

VHE Event Sims

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GPU Photon Propagation Code

- <https://github.com/PLEnuM-group/PhotonPropagation.jl>
- Forward ray-tracing of individual photons
- Pure julia implementation, CUDA accelerated photon propagation
- Customizable medium properties (absorption length, scattering length, scattering function, refractive index, dispersion), however only completely homogenous media supported
- Customizable emitters / receivers
- Uses IceCube parametrizations for Cherenkov light yields

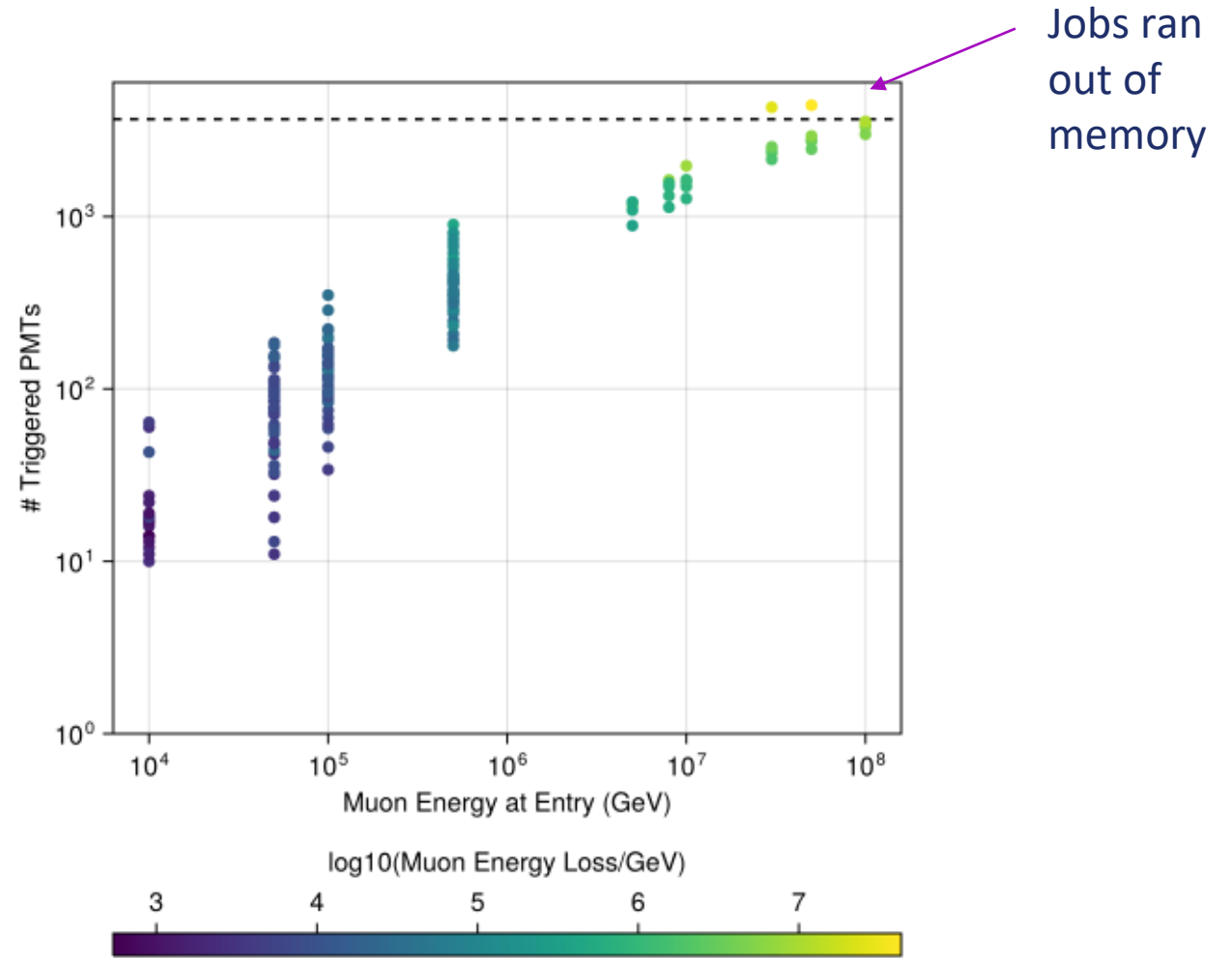
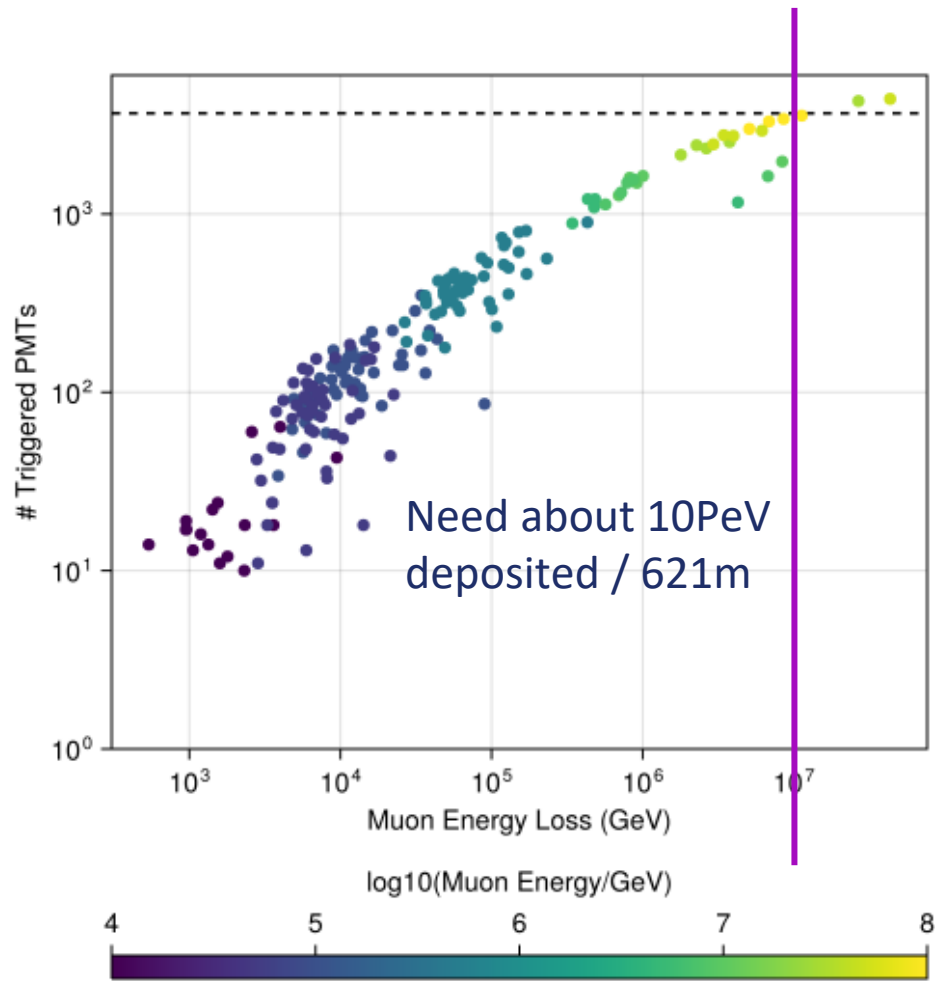
DOM Acceptance Bug

- **Old Algorithm:** For each photon that hits a DOM (sphere with 0.2159m radius), the angular acceptance curve is evaluated and converted into an effective area for each PMT.
Total acceptance probability is the effective area sum / $(4 * \pi * r^2)$
- The issue: Per direction, photons see a circular cross section, thus acceptance probability should be effective area / (πr^2)
- Light yield increases by factor 4

Event Resimulation

- Using detx file from <https://git.km3net.de/vhe-event/data/vhe-event-and-calibration-data>
- Using bestfit reco as MCTruth (vertex, direction)
- Shift muon back by 50m from fit vertex
- Simulate muon energy losses with PROPOSAL. Propagation length: 621m
- Muon energy losses (showers) are Cherenkov light emitters for photon prop
- Scan muon energy and resimulate muon propagation a couple of times for each energy

Simulation Results



Comparison to JSirene

