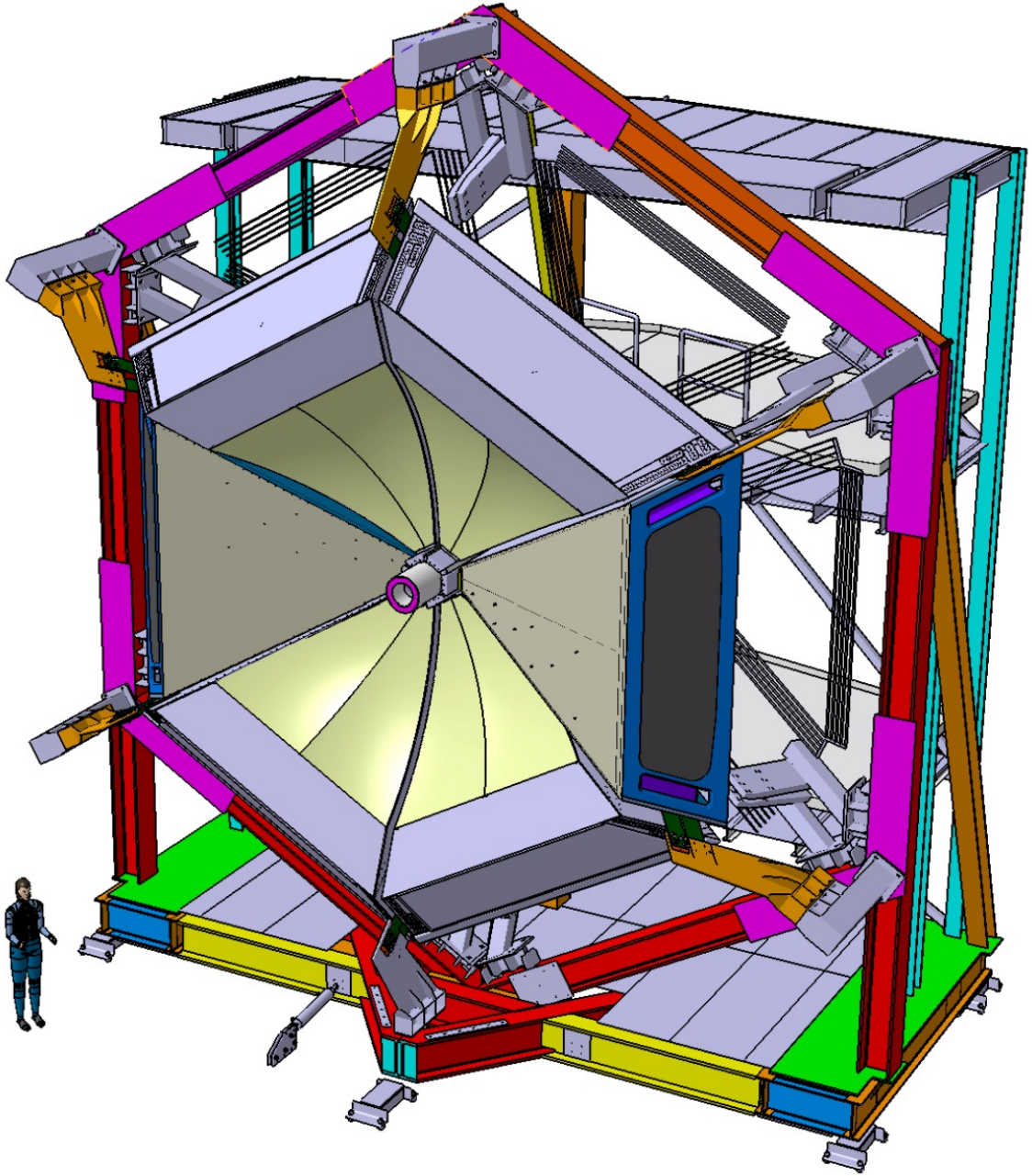


CLAS12-RICH Status-Report

July 18th 2014

Latests

AEROGEL:

Order of first 2 m^2 in process by INFN administration
5 large aerogel tiles from R&D at the Italian custom
Automatize laser-scanning test-bench ready
Rotating bench ordered
Dark+dry box under construction
Nest step: - Systematic measurements

MIRRORs:

Measures of surface roughness ongoing in Frascati on CMA and Riba samples
Planning D0 measurement last week of July
Next step: - Coating at ZAOT and SESO-Thales
- 2nd CMA demo on Marcon mandrel

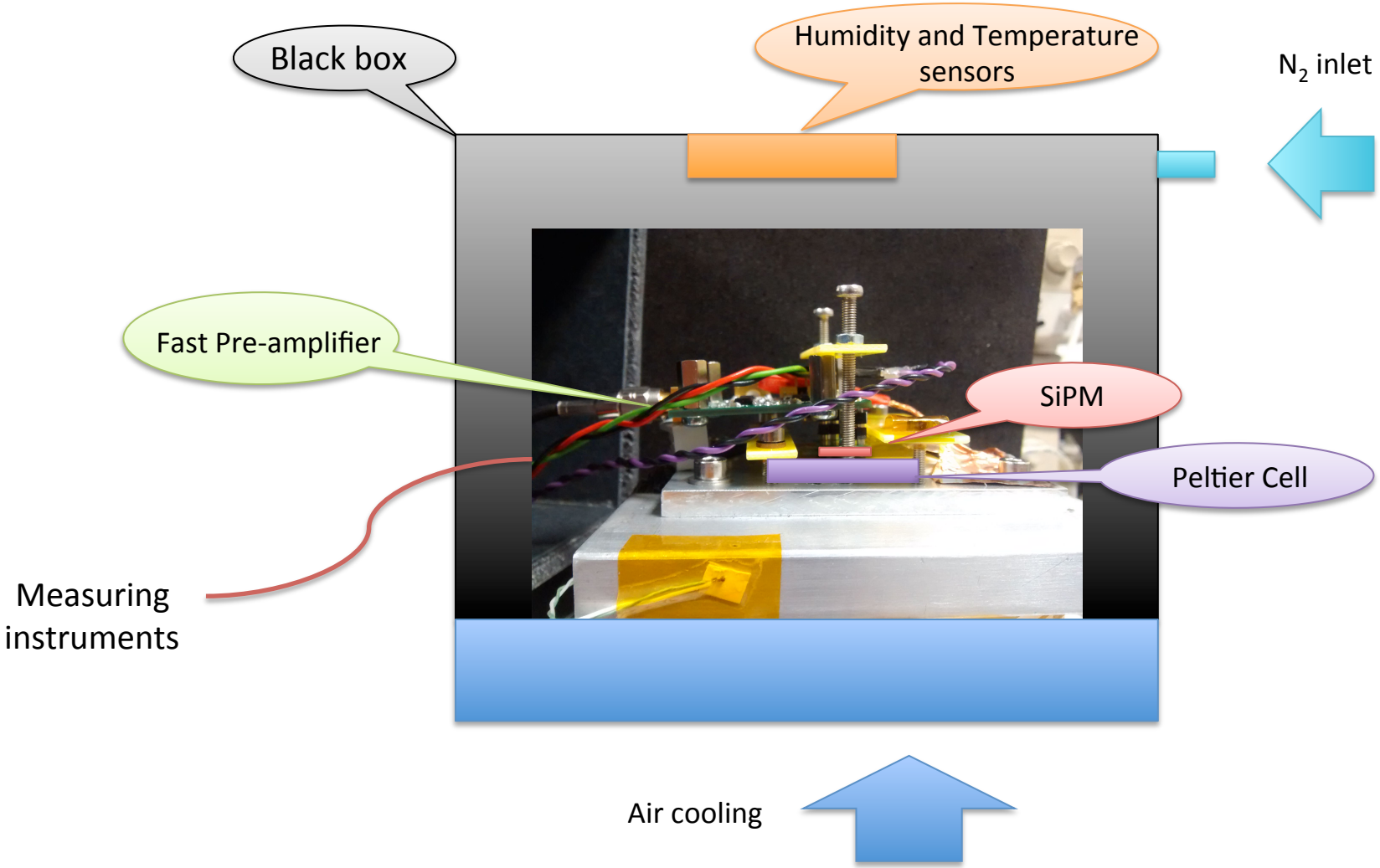
PHOTON-DETECTORs:

Two reject H8500 substituted by Hamamatsu
Checking H12700 performances along the pixel surface
SiPM irradiation analysis ongoing (Bachelor thesis just completed)

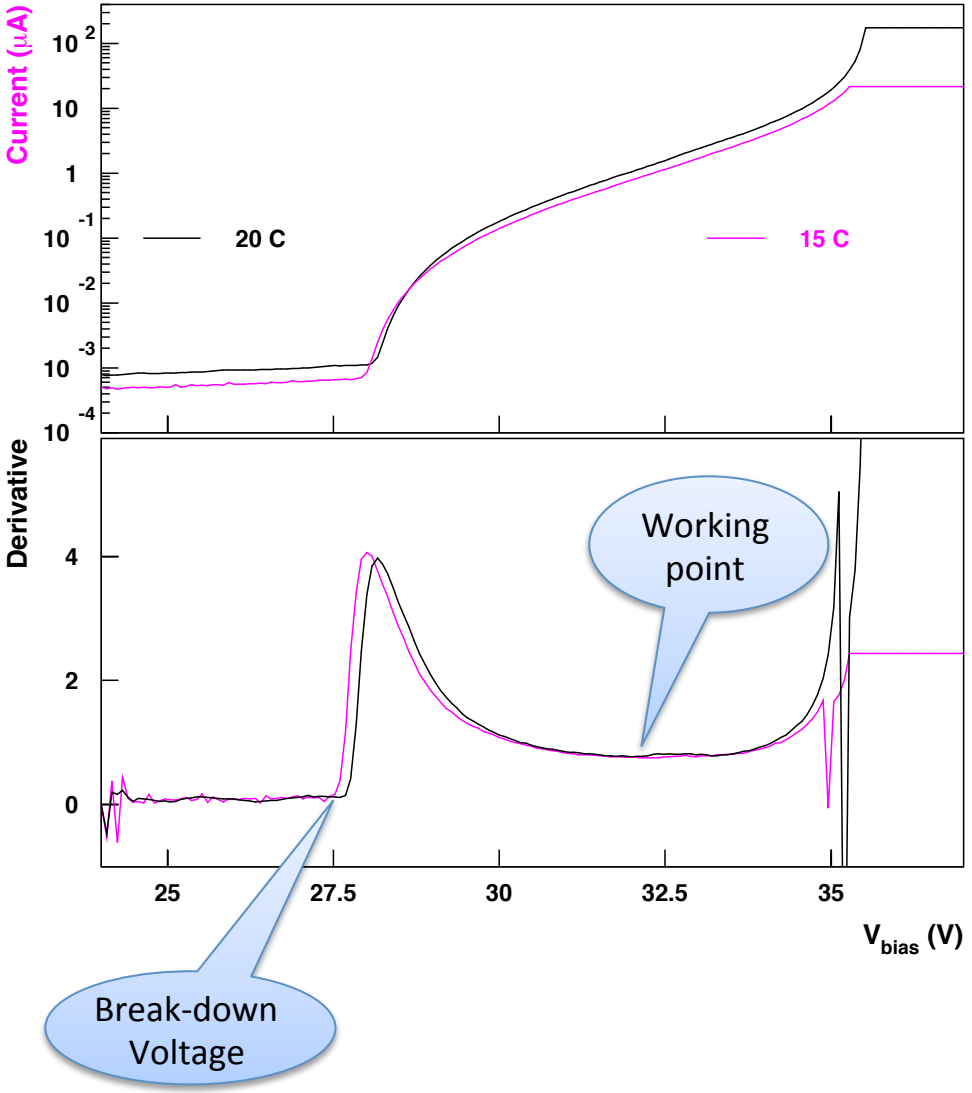
SiPM Test Bench

For SiPM temperature stability is crucial, temperature variation is important

At the moment working from -10 C to 60 C with 0.1 C resolution/stability

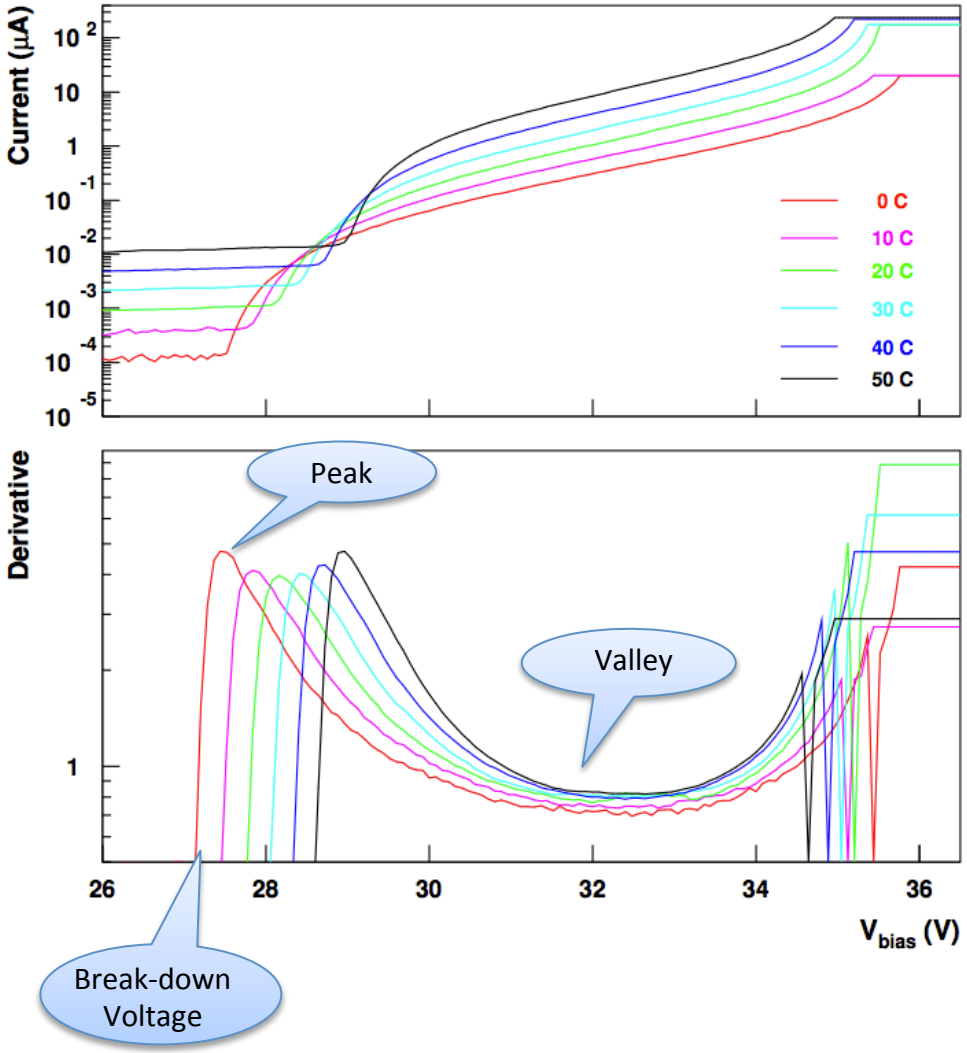


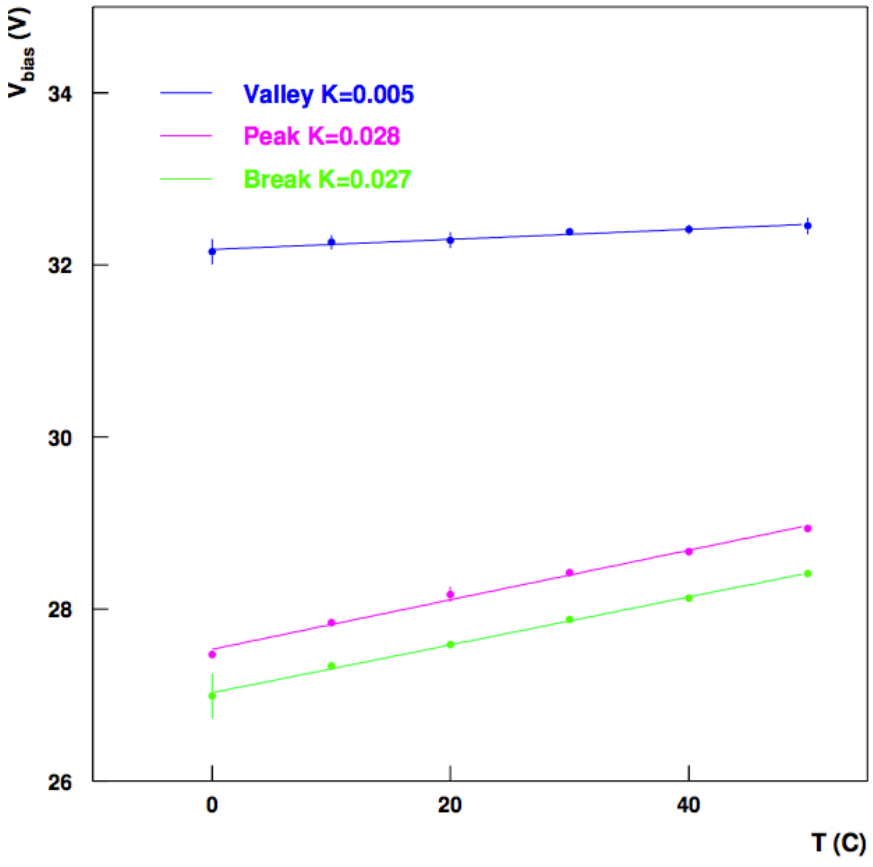
SiPM Dark Current



Temperature Scan

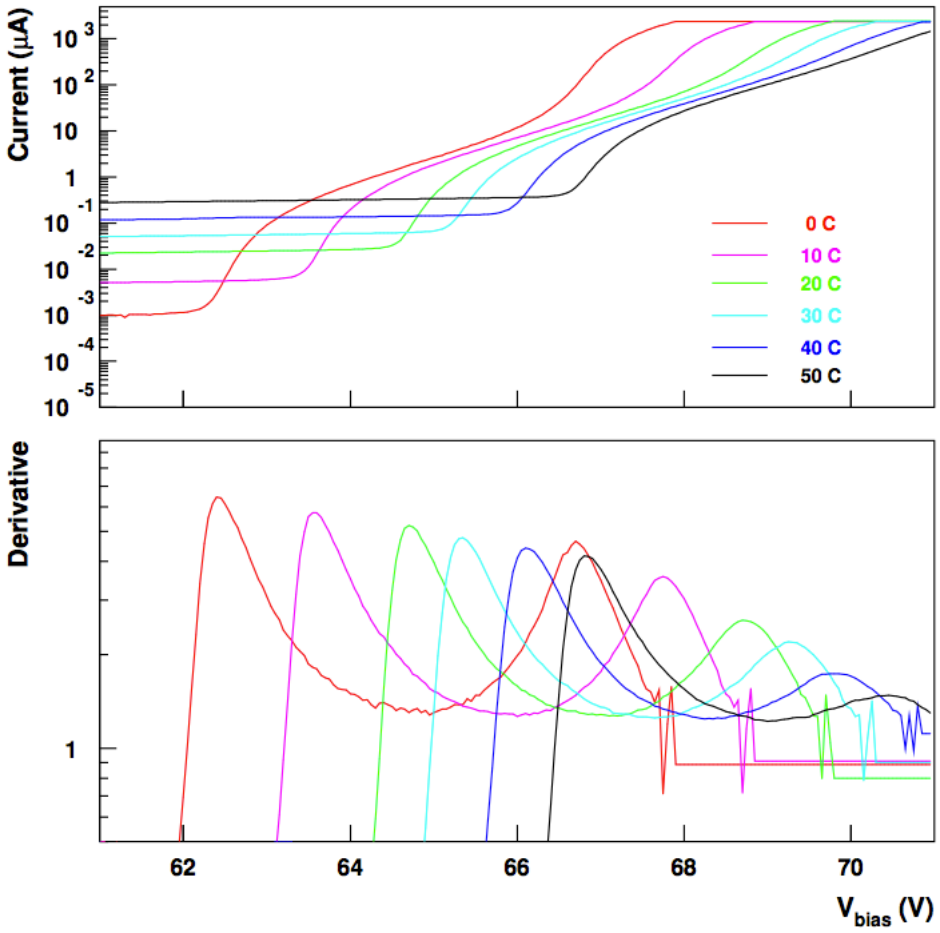
ASD-RGB3S-P-50
3x3 mm^2 AdvanSiD SiPM, 50μm cell

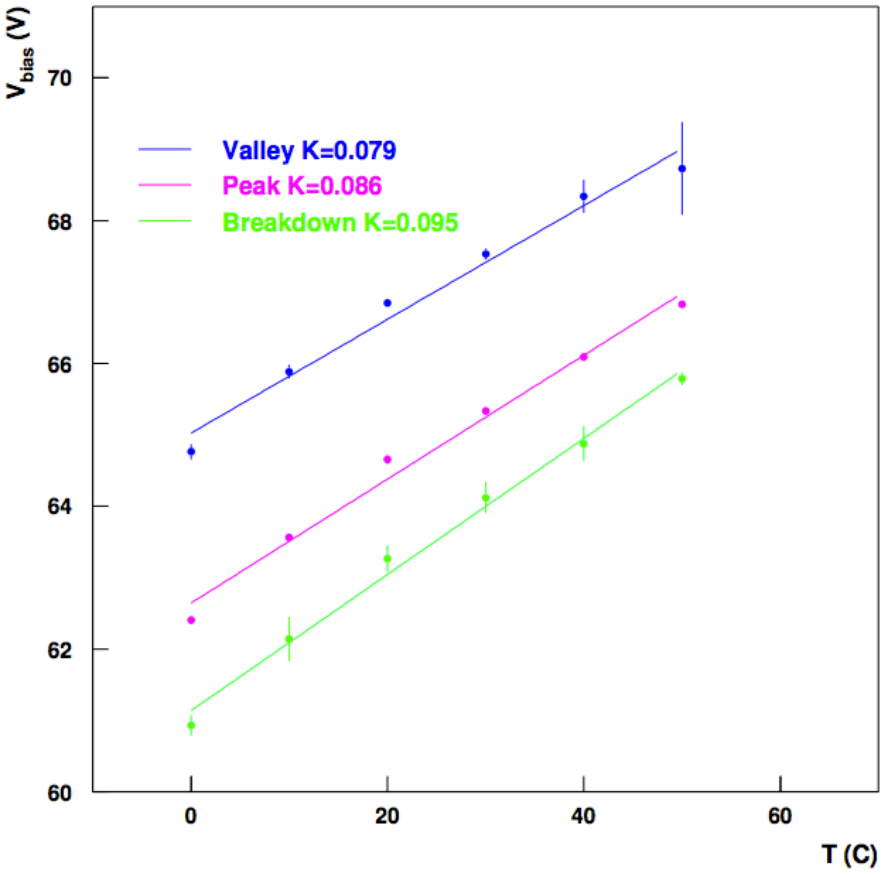




Temperature Scan

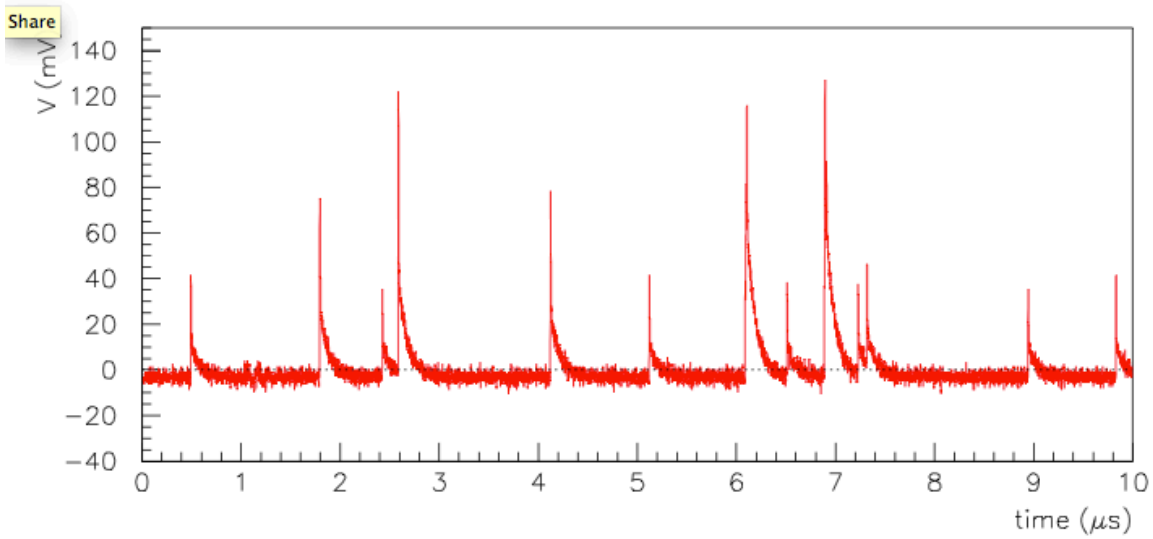
S12572-015-P
3x3 mm^2 Hamamatsu MPPC, 15μm cell

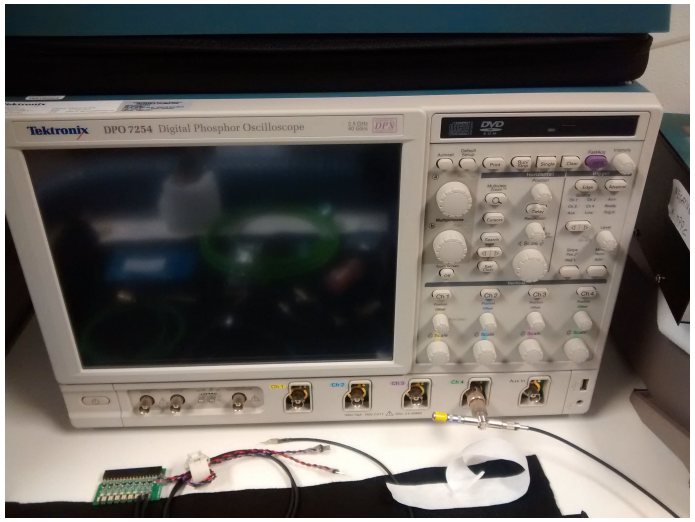


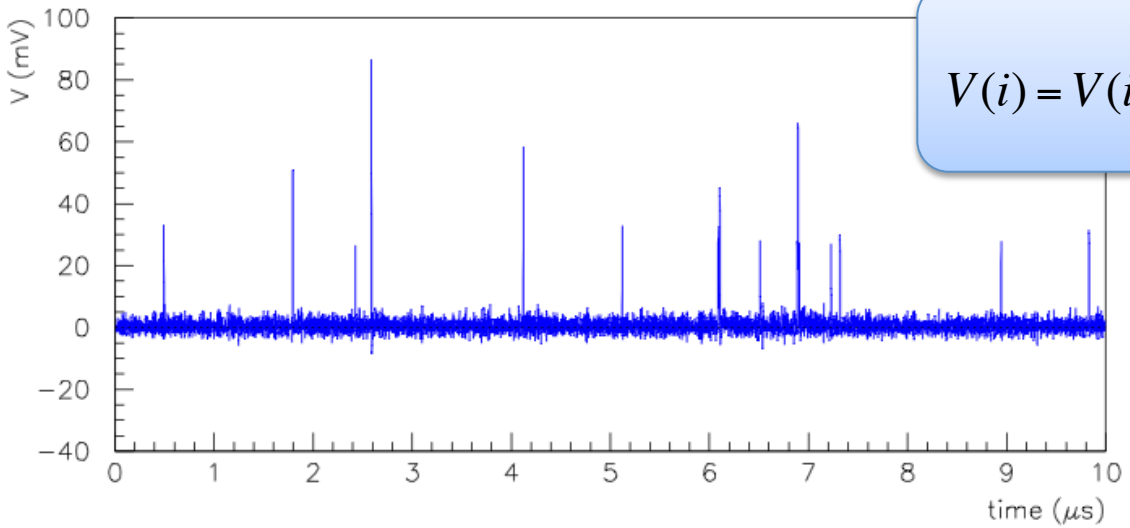


Signal Analysis

T=22 °

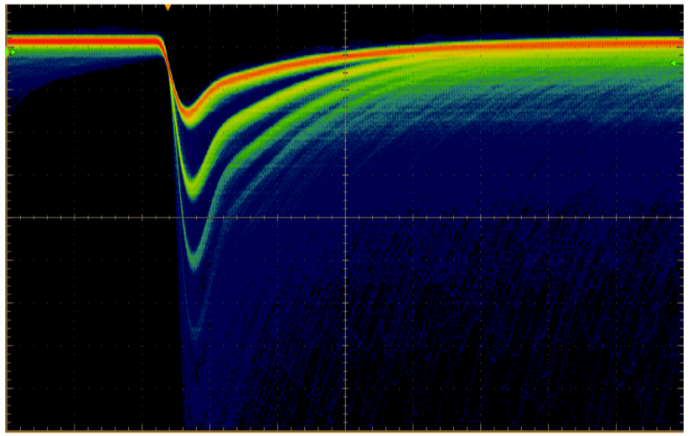


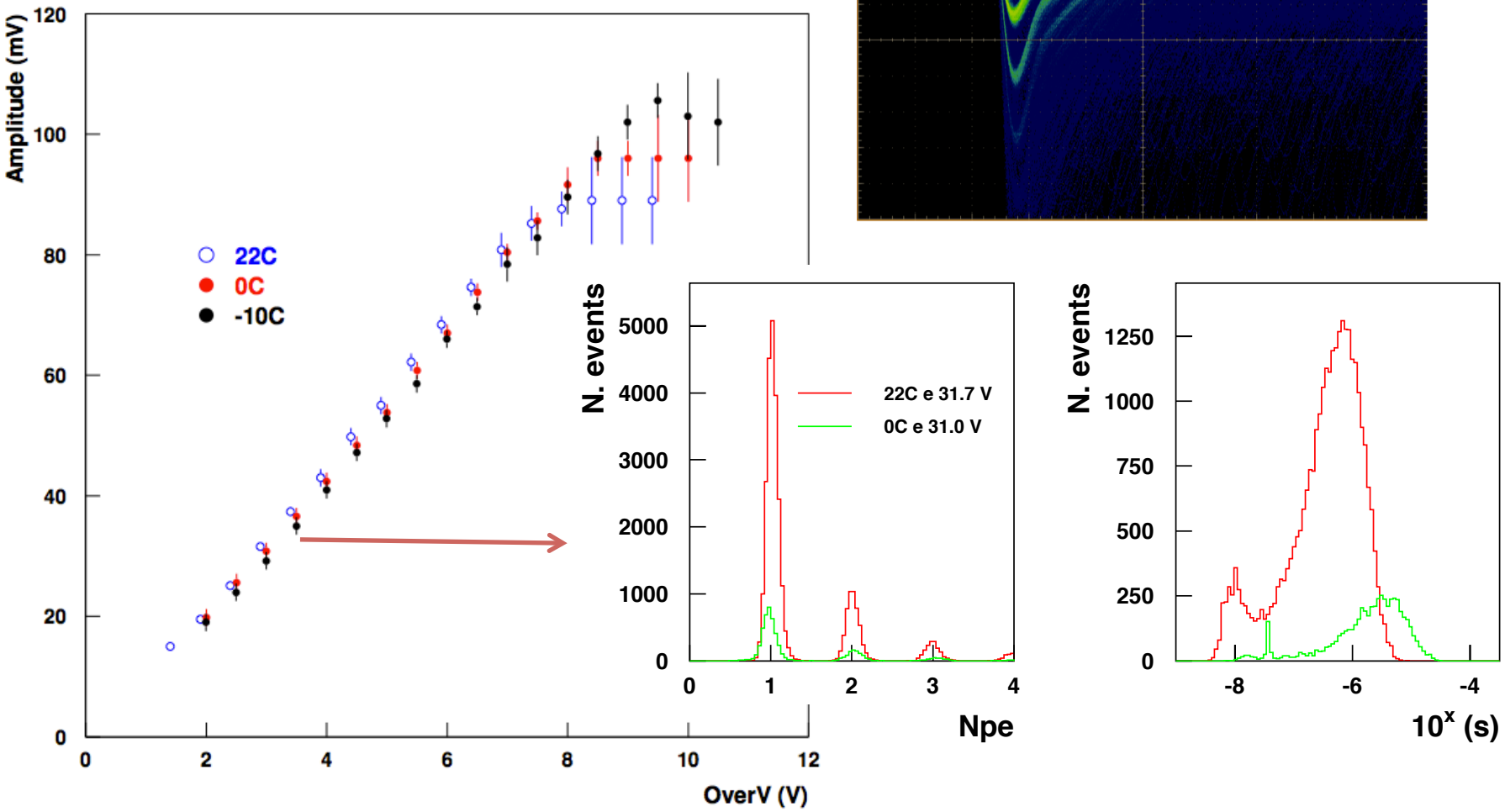




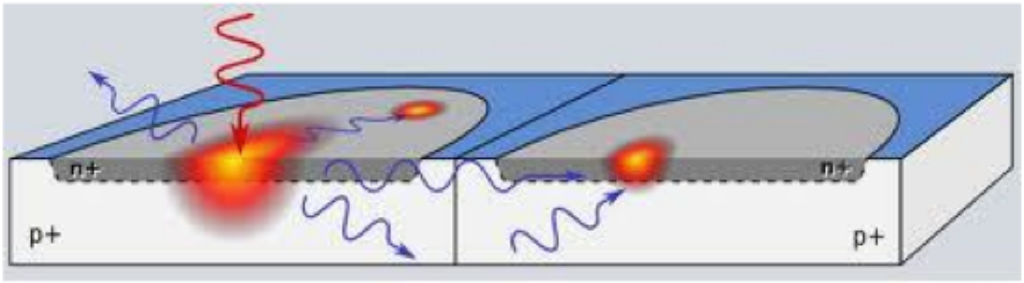
$$V(i) = V(i) - \frac{1}{N}\sum_{1}^{N} V(i-j)\, e^{-\left[T(i)-T(i-j)\right]/\tau}$$

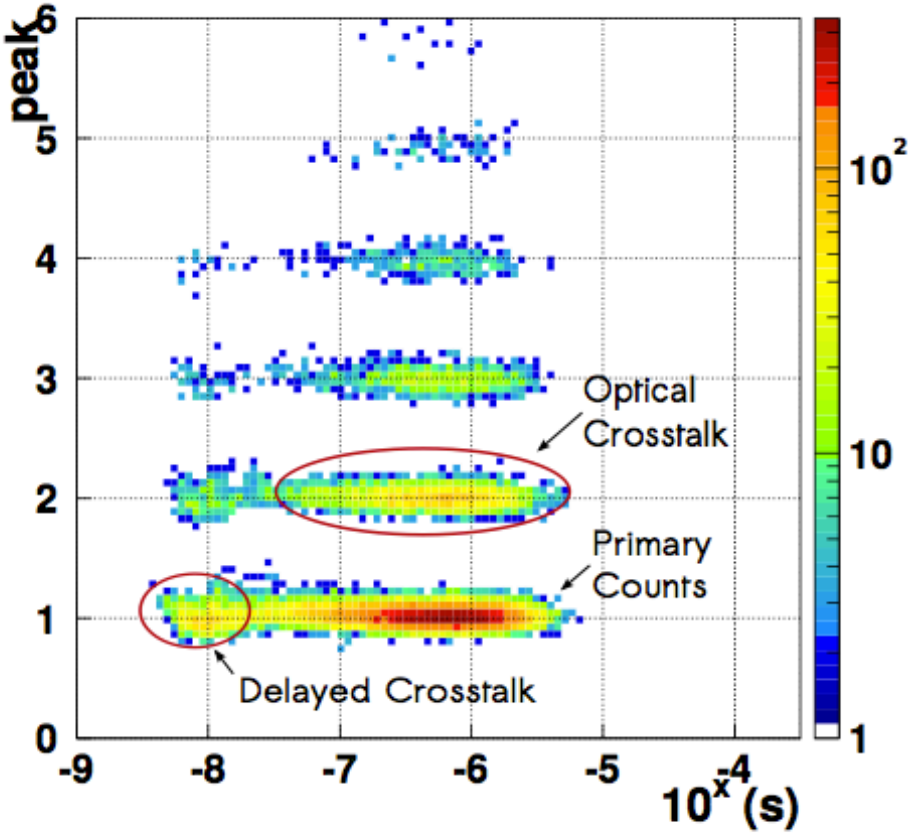
Working Interval

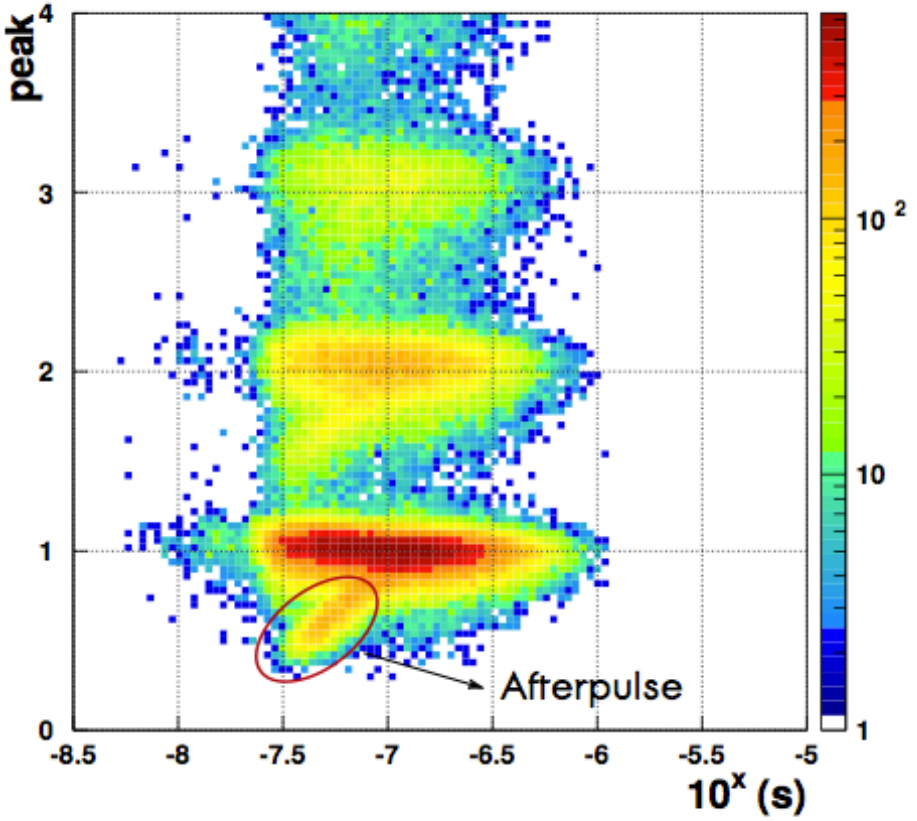




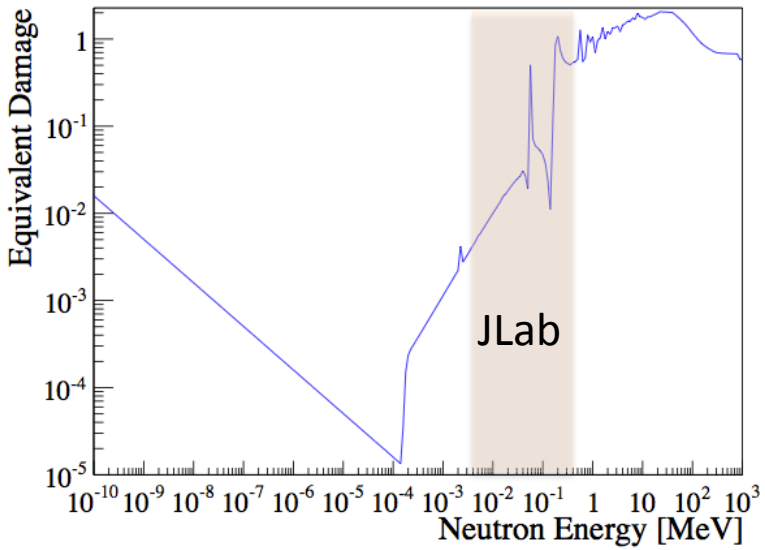
Correlated Background

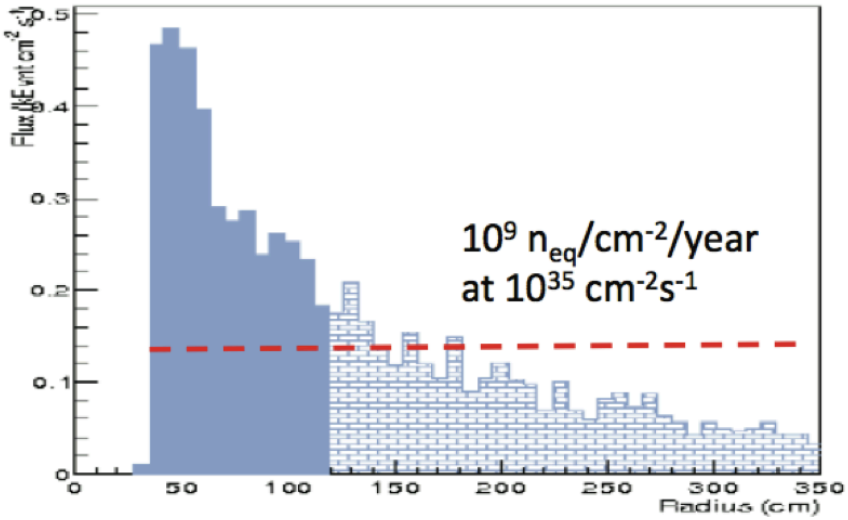


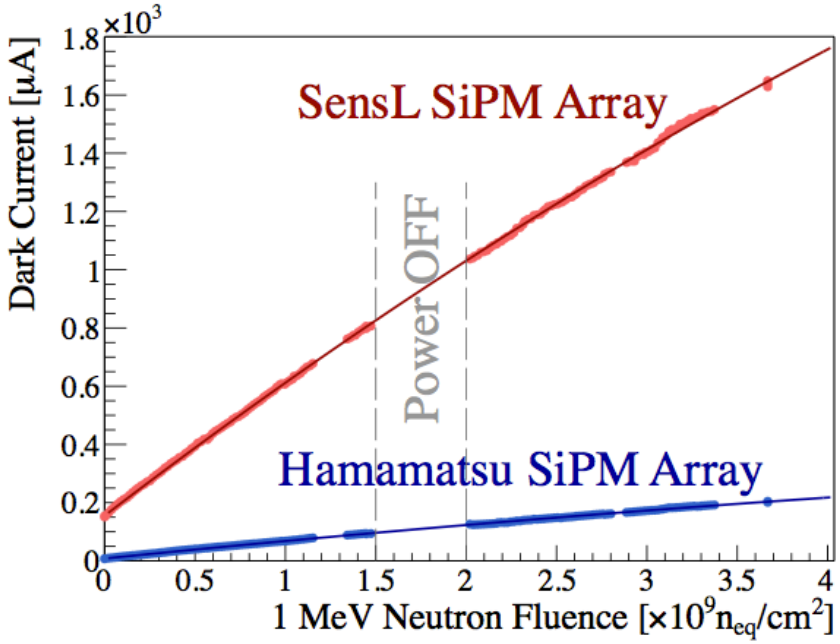




Neutron Damage

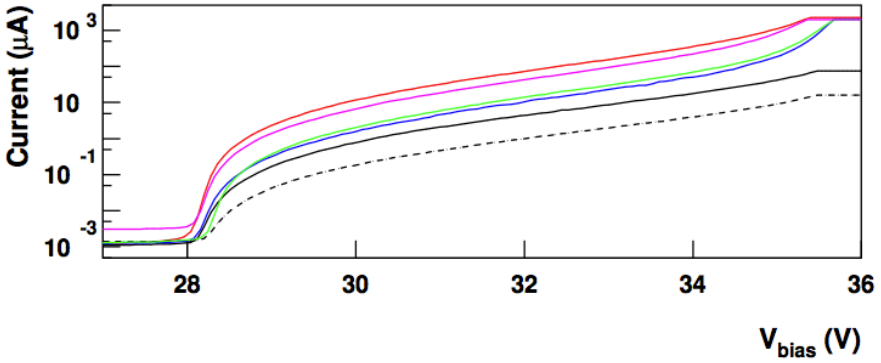


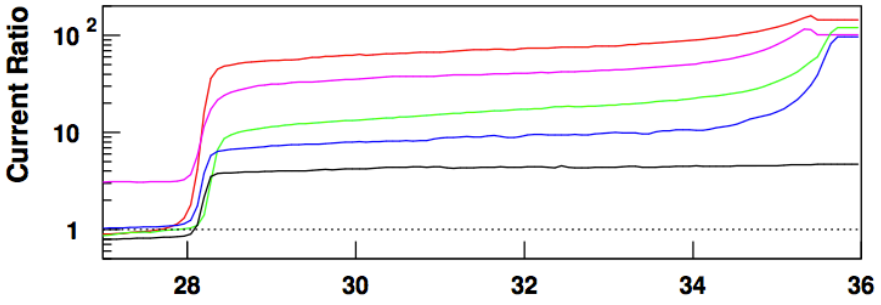


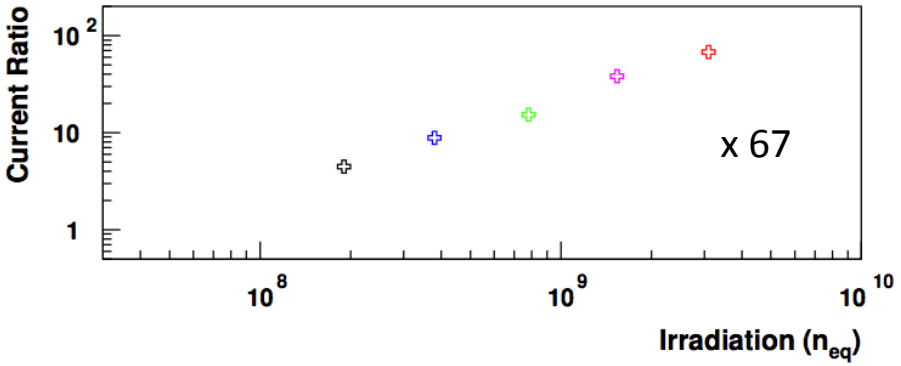


SiPM After Irradiation

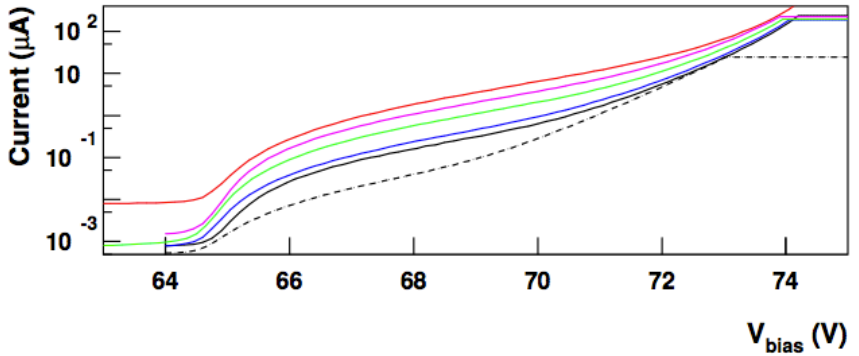
ASD-RGB3S-P-50
3x3 mm^2 AdvanSiD SiPM, 50μm cell

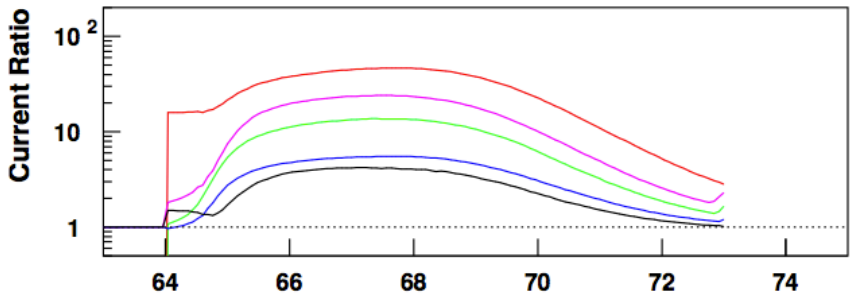


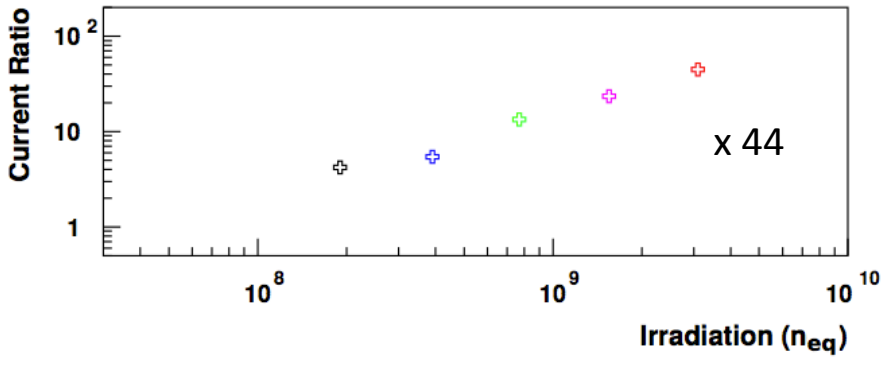




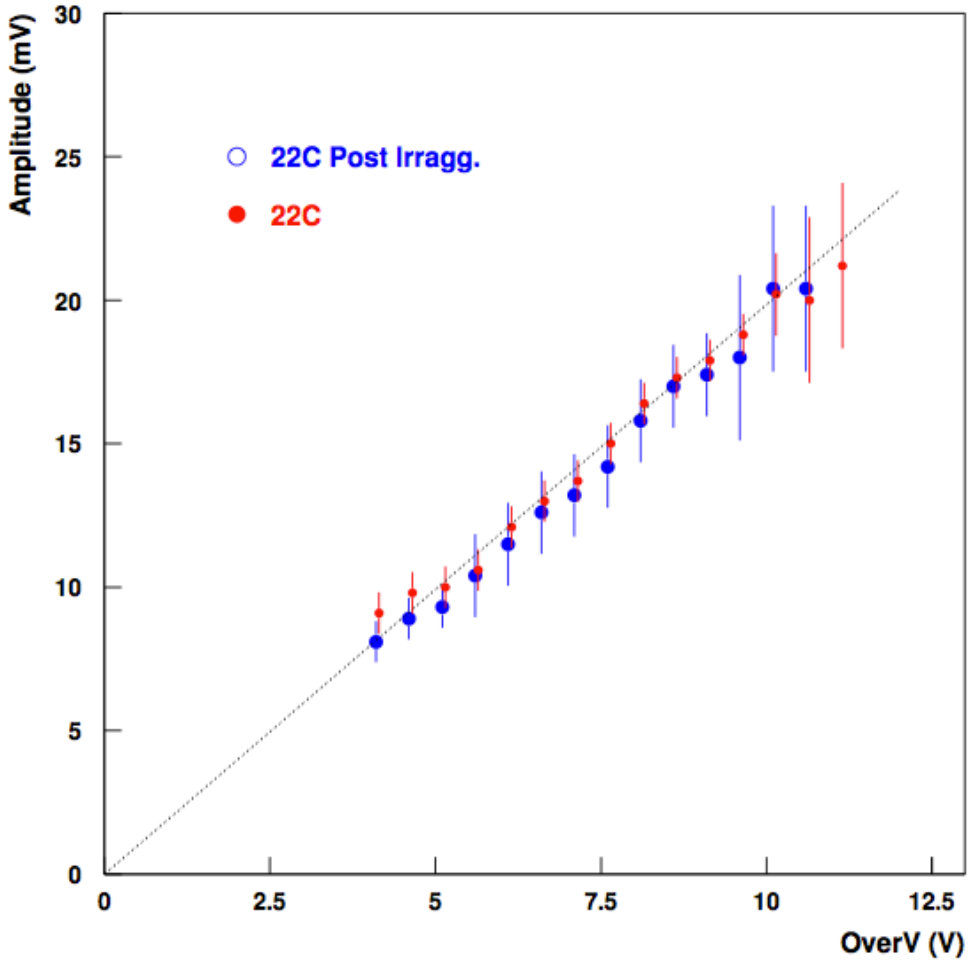
S12572-015-P
3x3 mm^2 Hamamatsu MPPC, 15μm cell





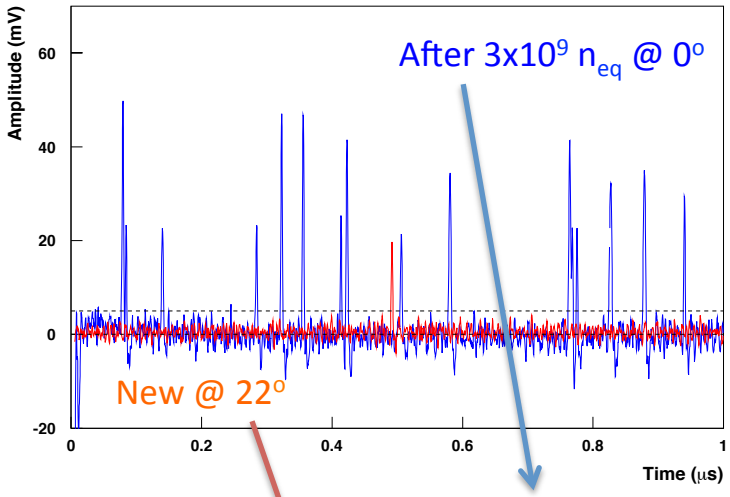


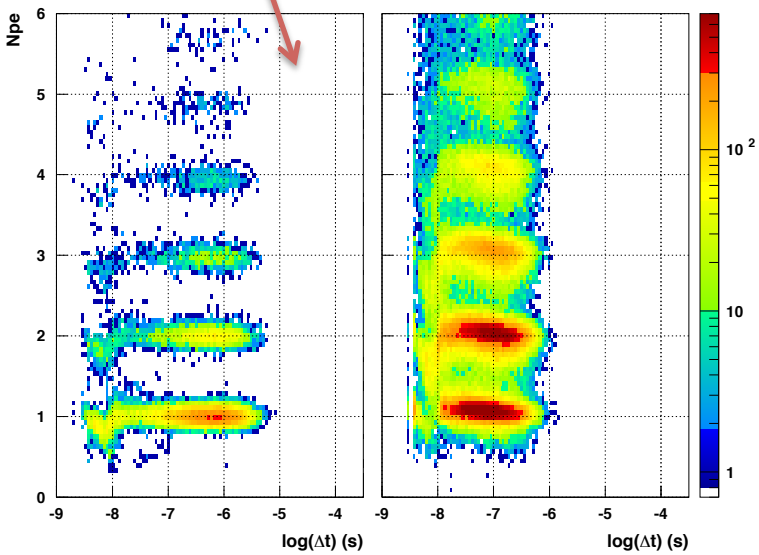
Working Interval



SiPM Irradiation

ASD-RGB3S-P-50
3x3 mm^2 AdvanSiD SiPM, 50μm cell

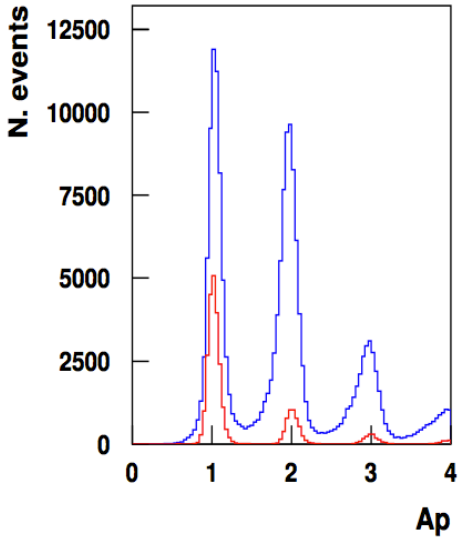


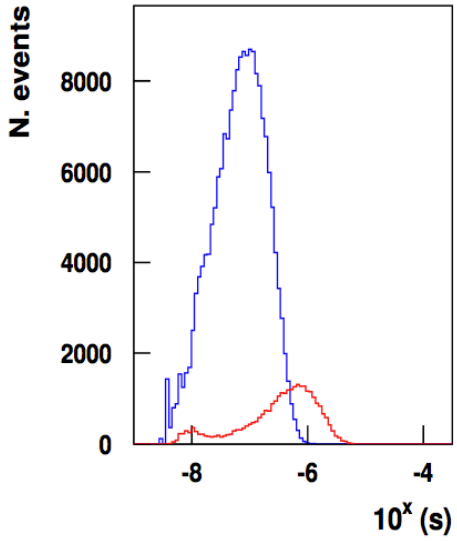


Dark counts after irradiation @ 22^o
x 4 Hamamatsu 15 μm
x 9 Advansid 50 μm

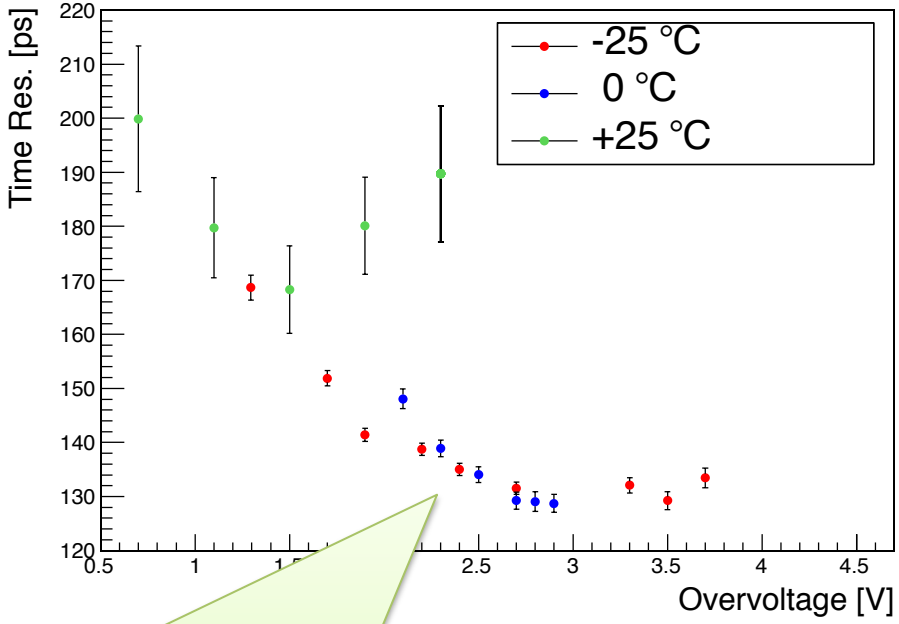
Dark Counts increase less then dark current !!

Dominant effect: cross-talk inflation
- clusters of simultaneous discharges (not a problem)
- new SiPM with trenches may suppress it

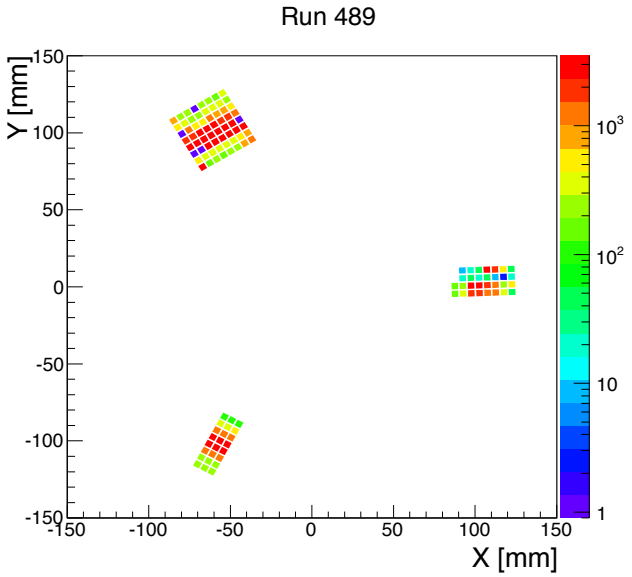


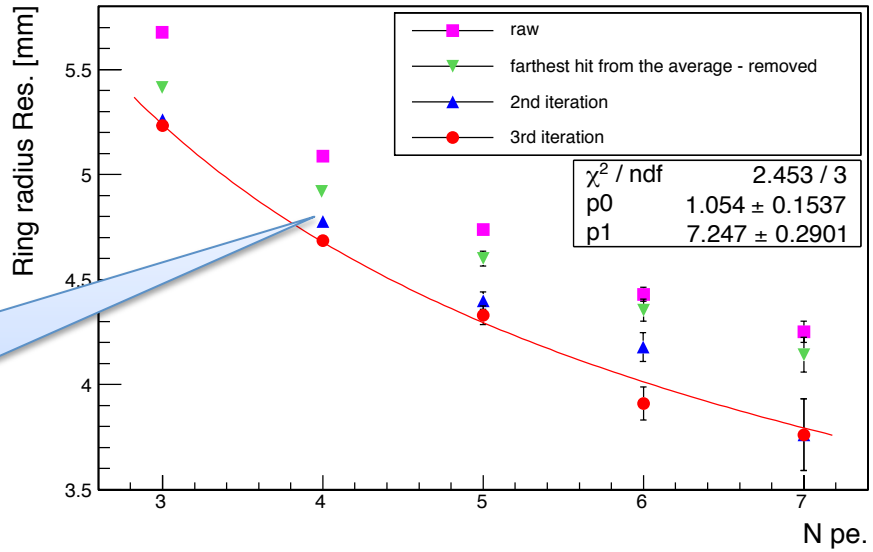


SiPM Prototype Results



Time resolution derived from time difference of SiPM hits after removal of the single channel vs trigger offsets:
- minor residual contributions from geometry
- dominated by discriminator threshold jitter





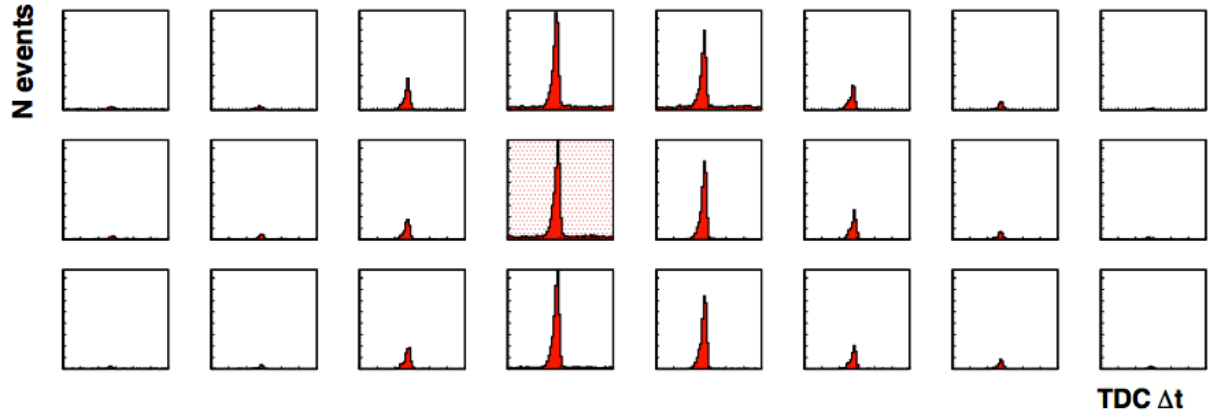
Spatial resolution improves with SiPM hit-time analysis: iteratively reject the farthest hit in time if time difference > 0.8 ns (3 sigmas)

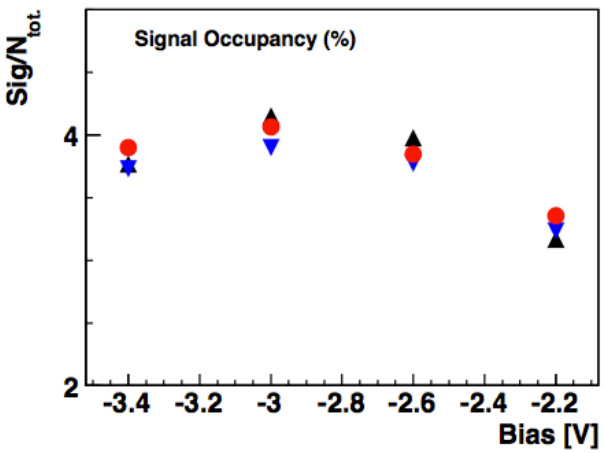
SiPM Prototype Results

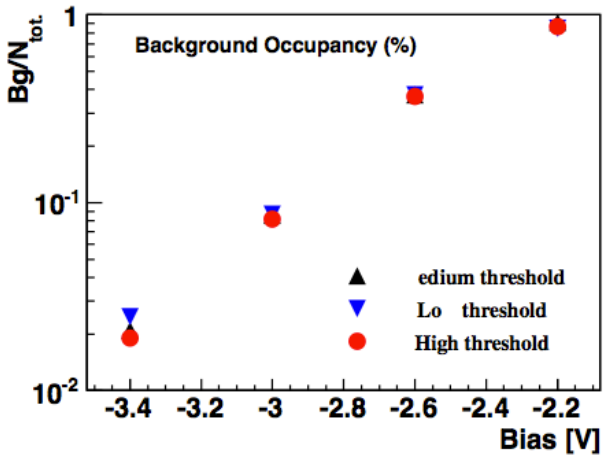
From CERN T9 tets @ -25°
within +/-3 ns Time window

10^{-4} Dark count occupancy

NEGLIGIBLE



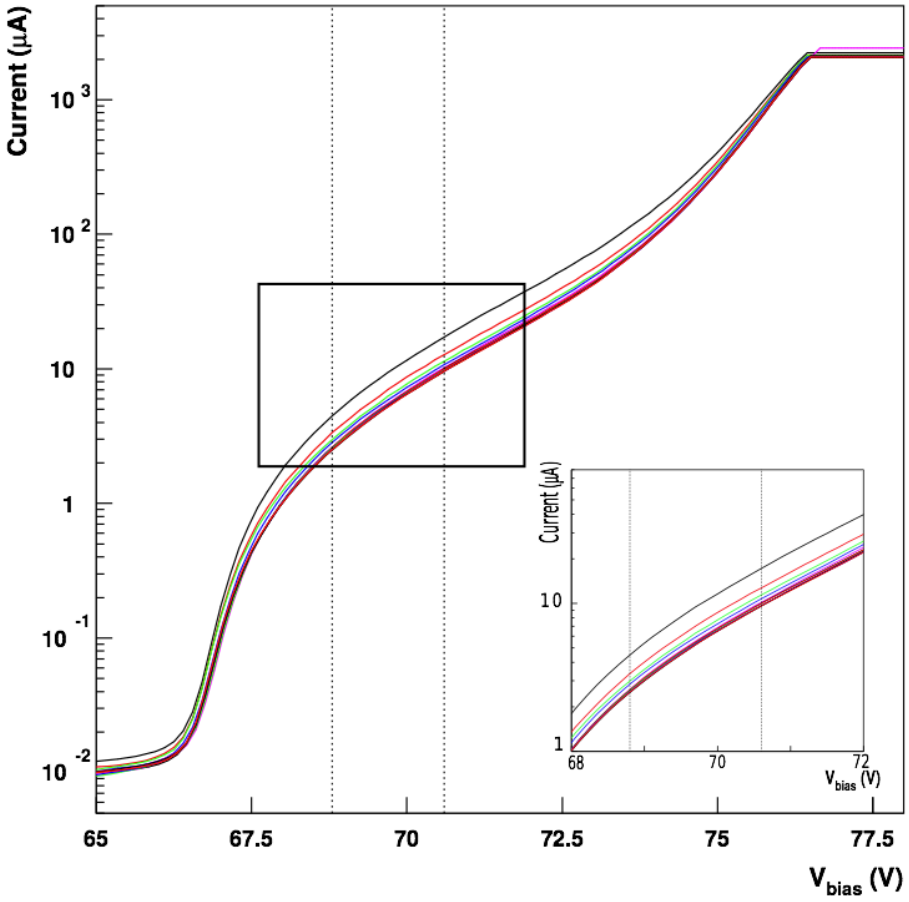


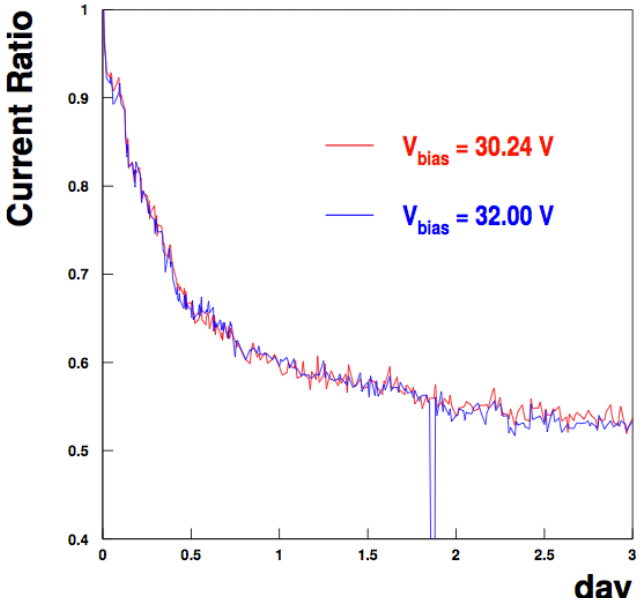


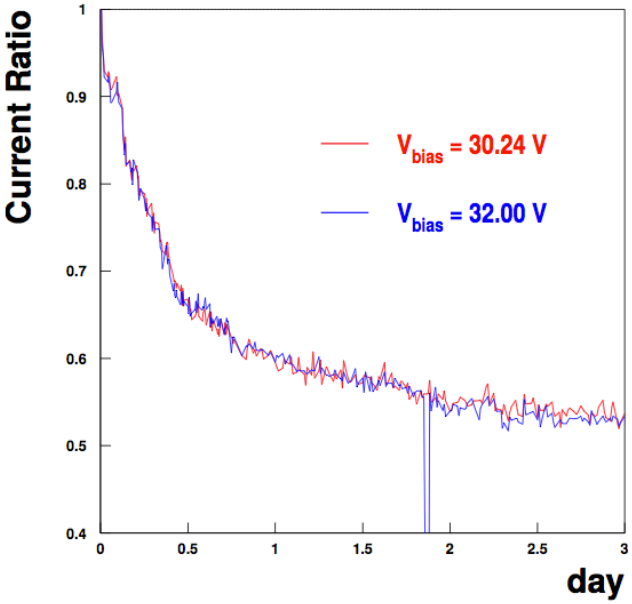
Dark counts after irradiation @ 22°
x 4 Hamamatsu 15 μm
X 9 Advansid 50μm

ACCEPTABLE

Annealing







Few days at 50° :

50 % gain in current

Effective in extending the SiPM lifetime