Understanding the temperature dependence of SiPM characteristics

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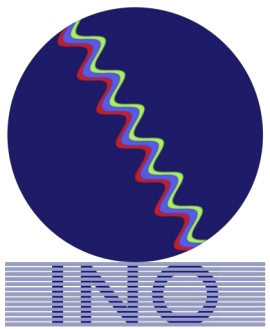
FRASCATI SUMMER SCHOOL
July 14, 2022

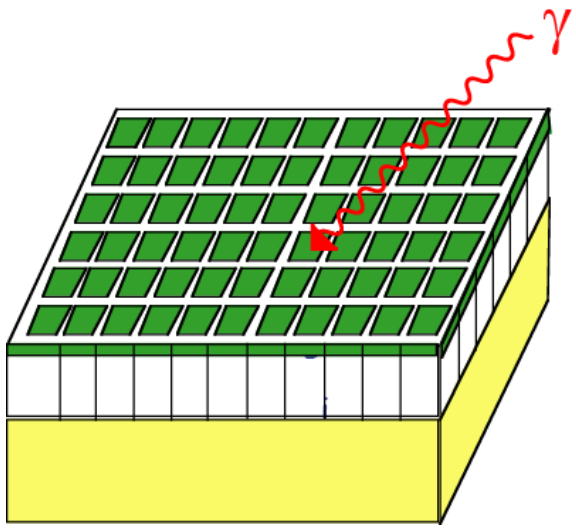


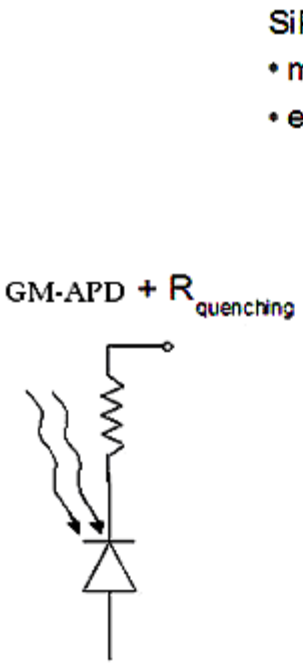
***Infosys fellow**

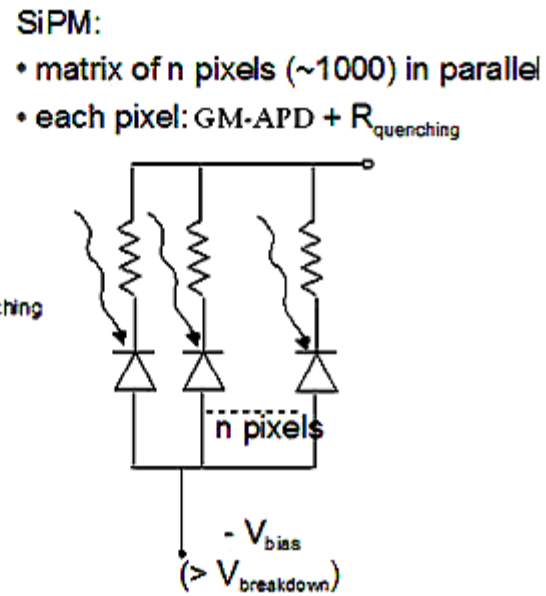
Outline

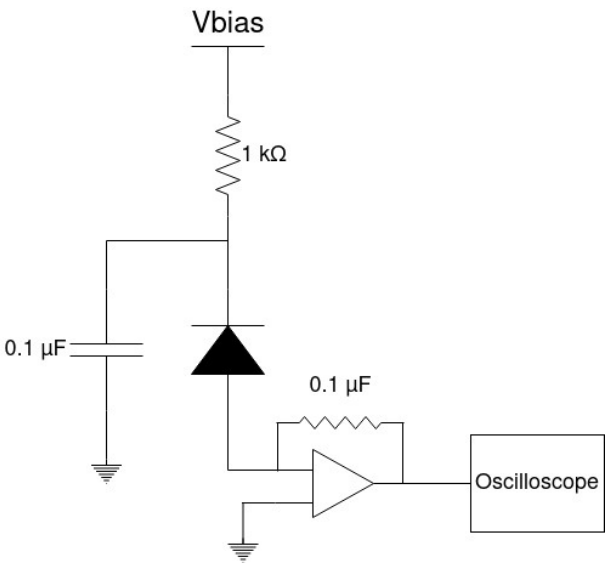
- Introduction to SiPM
- Types of correlated noise in SiPM
- Correlated noise as a function of V_{ov} and temperature

About Silicon-Photomultiplier



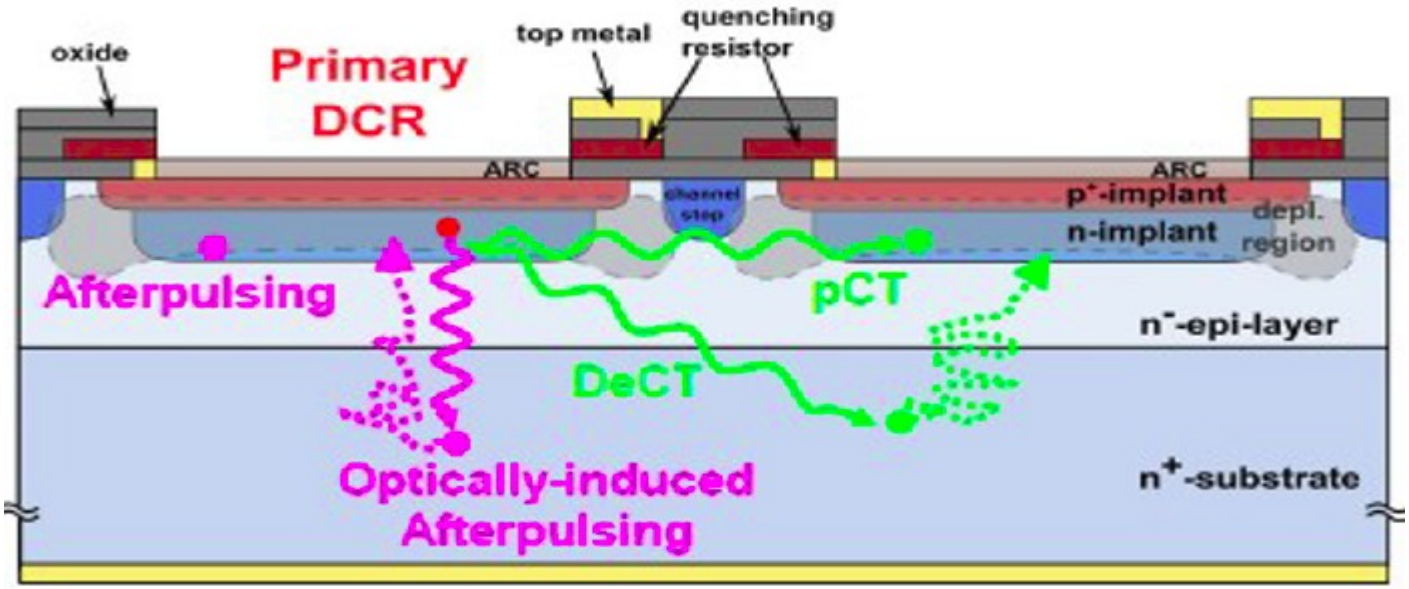


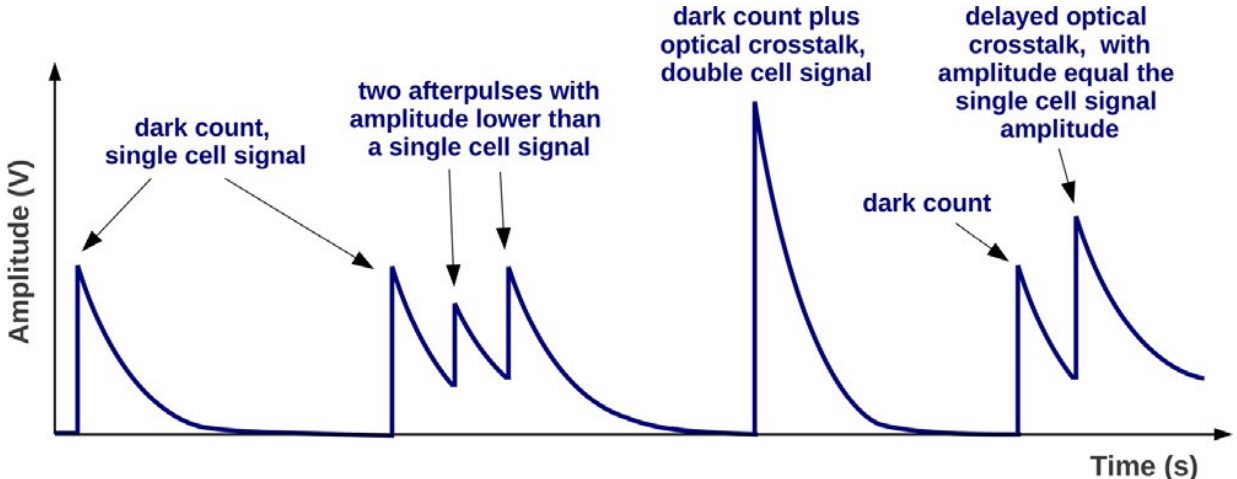


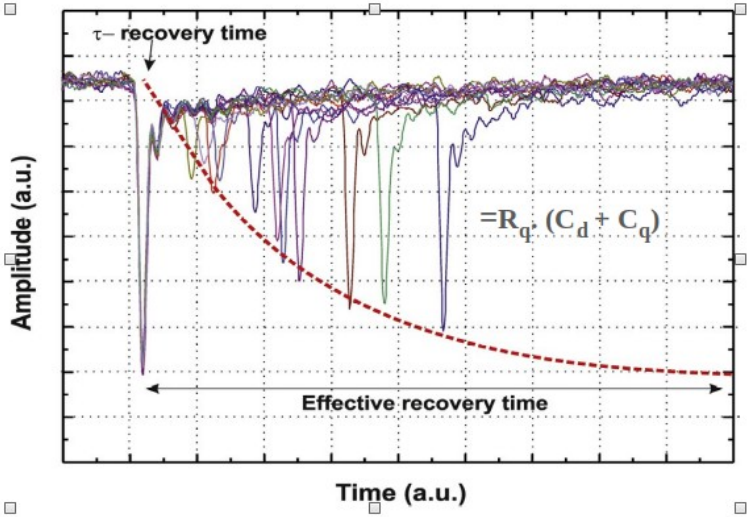


- S13360-2050VE Hammamatsu
- 2mm x 2mm with 1584 pixels, microcell of 50 um pitch, fill factor of 74%
- Overvoltage (V_{ov}) = V_{bias} - V_{bd}, V_{bd} : (53 ± 5)V
- Spectral range : 320 - 900 nm

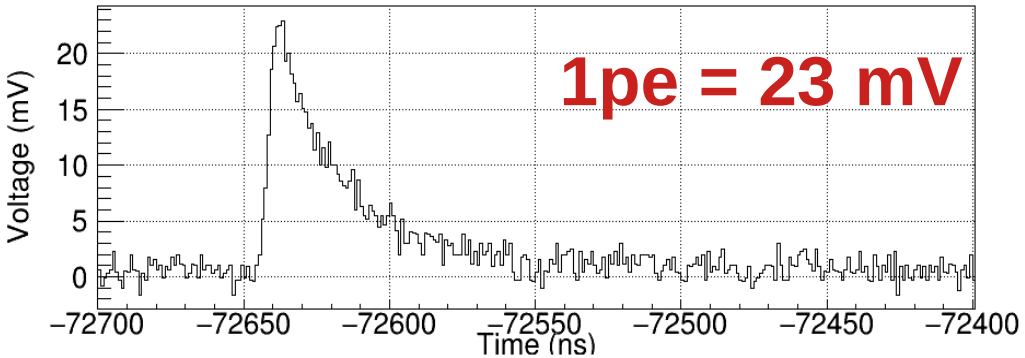
Correlated noise in SiPM

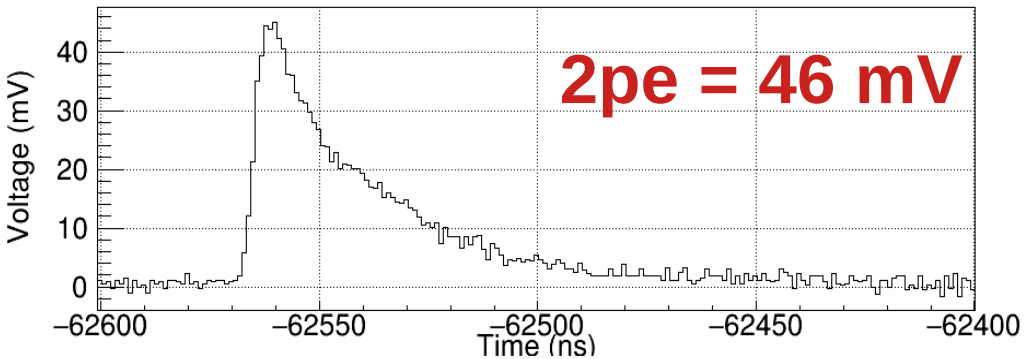


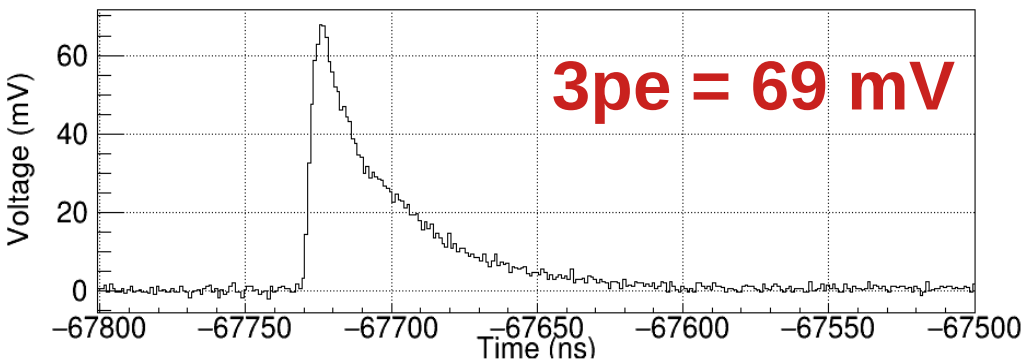


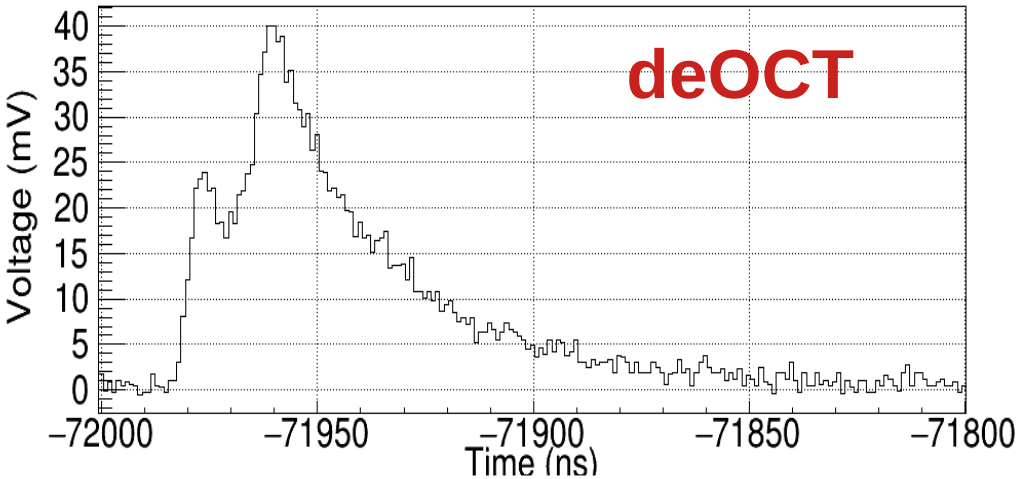


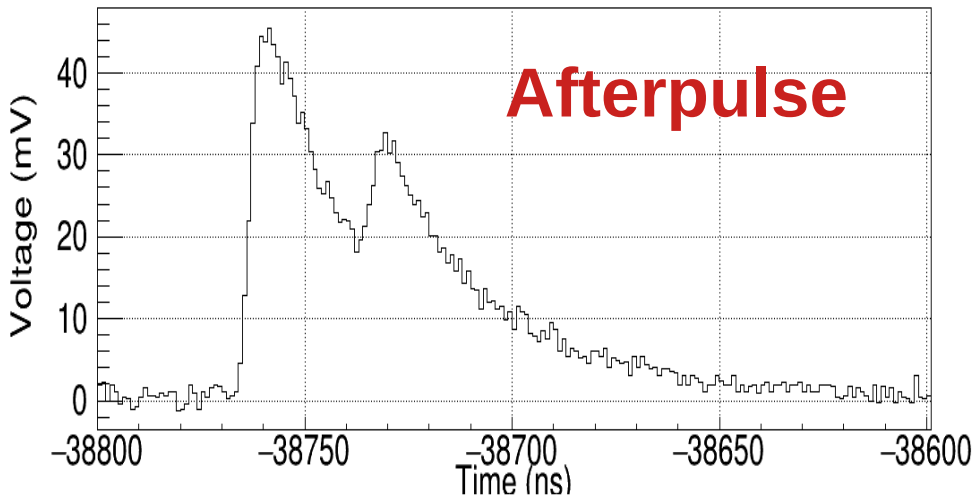
Correlated noise in SiPM



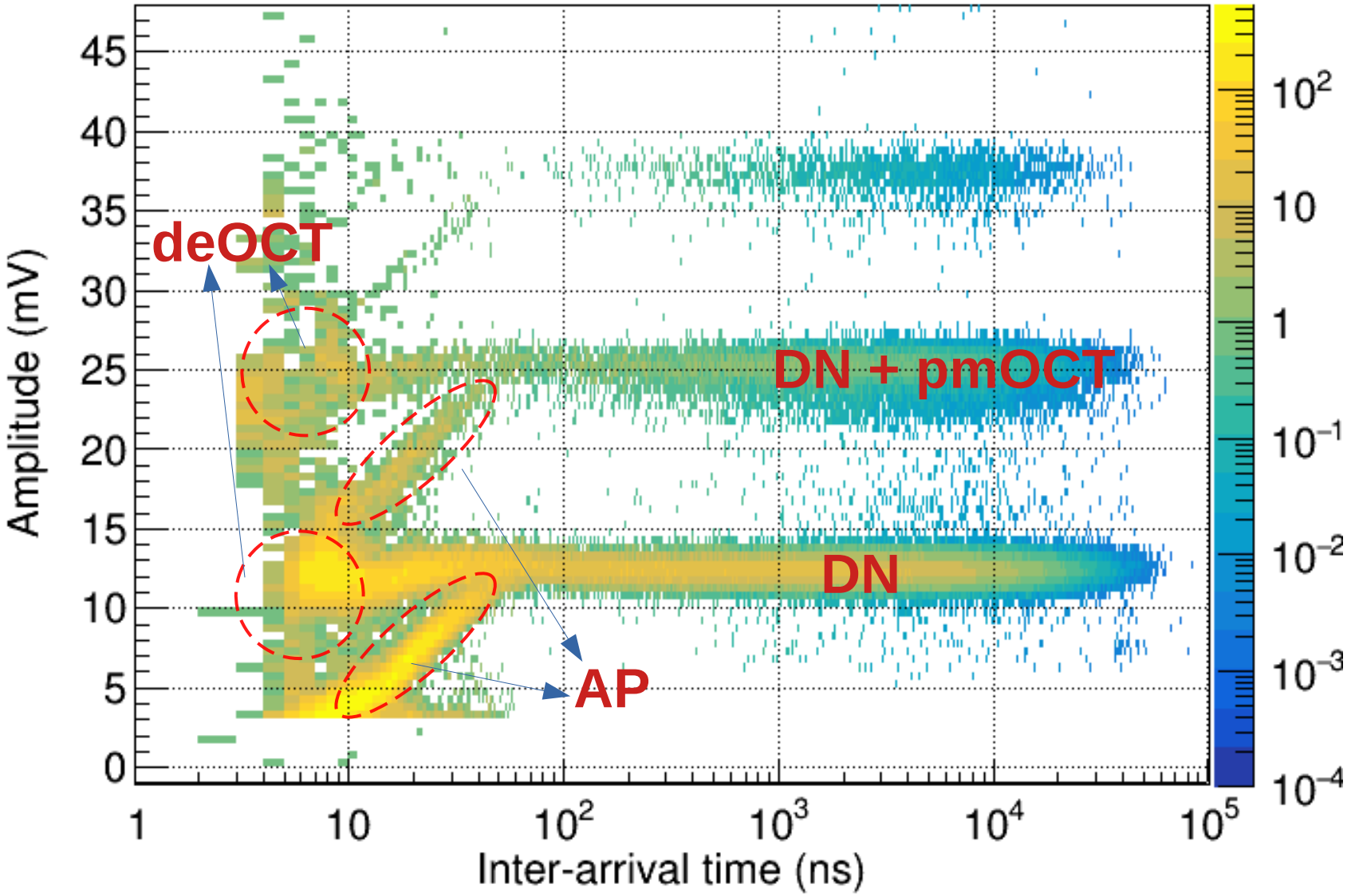




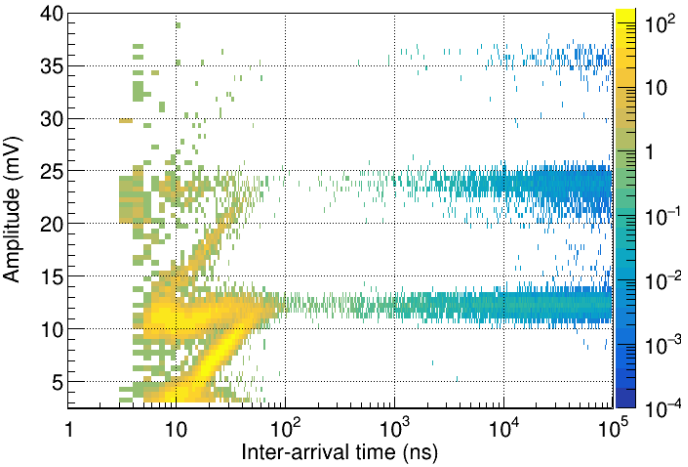


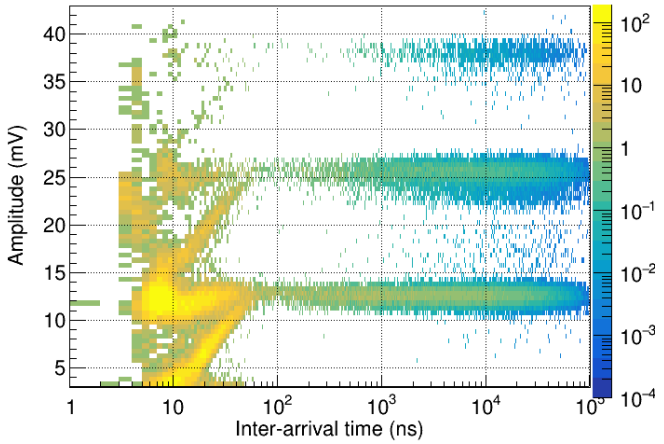


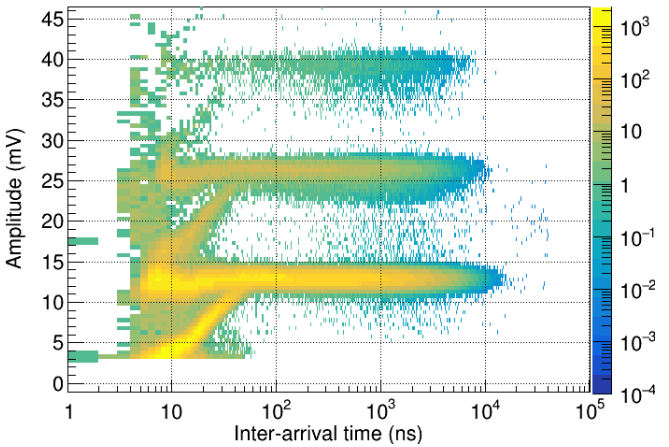
Correlated noise in SiPM



Correlated noise in SiPM



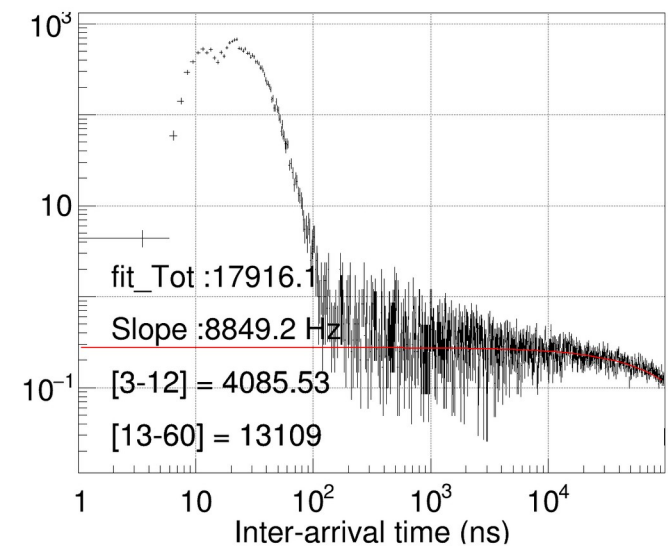


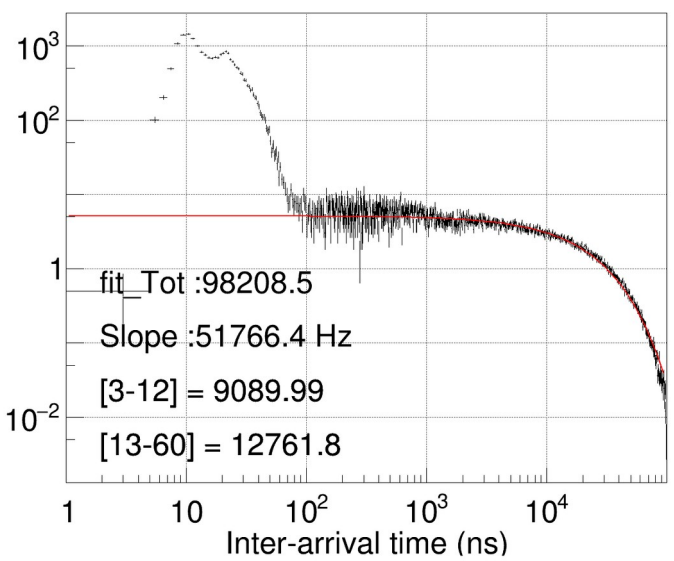


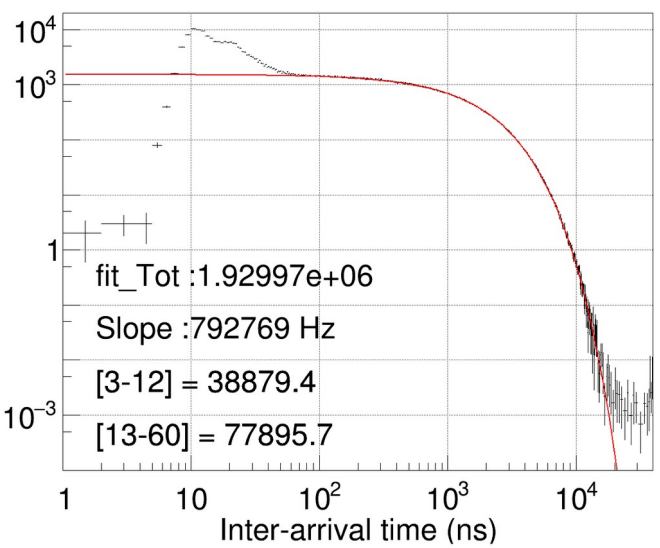
-20 ^{0}C

10 ^{0}C

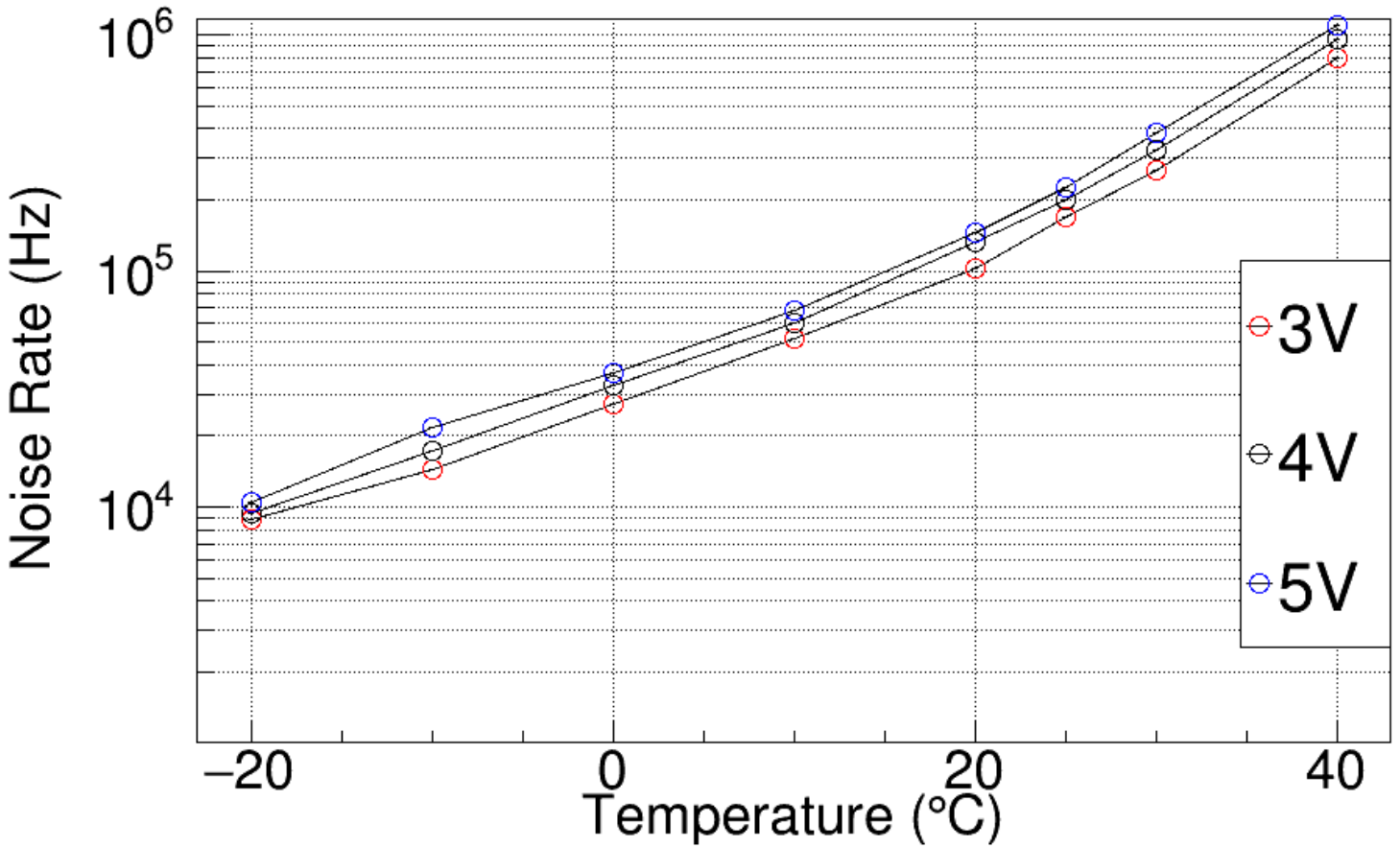
40 ^{0}C





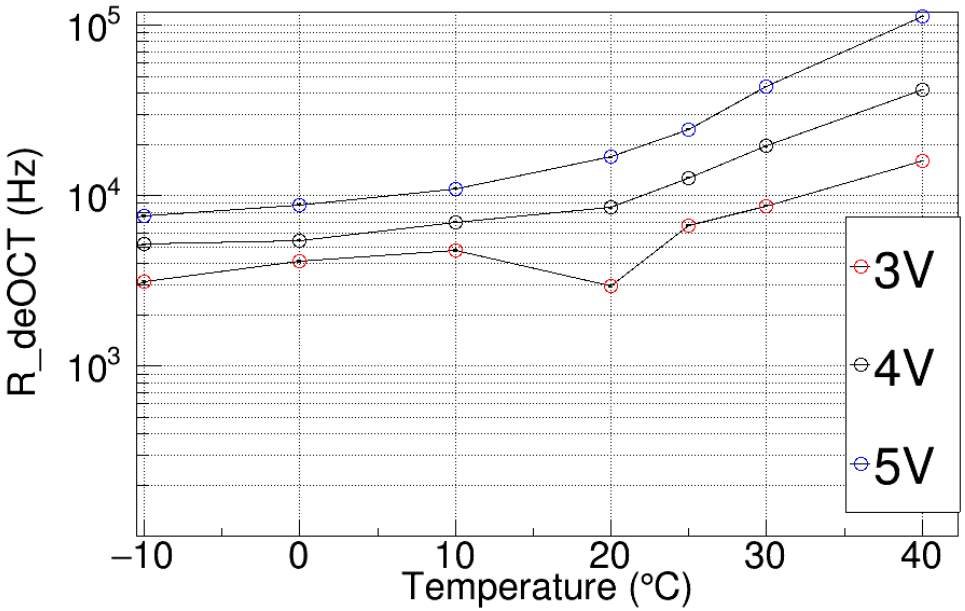


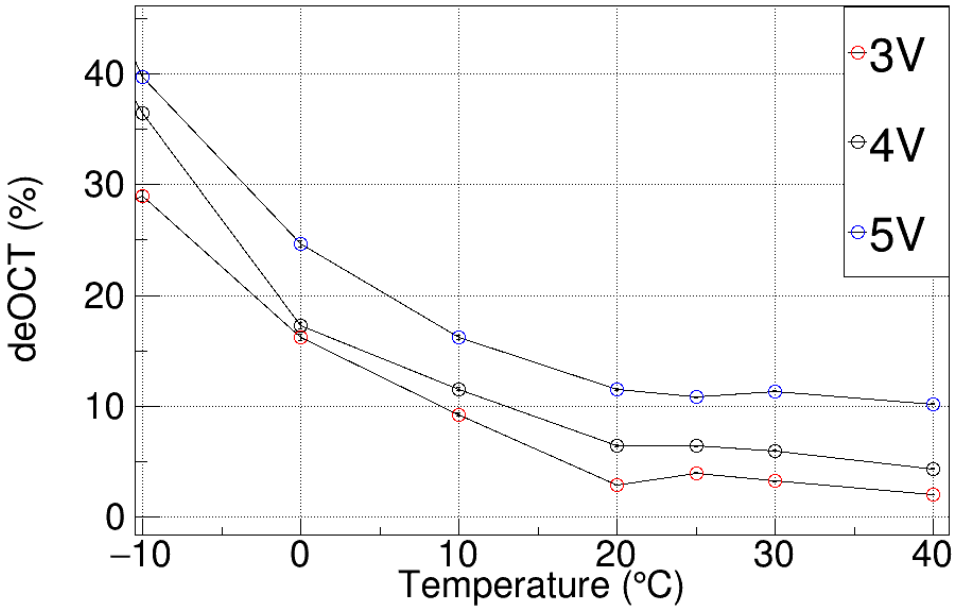
Dark noise w.r.t. V_{ov} and temperature



Dark noise measurement from the slope of exponential fit

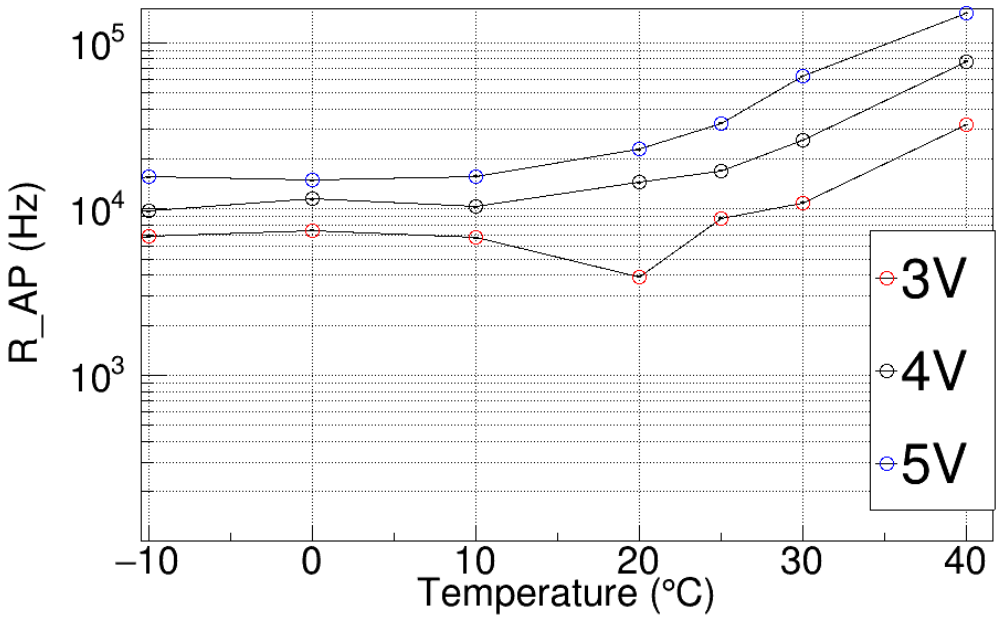
Delayed Optical Crosstalk

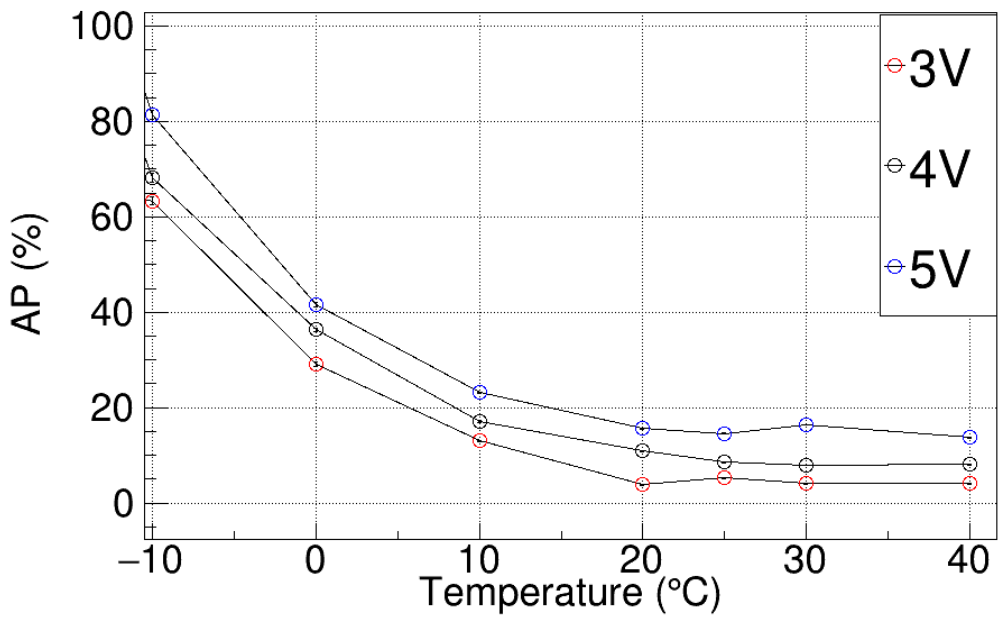




The absolute rate of delayed optical crosstalk increases with increasing temperature and overvoltage.
The fraction of deOCT out of total noise is decreasing with increasing temperature.

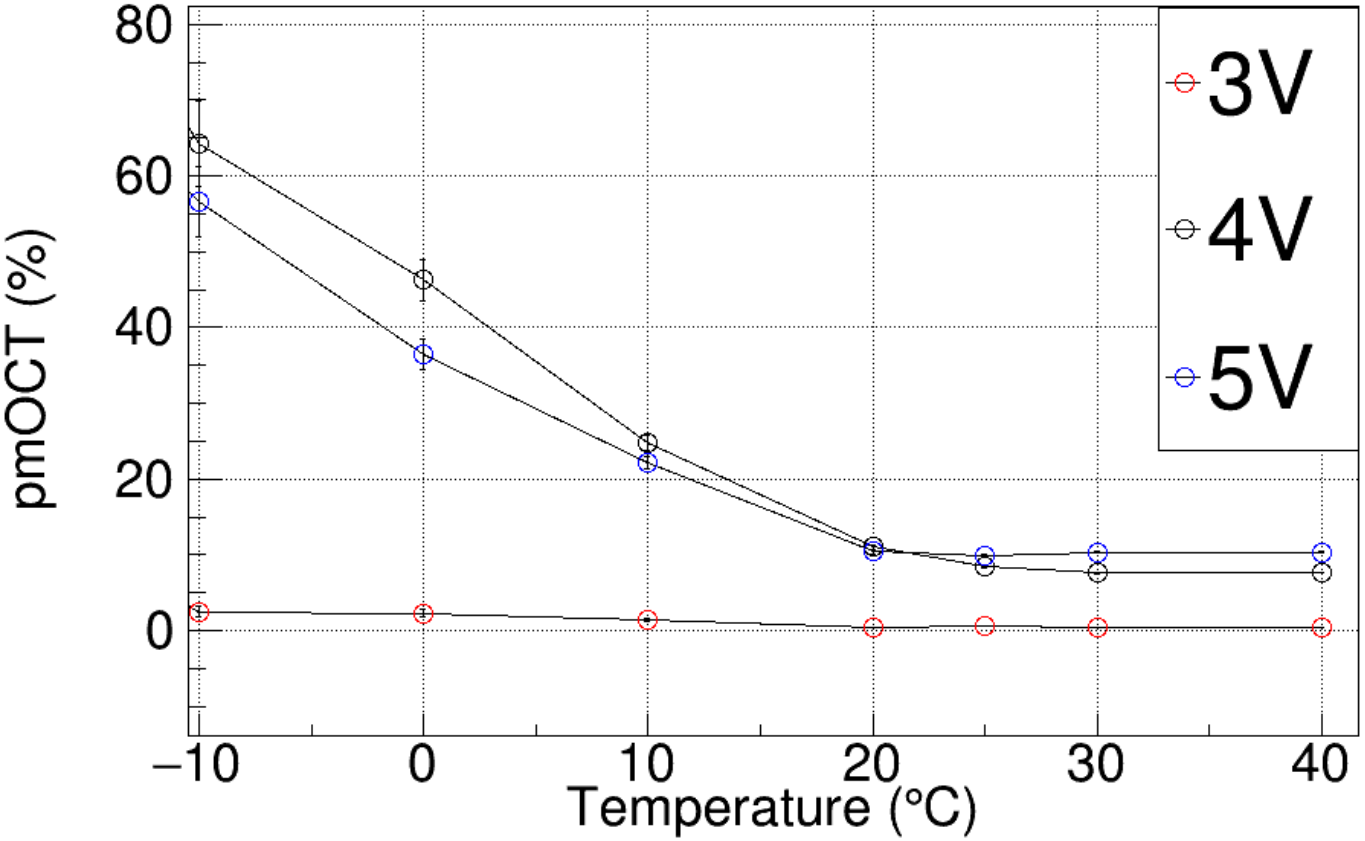
Afterpulsing





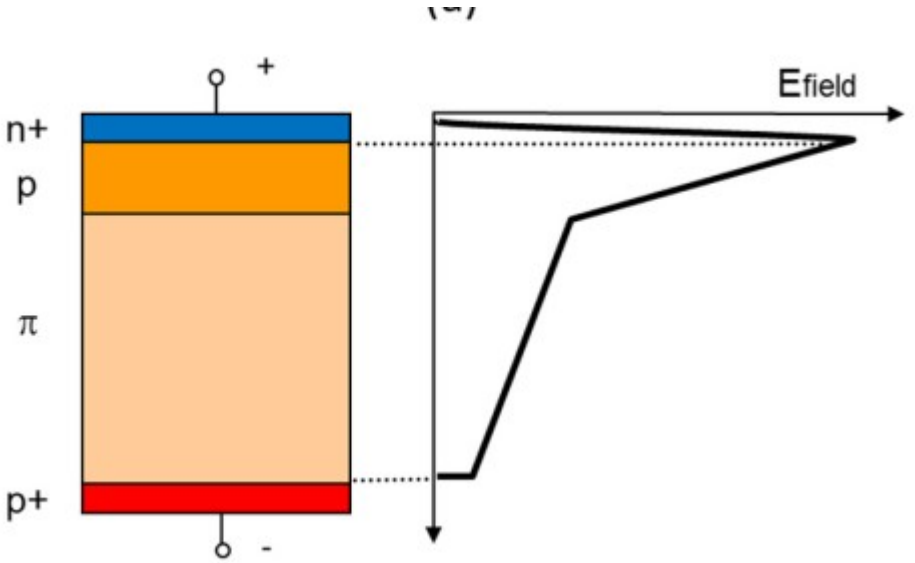
The absolute rate of afterpulse increases with increasing temperature and overvoltage.
The fraction of afterpulse out of total noise is decreasing with increasing temperature.

pmOCT



Same observations for prompt optical crosstalk!!

THANK YOU!!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