



# SiPMs test after gluing

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Mu2e-ITALIA meeting

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# - Overview -

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100 SiPMs have been shipped to LNF from FNAL:

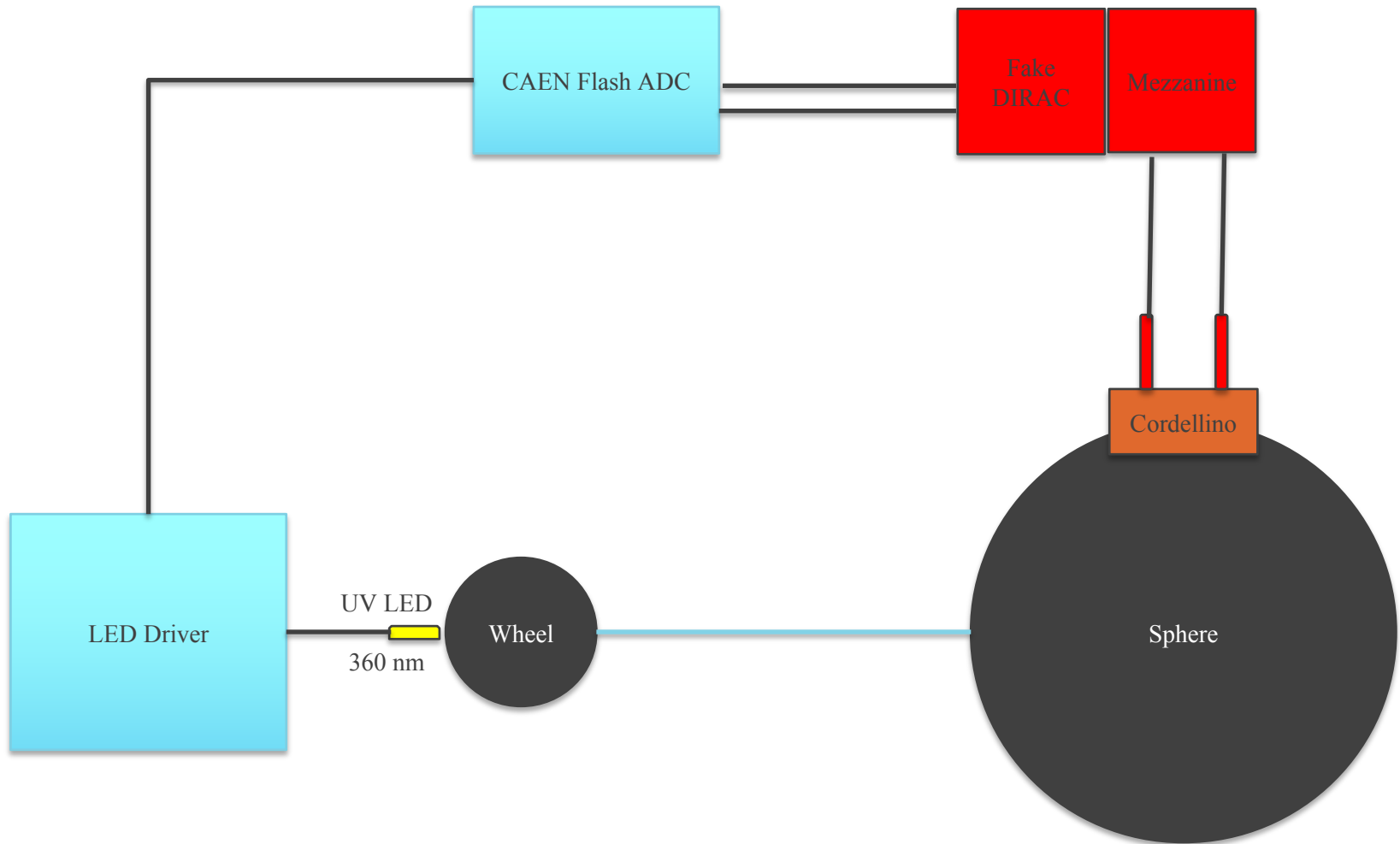
- 60 from MTTF sets: batches 3-5-6-7
- 40 goods: 7L and 7J

see Raffaella's talk

- Goal: to have 37 holder (74 SiPMs) to instrument the module-0
- What we want to measure: extrapolate the Gain of  $1.7 \times 10^6$  at  $V_{bias}$  at 20 degrees
- Procedure: change the amount of light distributed uniformly on 1 holder (2 SiPMs) with the Motorized Filter Wheels, fit the charge responses and to extrapolate the gain. Check the optimal  $V_{bias}$  in a way to obtain a Gain  $\sim 1.7 \times 10^6$ .

# - Station Layout -

Room Temperature 20 degrees



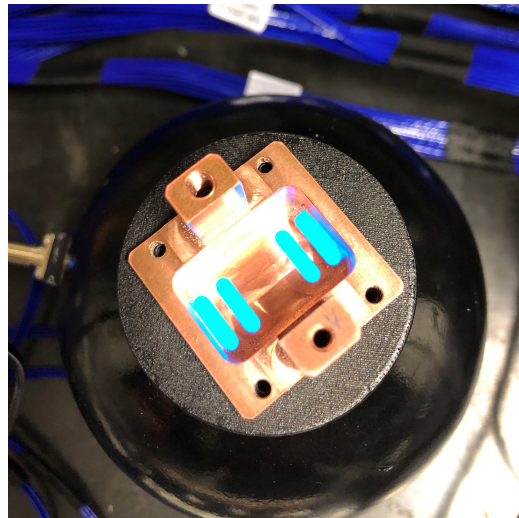
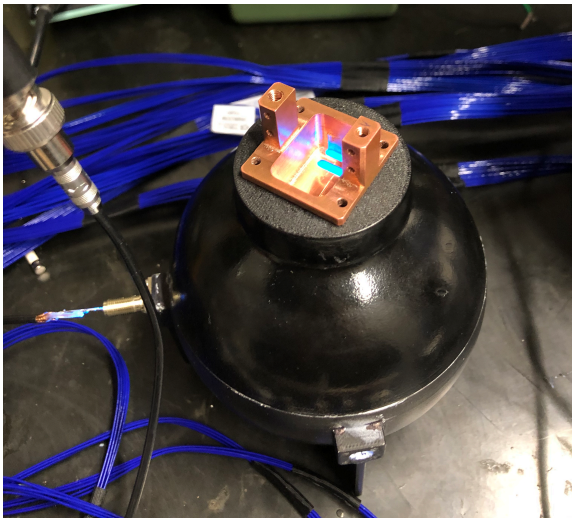
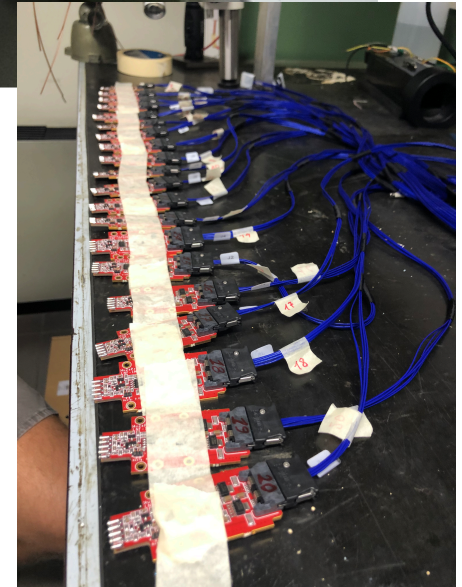
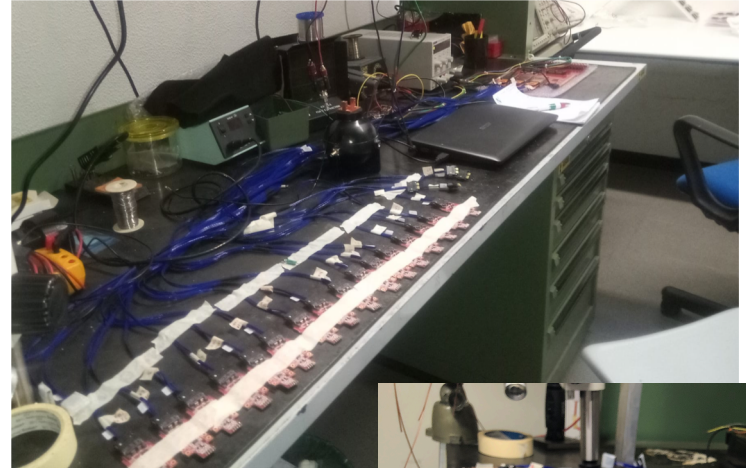


# - Procedure 1-

1. SiPMs Glued see Matteo's talk

2. Mount a complete cordellino:  
2 FEE calibrated previously  
by Raffa, Daniele and me

3. Insert the cordellino into the sphere





## - Procedure 2 -

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4. Set the HV value for the SiPMs (average of the 2 series per SiPM)
5. Start the DAQ
6. Move manually the Wheel positions
7. Fit the Charge response and extrapolate the Gain
8. Set the Vbias at the expected value to have  $1.7 \times 10^6$  of gain and CHECK
9. Extrapolate the Vbias value for -10 and 0 degrees → Database
- 10. Test with the module-0**

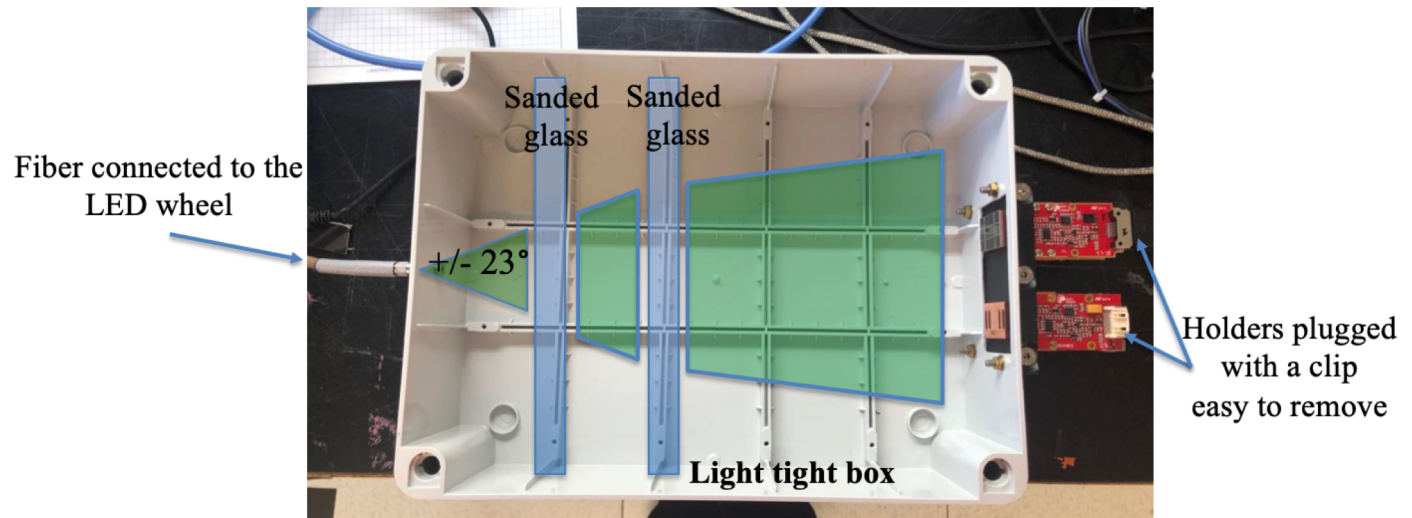
# - Example -

- Fit technique:

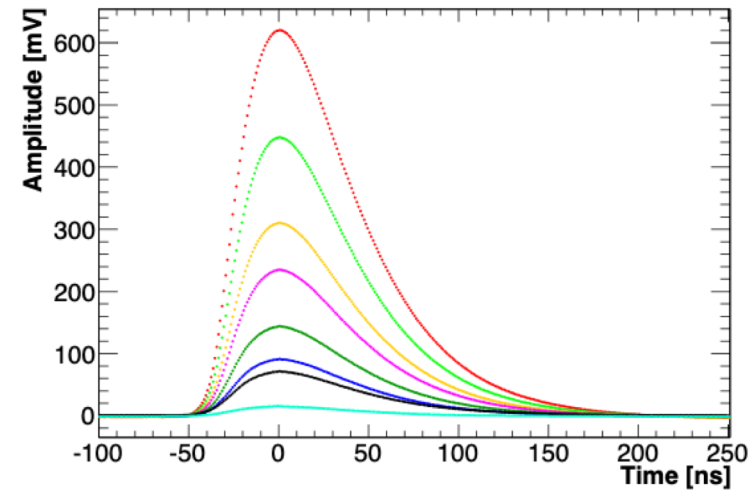
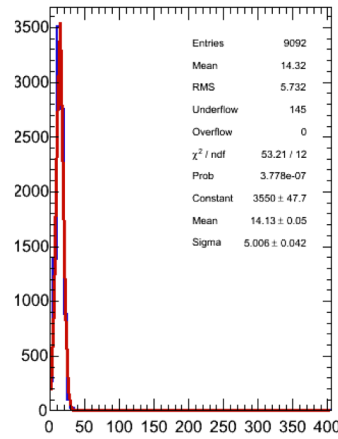
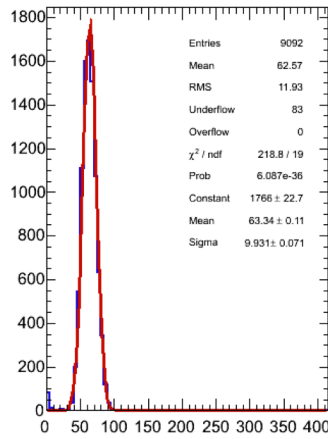
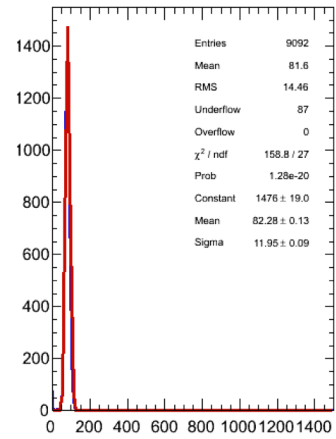
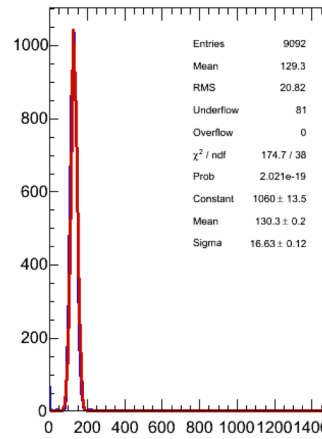
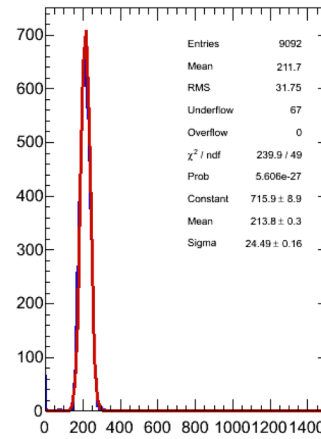
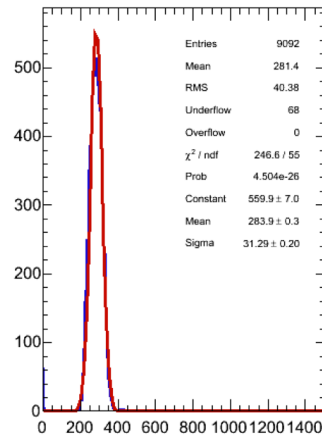
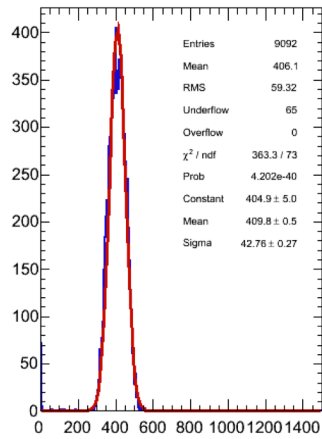
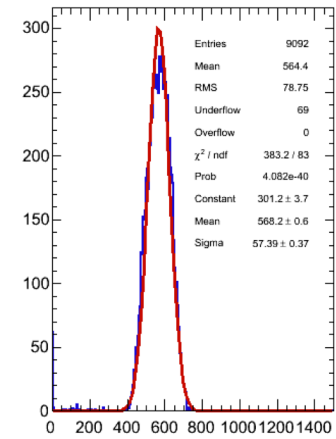
$$\frac{\sigma_Q}{Q} = \frac{p_0}{\sqrt{Q}} \oplus \frac{p_1}{Q} \oplus p_2 \quad \text{where the stochastic term is given by}$$

$$p_0 = \frac{1}{G_{SiPM} \cdot G_{amp} \cdot e^-} \implies G_{SiPM} = \frac{1}{p_0 \cdot G_{amp} \cdot e^-}$$

- Old test done at LNF

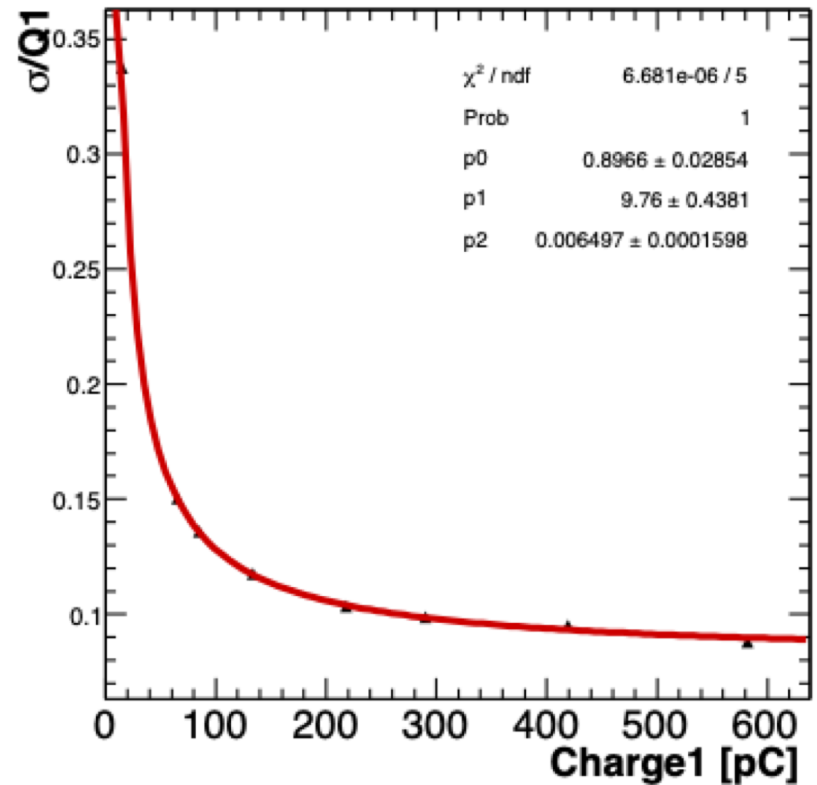
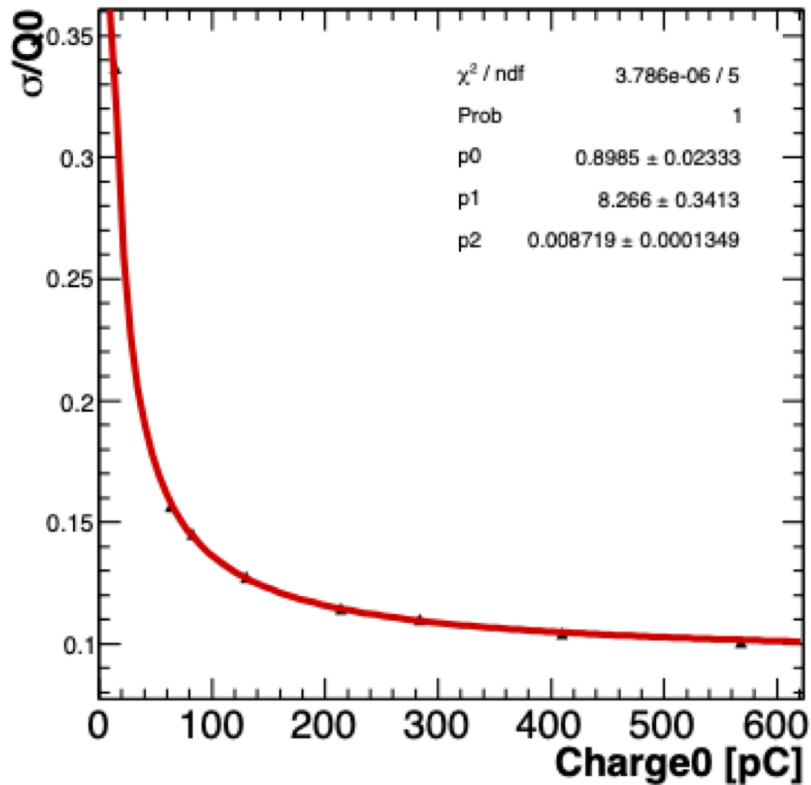


# - Example: charge channel 0 -





# - Example: Evaluation of the Gain -



$$\text{Fit} = \text{sqrt}(p_0/X + p_1/x^2 + p_2)$$

Channel0  $\rightarrow G_{\text{tot}} = 1/p_0 = 1/0.8985 = 1.113 \rightarrow G_{\text{sipm0}} = 1.113/(4 \cdot 1.6e-7) = 1.74e6$

Channel1  $\rightarrow G_{\text{tot}} = 1/p_0 = 1/0.8966 = 1.115 \rightarrow G_{\text{sipm1}} = 1.115/(4 \cdot 1.6e-7) = 1.74e6$

# Status vs FNAL

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- A more developed system has been already assembled at FNAL for the whole production.
  - 4 cordellini (8 SiPMs/FEE) each test
  - the station is thermalized with 2 peltier Cells (200 Watts)
  - automated station (Labview + DAQ)

Photo is missing  
“Sophie ieri si e’  
dimenticata 😊”

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- **Must be shipped back to LNF in case we decide to do here the whole gluing production.**
  - **In this case, we need to work to the logistic: i.e. SiPMs+Cordellino+FEE containers**

A large, multi-masted sailing ship is seen from the rear, sailing on the sea at sunset. The sky is filled with several bright, golden-yellow fireworks exploding. The sun is low on the horizon, casting a warm glow over the water and the ship. The ship's rigging and masts are silhouetted against the bright sky.

Una bella notizia..

GRANDE ELENA  
(porta da bere alla firma!)



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# SPARES