



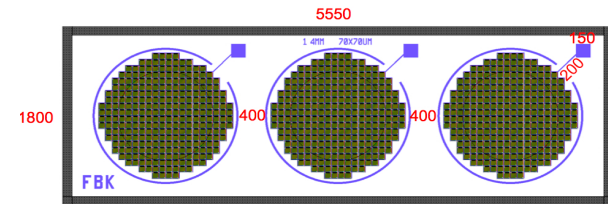
Ferrara SiPM Lab

Wander Baldini
INFN-Ferrara

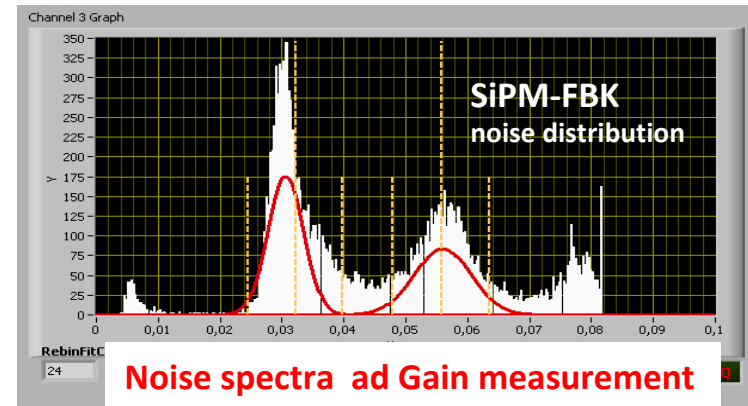
Expertise in Ferrara on SiPMs

Developed mainly in the environment of the *SuperB project*

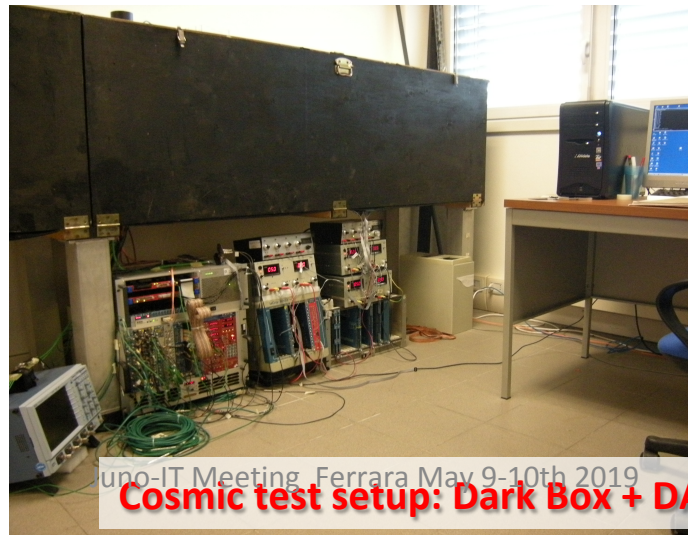
- Design of a custom geometry (SiPM shape, pixel size) in collaboration with FBK, specific for our requests
- Comparison with MPPCs (Hamamatsu) with cosmics and beam tests:
 - gain uniformity
 - noise level
 - breakdown voltage
 - time resolution



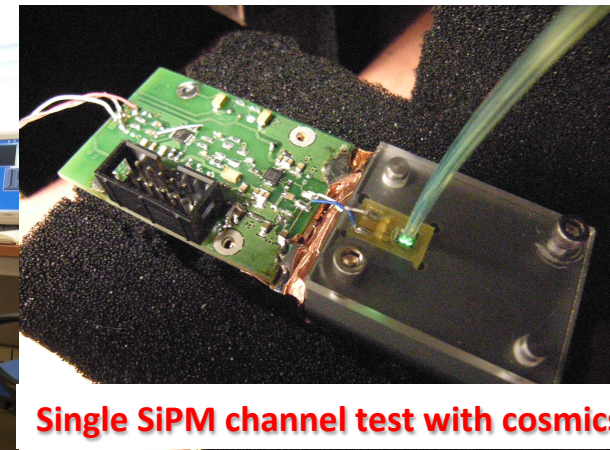
SiPM-FBK for SuperB-Ferrara



Noise spectra ad Gain measurement



uno-IT Meeting, Ferrara May 9-10th 2019
Cosmic test setup: Dark Box + DAQ

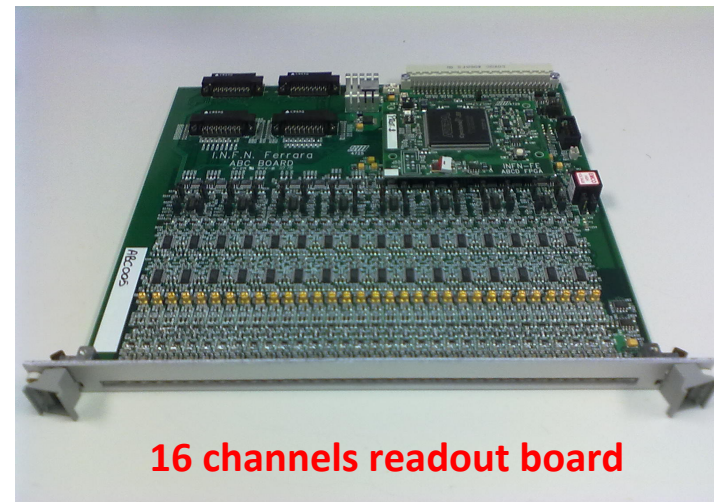
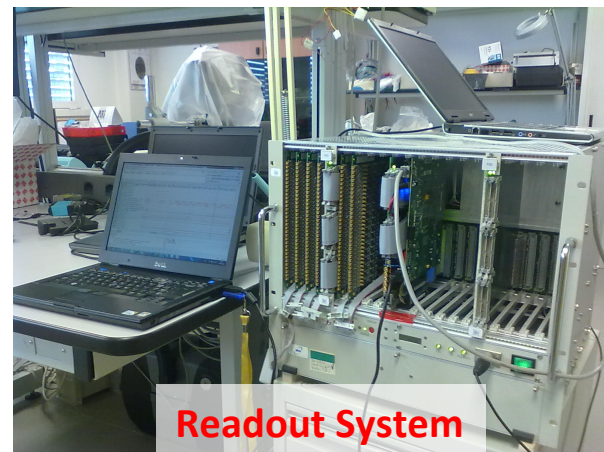


Single SiPM channel test with cosmics

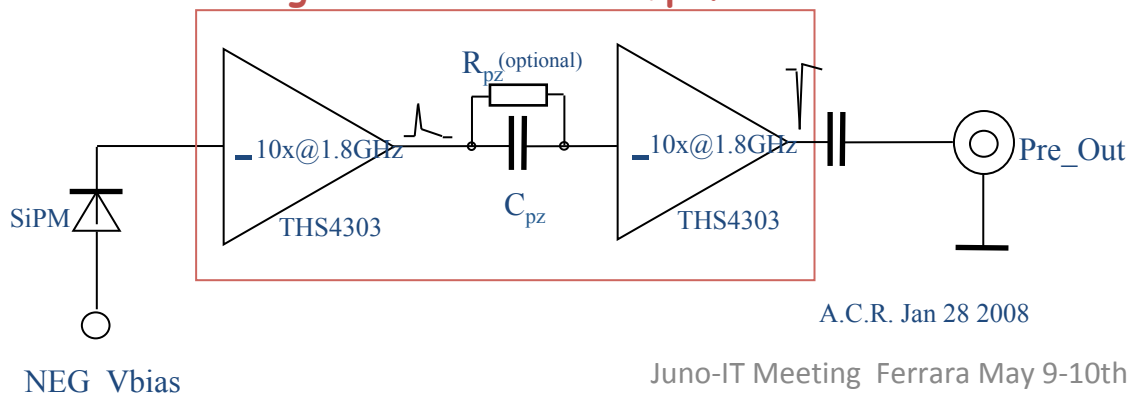
Expertise in Ferrara on SiPMs

Design and development of a specific Front End electronics

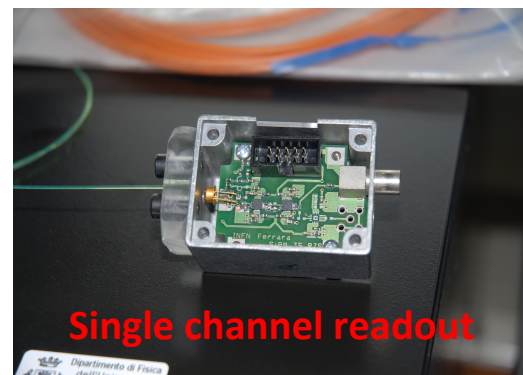
- R&D on a single channel fast R/O electronics for a < 1 ns time resolution
- Development of a 16 channels FE board



Single channel SiPM Amplifier



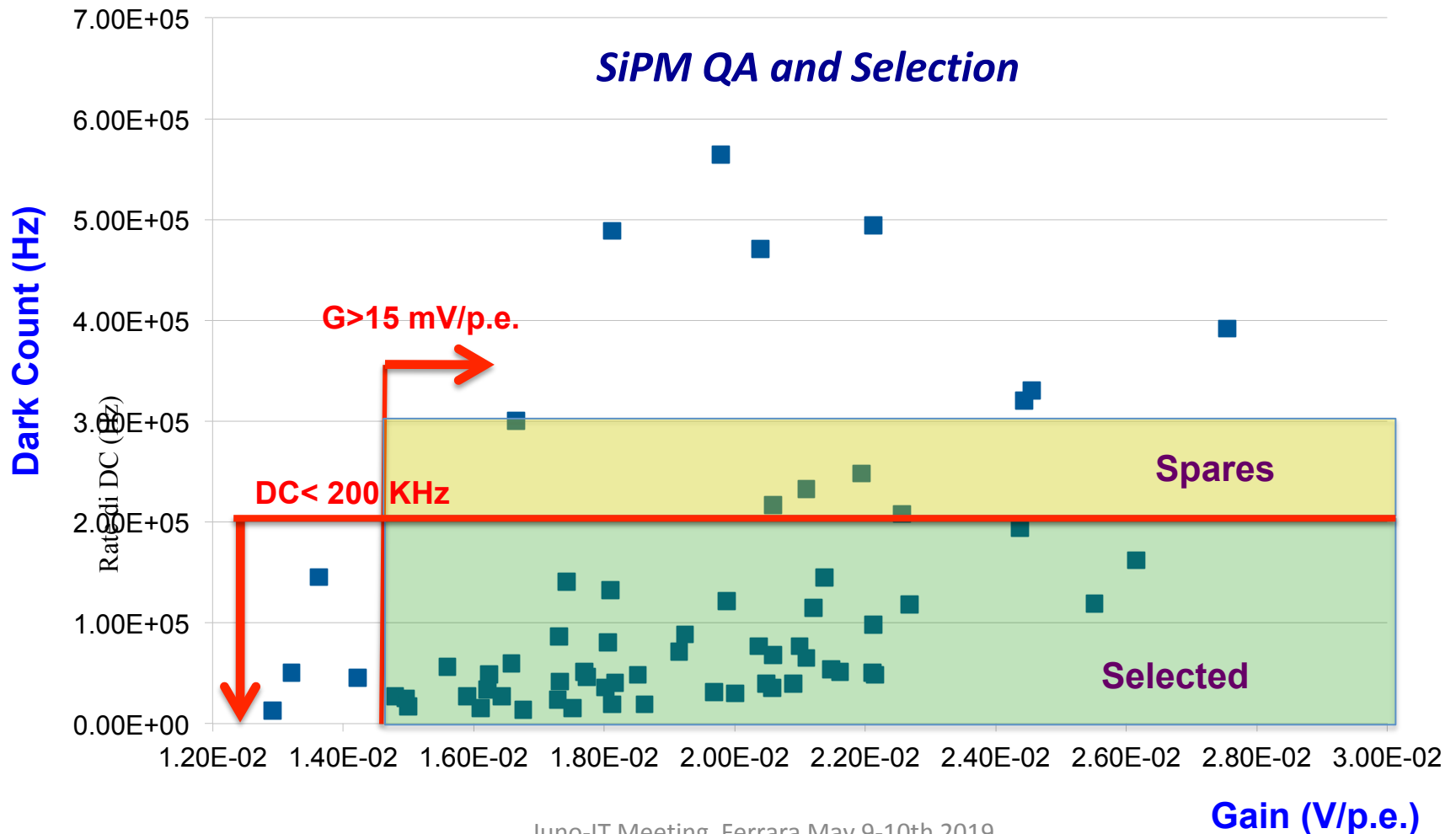
Juno-IT Meeting Ferrara May 9-10th 2019



Expertise in Ferrara on SiPMs

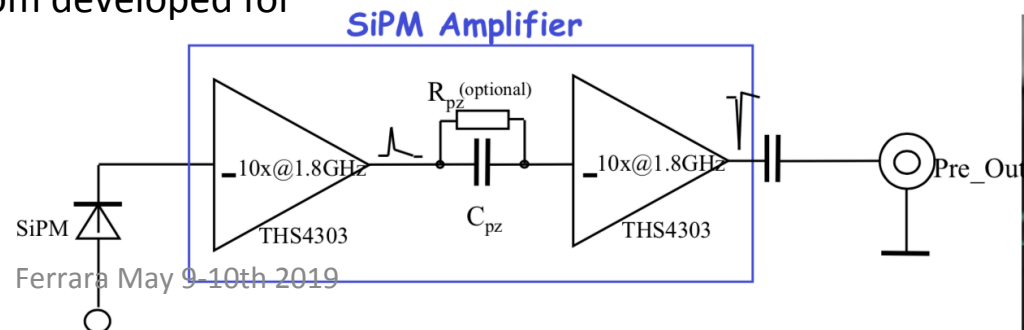
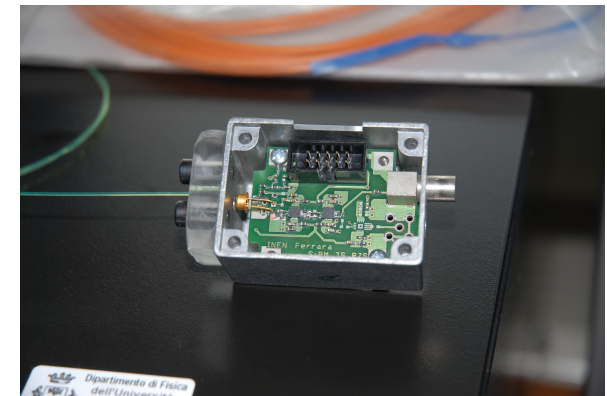
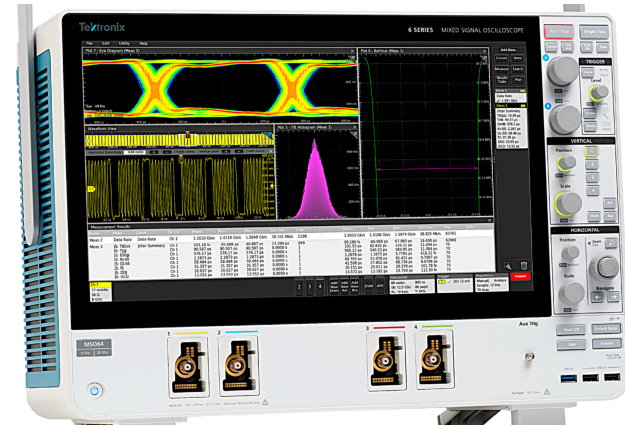
Quality Assurance of SiPMs Production:

Measurement of Gain, noise level and Breakdown voltage for each SiPM

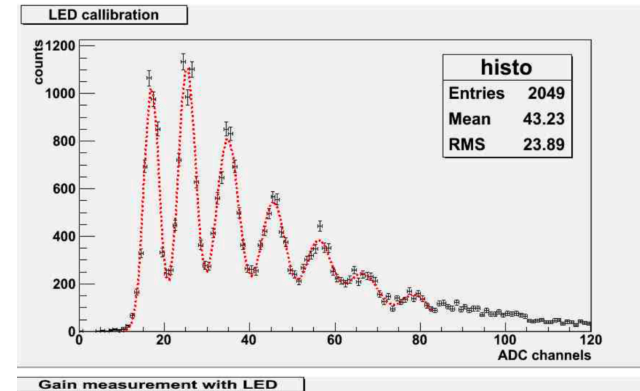


The Ferrara SiPMs Lab

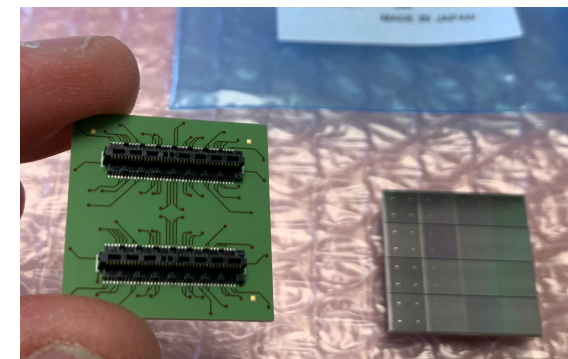
- We are setting up a laboratory especially equipped for the SiPMs tests:
 - Climatic chamber from +180°C (??) to -40°C (just delivered)
 - Dedicated high performance oscilloscope (already in lab):
 - 4 Ch (up to 32 digital ch), Up to 8 GHz, 25Gs/s, 12 Bit vertical resolution
 - Readout electronics under definition
 - CLAS12 exp @ JLAB, 32 ch boards optimized to detect few photons (R&D for RICH)
 - general purpose 32 ch CAEN electronics (xxROC based digital R/O)
 - few channels analog readout (custom developed for SuperB project)
 - Dark Box



The Ferrara SiPMs Lab



- Characterization of SiPMs:
 - gain homogeneity distribution (within a matrix and/or different matrices)
 - same for dark noise rates
 - cross-talk level
- We can also perform tests on Hamamatsu MPPC matrices (as “benchmark” for the JUNO SiPMs)
 - we have already in hands:
 - 2 Matrices 4x4 SiPMs – 3x3 mm² (S13361-6050AE-04)
 - 2 Matrices 4x4 SiPMs – 6x6 mm² (S13361-3050AE-04)



Conclusions

- The setting up of the FE-SPMs Lab is in progress....
- we plan to have it functional in the next months
- possibly have the first tests ongoing before the summer

- Support from the INFN-FE Electronics, Mechanical, IT services

- Common interests with other activities:
 - CLAS12 @ JLAB
 - LHCb @ CERN
 - DUNE @ FNAL