Overview of the Glass Prototype Simulation

- Program code is based on the Geant4 framework and located in private repository that belongs to Jefferson Lab GitHub organization. Please contact Tanja Horn for source code access.
- Glass Simulation program is built on top of the Ho San's program code.
- Control of the simulation is handled by Macro Commands defined in input macro file.

DetectorMessenger

Custom size and number of crystals in assembly:

```
/detector/setCrystalSize 20 20 200 mm
/detector/setCrystalNumberX 3
/detector/setCrystalNumberY 3
```

Specify detector type. **Hamamatsu PMT or MPPC** setups are defined in the code: R4125, R2059.. Each detector has specific QE curve.

```
/detector/setDetectorType R4125
/detector/setDetectorType S13360-MPPC
```

User specifies material: PWO (Siccas, Crytur), SciGlass (heavy glass, generations 1, 3, 4):

```
/detector/setCrystalMaterial SciGlass-4
```

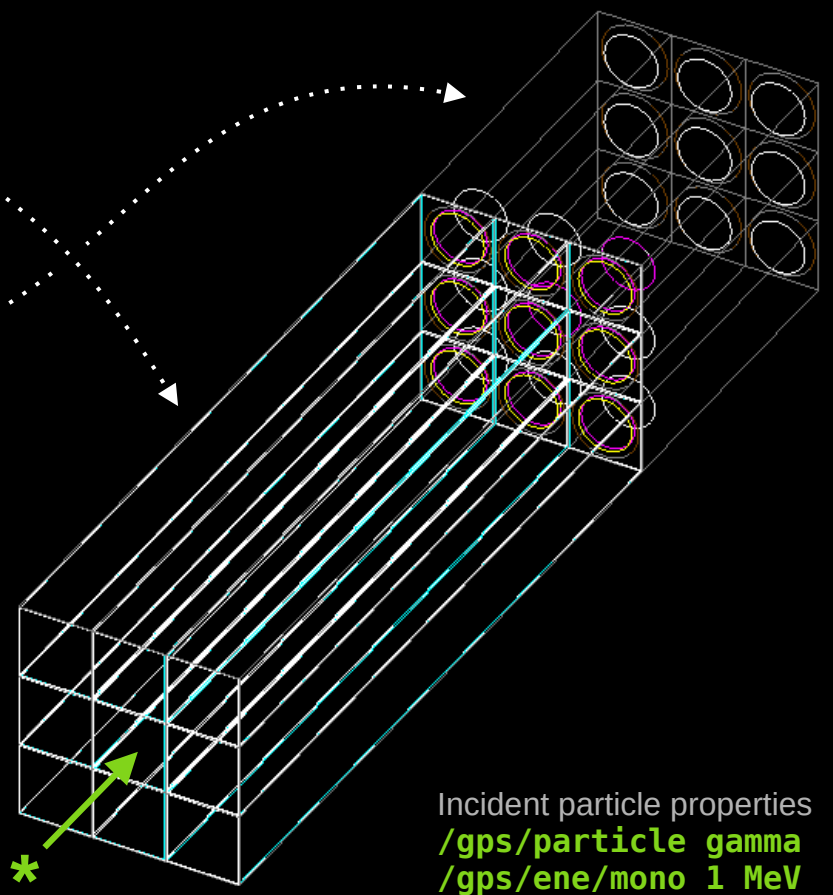
Physics Messenger

Select any default Geant4 physics list

```
/physics/selectList FTFP_BERT
```

Add optical physics (optional)

```
/physics/addOptical
```



Incident particle properties

```
/gps/particle gamma
/gps/ene/mono 1 MeV
```

Scintillator Materials Definition

Every material defined in the program has unique set of properties:

- For energy deposition: **elemental composition**.
- For optical readout: **refractive index** (RI), **measured transmittance** (T at certain distance), emission spectrum, scintillation yield. **Absorption length** is calculated as a function of RI and T.

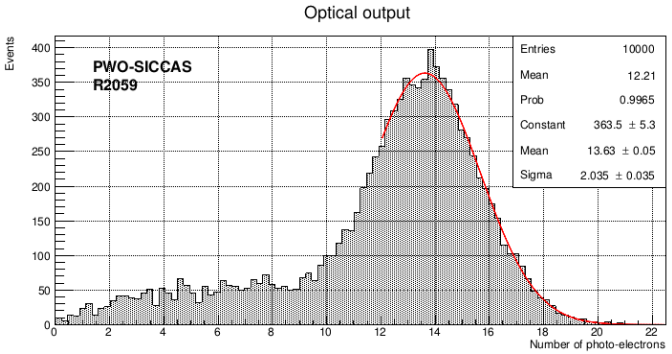
Program Output

UserAction classes

Collect **PE output from every detector**. Based on detector geometry, cathode size and QE of the user-selected detector.

Detect **Cherenkov/Scintillation** photon ratio produced in simulation.

Count particles leaving the simulation (ensure **energy balance**).

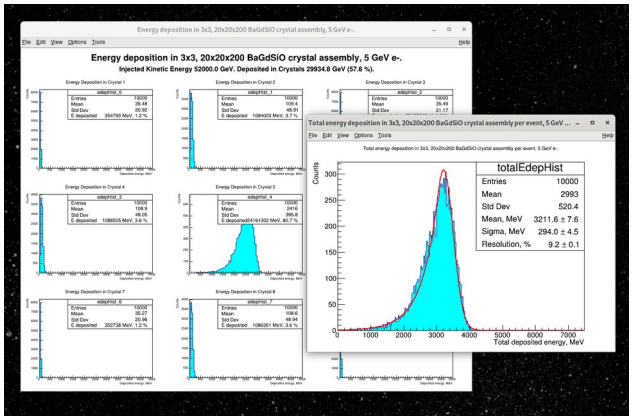


PrimitiveScorer class

Collect energy deposited in each crystal.

Fit energy deposition with Crystal Ball function.

Calculate the **energy resolution**.



ScoringMesh class

Visualize energy deposition in the crystal and detector assembly