

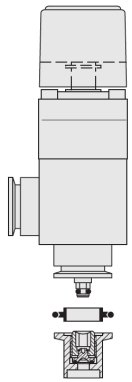






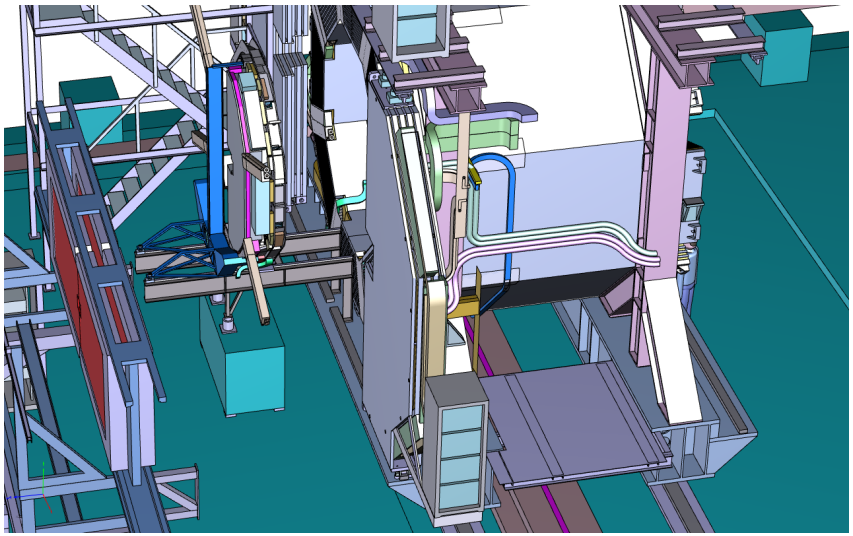
Kat.-Nummern

283 25/26/27
283 21/22/23
215 722



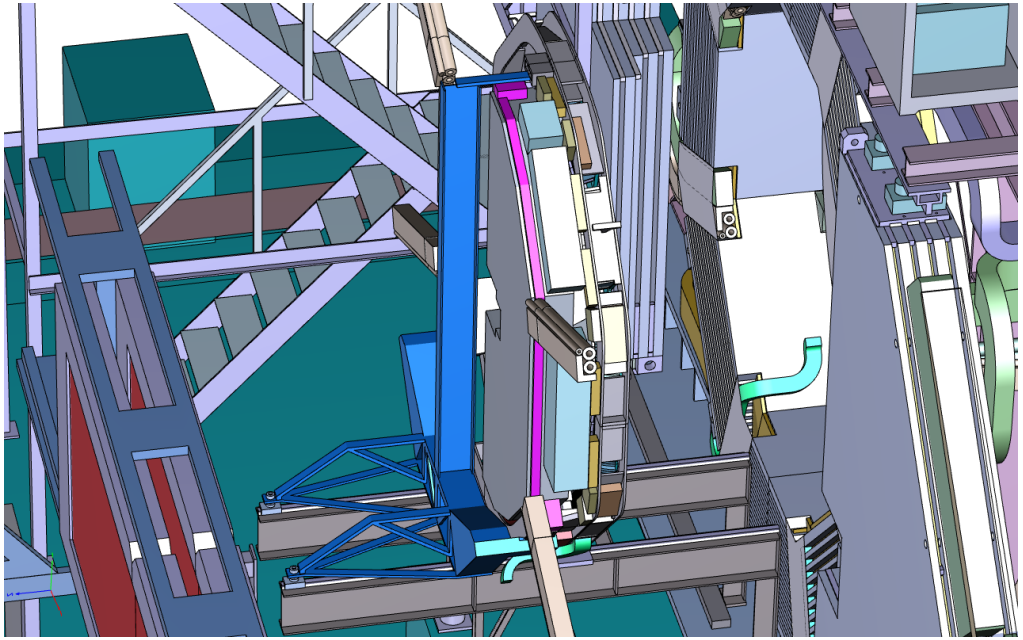
Insertion of Forward Endcap into Panda Magnet

- There has been a meeting in May at Jülich intended to discuss the forward endcap insertion into the Panda magnet
- All involved partys attending (Bochum, GSI, Jülich)
- Agreed on insertion procedure suggested by Jost



- Roll in of endcap on rails ending in front of magnet
- Clamp rolls on roll-in frame prevent fall over of endcap
- Suspension of forward endcap frame at most stable points (suggested by KVI engineers)

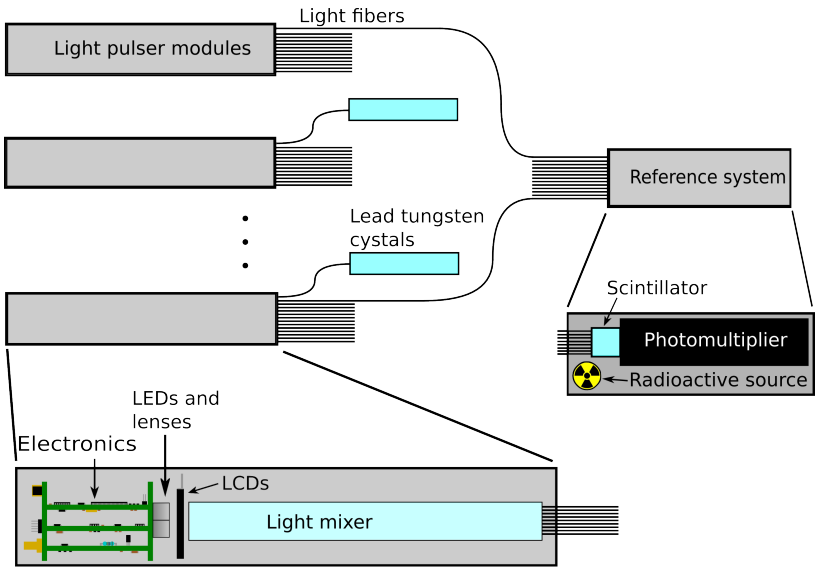
Insertion of Forward Endcap into Panda Magnet

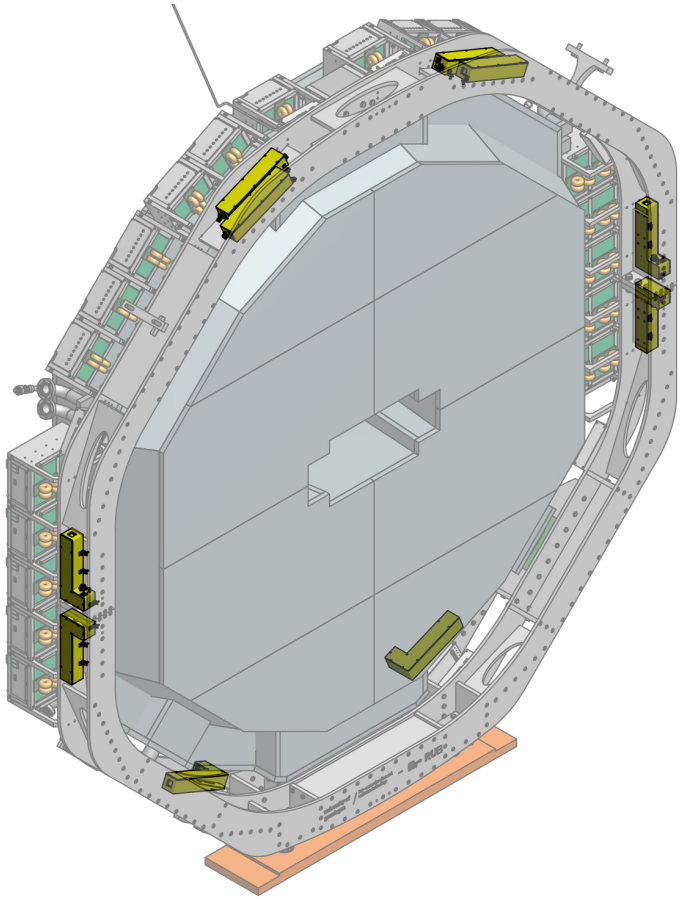


- Lowering of forward endcap into feed holes in magnet by very slight tilting (lowering at position of front bearings only)
- Additional securing by use of 8 securing screws on backplate (coupling also backplate to roll-in frame as during transport)
- Receiving endcap from transport frame in the same way as putting it into magnet
- Open: How to crane roll-in frame w/ endcap to rails?

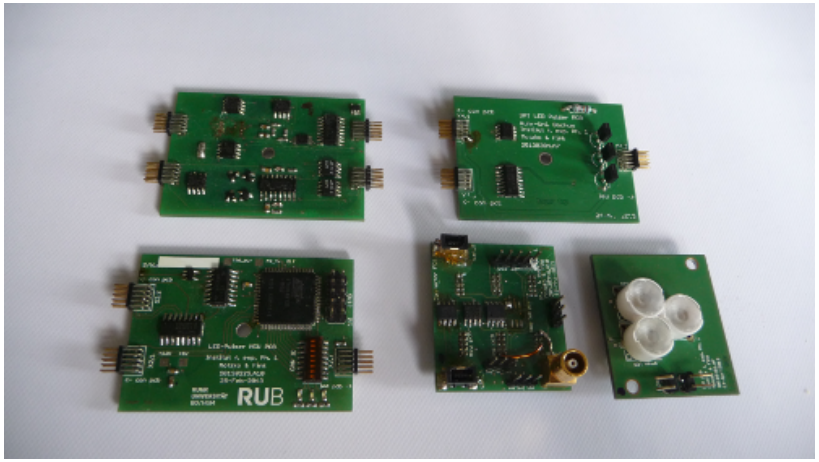
EMC Light Pulser: Intention

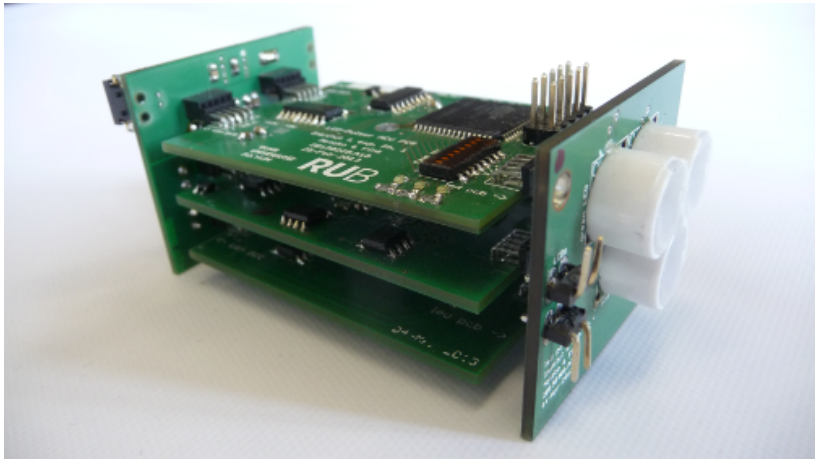
- System modeling $PbWO_4$ scintillation light
- Injection into every single crystal by light fibre bundle
- Several compact light sources (forward endcap: 10 units)





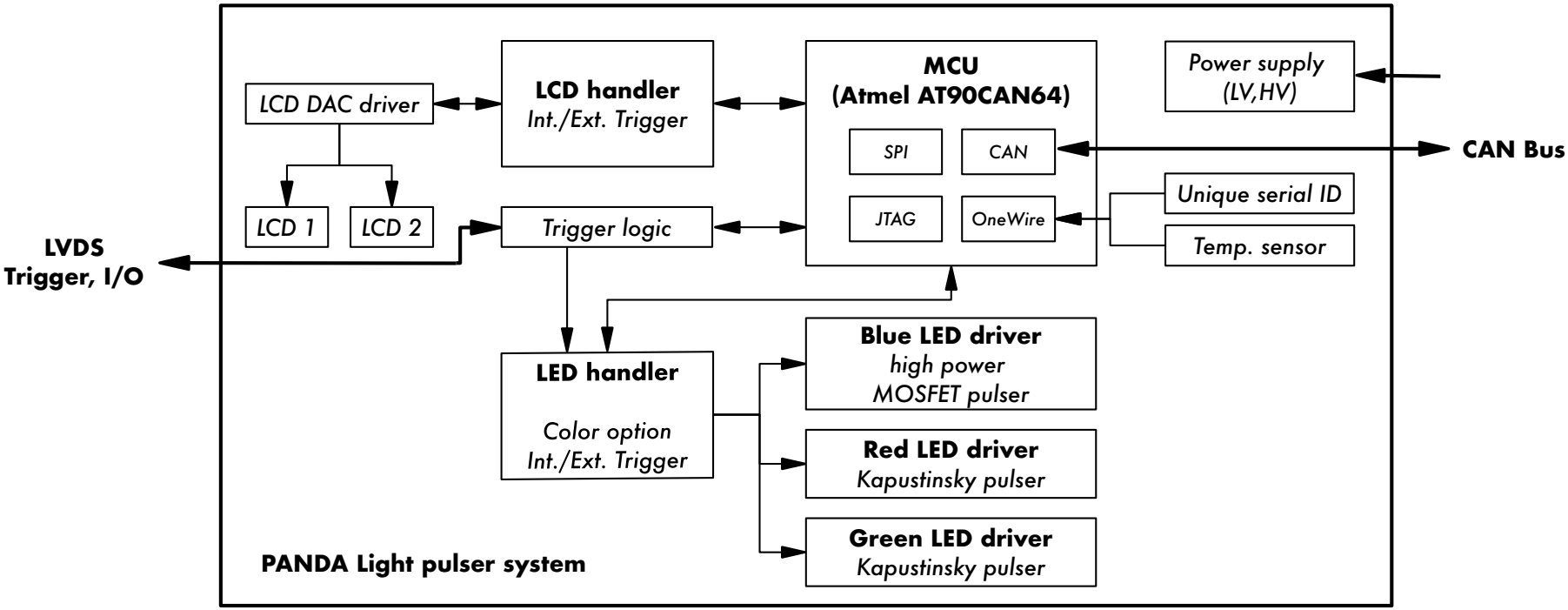
EMC Light Pulser: Light Source



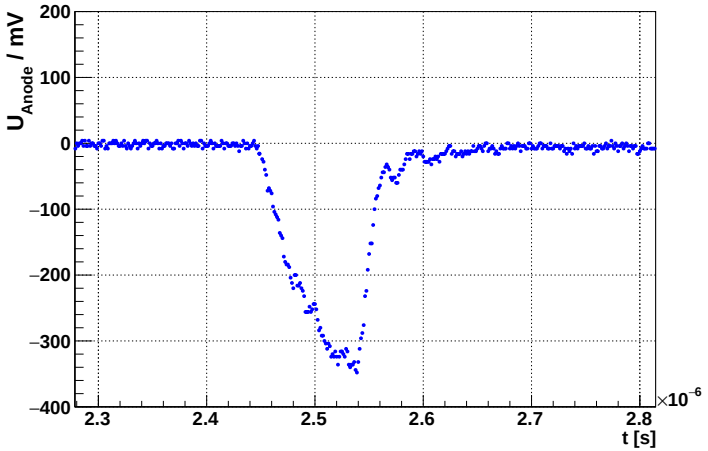


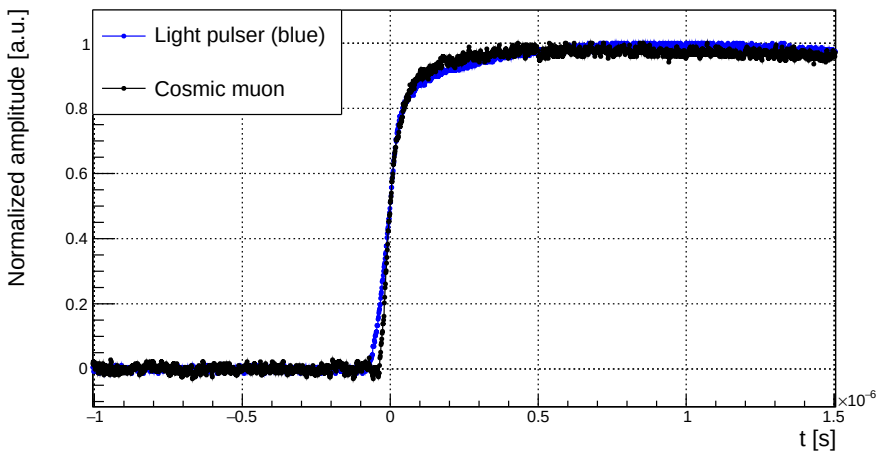
- Compact pack of interconnected PCBs:
  - Microcontroller
  - LED-drivers (blue and red/green)
  - LCD-drivers
  - Connector-PCB
  - LED-PCB

EMC Light Pulser: Light Source



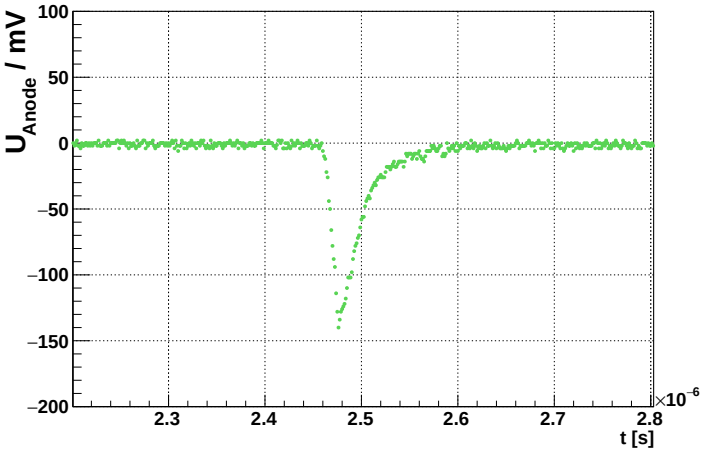
EMC Light Pulser: Light Source

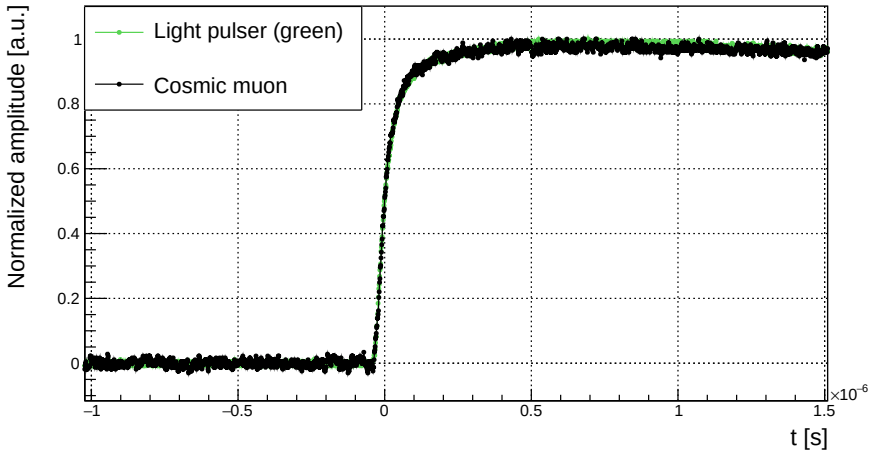




- Light pulse shape modeled to result in equal response of light pulser and (cosmics) scintillation at preamp output
- Testing the whole readout chain
  (photo detectors -> preamps -> ADCs...)
- High intensity blue LED pulse shaping challenging
  (full energy range)

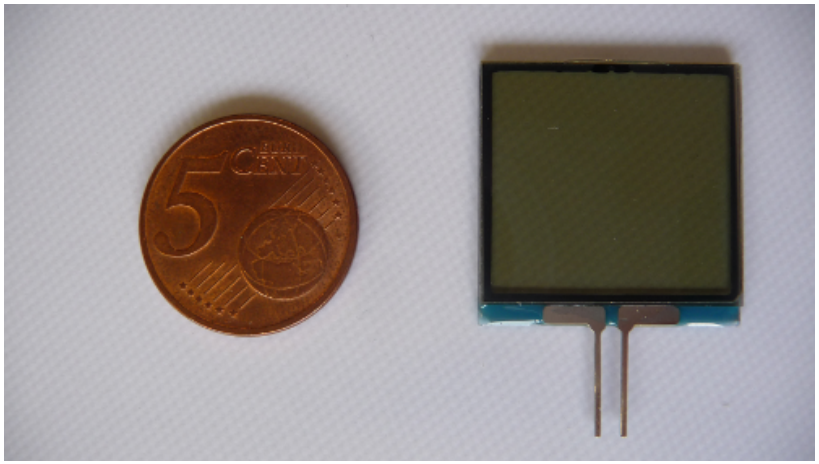
EMC Light Pulser: Light Source

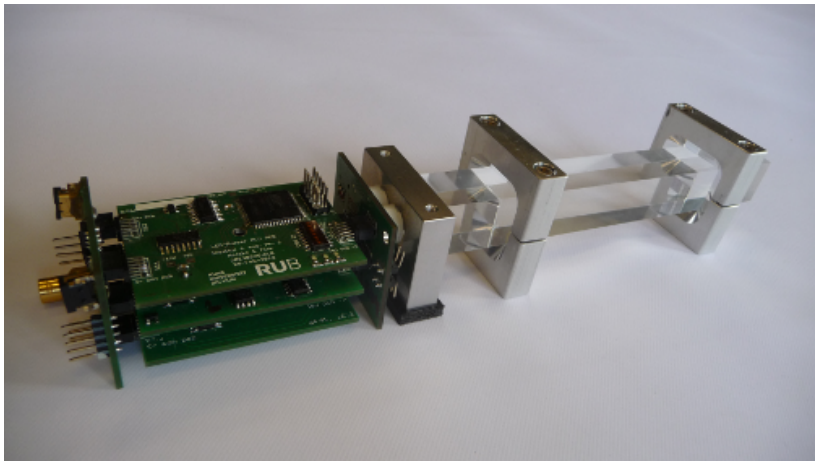




- Red and green low intensity LED pulses
  even closer to scintillation peamp response
- Covers only a fraction of whole range
- Allows distinction of radiation damage induced light losses (not occuring a red light wavelengths) from other sources of detrioration

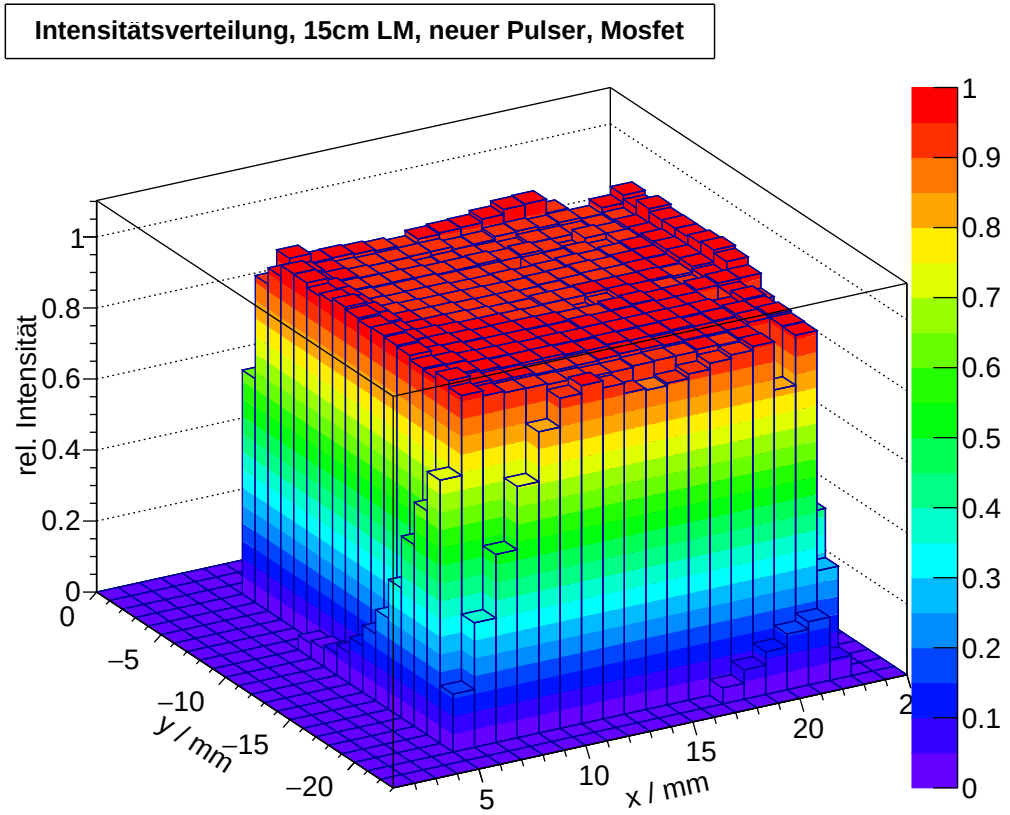
EMC Light Pulser: Light Source





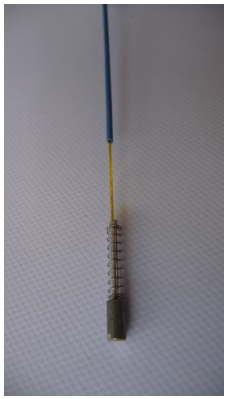
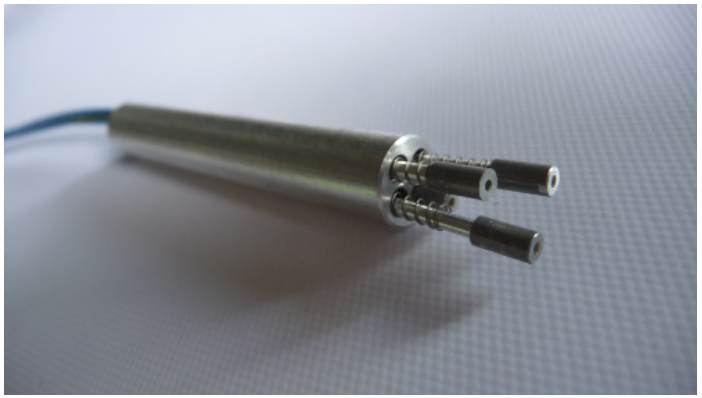
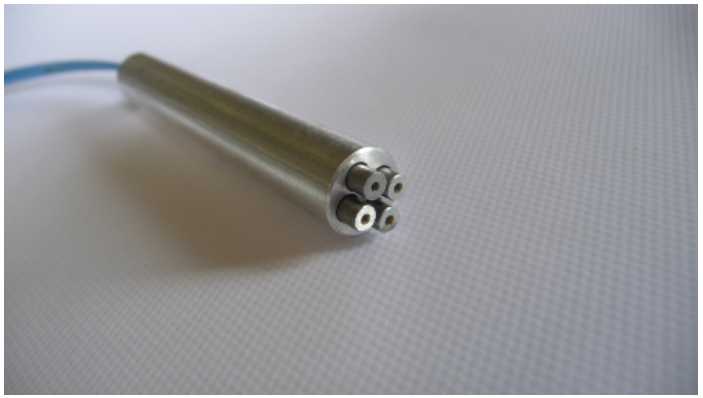
- Variable light intensity (LCDs) up to 12 GeV (forward endcap single crystal maximum)
- Compact overall design (LCD attenuator)
- No maintenance (no attenuation mechanics)
- Plexi glass light mixing bar

EMC Light Pulser: Light Source



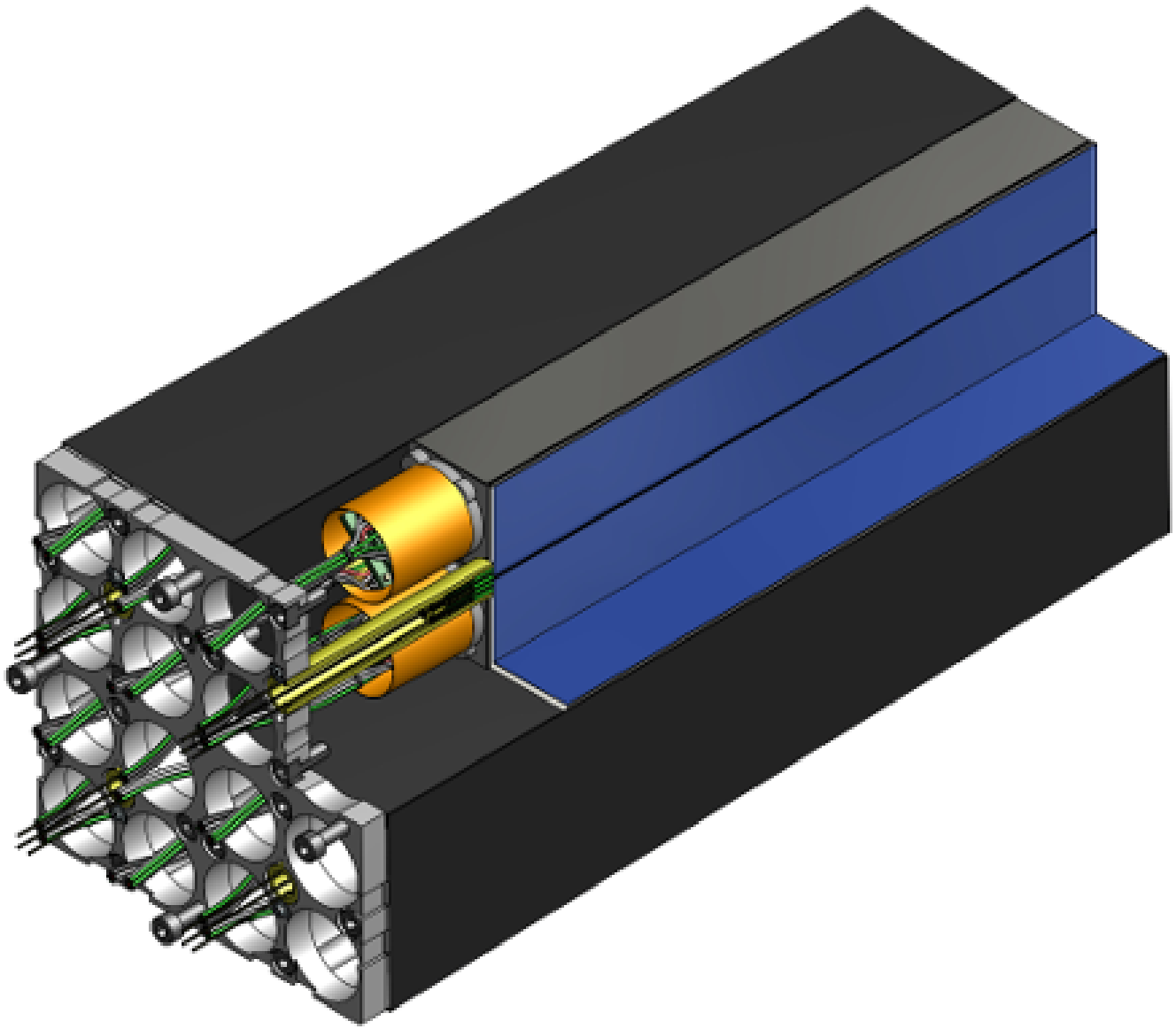
- Typical intensity profile at light mixer and face
- Intensity variation in the order of 5%
  for a given intensity setting

EMC Light Pulser: Light Distribution

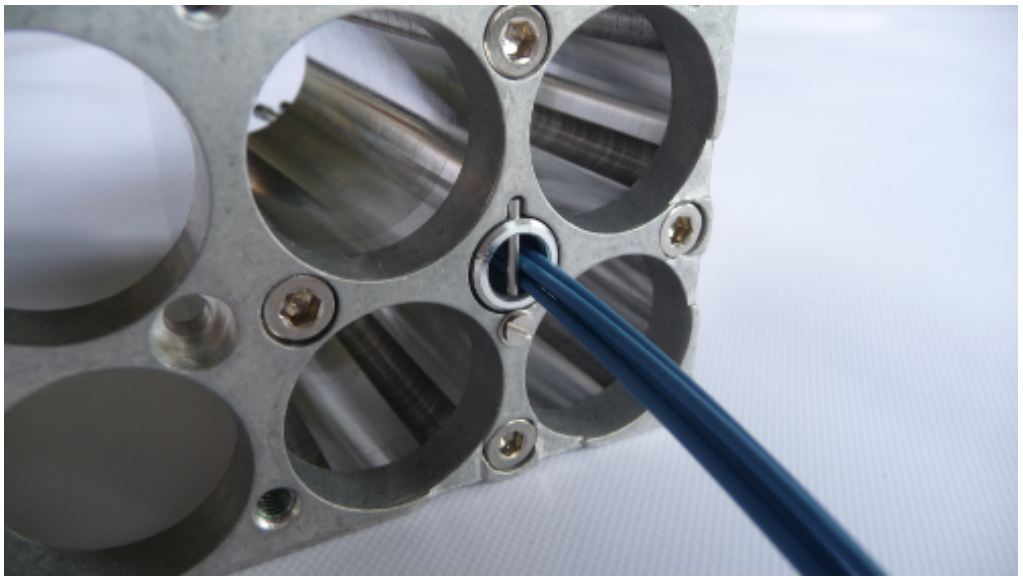




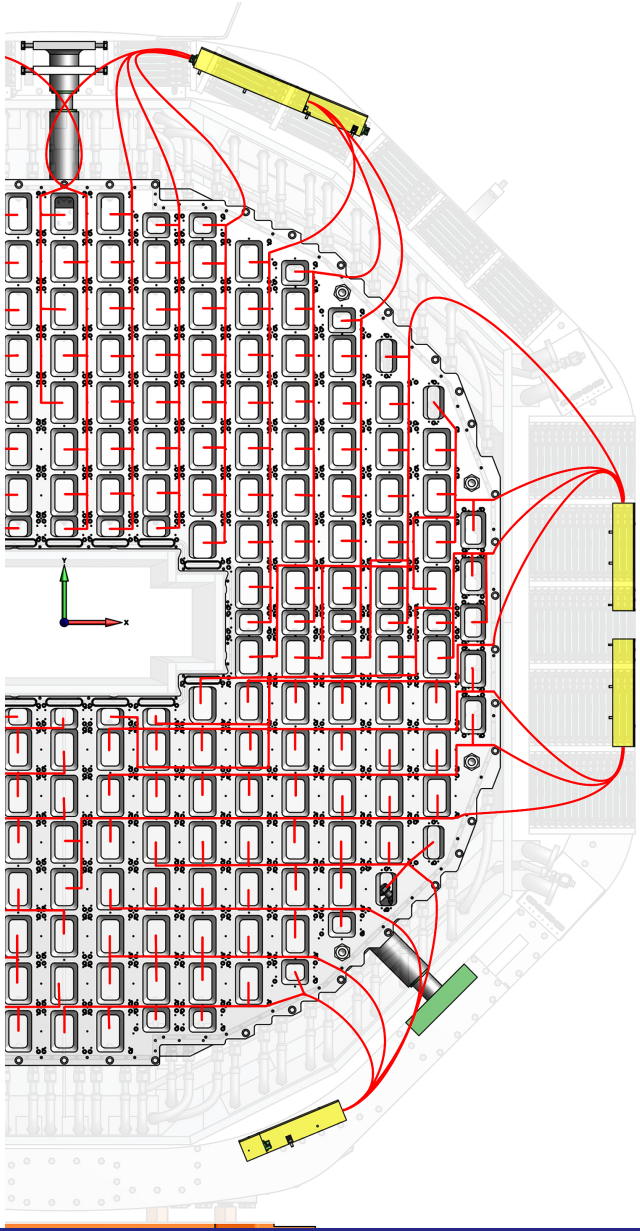
- Light fed to every single crystal by 4 x μm fibres (bending radius!) each, glued into one aluminum capsule
- Four capsules sitting spring loaded in one 4-crystal fibre plug
- Plugs sitting in mountplates of the subunits, light fed in from crystal read out side

EMC Light Pulser: Light Distribution



EMC Light Pulser: Light Distribution





- 4-crystal fibre plugs secured in mountplate
- Detailed routing schema for light fibre bundles
- Maximum fibre length about 2 m

Summary/Outlook

- VPTT subunit series mass production started
- APD subunit production to start around November, need to solve annealing LED cabling
- Finishing of mechanics of forward endcap progresses, to be done:
  - Front cooling piping
  - Finishing all tubing fittings on all coolant 'distributor bones'
  - Coolant flow tests and adjustment of flow
- Light pulser paper in good shape, to be done:
  - Stability of reference system (long term drifts)
  - Hadronic radiation hardness of LED driver (MOSFET) and microcontroller: n (GI), p (KVI)
- Modification of light pulser units for barrel use?
  - 10 times more light easily achievable
  - Increasing intensity at cost of dynamic range? (1 LCD attenuator only?)