

# Ferrous Materials:

## Barite Wall Hooks

Eric King

Updated:

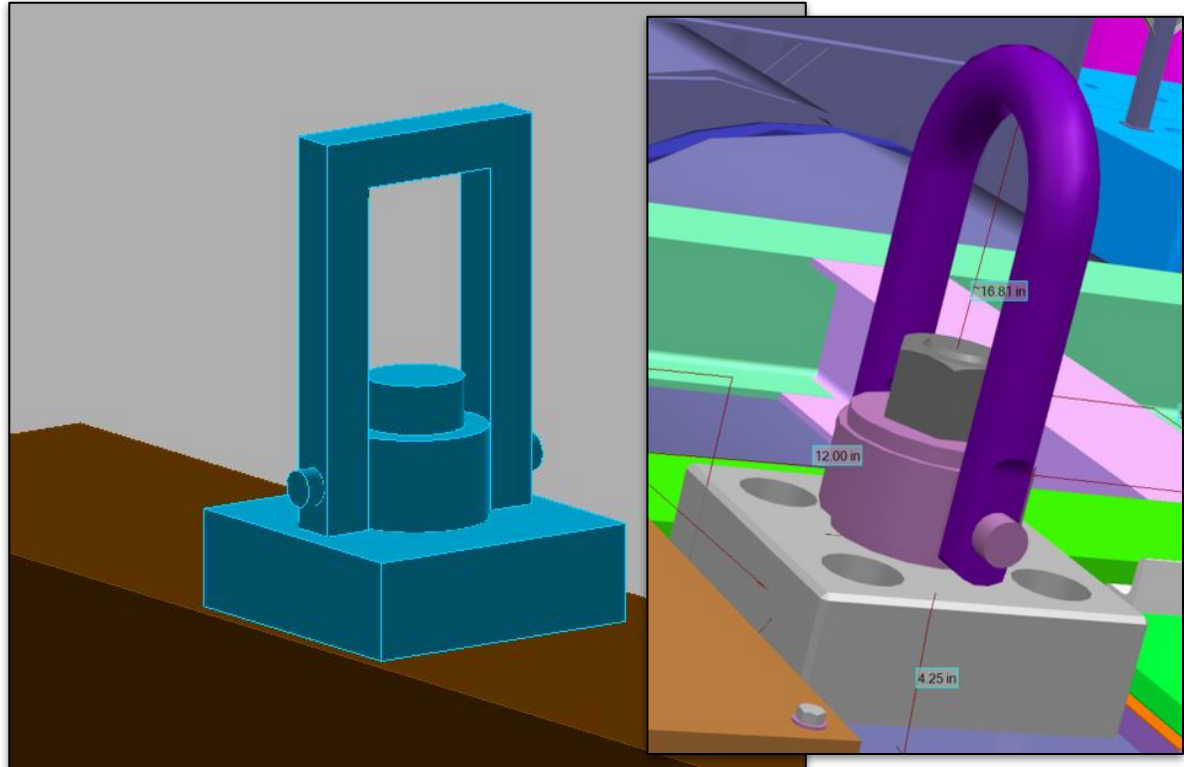
June 12th, 2023

# 9097 – (NEW) Barite Wall Hooks

Previous results were unfavorable; so we decided to go with more accurate modeling.

Changed:

- Wall increased in size and hooks location changed.
- Physical wall supports in this simulation.
- Hooks now modeled as shown.
- Previous model was rectangular shell 2" thick



# 9097 – Barite Wall Hooks

Material	X r	Spin Polarization (P f)	Frac e- on Target	Frac of events Per Moller
Mild Steel	2000	1E-02	1E-11	1E-07
Stainless Steel (Worst)	1	1E-05	1E-08	1E-04
Stainless Steel (Ideal)	0.01	1E-07	1E-06	1E-02
Aluminum	0.0001	1E-09	1E-04	1E+00
Inconel 625	0.001	1E-08	1E-05	1E-01
Brass/Bronze (Worst)	0.001	1E-08	1E-05	1E-01

**I'd consider this a lower-limit for the component. Barite wall supports were SS in simulation but may be Al in reality so there will be more punch-thru.**

Barite Wall Hooks

Simulation Date: 5/30/2023

Detector # 9097

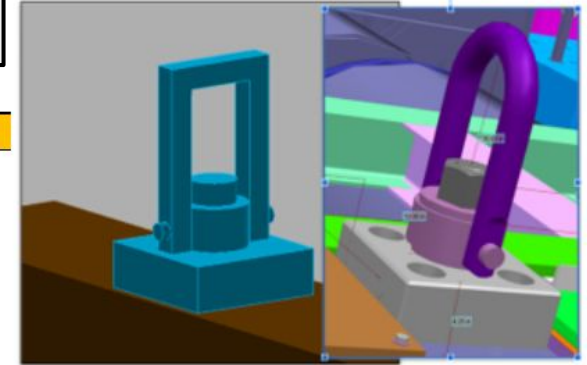
Barite Wall Hooks -- Unweighted By BField

Total Primis 10,000,000,000 Total Secondaries: 500,000 (per sens det)

Primary Counts			Primary Fractional		
Primaries	Electrons	Gammas	Primaries	Electrons	Gammas
9097	0	0&1	9097	0	0&1
		348			3.48E-08

(9928 MainDet) Secondary Counts - 0&1			(9928 MainDet) Secondary Fractional - 0&1		
Secondaries	Electrons	Gammas	Secondaries	Electrons	Gammas
9097	477	1633	9097	9.54E-04	3.27E-03

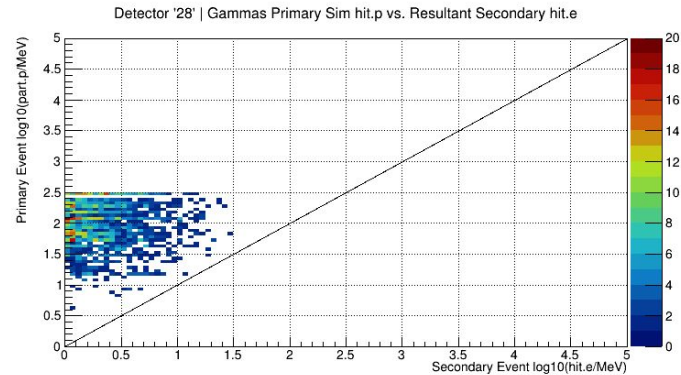
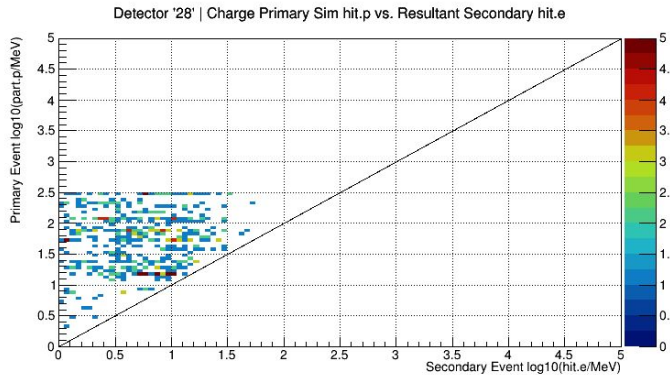
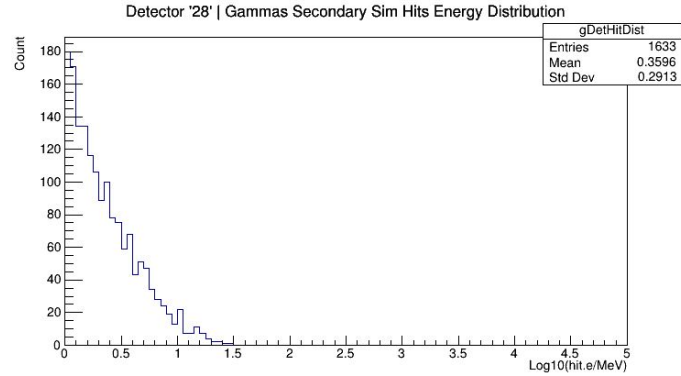
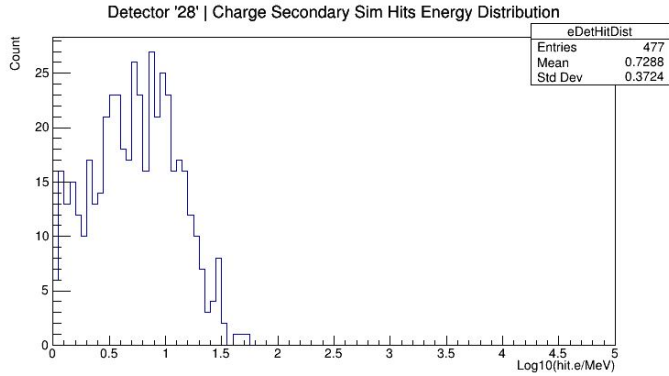
(9911 PMT Region) Secondary Counts - 0&1			(9911 PMT Region) Secondary Fractional - 0&1		
Secondaries	Electrons	Gammas	Secondaries	Electrons	Gammas
9097	1855	5669	9097	3.71E-03	1.13E-02



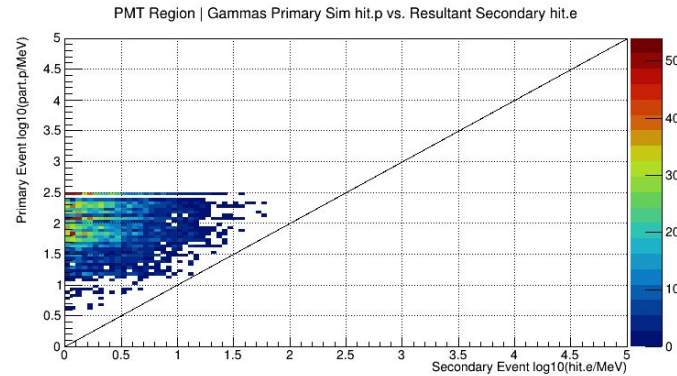
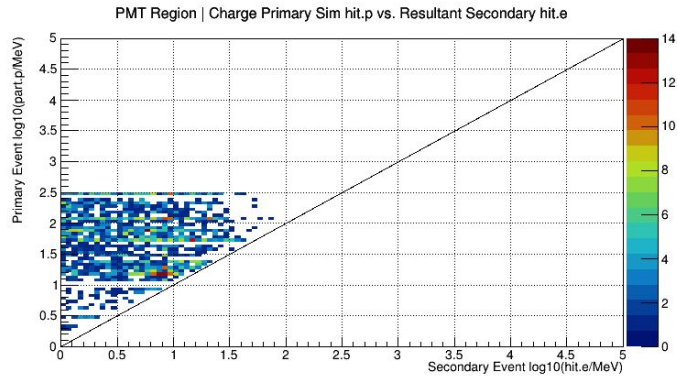
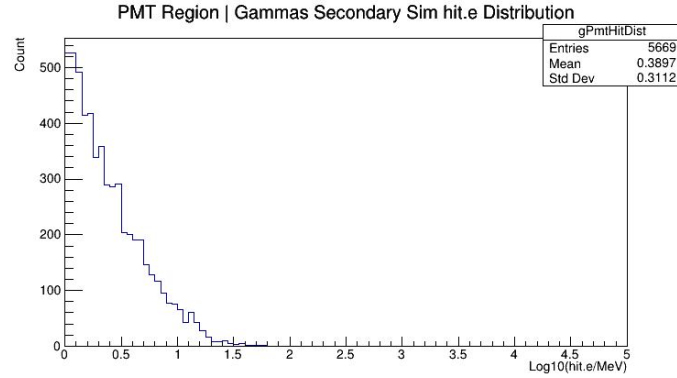
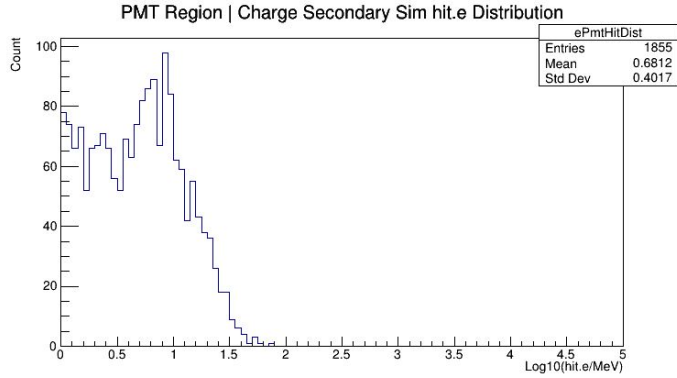
(9928 MainDet) Total Fractional - 0&1		
Secondaries	Electrons	Gammas
9097	3.32E-11	1.14E-10

(9911 PMT Region) Total Fractional - 0&1		
Secondaries	Electrons	Gammas
9097	1.29E-10	3.95E-10

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# Primary Hits on Hooks

Total primary electron hits: 348

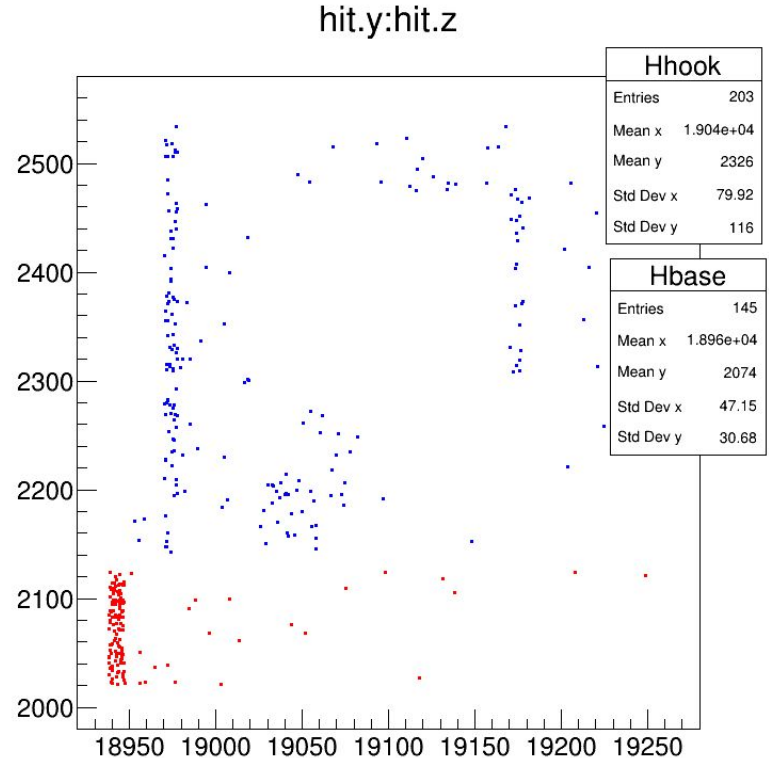
Hits on bases: 145 (hit.y<2125)

Hits on portions above base (hooks): 203 (hit.y>2125)

Base percentage: ~40%

Hook percentage: ~60%

Roughly, this is a 50-50 split.



# Secondary Hits Divided up by Primary Hit Region

Det-hit-hook (blue): 9234 total

Det-hit-base (red): 400 total

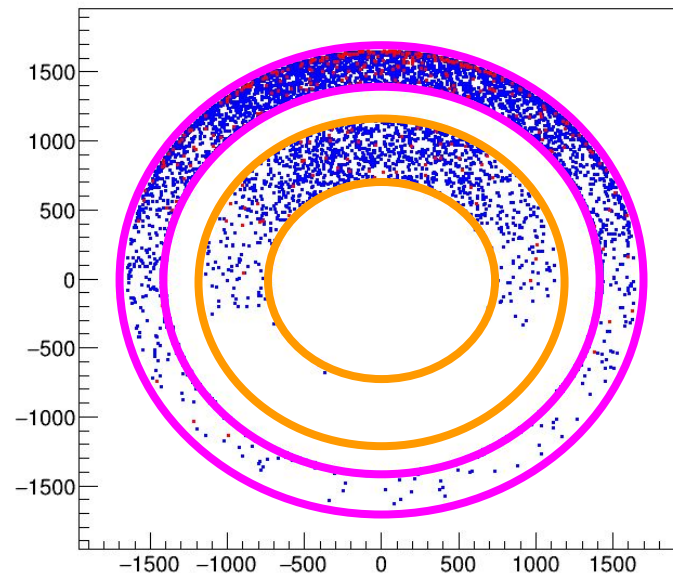
Source	Total	Main Det	PMT Region
Hooks	9234	2037	7197
Bases	400	73	327

**Magenta** area is cylinder in Z that covers the region of the PMTs—the surface area of this is overmodeled but

**Orange** area is main detector region of interest.

I quantified the individual detector regions via ROOT command line so there are no individual plots.

hit.y:hit.x {part.vy>2125}



The “hook” portion of the barite wall hooks are responsible for 95% of the ferrous backgrounds.

# Conclusion

- The ferrous backgrounds from the barite wall hooks are borderline with our conservative assumptions.
  - The modeling is fairly accurate per the surface area that we be exposed to the scattered beam flux.
  - Supports in the simulation were made of stainless steel which shadow the hooks a bit. If they are aluminum there may be more punch-thru increasing rates.
- Simulation results support removing the hooks, if possible, during production for the minimization of ferrous backgrounds.
  - *If the hook portions can be unbolted and removed then these are of absolutely no concern.*