



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Report on Working Group # 2

The MU2E detector: calorimeter

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LNF INFN Frascati

MUSE Scientific Board meeting

13-Sept-2018

Mu2e

Overall EMC status

- Analysis of Module-0 data completed
- Production for crystals and sensors is proceeding well
- **Test of radiation hardness of FEE, MB, DIRAC with dose done**
 - V3 of FEE needed
 - V2 of DIRAC also needed
- **Work on integration for mechanics proceeds**
 - next step is CRR end of October

Delivery and test of CsI prod-crystals

Working Baseline

Target: **July 2019**

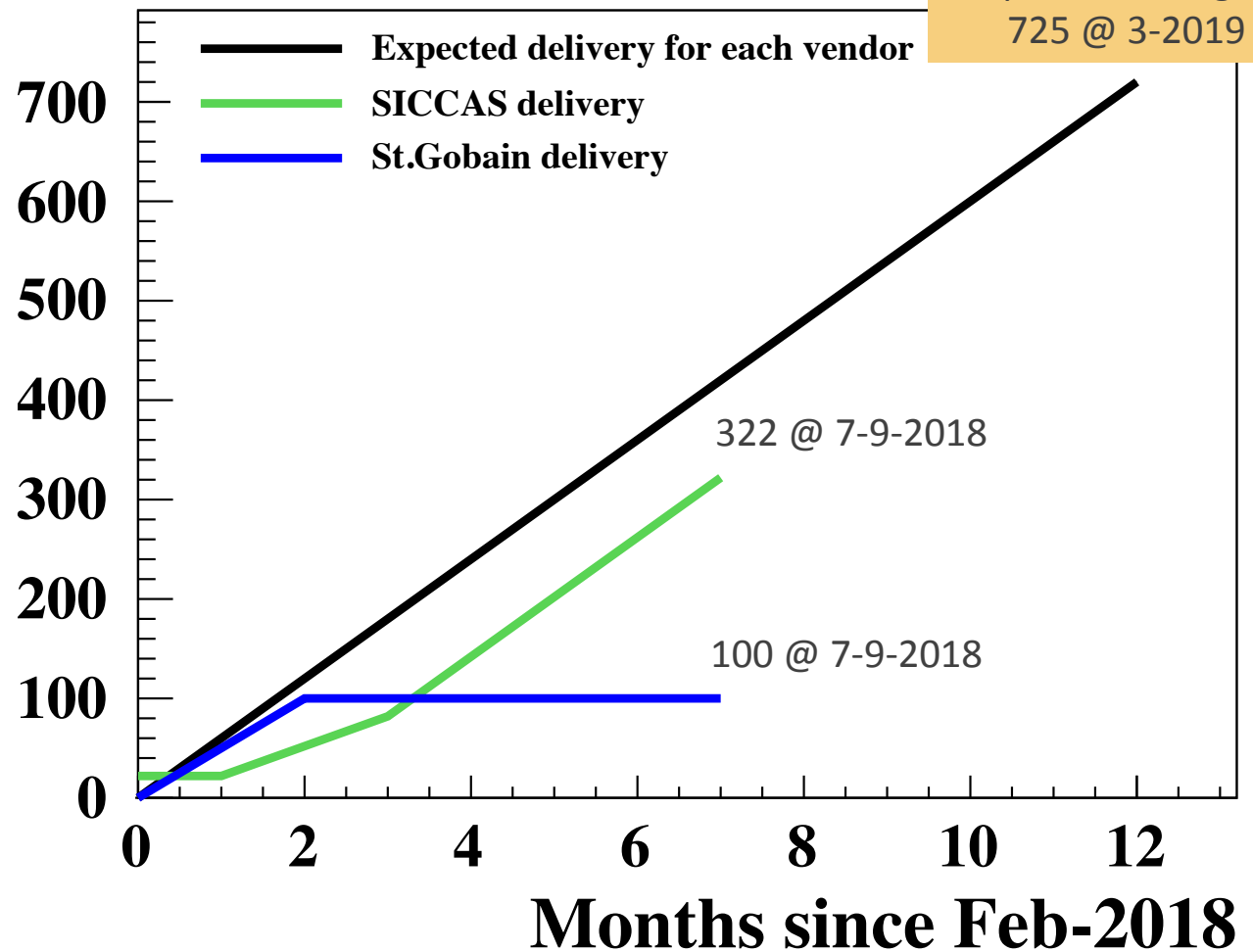
St.Gobain production stopped due to bad mechanical specs in April 2018

Technical visit to St. Gobain in May:
 → Problems identified
 → 2 x 5 pieces produced
 → Completing survey

Plan is to resume Production @15-10-2018:
 with “x2” prod. Pace
 NOT YET AGREED

50% SICCAS prod @ end of September.

Crystals

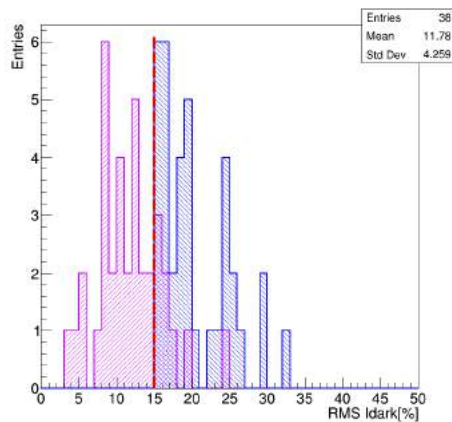


Mu2e



Delivery and test of production SiPMs

Batch number	Accepted	Rejected
Batch 1	288	4
Batch 2	277	3
Batch 3	277	3
Batch 4	280	0
Batch 5	280	0
Batch 6	280	0
TOTAL	1682	10



- ❑ Improvement on rejection factors reached this month by moving the test temperature from 20 to 25 C to better compare with Hamamatsu QC
- ❑ Batch 7 also completed this week for a total of 1962 i.e. around ½ production.
- ❑ Rj factor < 1 % level

Test with dose @ Calliope

Both SiPM, FEE, MB and DIRAC board irradiated at Calliope

- ❑ SiPM, FEE up to 80 krad
- ❑ MB-DIRAC up to 20-30 krad

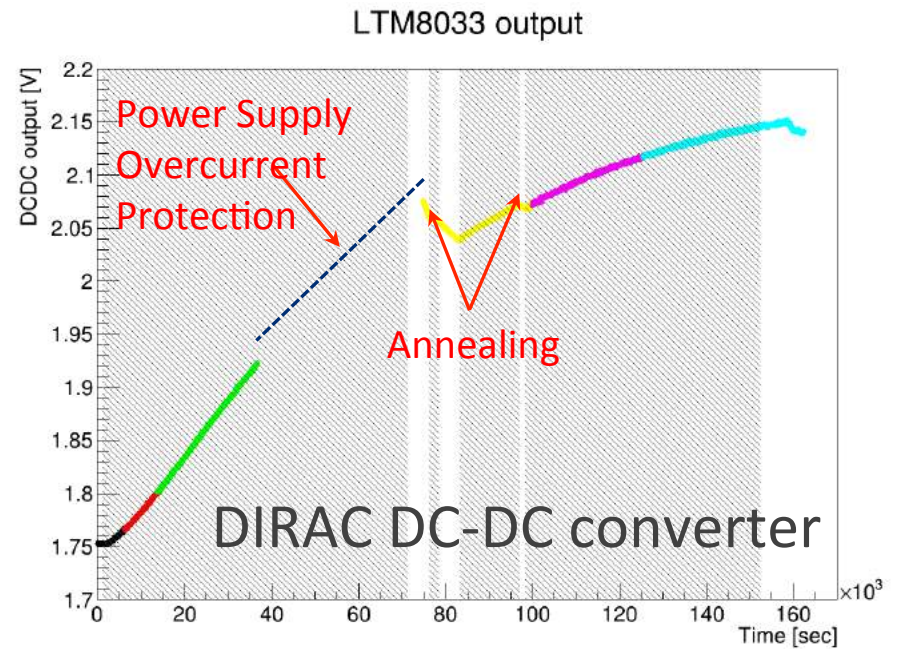
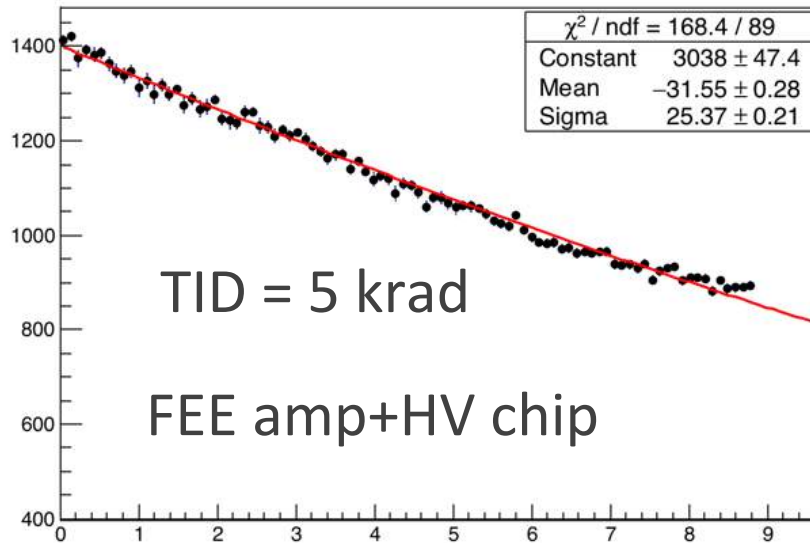
SiPM OK, Preamplifier OK, HV-regulator problems on LDO, ADC/DAC

- New FEE design in progress to cope with this problem
- Simulation of muon beam stop effect on “radiation” planned

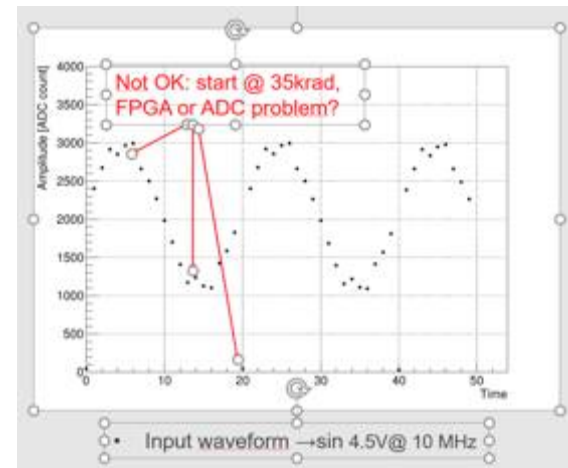
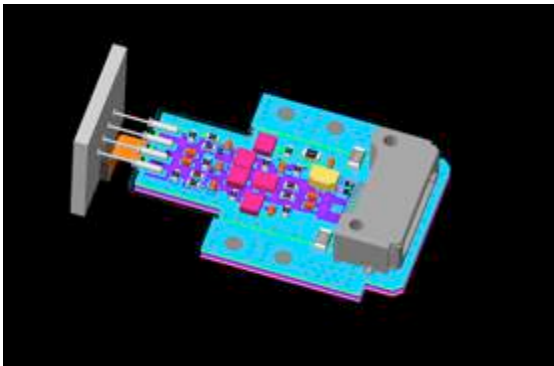
DIRAC board looks compliant up to 20 krad for DC-DC converter but problems are expected for FPGA and optical links

- New version with Polar Fire FPGA in progress
- New optical links VTRX already procured at CERN

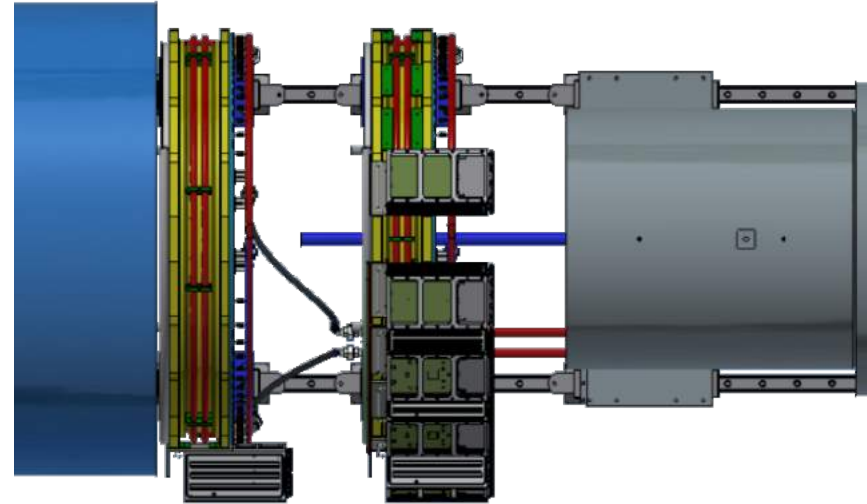
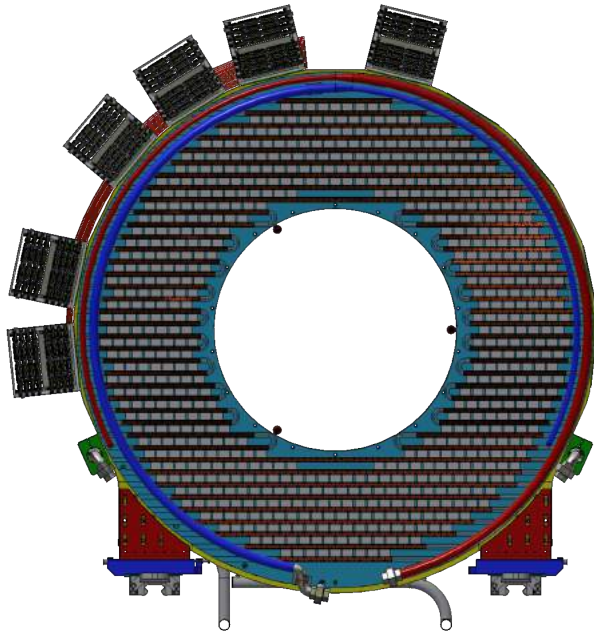
Test with dose @ Calliope



30% drop in 5 krad \rightarrow 6% /krad ..
Large variation in voltage regulation

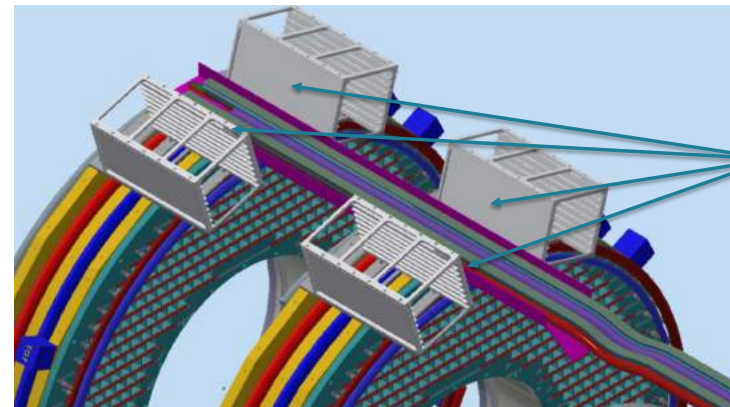


Mechanics: integrations of drawings



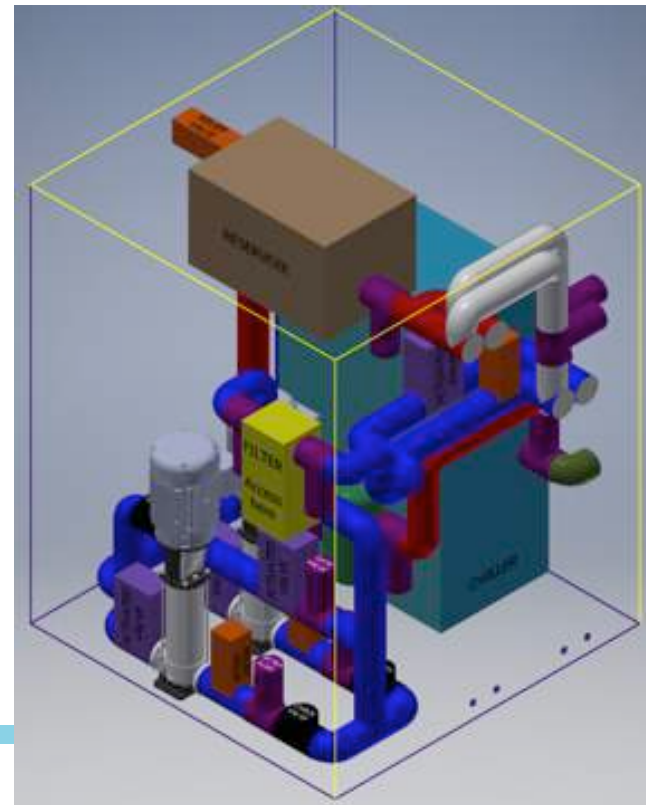
In view of the Calorimeter Mechanical system CRR, the Integration proceeds well:

- Calibration source
- Cooling and source services
- Crate services

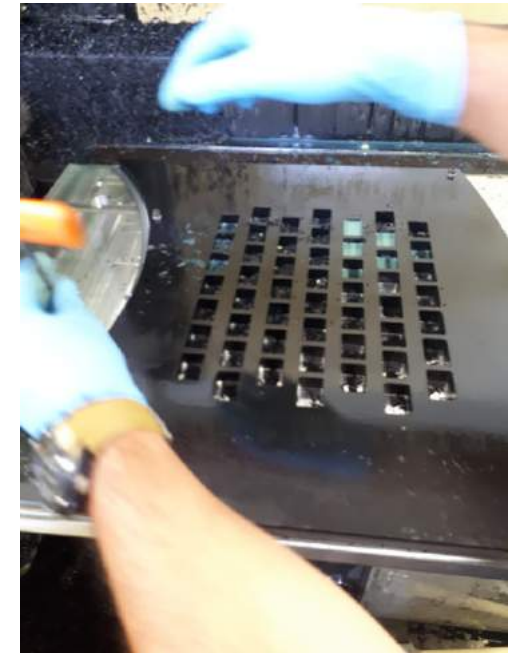
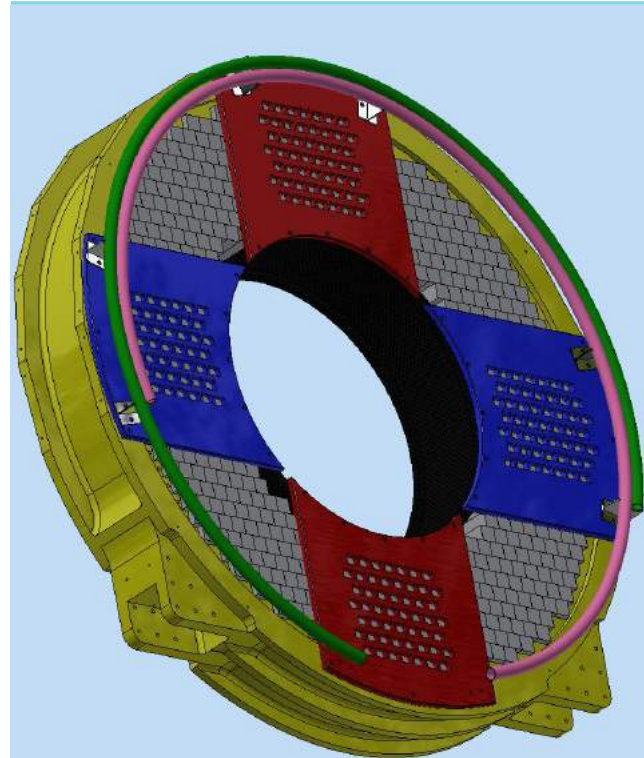
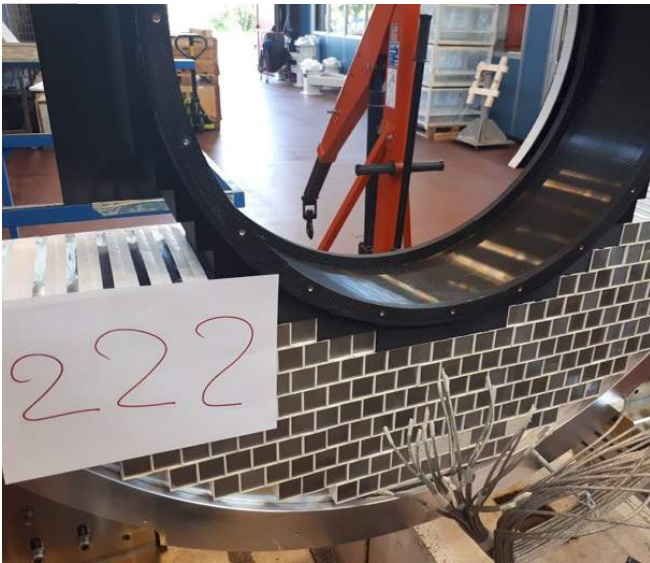


Mechanics: latest progress

- ❑ Completion of measurement of the stacking tolerances @ SIDET
→ freezing the FEE end-plate design and assembly procedure
- ❑ Large Improvement on Cooling station design
- ❑ Continuing measurement & simulation to understand the equilibrium temperature reached by the calorimeter external surface in the DS



Mechanics: status of full size mockup



After the successful stacking of 222 “dummy” crystals .. the full-size mockup is getting more realistic with the introduction of a cross of “fake” FEE-plate → [Check of crystal-SiPM alignment](#)

Status of deliverables

- D2.1 (Technical Design Report) Month 12
- D3.3 (Design of the Mu2e Laser system) Month 18
- D4.2 (Development of Mu2e simulation code) Month 32
- D2.2 (Production DB for crystals and sensors) Month 36
- D2.5 (Assembly of the first calorimeter disk) Month 42

Deliverable D2.2 is well on track

- Production DB for crystals already operative
- Next months will be spent to complete prod DB
also for SiPMs