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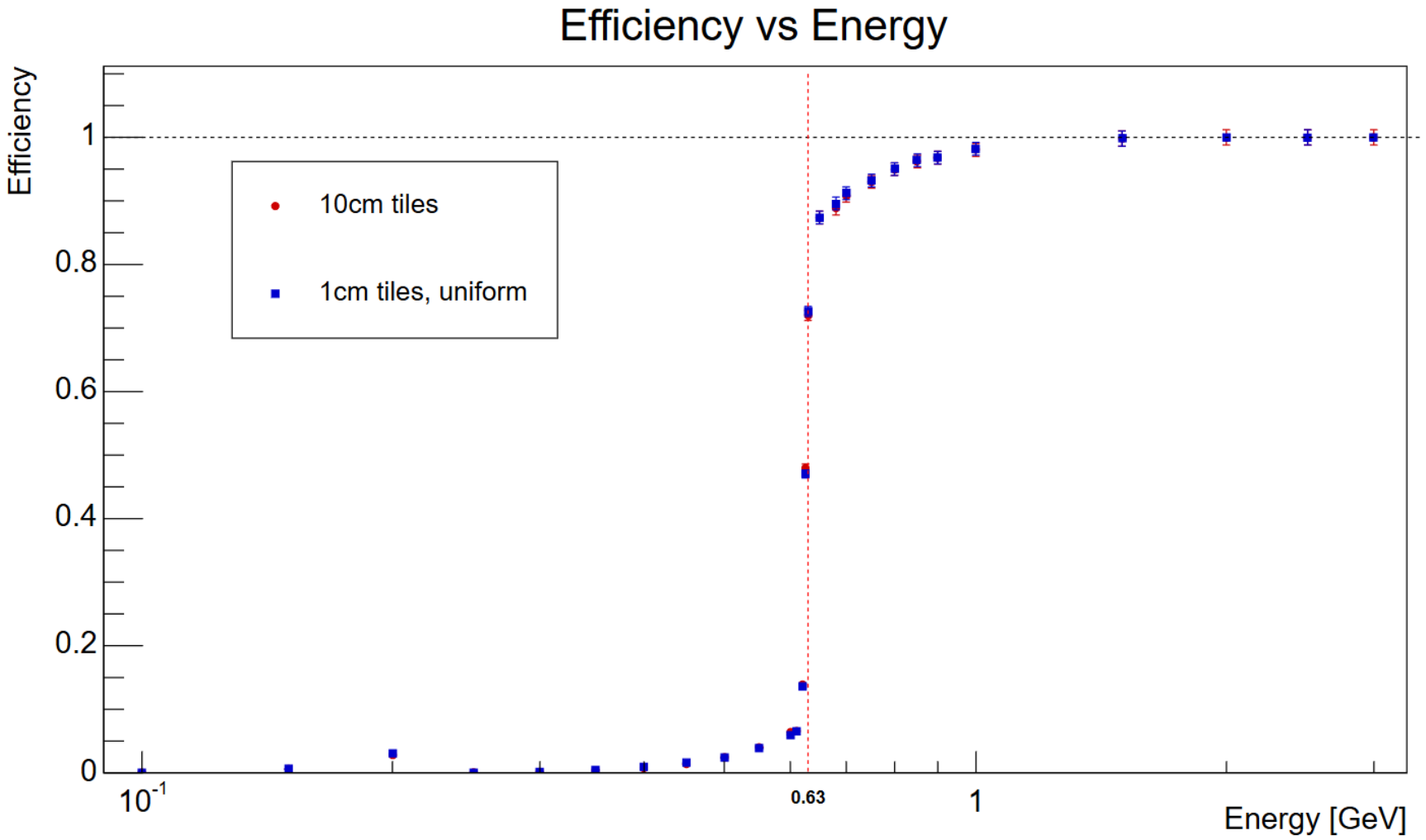
Goal of my research

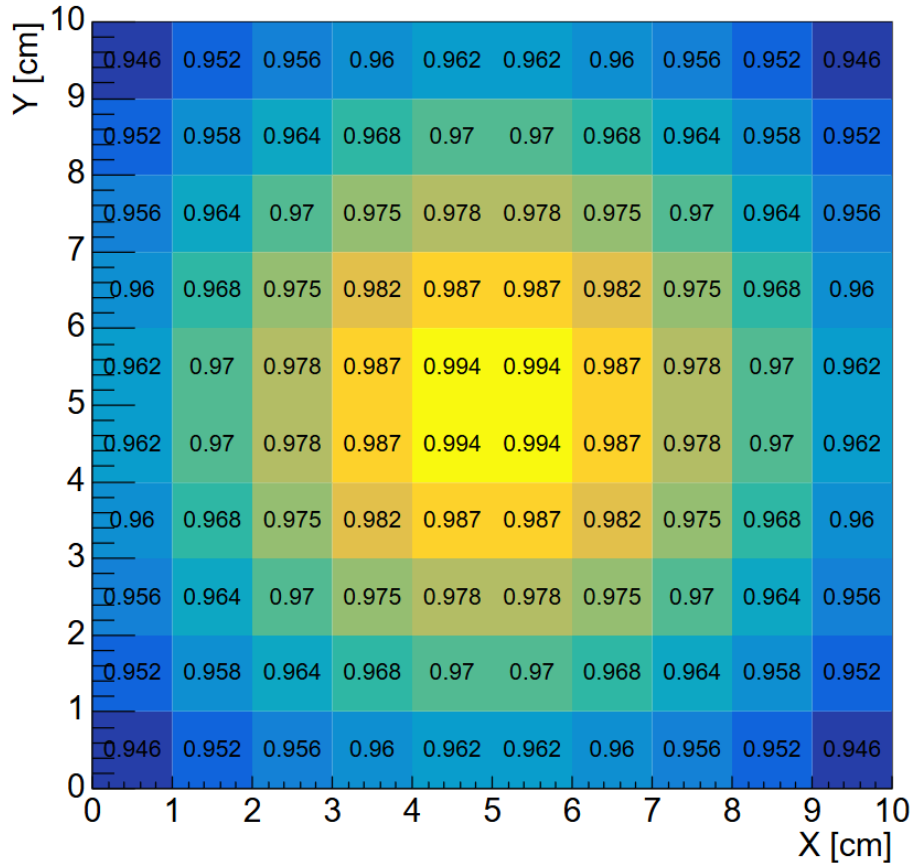
- Investigate how scintillator non-uniformity affects the SiPM response and the efficiency of the HCal.
- Reduce the tile size from default 10cm to 1cm, and apply different weight to each 1cm × 1cm sub-tile to model non-uniform light collection
- The study specifically targets proton interactions right now.

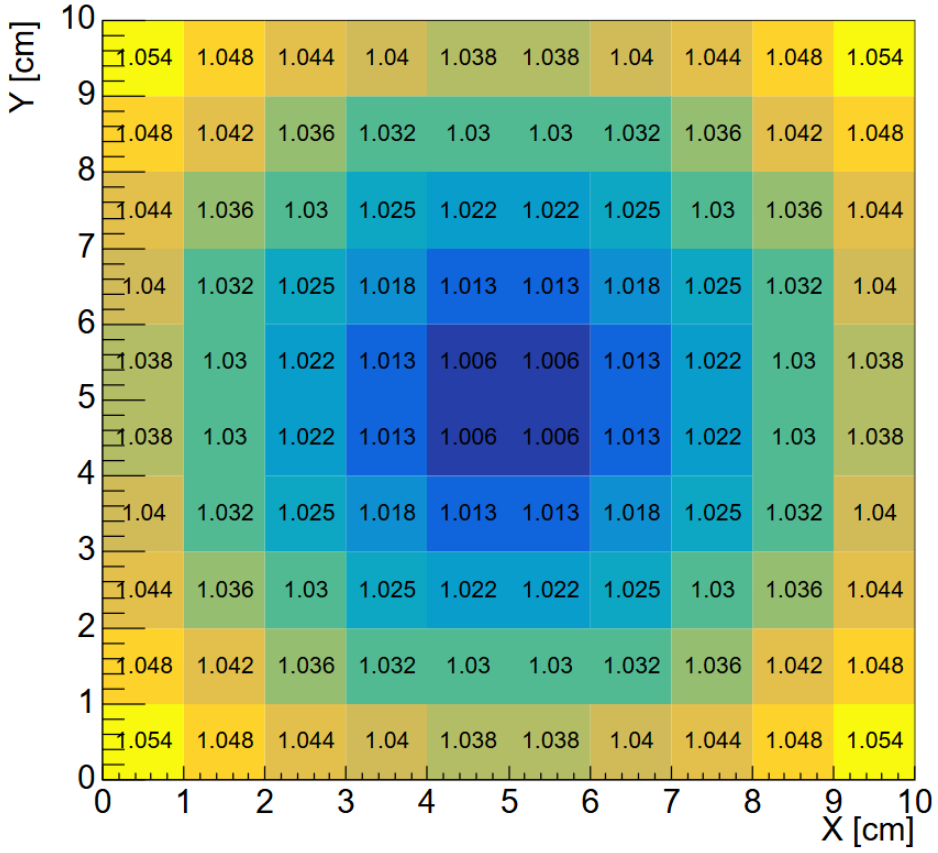
Default tiles vs. uniform sub-tiles



- With no weights applied to the 1 cm tiles, the two datasets show good agreement.
- The dataset using 1 cm tiles exhibits slightly larger error bars

Weight map for different non-uniformity setup

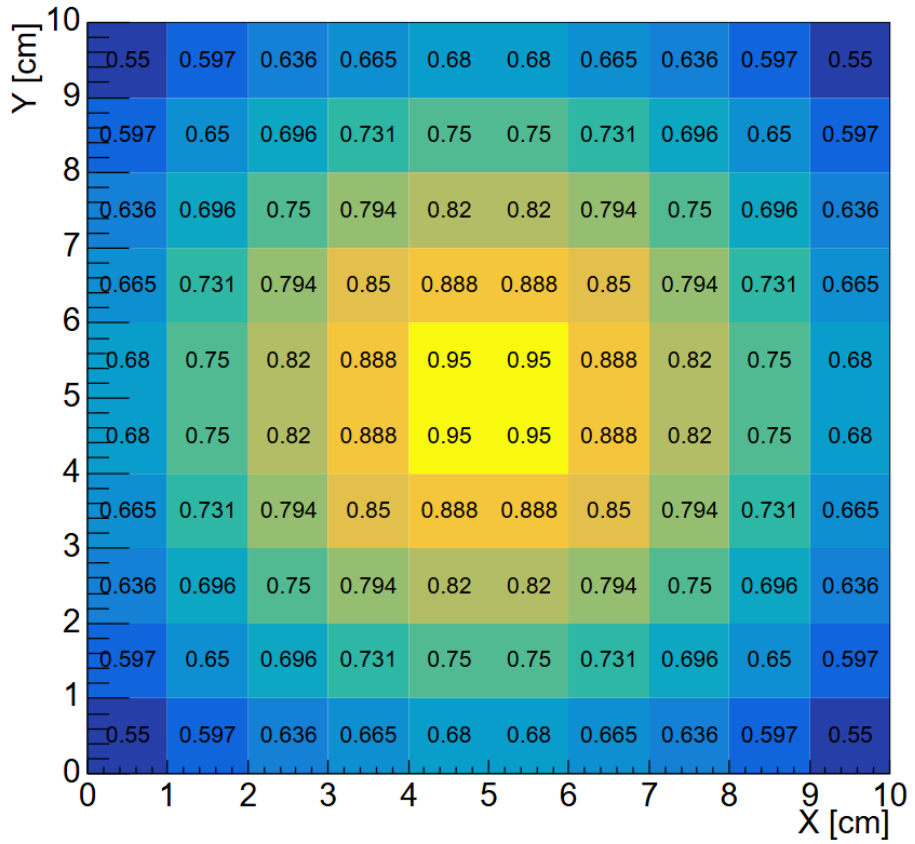




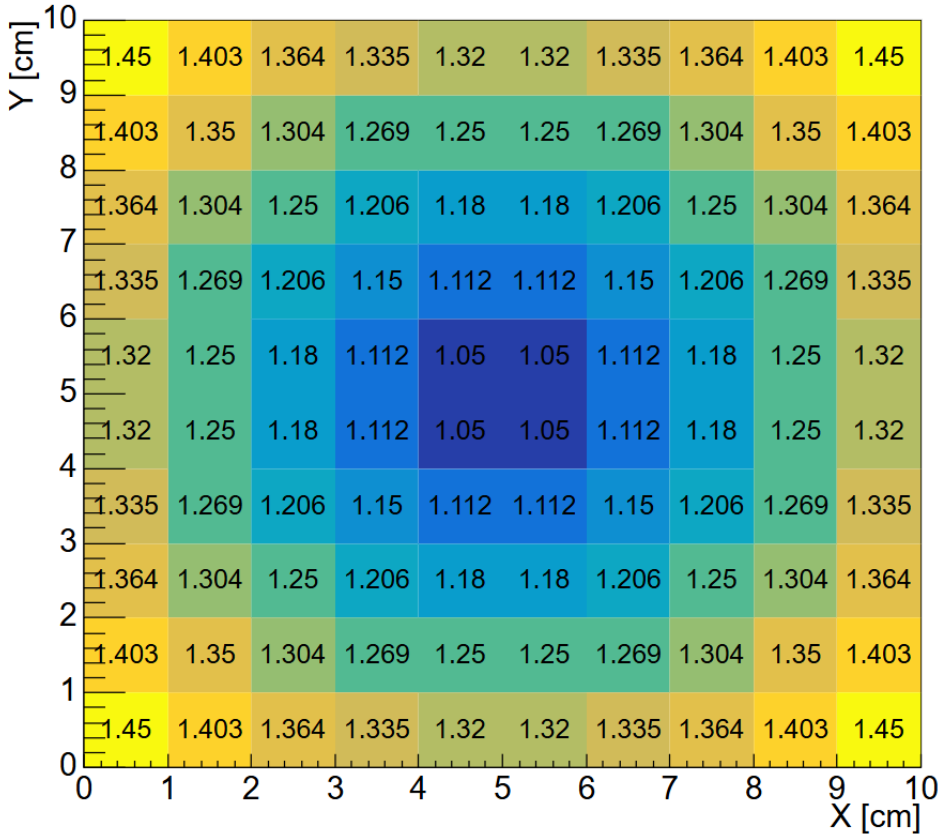
▲ 1cm tiles with non-uniformity(5%)

▼ 1cm tiles with inverse non-uniformity(5%)

Weight map for a larger non-uniformity

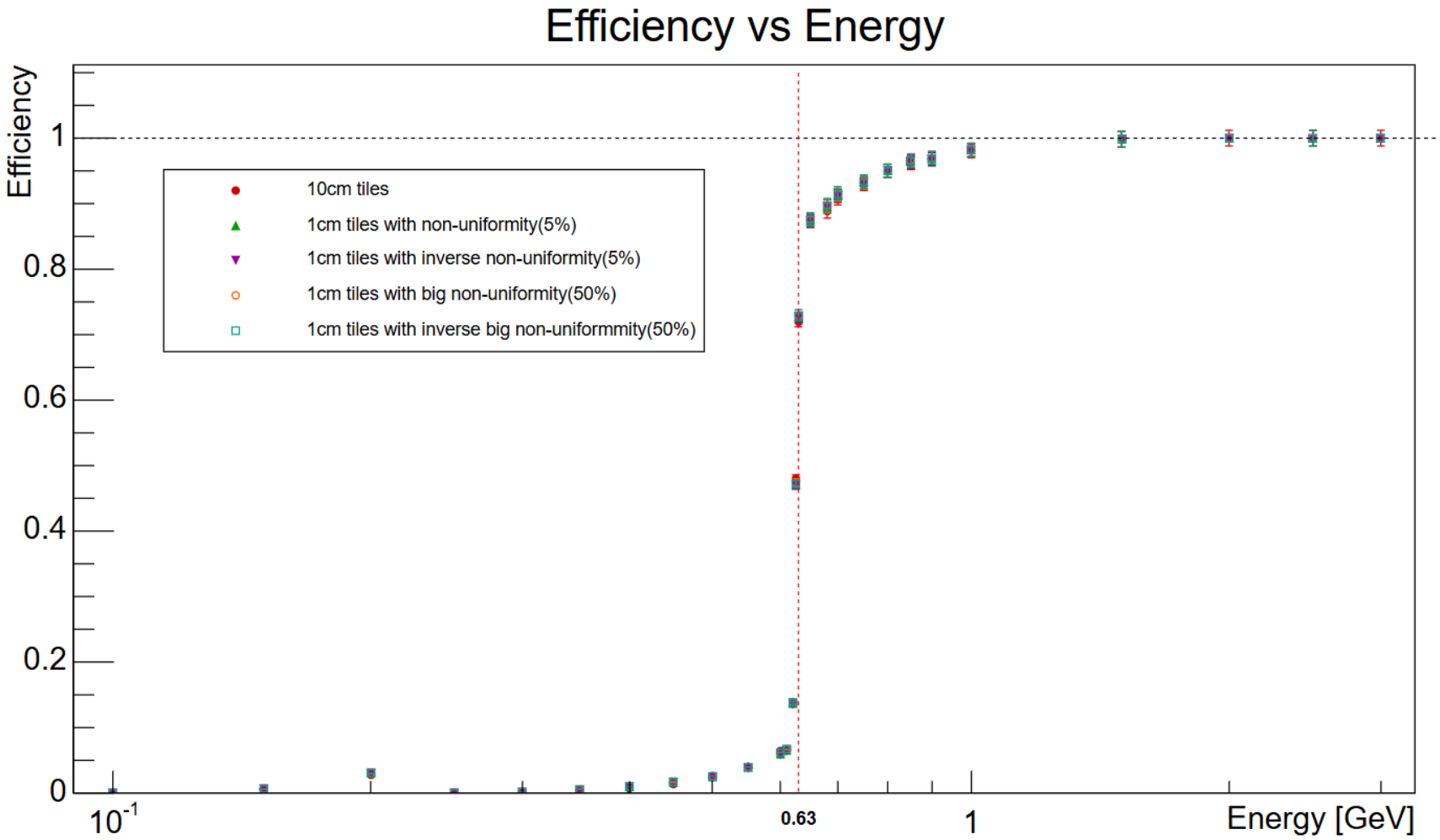


- 1cm tiles with big non-uniformity(50%)

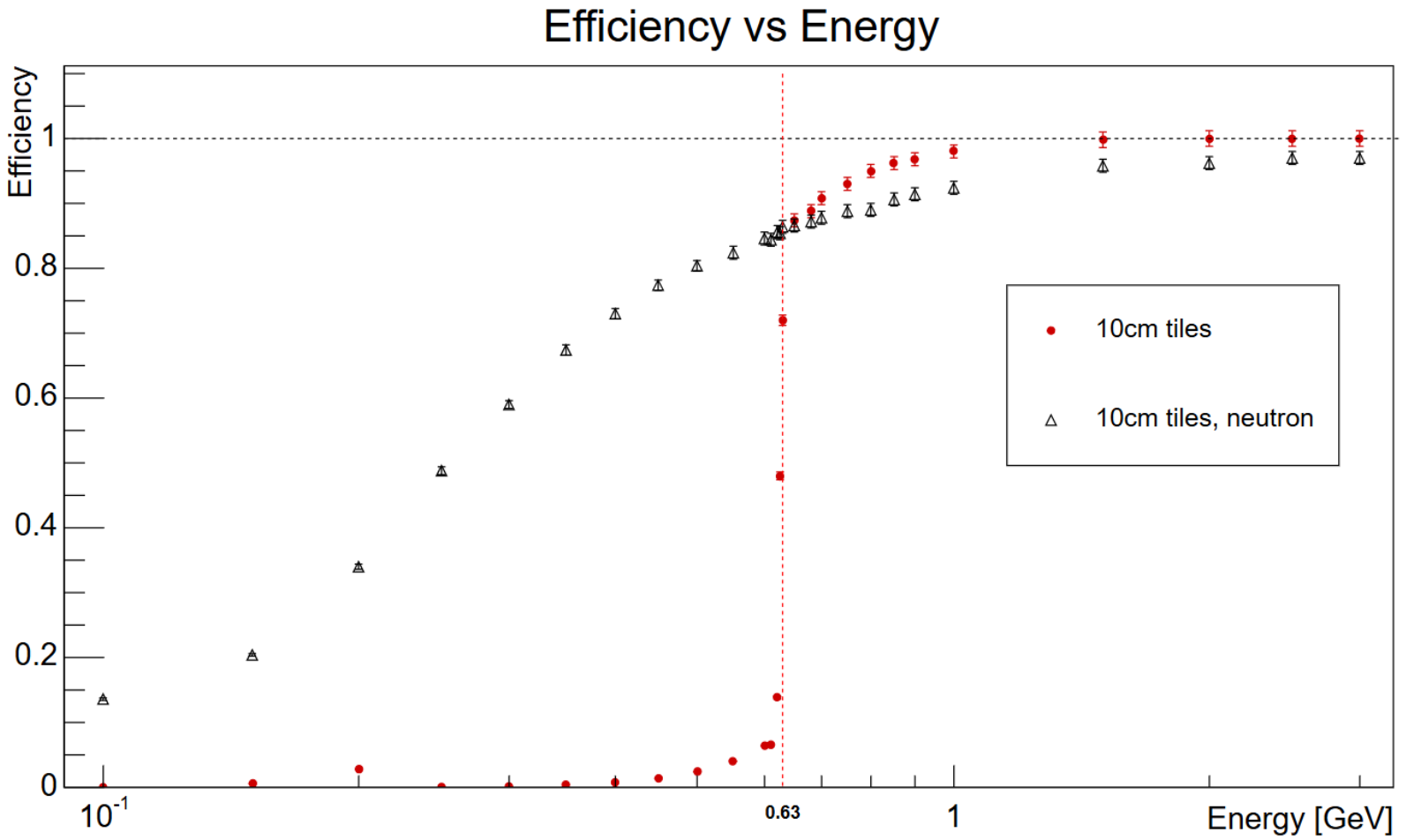


- 1cm tiles with inverse big non-uniformmity(50%)

Efficiency of different non-uniformity

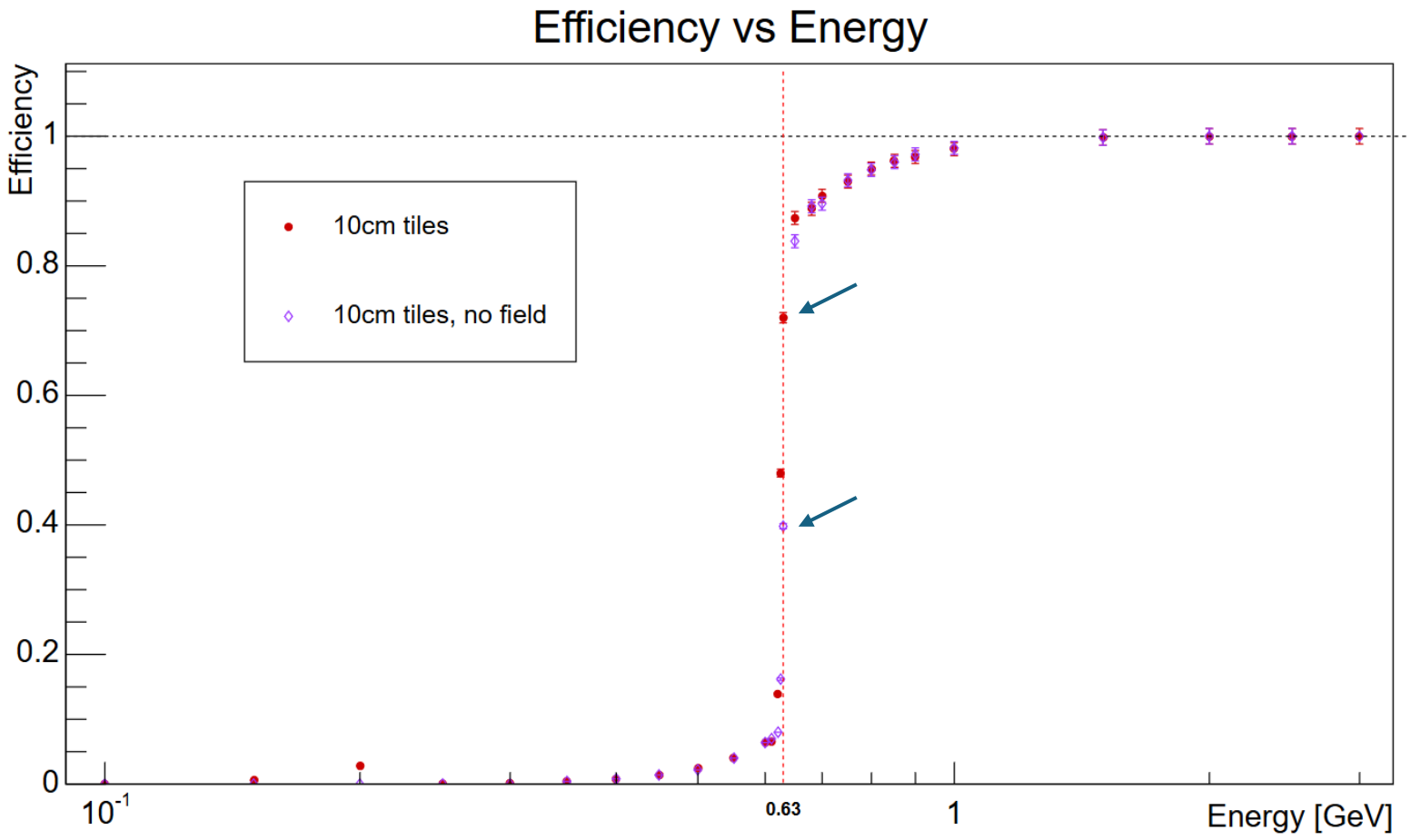


Proton vs. Neutron



- All approaching 1 at higher energy.
- From 0.0 to 1.0 GeV momentum energy, they evolve very differently.

Magnetic-field on/off



- The pattern of how the efficiency evolve doesn't change
- At same energy, efficiency is higher with field on, comparing with field off.
- The difference is significant at range 0.6-0.7 GeV, the sharp transition.

Next

- Select events from the ranges 0.5–0.6, 0.6–0.7, and 0.7–0.8 to examine the behavior before, during, and after the sharp transition.
- Change the geometry of the detector to see how that sharp transition changes.
- Try some other charged particles.