

GEANT Simulations of the New Compton Photon Calorimeter

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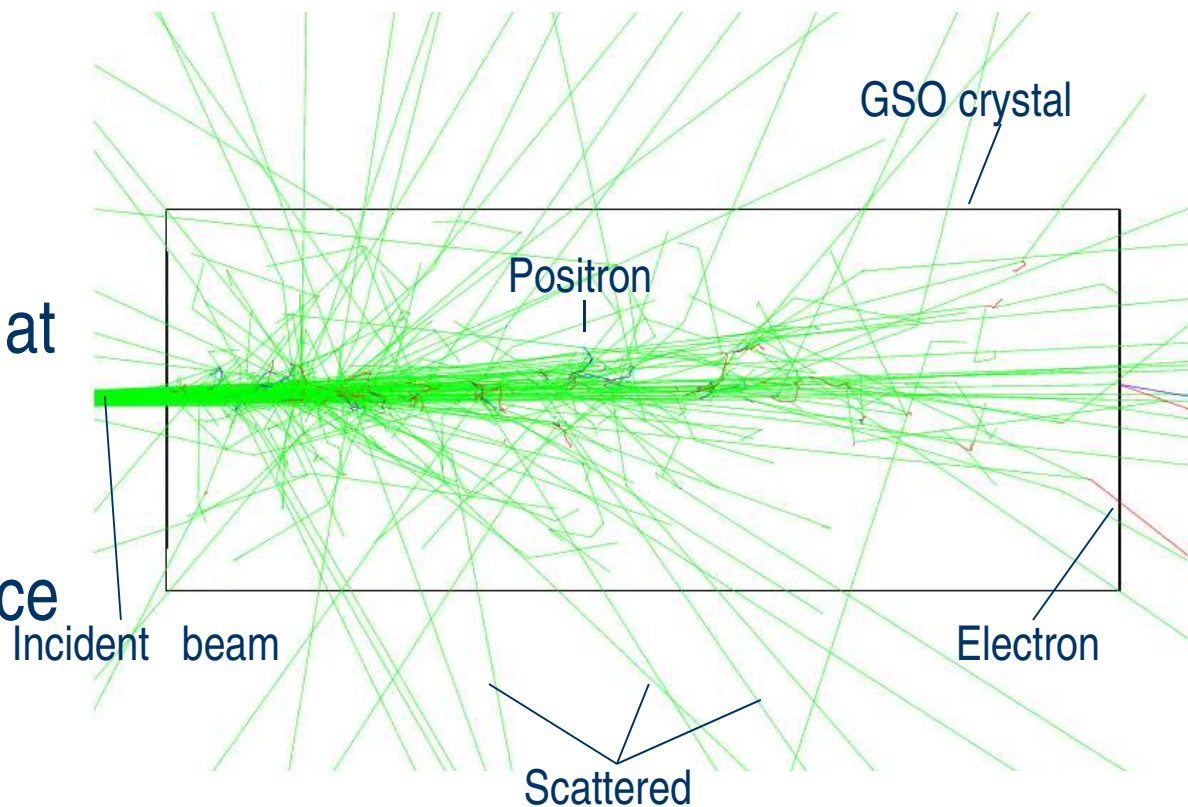
HAPPEX Collaboration December
7, 2007

GSO Crystal

- As part of the Compton polarimeter upgrade, we are upgrading the calorimeter that detects scattered photons
- We have ordered a single, solid cylindrical GSO (Gd_2SiO_5) from Hitachi Corp.
- 3 cm radius, 15 cm in length
- Delivery at CMU expected later this month

GEANT Simulation

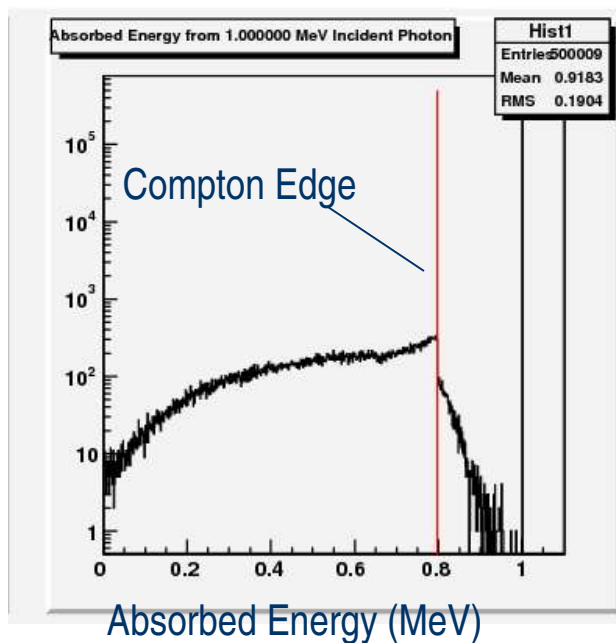
- Simple GEANT model of Hitachi GSO crystal
- Incident photons at 10 discrete energies, slight uniform divergence



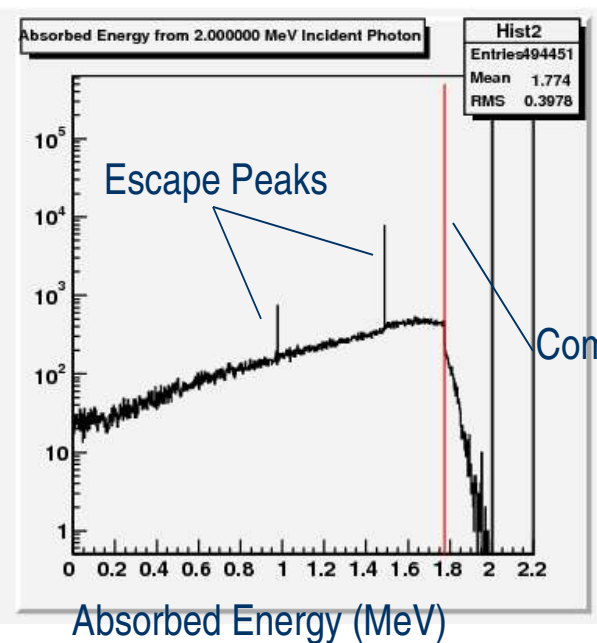
GSO Response to Monoenergetic Photons

- Histograms of absorbed energy from monoenergetic photons show expected physics processes

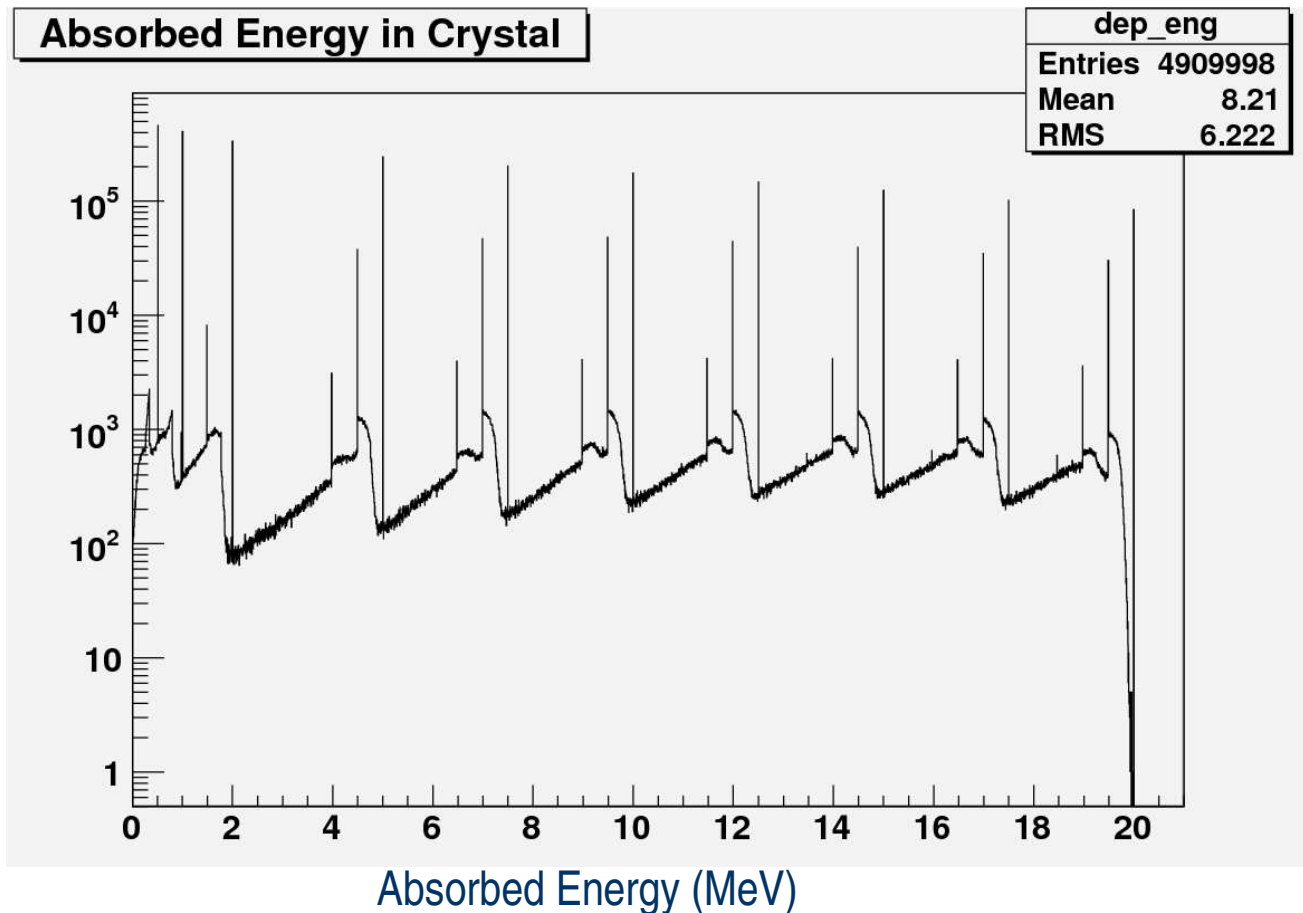
1 MeV photons



2 MeV photons

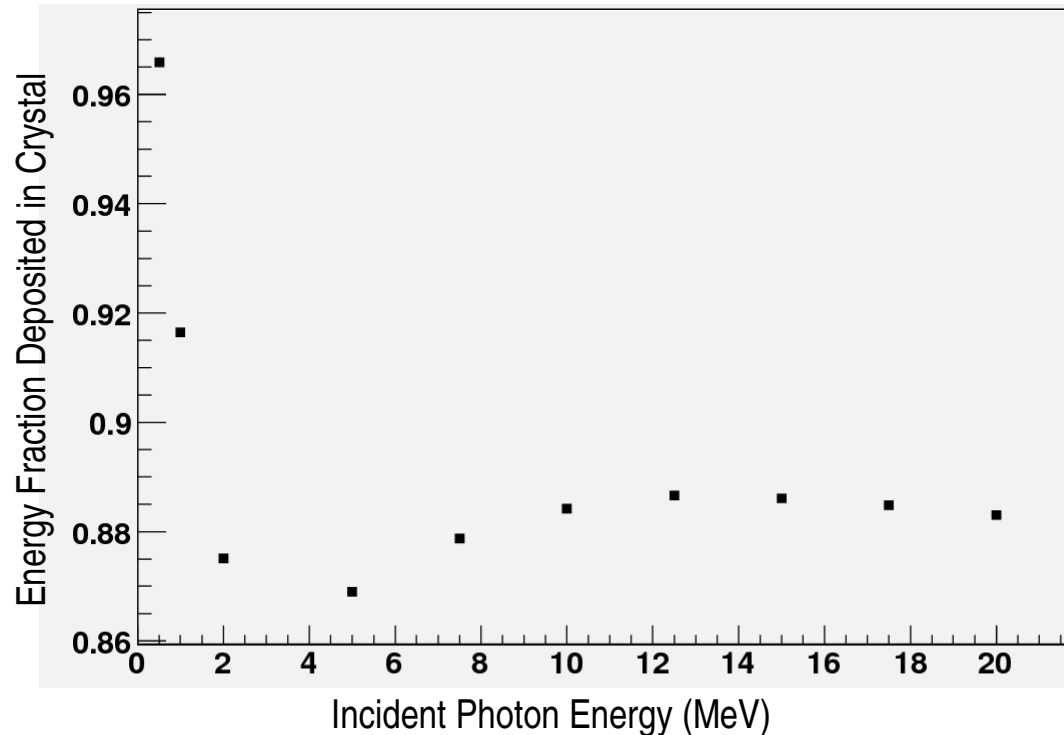


Response to Varied Photon Energies



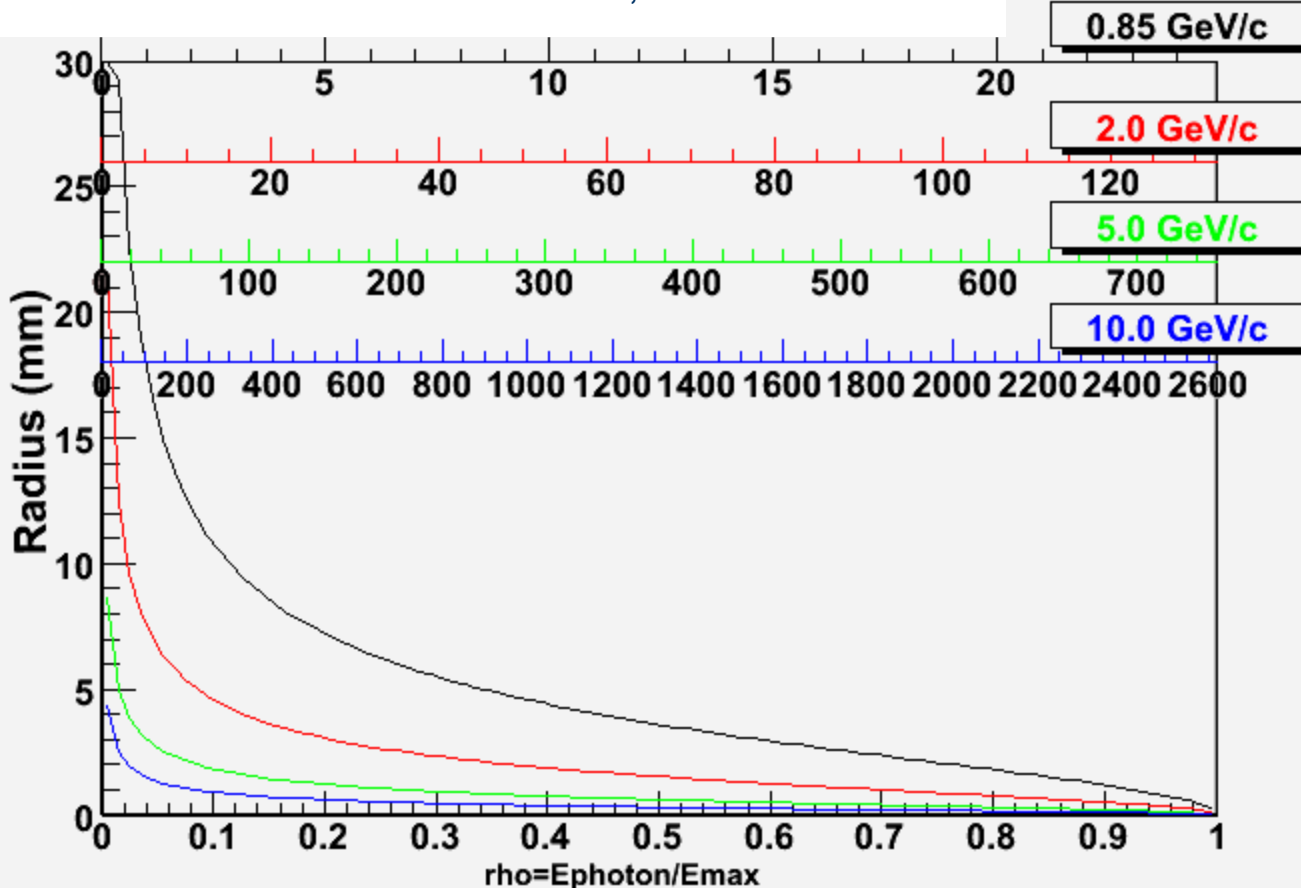
Fractional Energy Deposited Per Photon

- Crystal absorbs a high fraction of each incident photon's energy



To Do – Beam Modeling

Radius of Scattered Photons, 6 m from Interaction Point

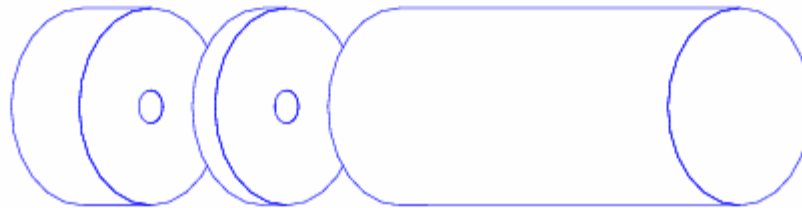


Compton-scattered photons strike crystal at position and angle dependent on their energy

We need to simulate this effect to see how sensitive we are to it

Future Work

- Improve description of incident photons
- Model the effects of various radiator and veto elements

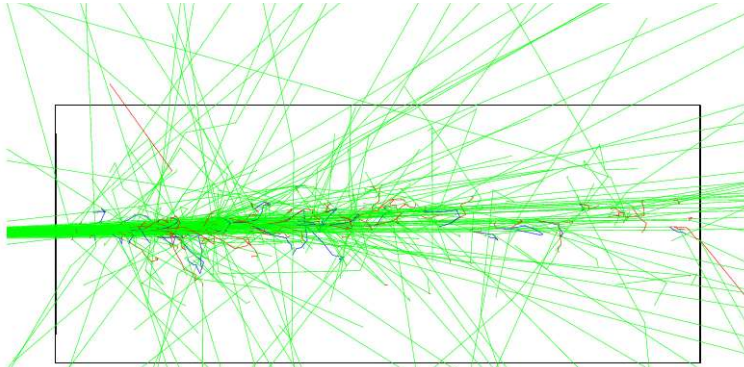


- Study feasibility
- Finalize detector design

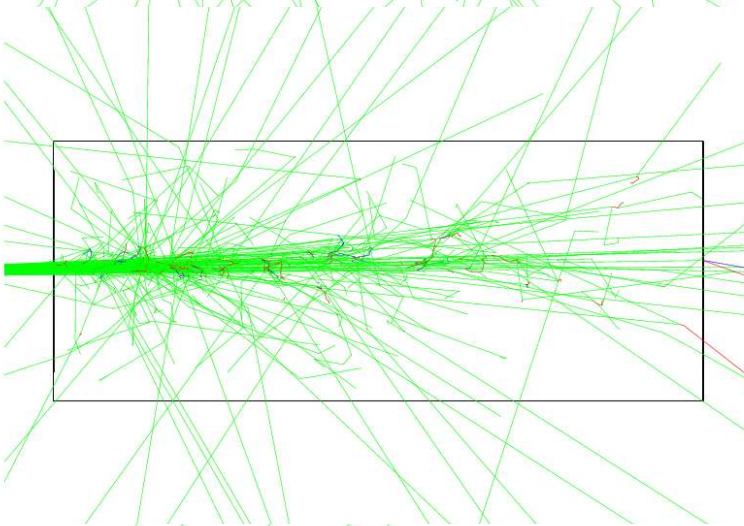


Thank you!

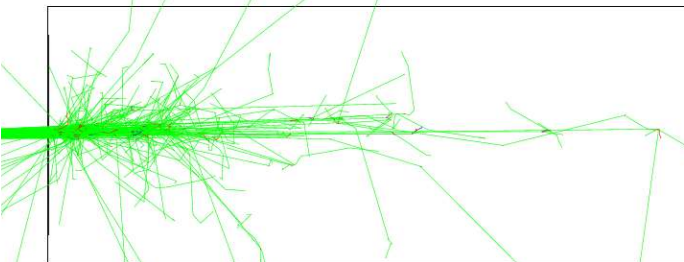
Density Effects



$\frac{1}{2}$ Normal Density



Normal Density



2x Normal Density