Prex Meeting

SAM Geometry Optimization

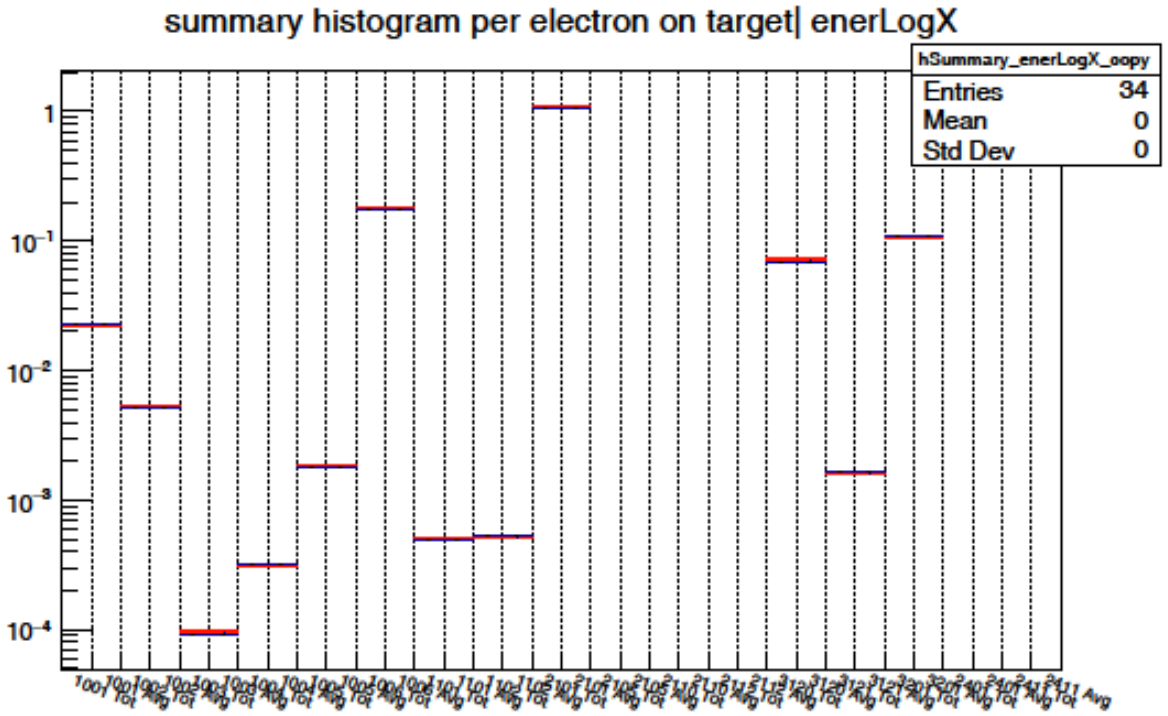
Cameron Clarke

6-13-2018

Confirming the simulation matches prior work:

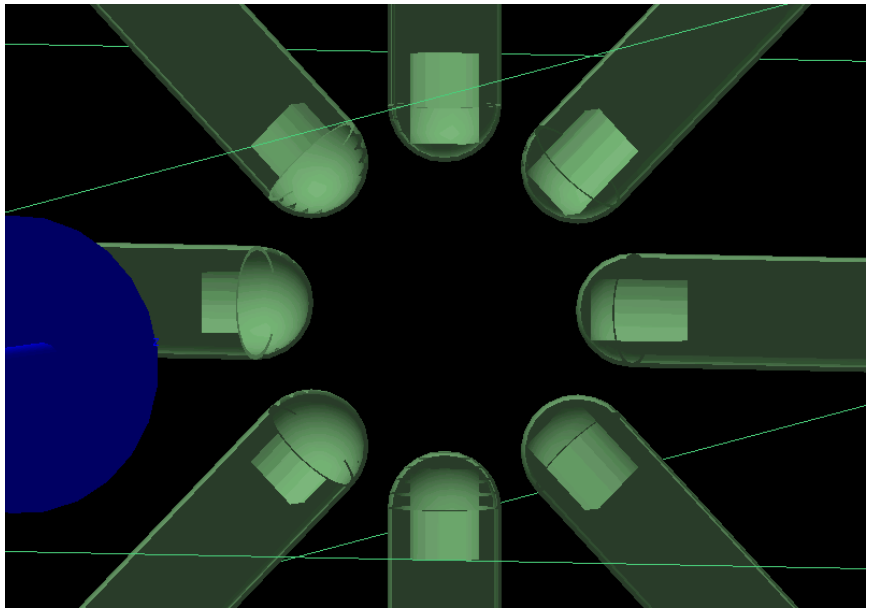
(6.3M events or so)

My results (generator 7, full prex geometry) match Ciprian's results – the red and blue lines for the two data sets are right on top of each other for all detectors studied



Potential methods of reducing radiation

1) Spherical end cap – New configuration: the tip reaches where the tip of the cylindrical one originally was, thickness reduced to 10mills of an inch from tip up to 6cm along SAM can

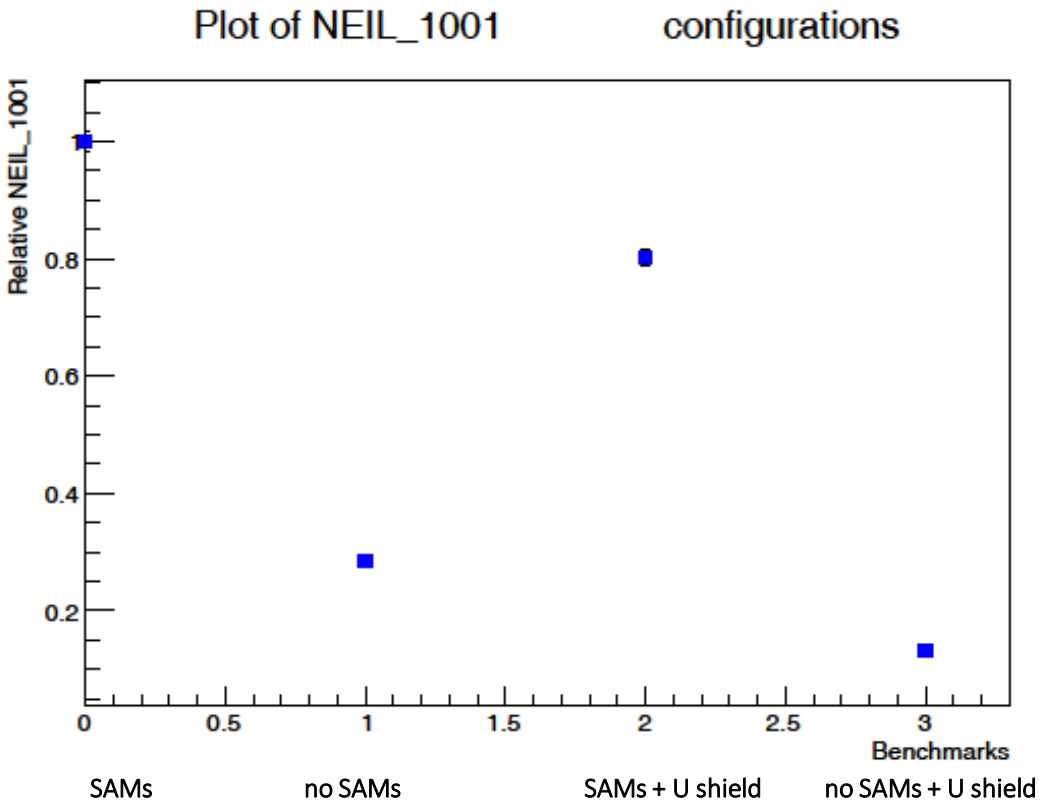


2) Changing parameters of the SAMs
- Thickness of Quartz
- Thickness of aluminum wall and window
- Radial offset of entire apparatus

Baseline simulations

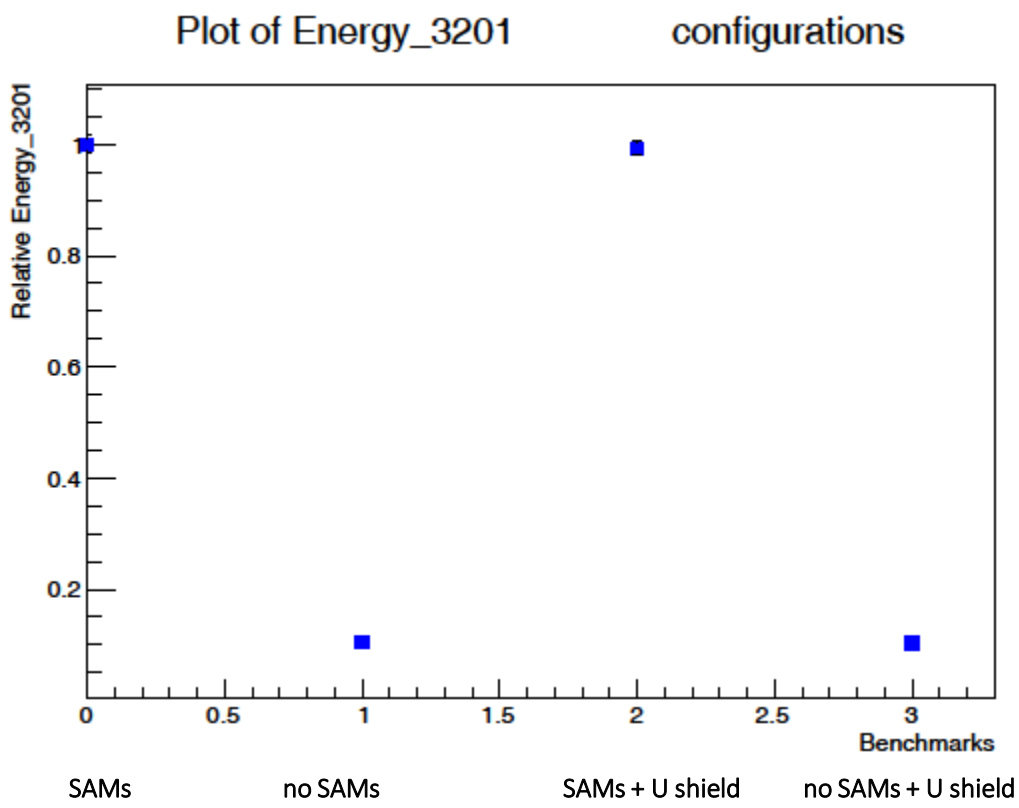
(original cylindrical endcap config)

NEIL in LHRS



Energy Deposited in O-Ring

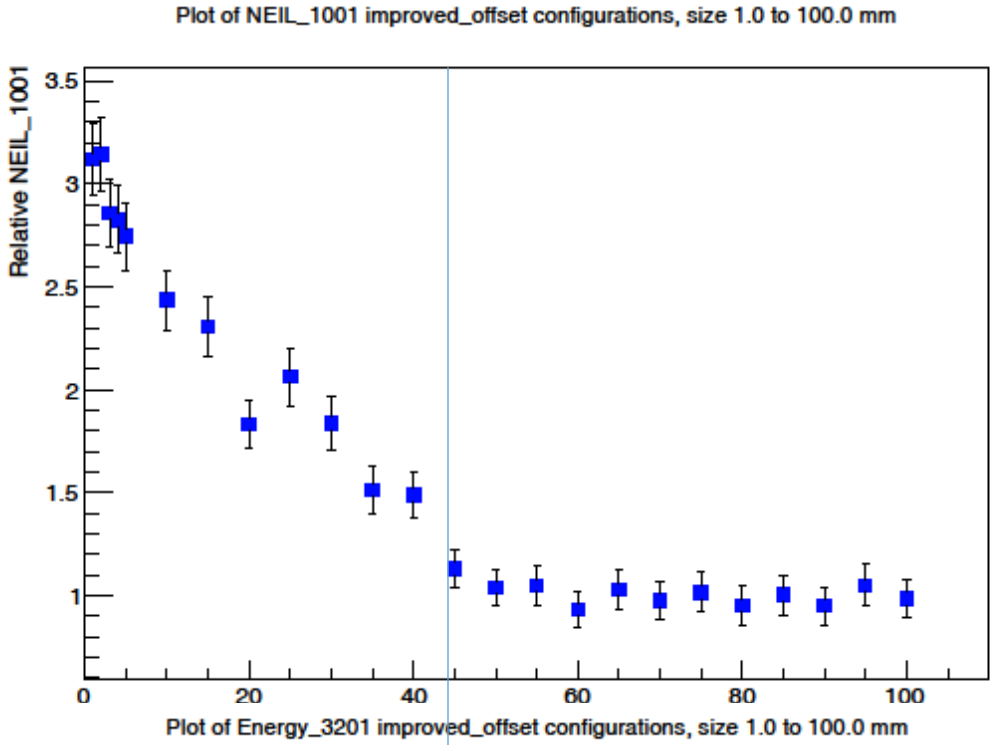
Neutron Flux > 25 MeV on the Roof (looks similar)

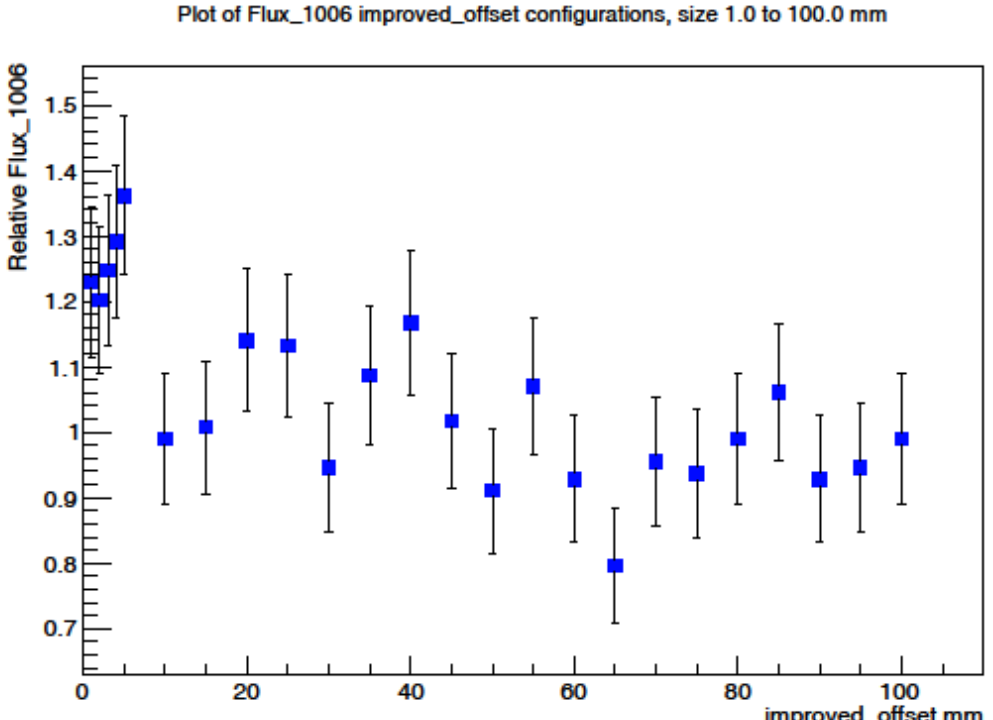


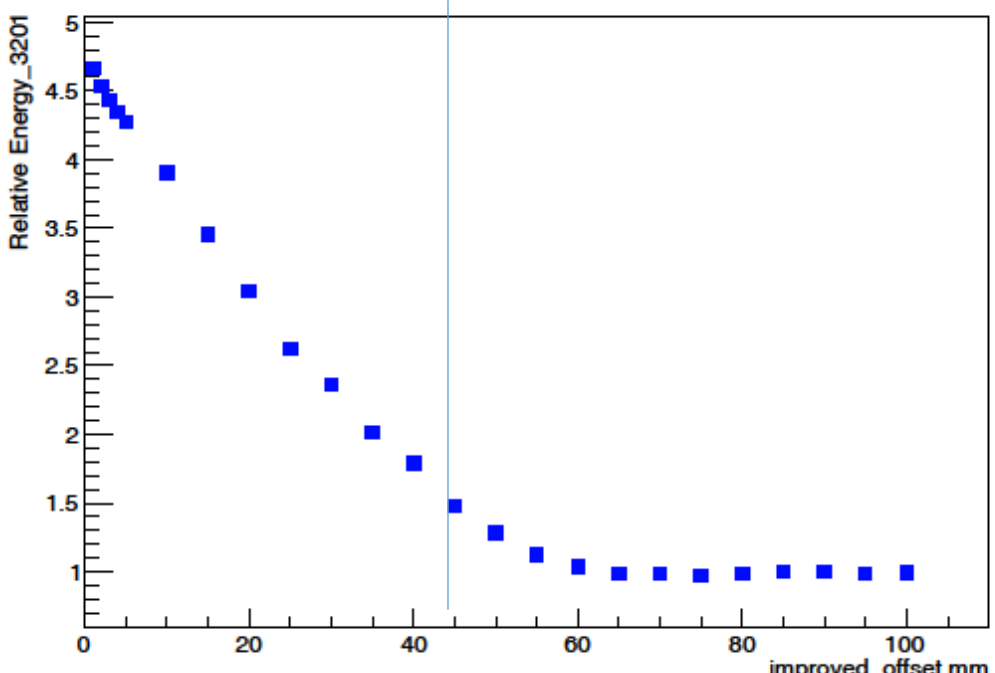
The SAMs+Ushield configuration (entry 2) is our starting point, and we want to get to the levels of noSAMs+Ushield (entry 3)

- NEIL in LHRS
- Roof Flux Neutrons with E>25 MeV
- Energy in O-ring

(blue line arbitrarily at 45mm offset)







The new “improved” spherical end-cap configuration gets pretty close to the goal, but the aluminum thickness is not that important (ran 10 mills and 5 mills thicknesses)

This is just a summary of data plotted, arbitrarily chosen at 45 mm offset:

Baseline: Quartz Thickness=13mm, offset=0mm, Aluminum Can Thickness=1500um - Ratios w.r.t. Goal			
Configuration (offset = 45mm)	Sph (canthick = 254um)	Sph (canthick = 127um)	Cyl Baseline (45mm offset)
det-1001-LHRS NEIL	1.13	1.14	1.30
det-1006-Roof Flux	1.02	1.21	1.13
det-3201-O-Ring Energy	1.48	1.42	2.14

Goal for matching noSAM configuration is NEIL -> 1, Roof Flux -> 1, O-Ring Energy -> 1

There is a ~10% uncertainty on these baseline numbers, and on each configuration, so this is only a rough estimate

The “improved” configuration uses

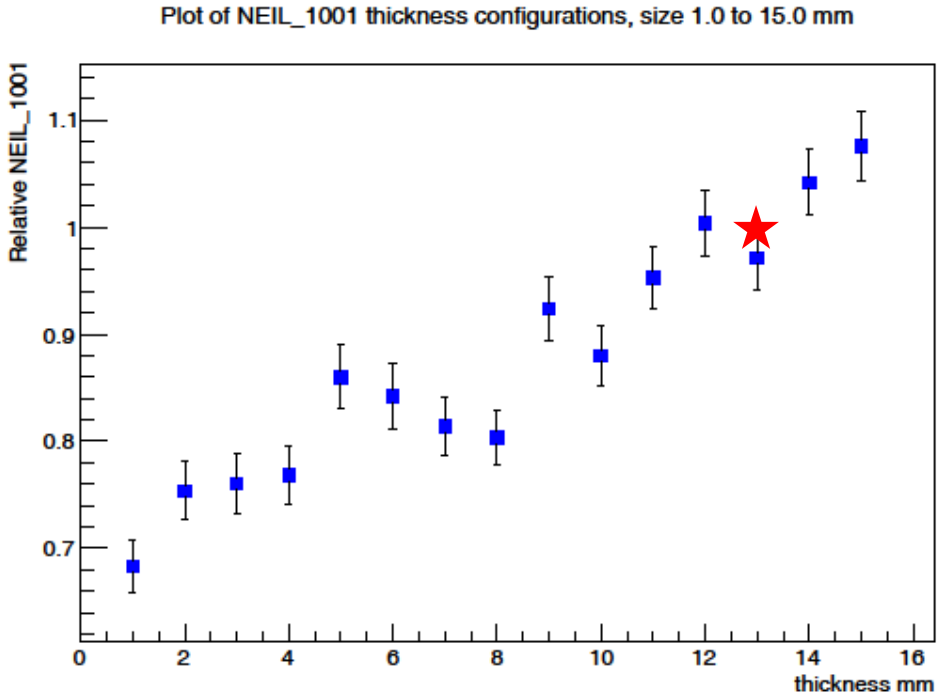
- Spherical end cap
- 13 mm thick quartz
- 45 mm radial offset
- 10 mills of an inch (0.254 mm) thick aluminum walls (for first 6 cm, then 1.651mm thick)

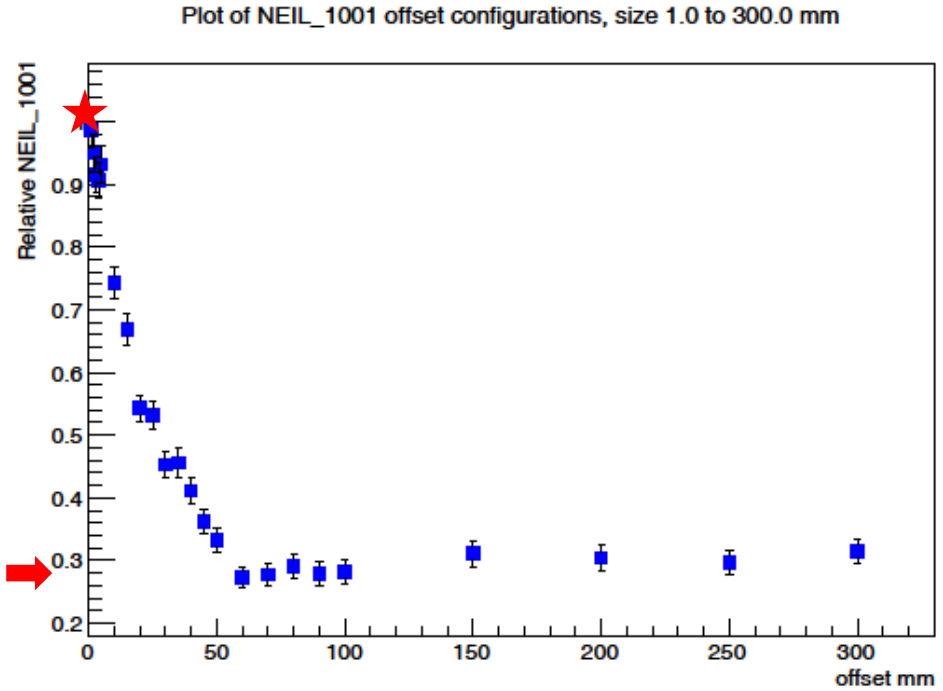
Supplementary

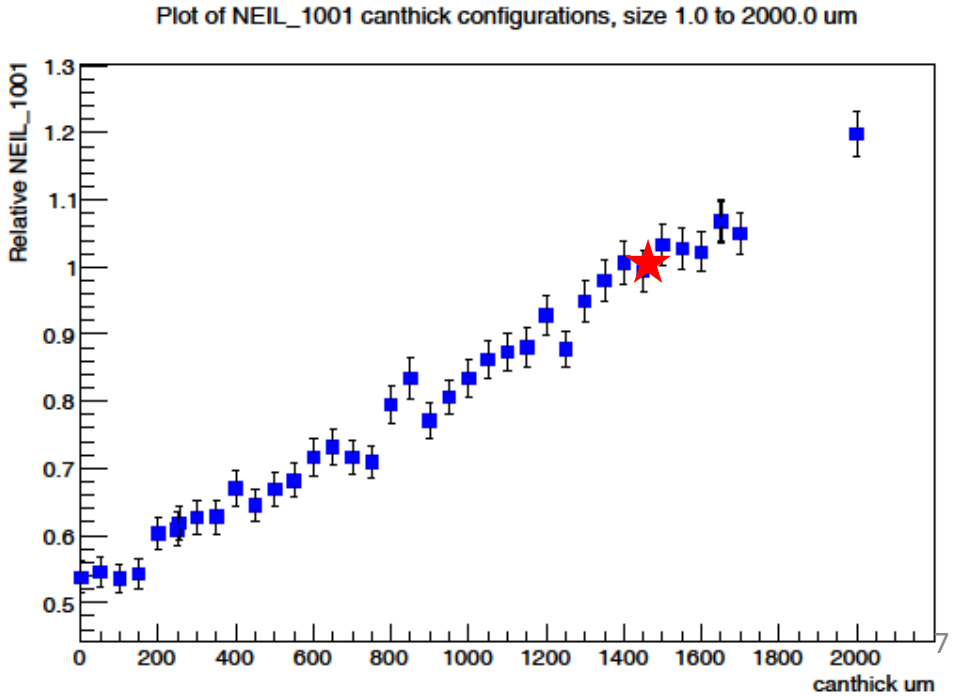
★ = the baseline configuration

➡ Combined goal for matching no SAM configuration is NEIL -> 0.28

NEIL calculations in LHRS



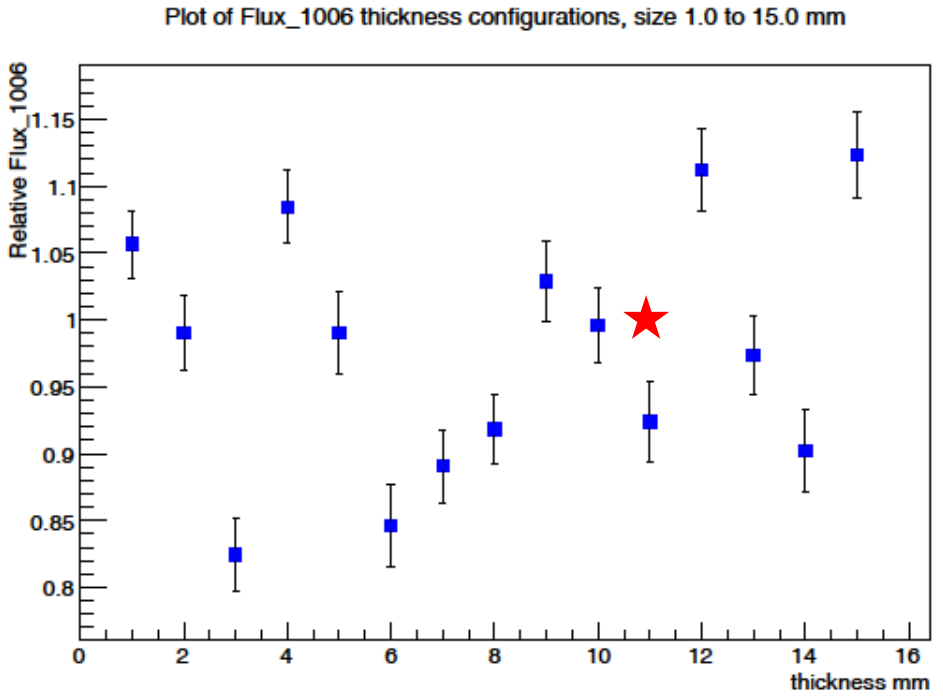


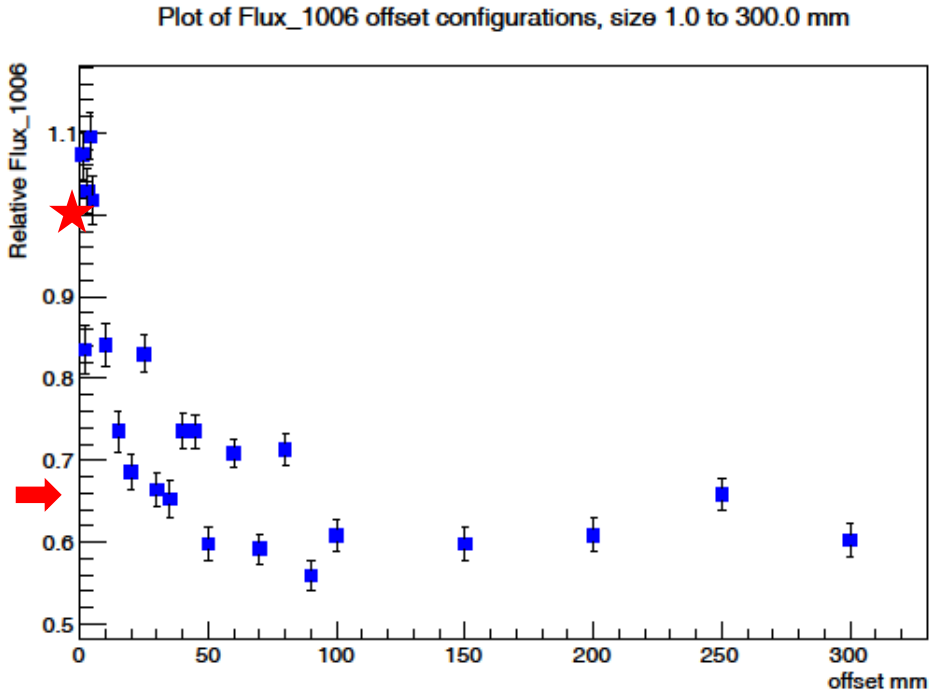


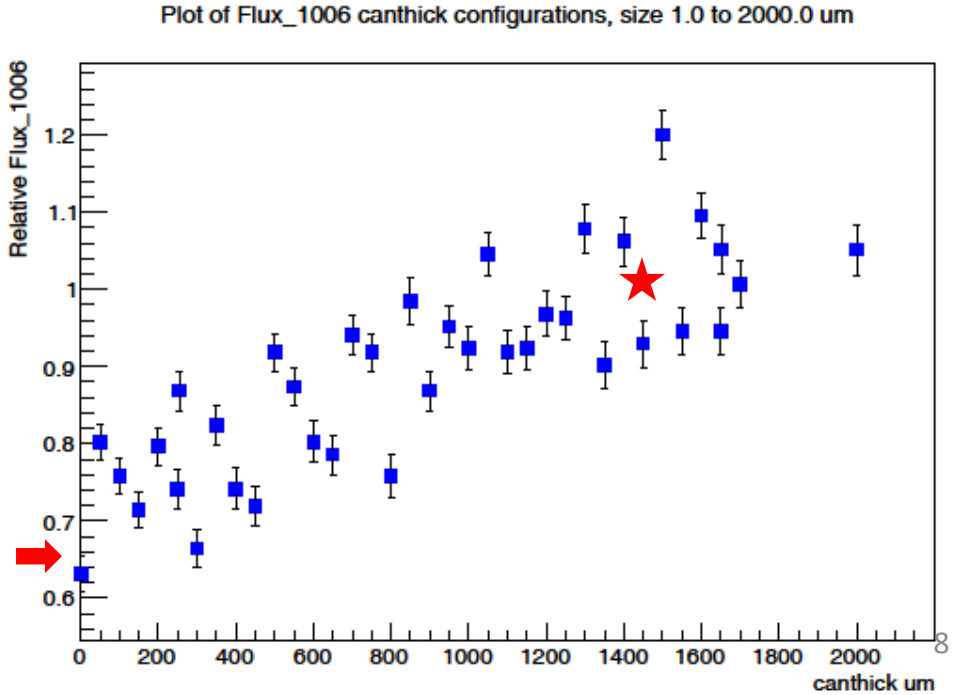
★ = the baseline configuration

➡ Combined goal for matching no SAM configuration is Roof Flux -> 0.65

Flux on Roof



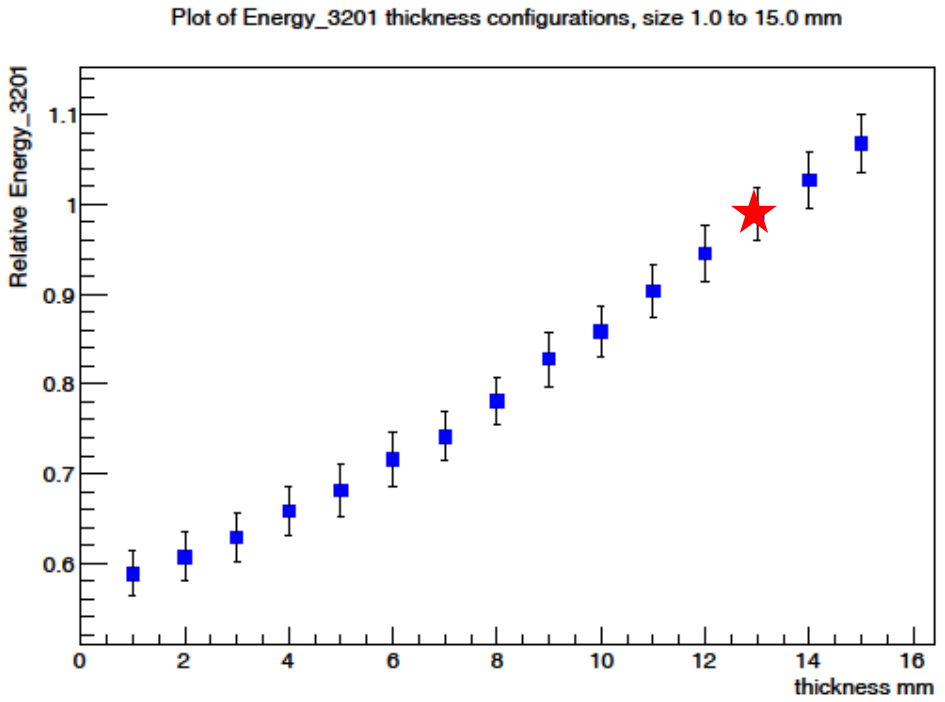


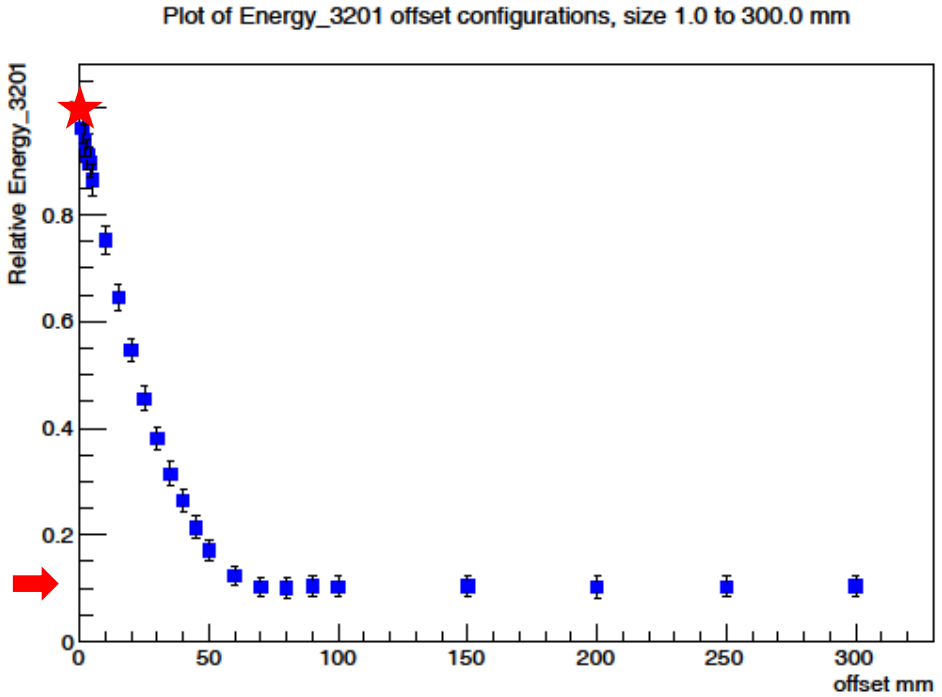


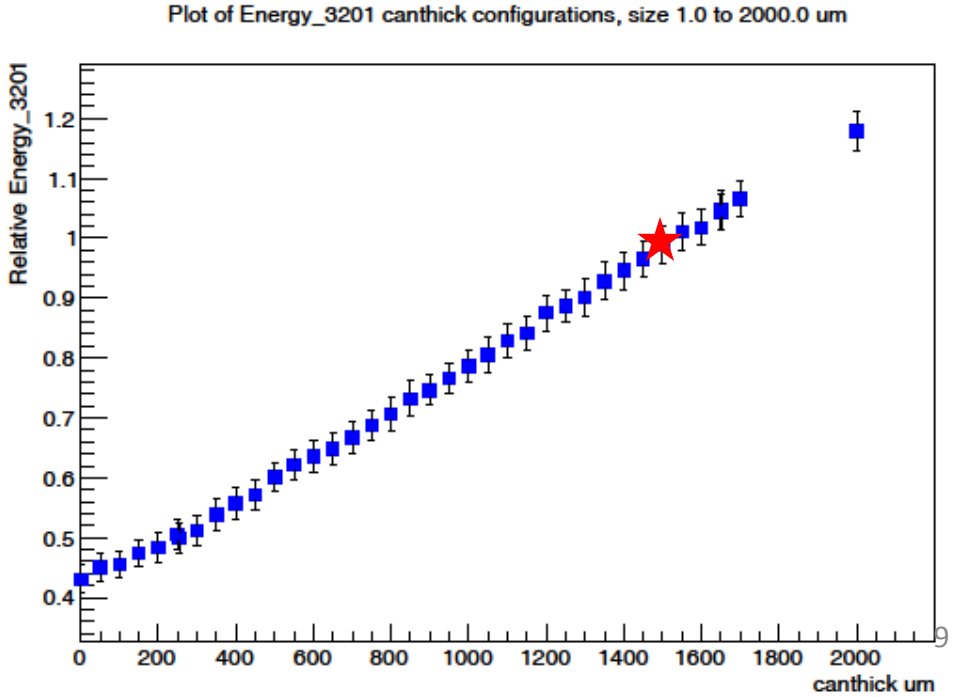
★ = the baseline configuration

➡ Combined goal for matching no SAM configuration is O-Ring Energy -> 0.1

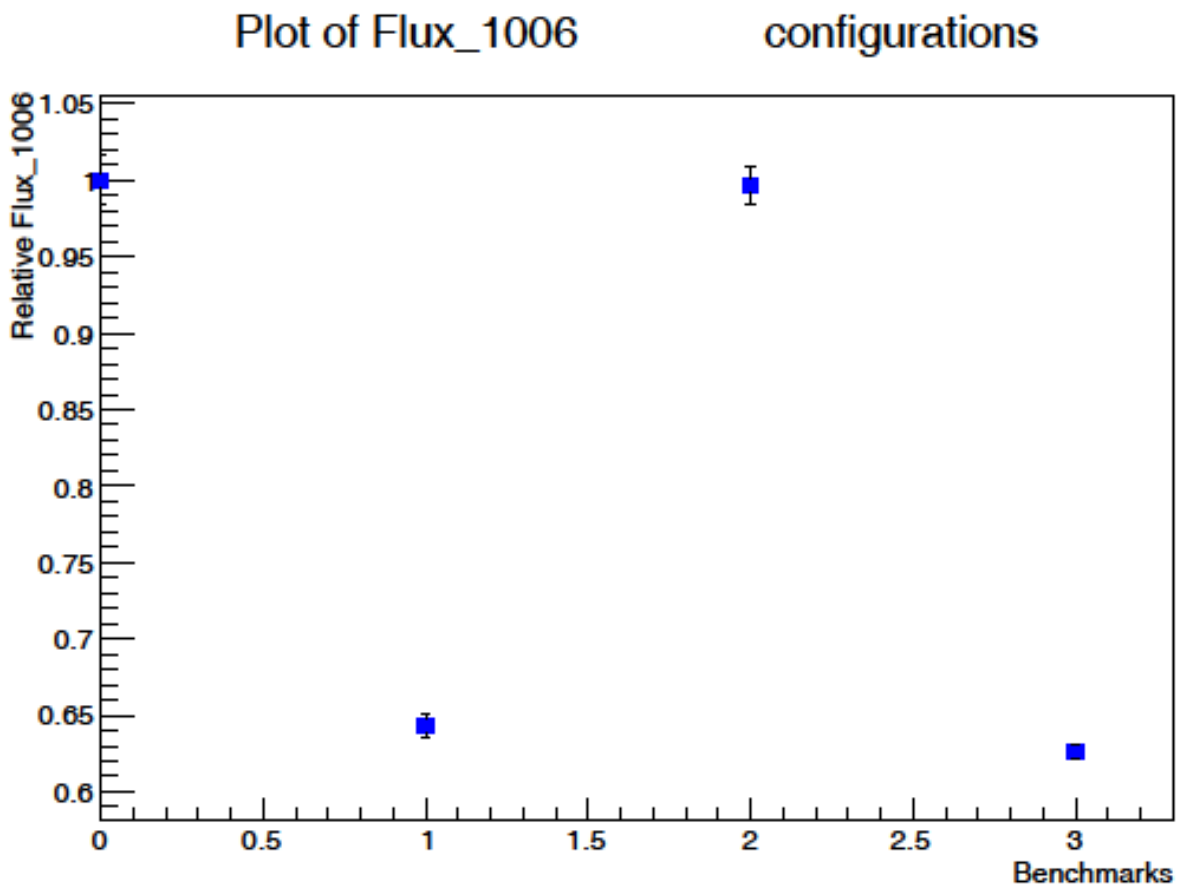
Energy in O-Ring







This is the Relative flux on the roof plot that didn’t fit in slide 3



Editable excel data inclusion

Baseline: Quartz Thickness=13mm, offset=0mm, Aluminum Can Thickness=1500um - Ratios w.r.t. Goal				
Configuration (offset = 45mm)	Sph (canthick = 254um)	Sph (canthick = 127um)	Cyl Baseline (45mm offset)	
det-1001-LHRS NEIL	1.13	1.14	1.30	
det-1006-Roof Flux	1.02	1.21	1.13	
det-3201-O-Ring Energy	1.48	1.42	2.14	
Goal for matching noSAM configuration is NEIL -> 1, Roof Flux -> 1, O-Ring Energy -> 1				
There is a ~10% uncertainty on these baseline numbers, and on each configuration, so this is only a rough estimate				