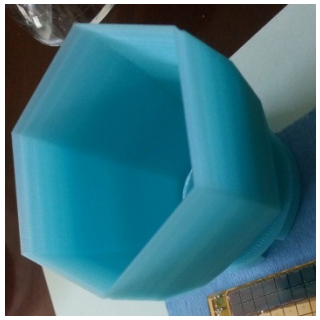
PADOVA

Discrete components sum stage
+
Optics
(preliminary slides)

Riccardo +
Cornelia, Christian, Daniele, Mosè, ...

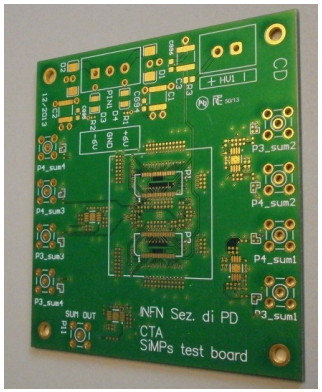
Summary



Winston cone
(LST standard?)

Lens?
(pconvex?
custom?)

SiPM matrix
(FBK:NUV-HD)

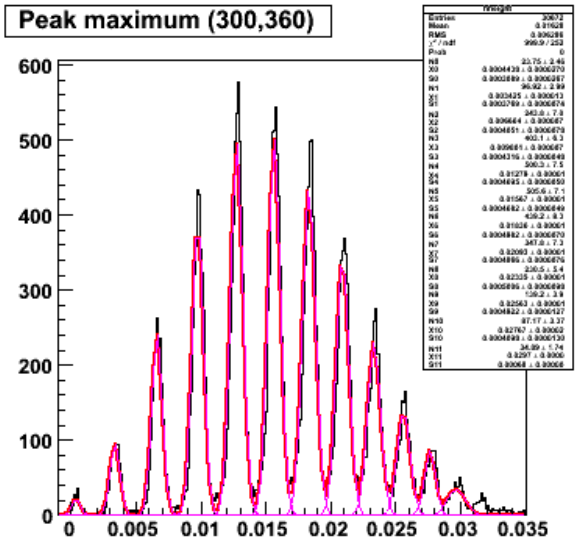


Sum
(discrete)

To R/O

Replace as little as possible of the LST design
PMT sensor is replaced with SiPM matrix, electronics to sum it into one output signal

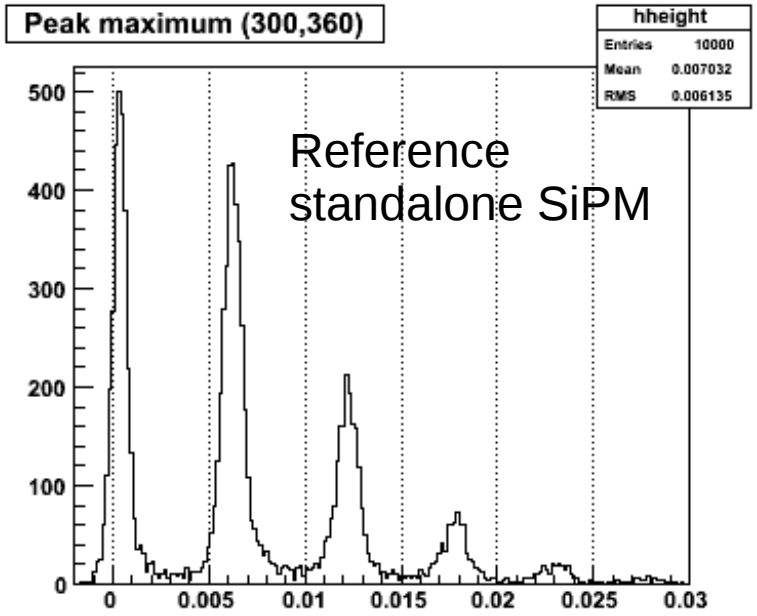
Current status: SiPM

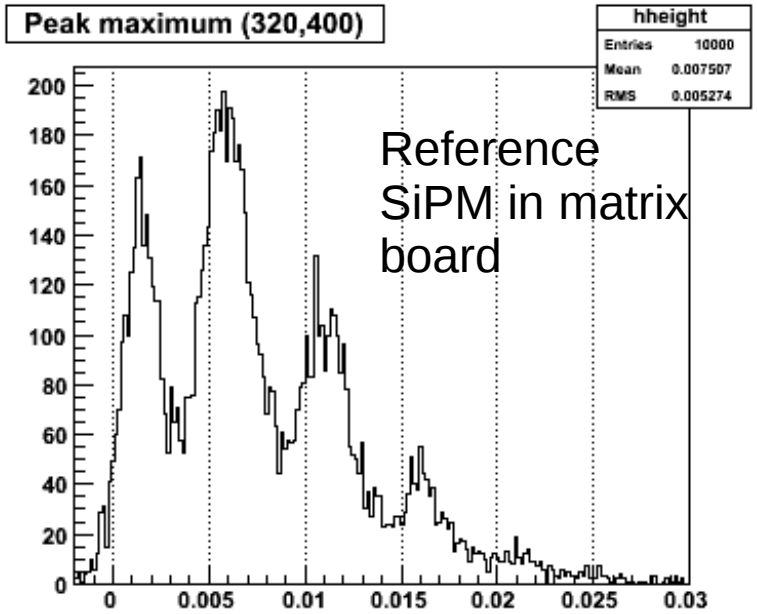


Current FBK SiPM
Not final version (new samples show nice increase in QE)
Left: readout w/ just preamp and DRS4 eval board (V~28V)

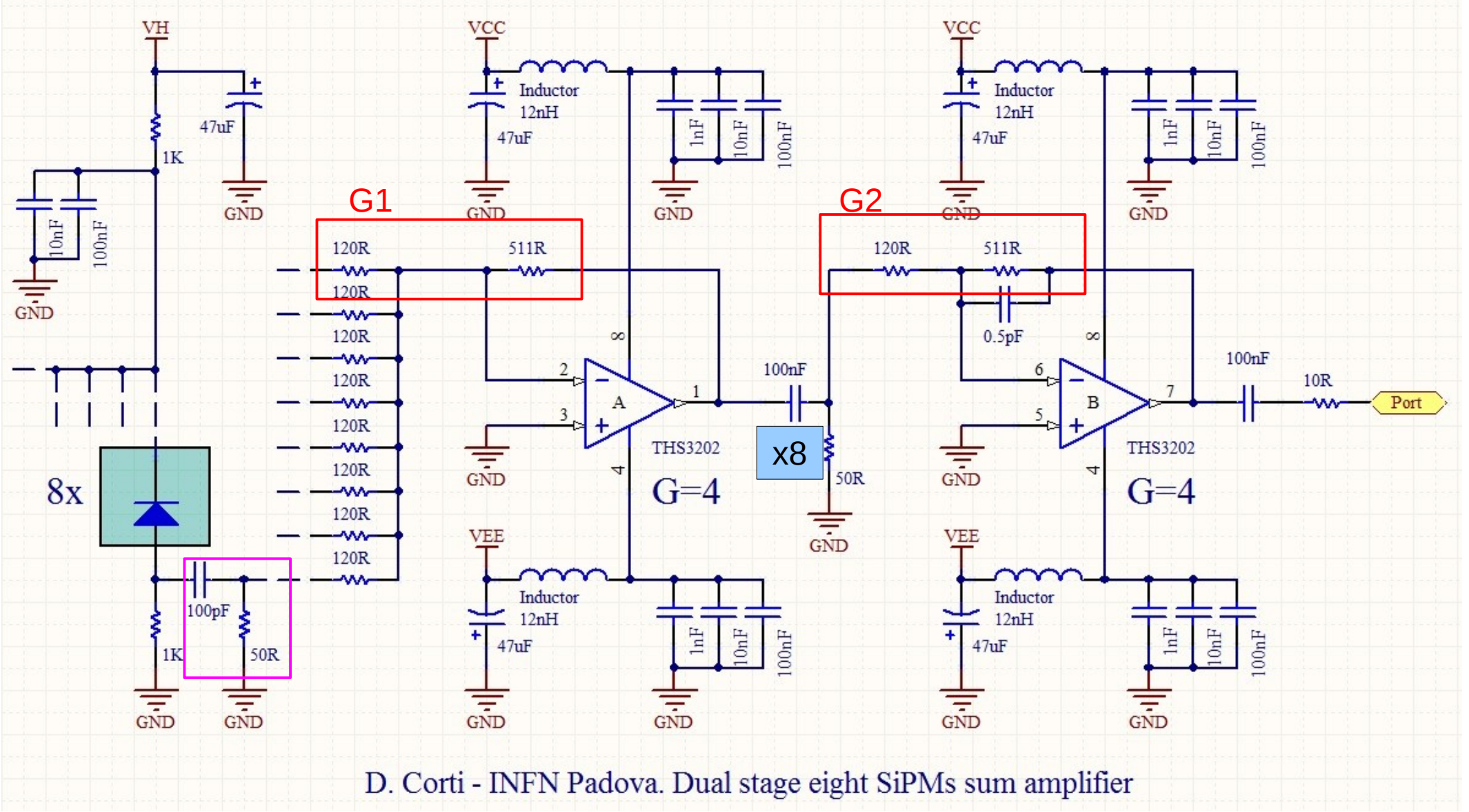
Placing in test matrix adds significant noise
It was necessary during sensor characterization and sum board prototyping

Example below : contemporary acquisition, SiPM from same lot, same bias, same preamp:



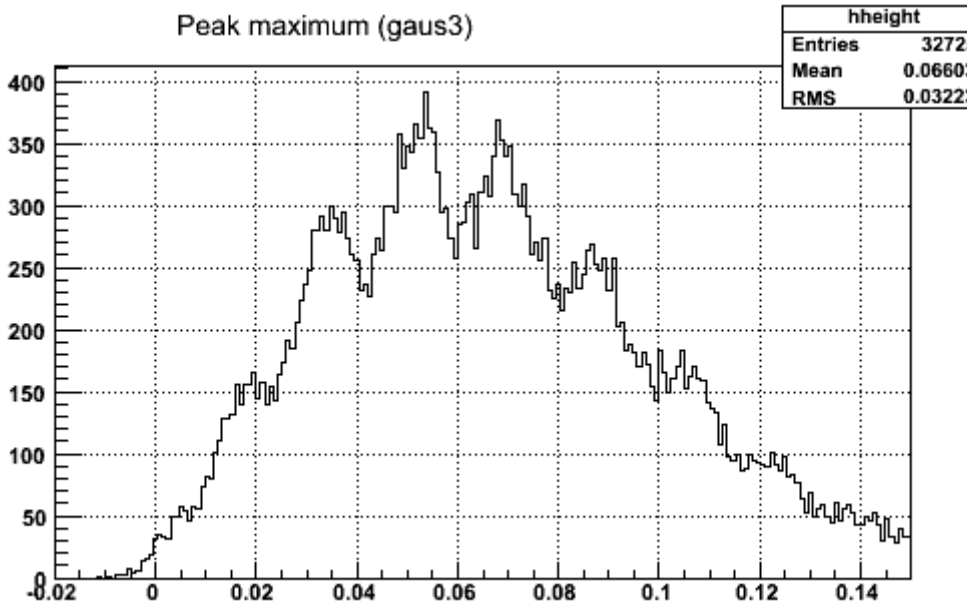


Sum stage 1

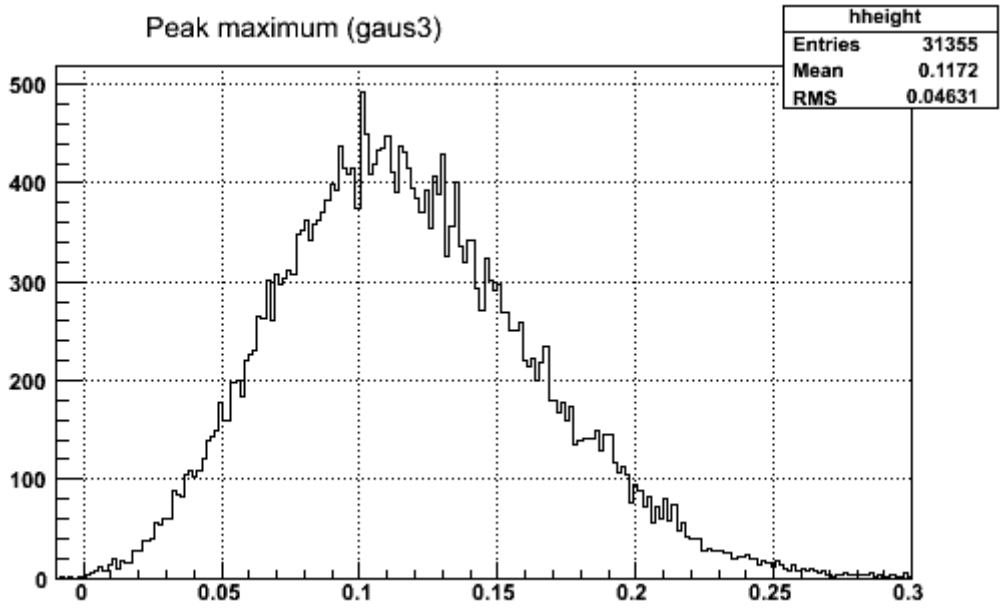


Not final parameters (this is for G1=4x, G2=4x).
Current: noise 700uV at the output stage (with G1=6x, G2=4x)

Sum stage 2



Summing 4



Summing 8

Currently: phe peaks visible up to ~6 SiPMs
A lot of noise is from the large test board, several cm tracks from SiPMs to bias and sum
(10% gain spread in SiPM lot at V_{op})

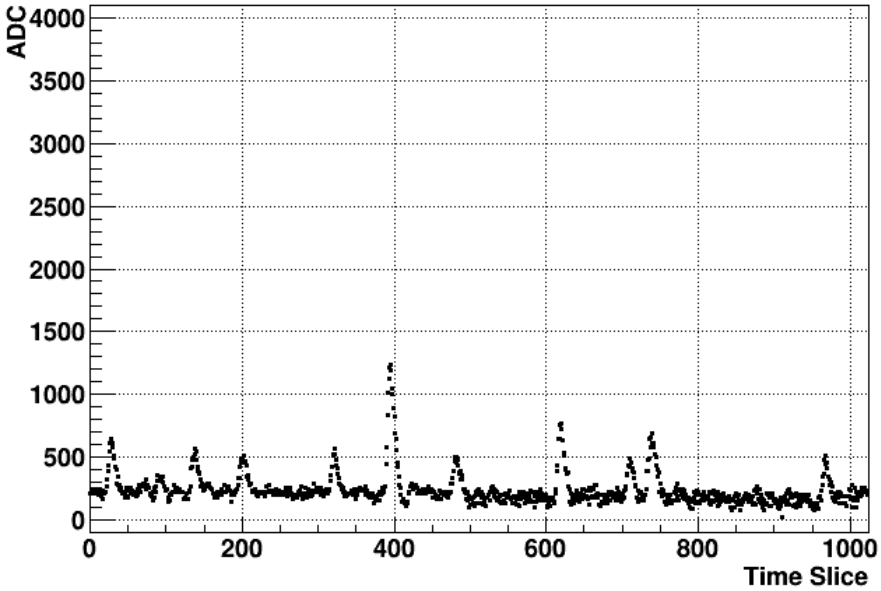
Going forward

Sum electronics is now finalized (low noise, good bw)
New PCB embedding sensors (*front*) and first electronic (*back*)
4x4 o 5x5 3x3 mm^2 SiPM's, depending on results from optics (see later)

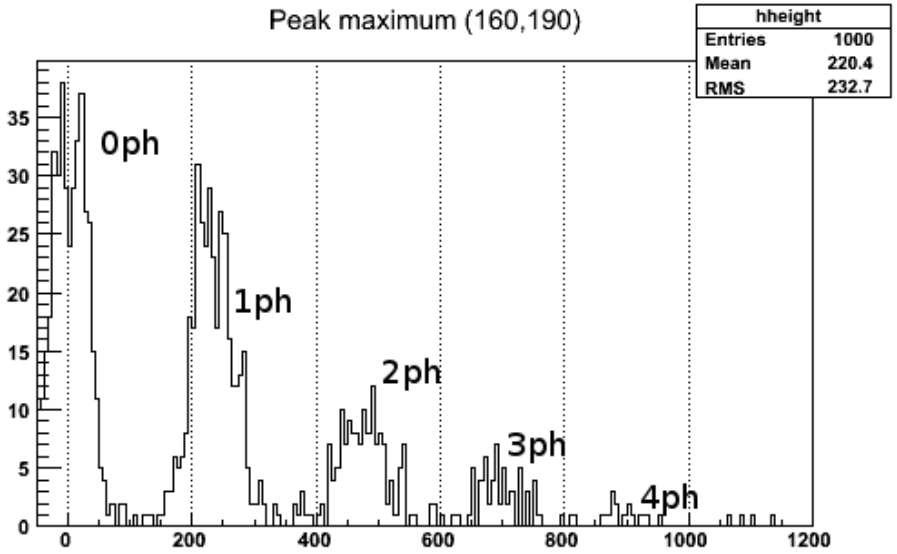
Separate power for different sensor blocks? Envisaging pre-selection of SiPM by gain at FBK, so it could be unnecessary (current gain spread in test Si matrix is 10%)

Dragon readout

Borrowed Dragon_v3 from Pisa (thanks Riccardo)
Readout working (thanks R., Yusuke)

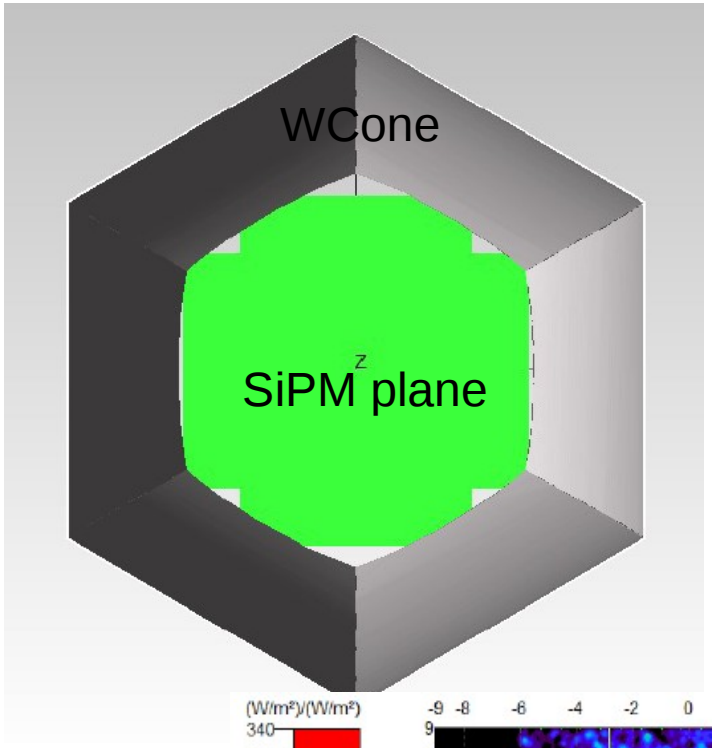


SIPM signal with Dragon preamplified for show, 2GS



First “finger plot”
2GS, ref. standalone SIPM FBK + preamp (uncalibrated)

Optics



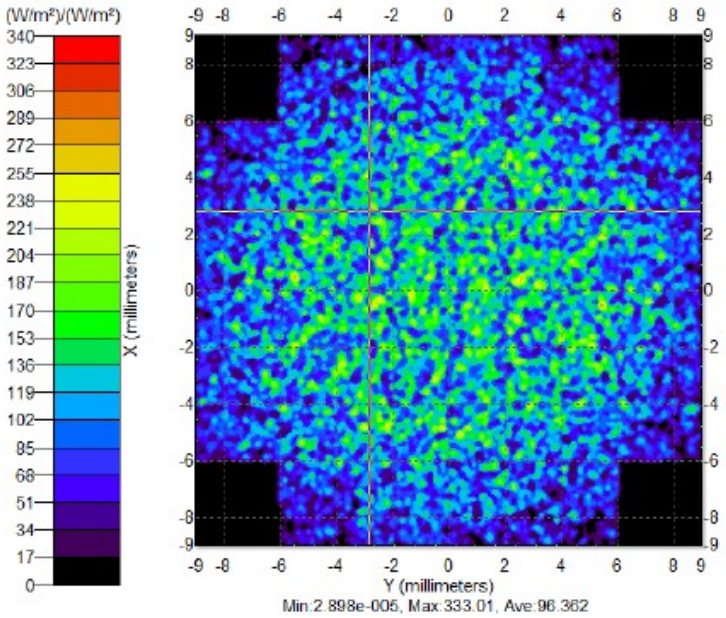
Simulations undergoing to decide lens characteristics
Impacts on sensor area / # of sensors of course

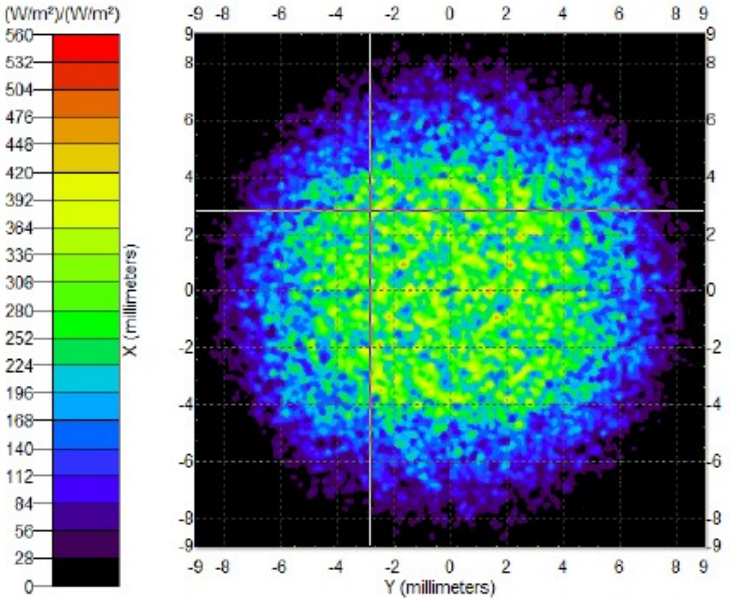
Left: example of “cross” configuration w/ 32 3x3mm^2 SiPMs

Test: lens shape, height, ...

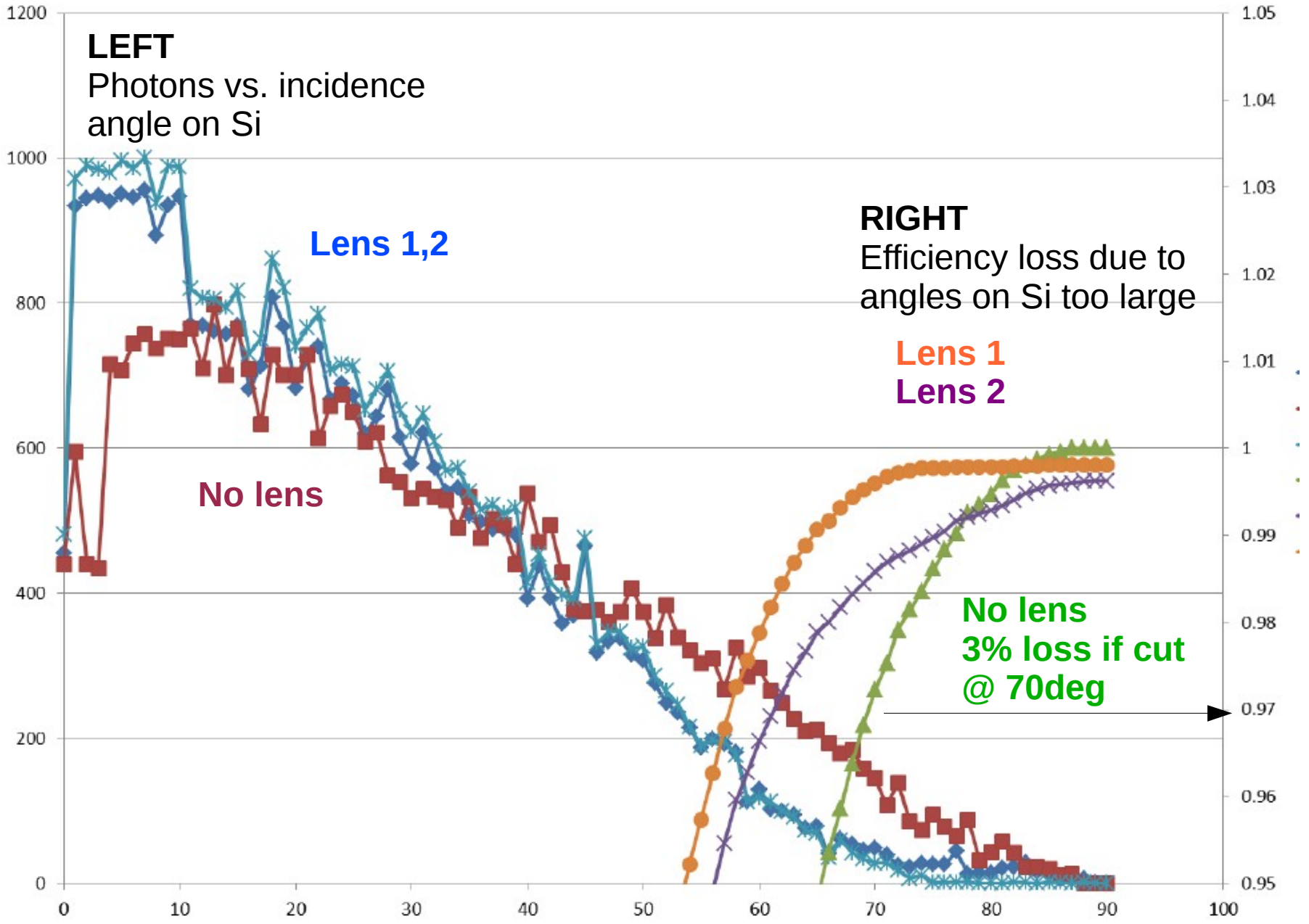
No lens

Plano-convex lens
Curvature as PMT

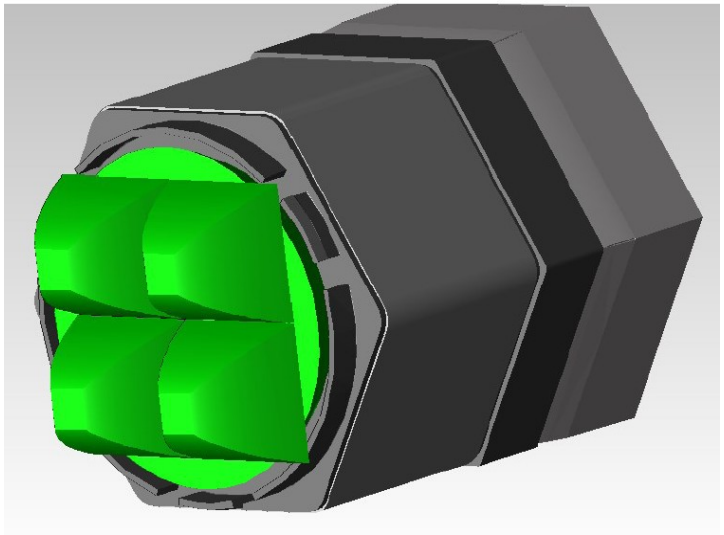




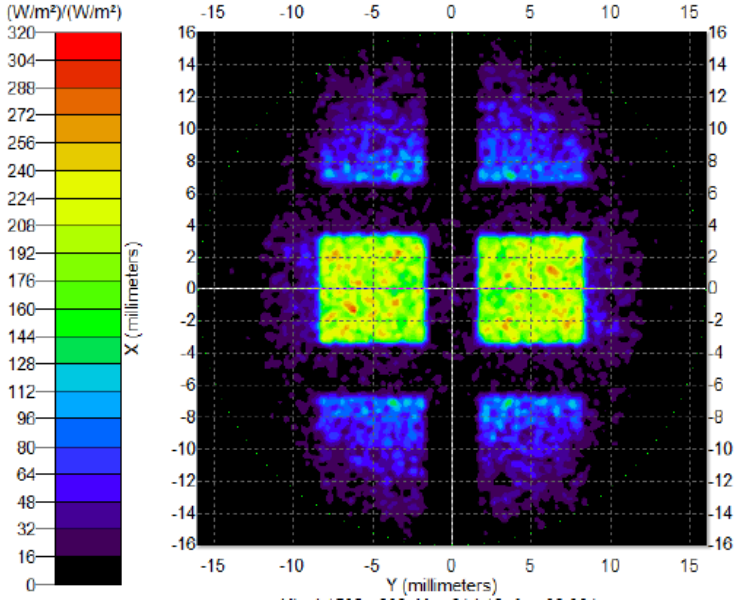
Preliminary lens performance

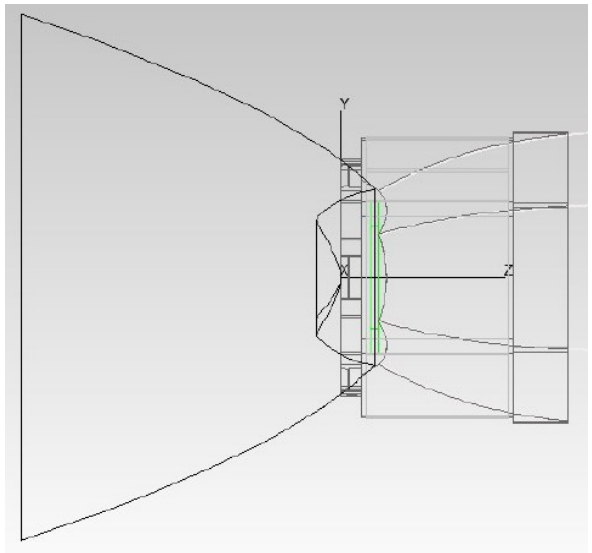


Custom lenses (glass or PMMA)



"Tooth" lens
Various scenarios





"Hollow point" concentrator

Ongoing (rapidly now)