SoLID LGC Update

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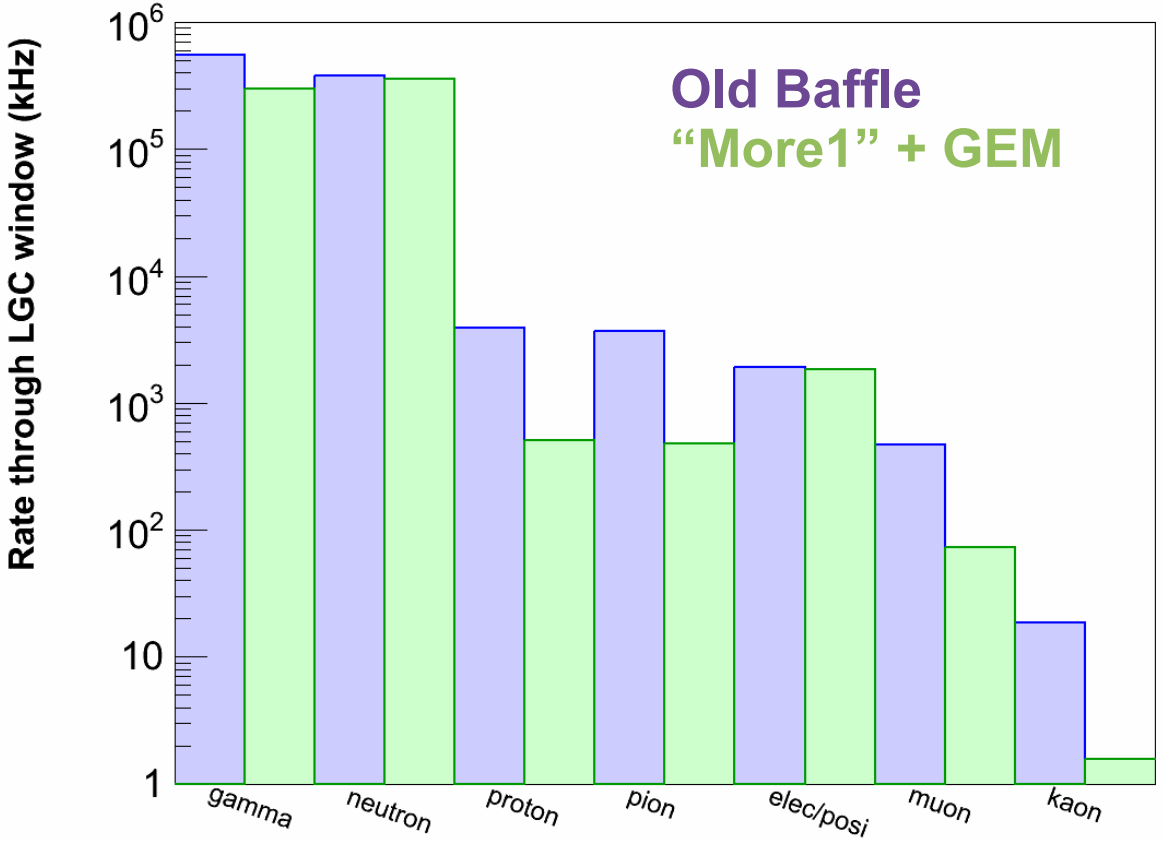
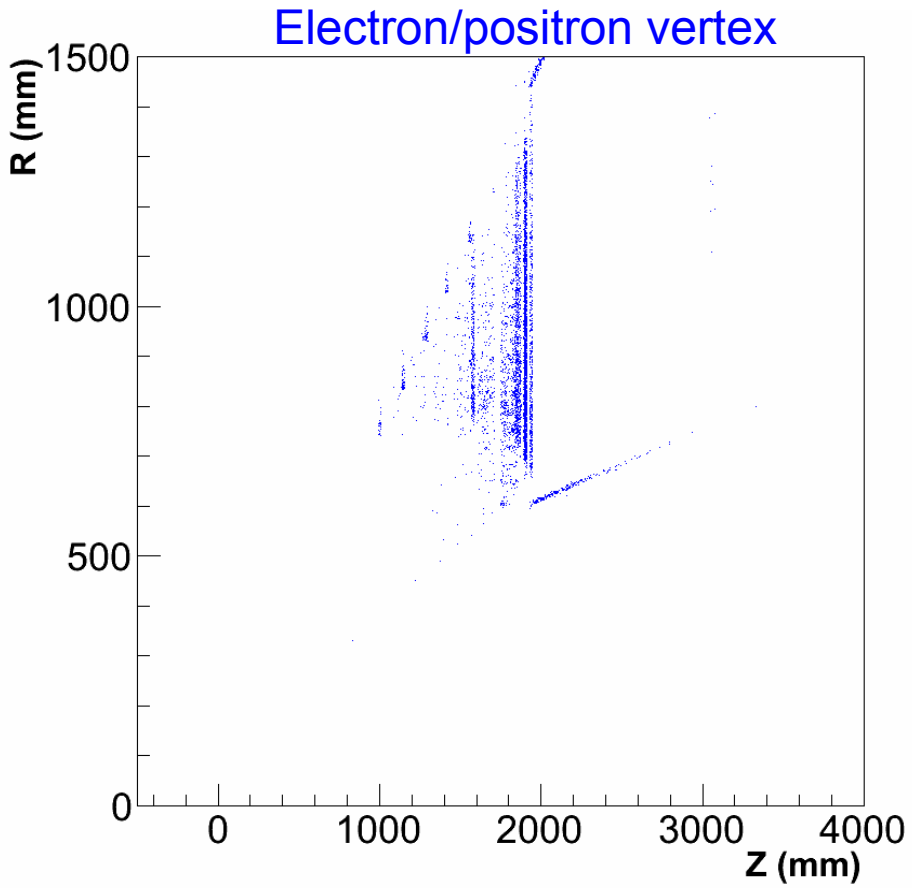
November 8th 2013

Updates on PVDIS background rates

- The GEM detectors in PVDIS are now included in the simulation.





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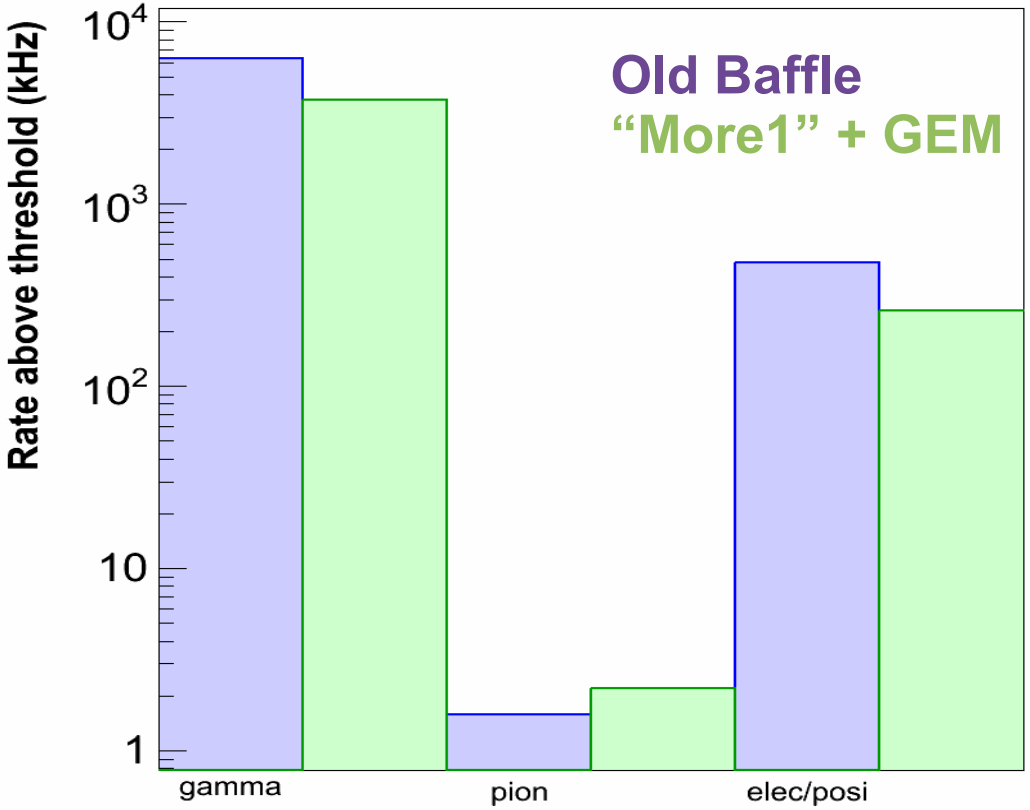

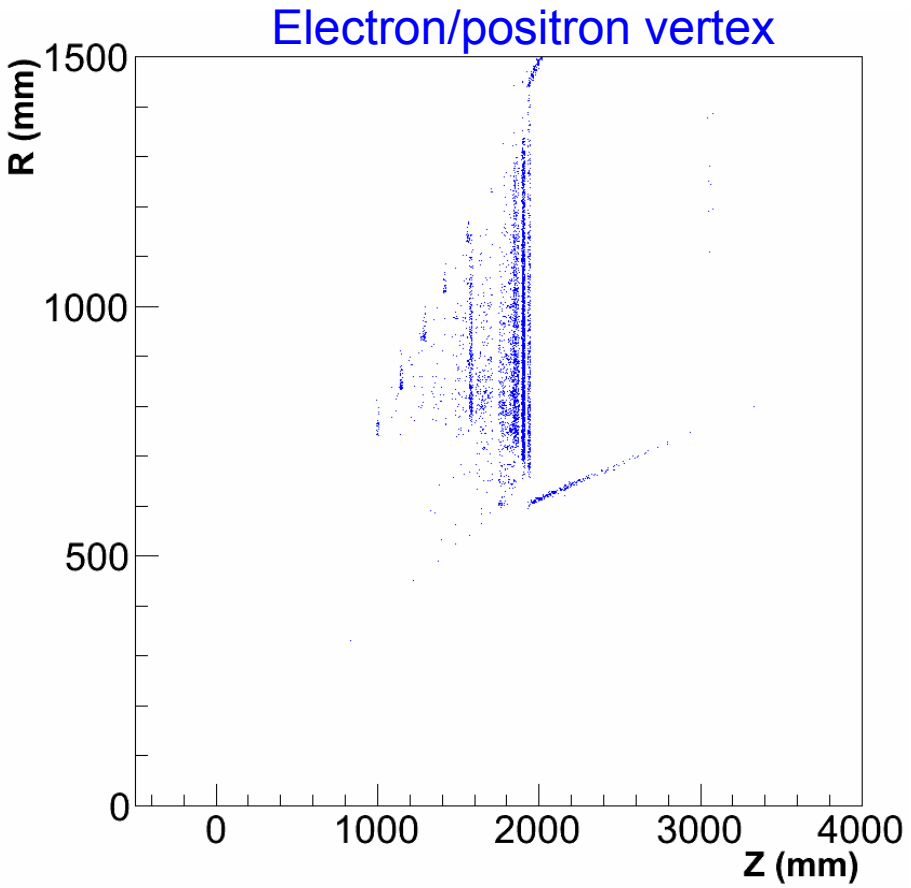

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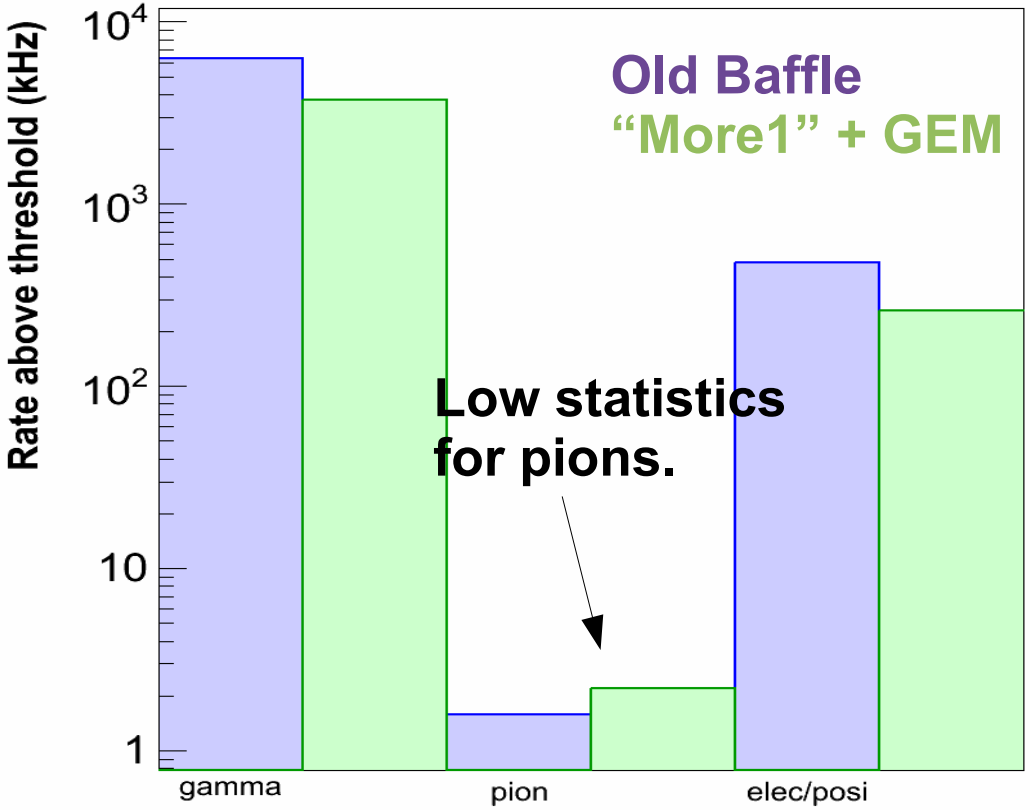
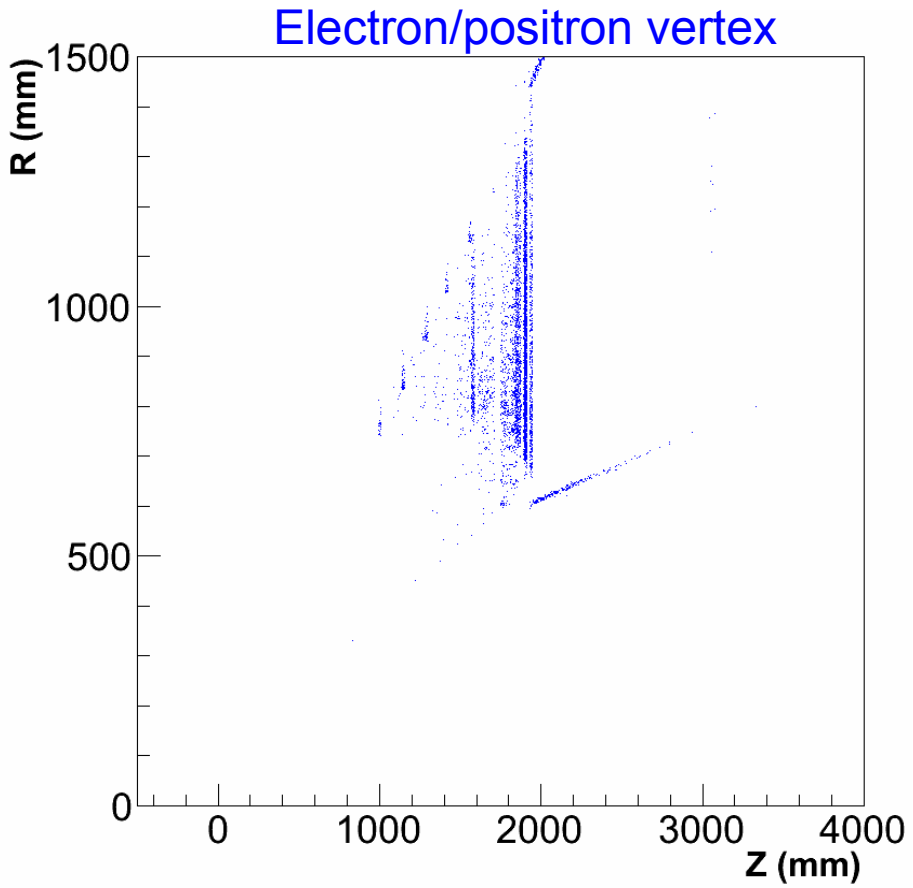
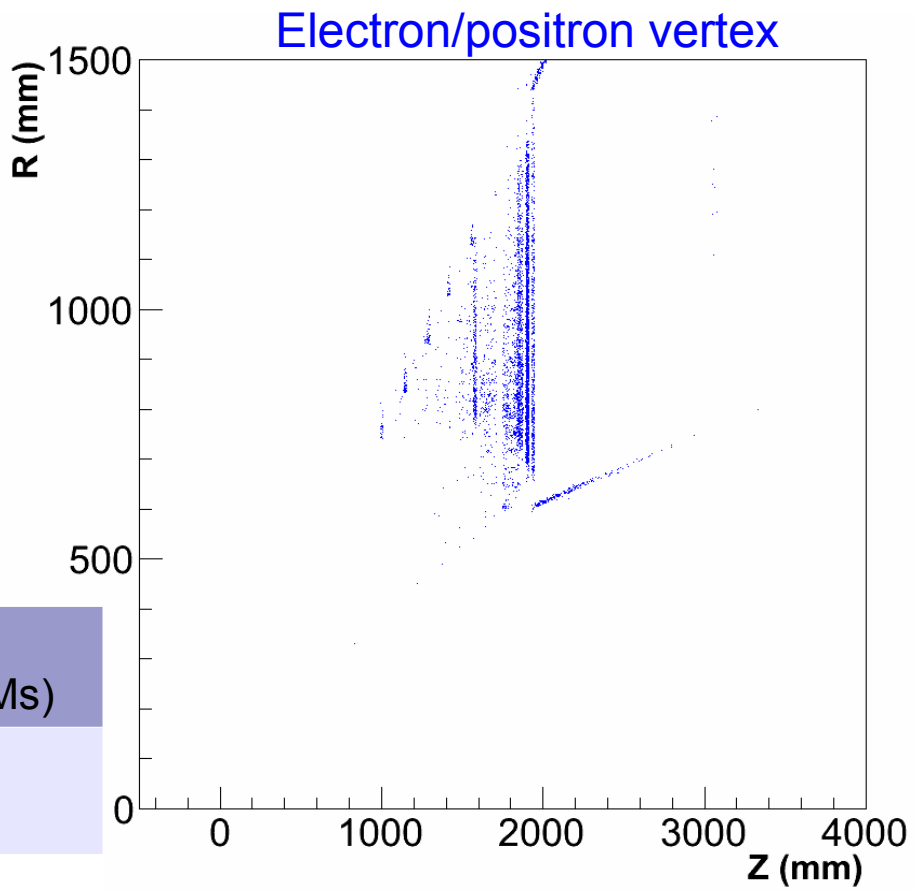




Updates on PVDIS background rates

- The GEM detectors in PVDIS are now included in the simulation.
- Slight increase in rates but still below previous baffle design:

(rate per sector)



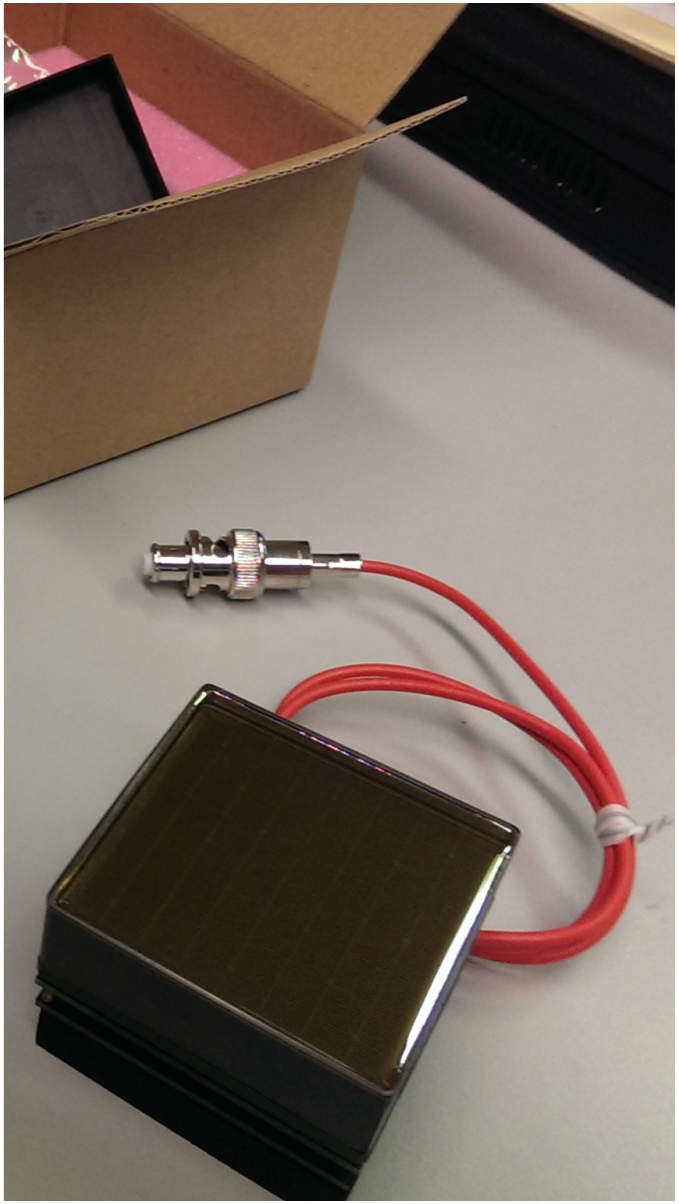
(Units in MHz)	Old Baffle (no GEMs)	"more1" (no GEMs)	"more1" (with GEMs)
1 or more pe's per sector	4.94	2.99	3.31
2 or more pe's per sector	3.44	1.93	2.52
1 or more pe's in two different PMTs	2.50	1.56	1.99

Next steps for simulations

- Total particle flux onto PMTs from low energy background. (Just finished running on farm)
- Parametrize low energy background. (Done for PVDIS, in the works for SIDIS).
- Do full pi/e rejection/efficiency analysis:
  - Use new pi/e ratios for new baffle (Have: from Zhiwen)
  - Include parametrization above for pion pile-up.
- Migrate to GEMC 2.0 (In progress, slowly)

PMT considerations:

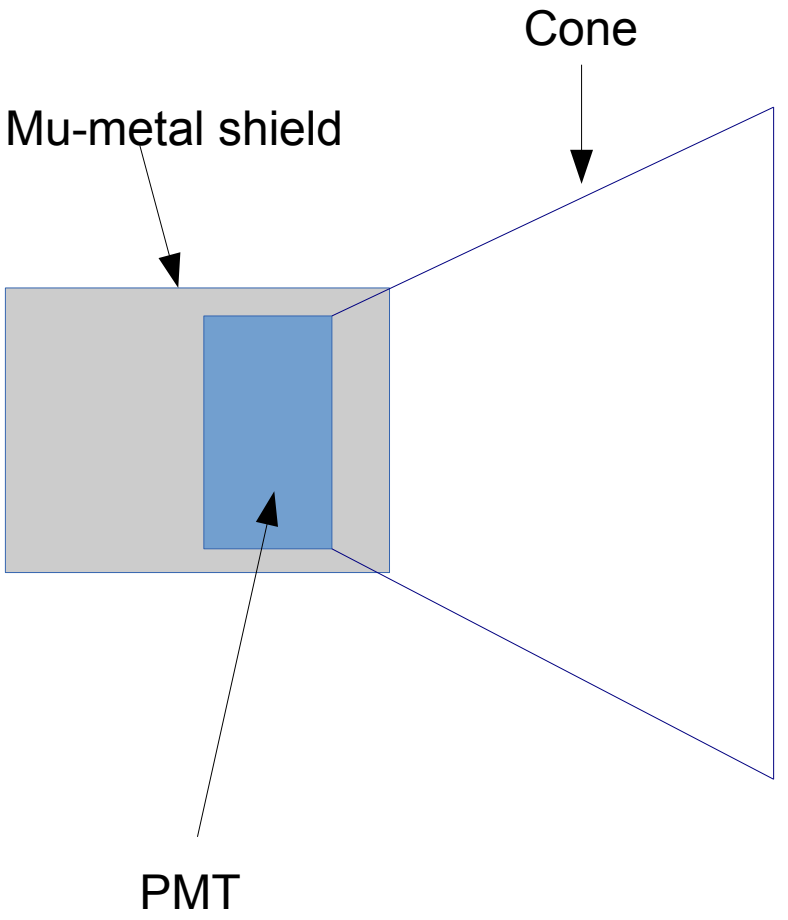
- We have H8500 PMTs here at Temple, and we have been setting up a VMI DAQ for testing purposes.
- Wavelength Shifting facilities at Temple
  - Developed in house and managed by the Nuclear Physics group at Temple
  - Ability to coat PMT surfaces with p-Terphenyl.
  - Facilities to test PMTs after coating.
  - Could provide a 30% increase to total photoelectrons for the SoLID LGC!!
    - Needs simulation testing (geant4 handles WLS)
    - Needs prototype testing.



Wavelength Shifter Options

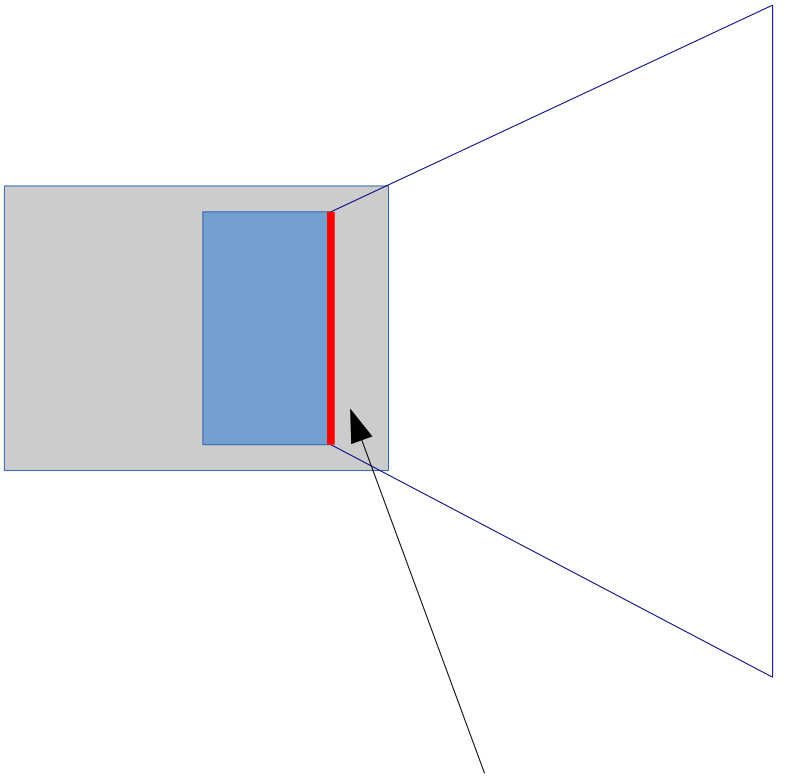
- There are a few possibilities for where to put the wavelength shifter.

Cartoon of PMT-Shield-Cone Assembly
(not drawn to scale)



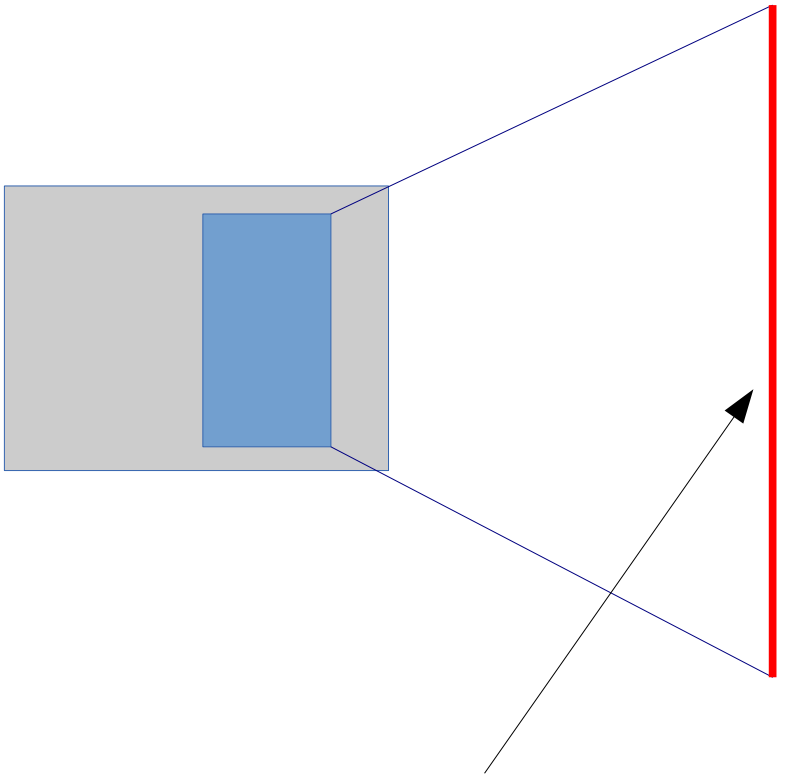
Wavelength Shifter Options

- There are a few possibilities for where to put the wavelength shifter.
  - Standard option: coat PMTs directly.



Wavelength Shifter Options

- There are a few possibilities for where to put the wavelength shifter.
  - Standard option: coat PMTs directly.
  - Add glass and coat at cone entrance.
    - Pros:
      - Reflection efficiency of cone will be higher.
      - Saturation of PMT array will be more uniform.
    - Cons:
      - Larger surface to coat.
      - More material needed + added weight to cone.
    - What is the total gain including gains from wavelength shifting and losses from reflection or absorption in the glass? Will be simulated!

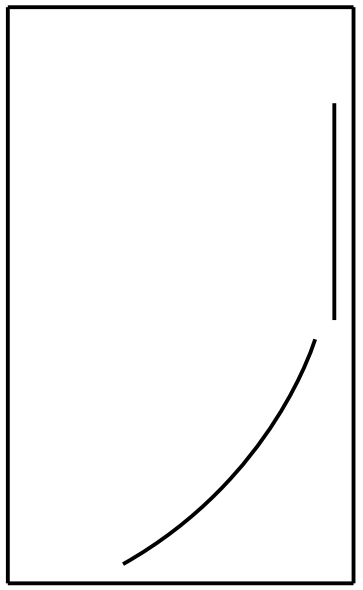


Glass plate with p-Terphenyl coating

Tank Design Considerations

- Basic design has been frozen now for a while.
- Some considerations if we want to add a baffle after the LGC:
  - Feasibility and relative difficulty is dependent on the exact shape of the space needed:

Current Design



Cartoon. Not drawn to scale.

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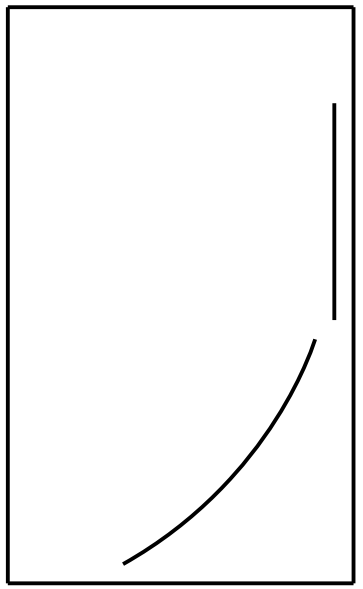
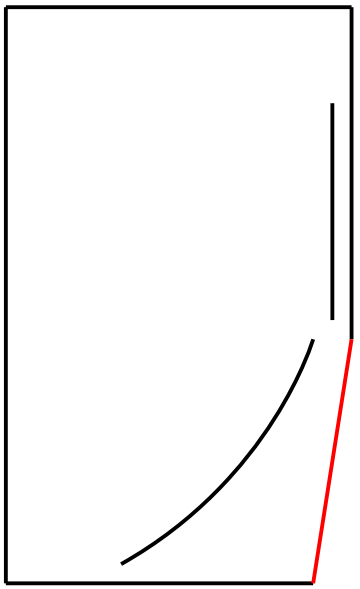


Moderate modification is already complicating design.



Changes would be needed for exit window design, support for the exit window, support/mounting for the mirrors and overall tank support, and more...

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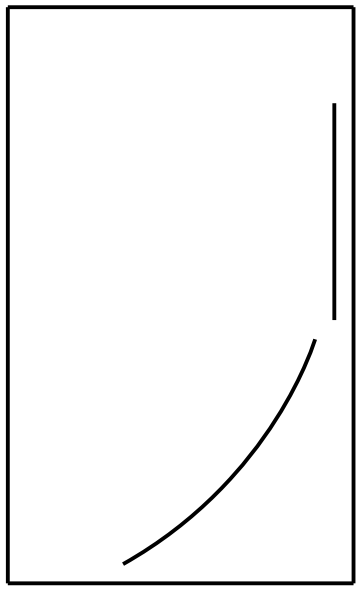
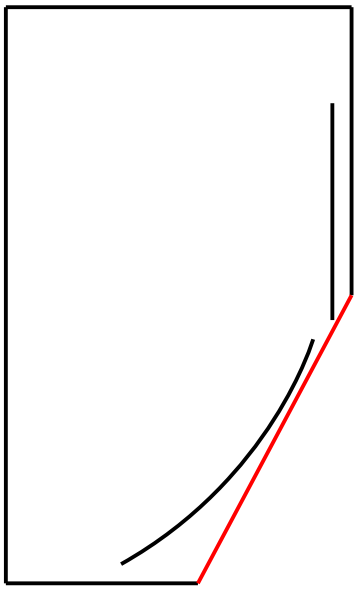


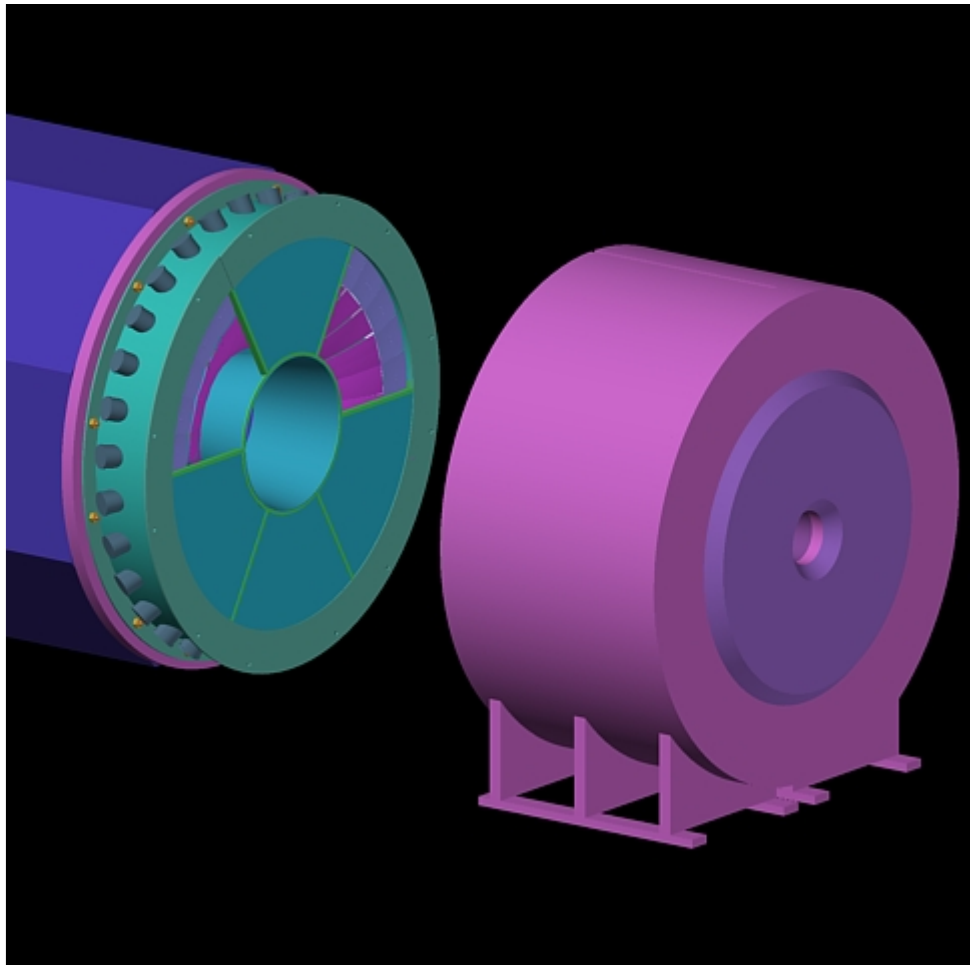
Major Modification



Likely NOT possible without a complete redesign.

Support mounting considerations

- The LGC has been designed to have support from being mounted to the back of the magnet housing.
  - As designed now, the LGC could not provide any substantial additional support to a lead baffle downstream.
    - Any additional baffle will have to be mounted and supported independently.



Next steps

- Low energy background flux directly on PMTs.
- Update e/pi separation for latest geometries and low energy background pile-up for both SIDIS and PVDIS.
- Prototyping of Cerenkov.
- Simulation and lab testing of wavelength shifting gains.