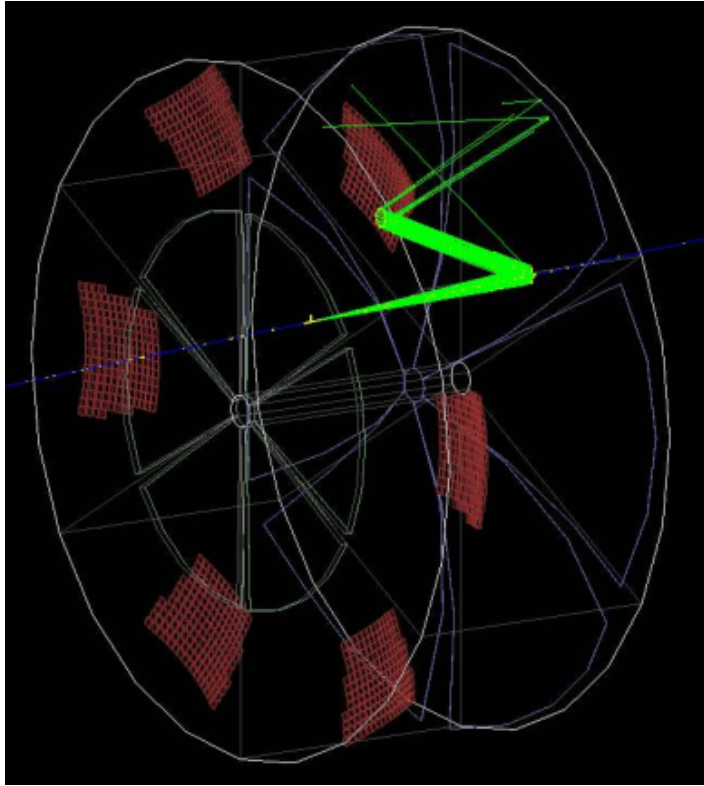# dRICh in Fun4all

Christopher Dilks
ECCE PID Meeting
19 May 2021
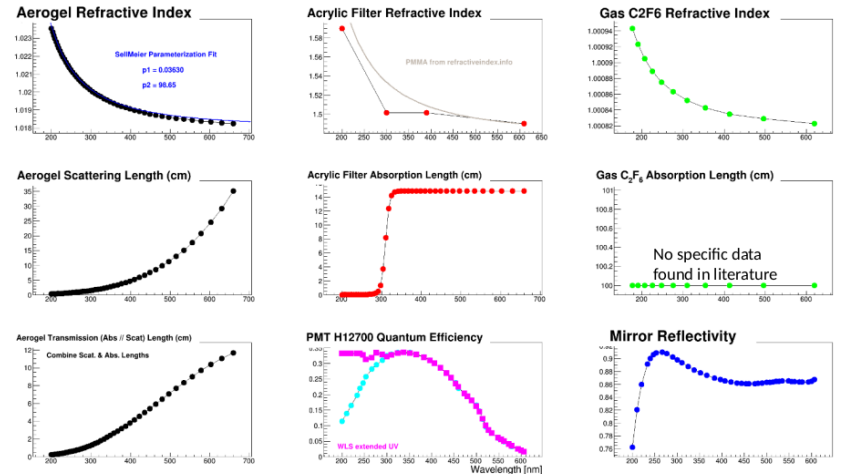
dRICH Design

Geometry in Fun4All

Photon Detectors

≈210 cm

Aerogel + Acrylic Filter

Gas C2F6

Charged particle
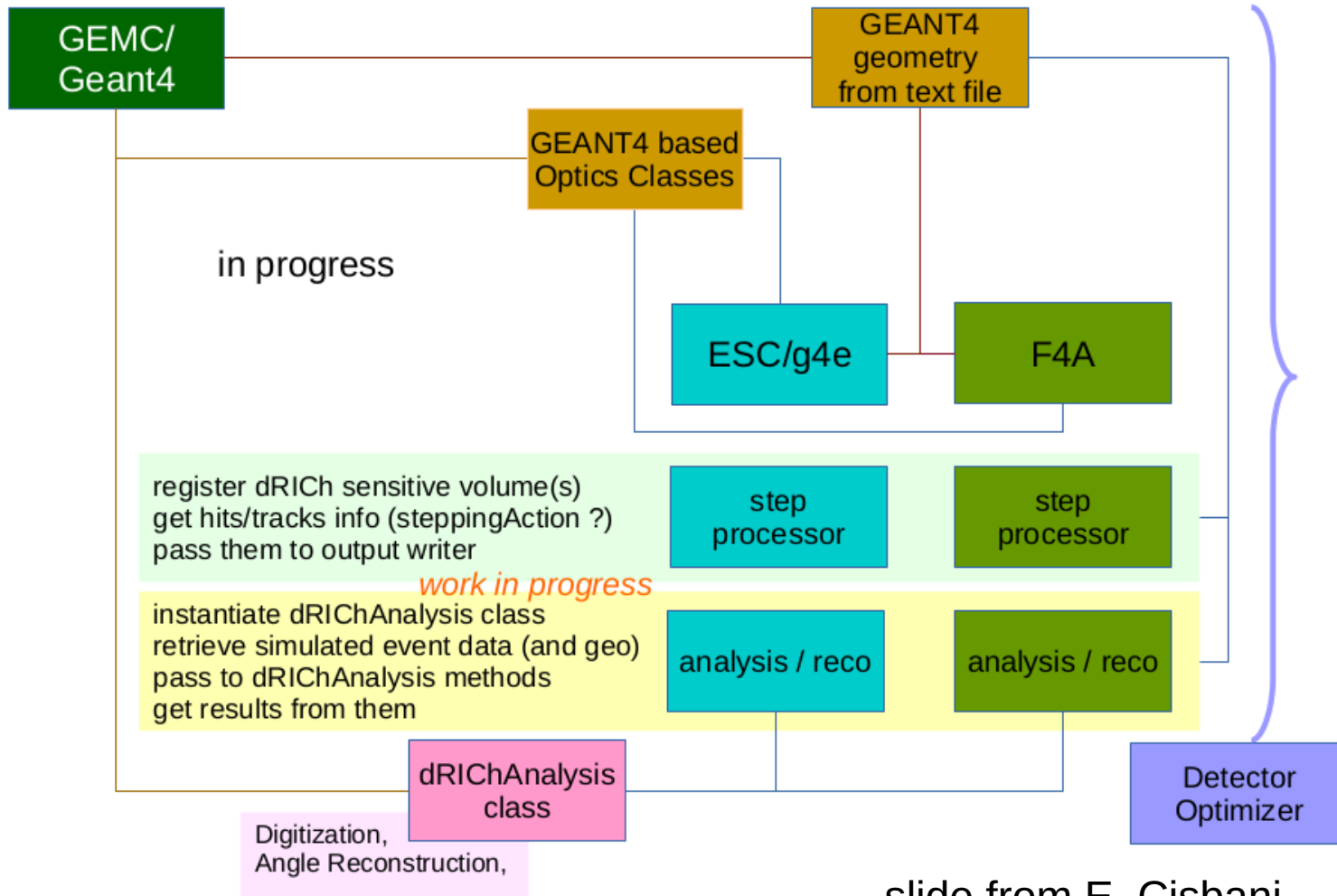
Spherical Mirror

Beam pipe(s) region
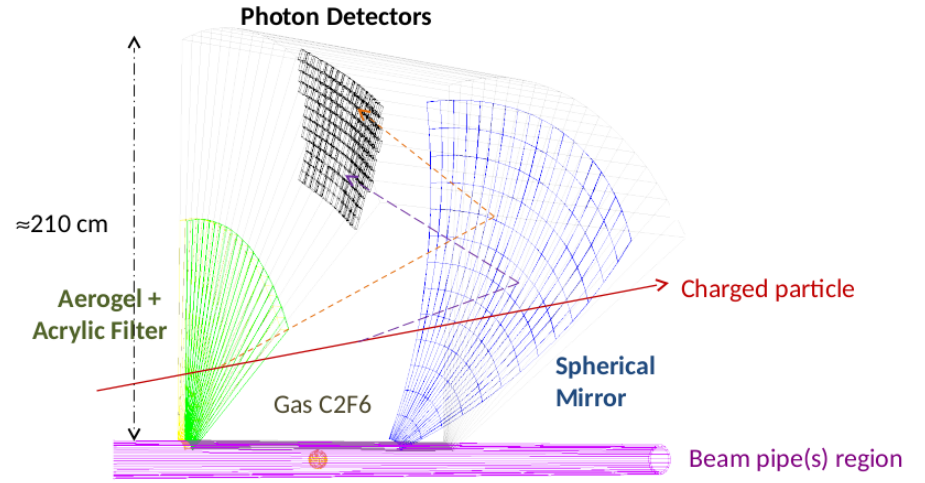
dRICh main optical characteristics

Shall be reasonably parameterized in order to test different configurations

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Software Map

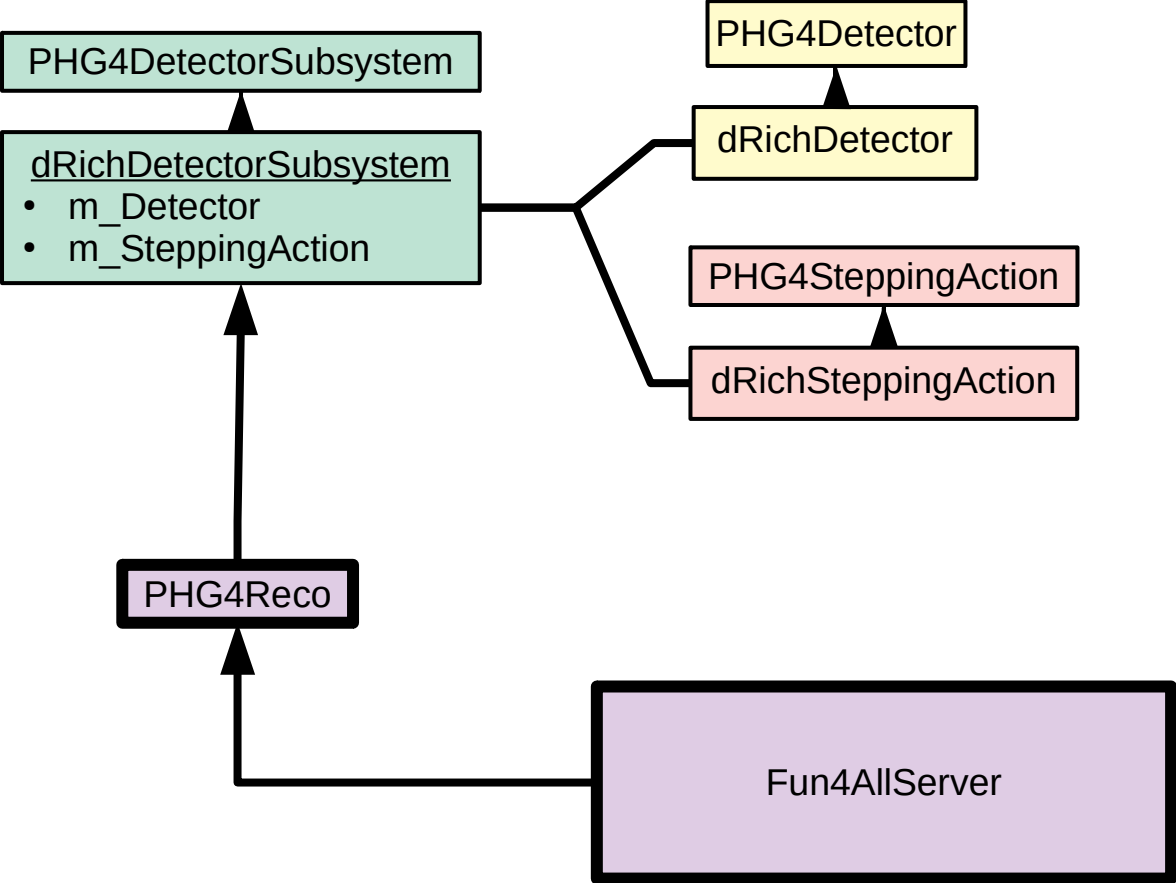## Overall

slide from E. Cisbani

F4A Implementation Details


```
PHG4DetectorSubsystem

dRichDetectorSubsystem
 •  m_Detector
 •  m_SteppingAction

                    PHG4Detector
                    dRichDetector

                    PHG4SteppingAction
                    dRichSteppingAction

PHG4Reco

Fun4AllServer
```
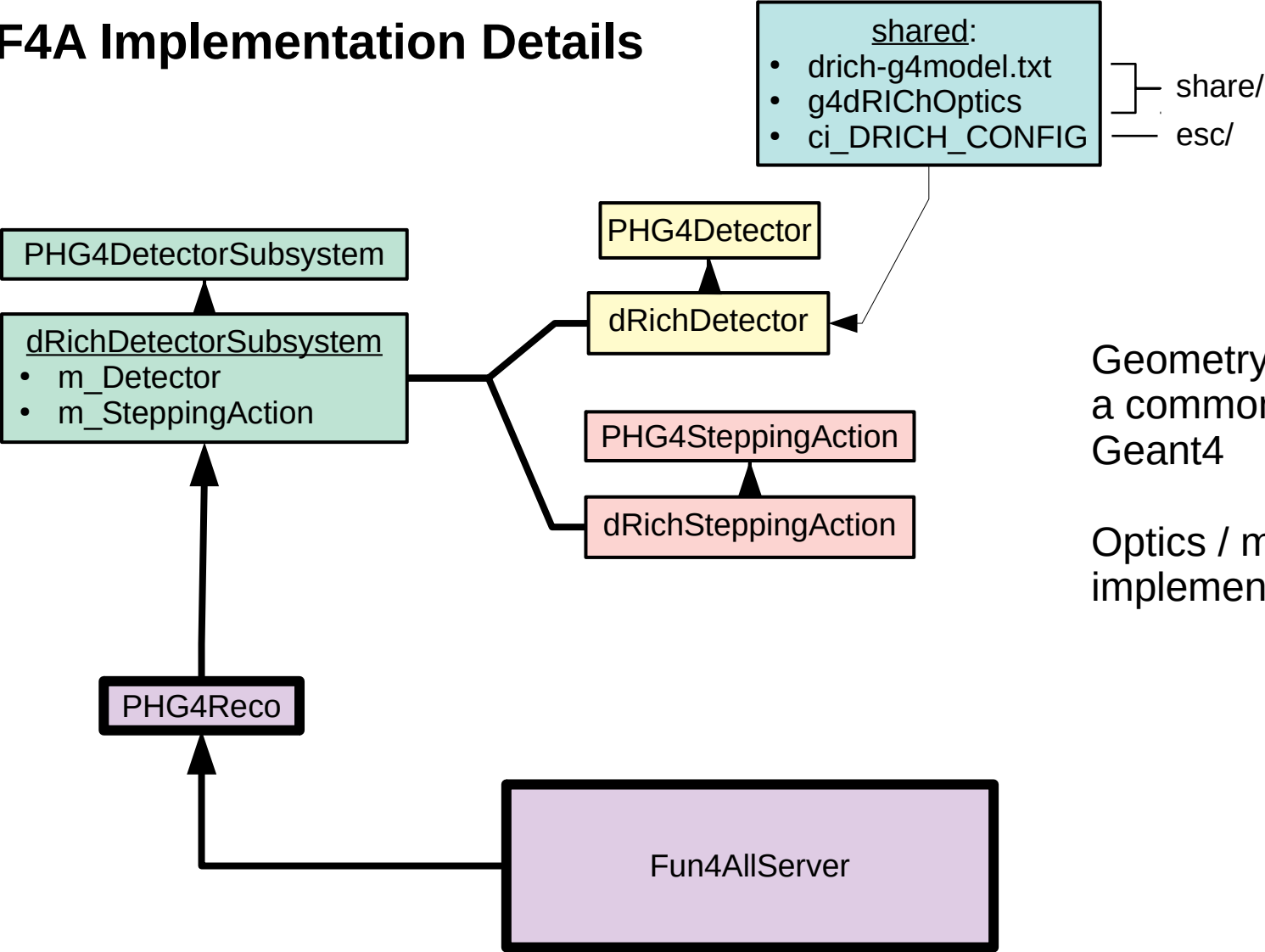
Starting point:
<u>f4a template</u>

To keep things "standardized", development of the f4a port began with the f4a template detector

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F4A Implementation Details

shared:
- drich-g4model.txt
- g4dRIChOptics
- ci_DRICH_CONFIG

— share/

— esc/

PHG4DetectorSubsystem

dRichDetectorSubsystem
- m_Detector
- m_SteppingAction

PHG4Detector

dRichDetector

PHG4SteppingAction

dRichSteppingAction

PHG4Reco

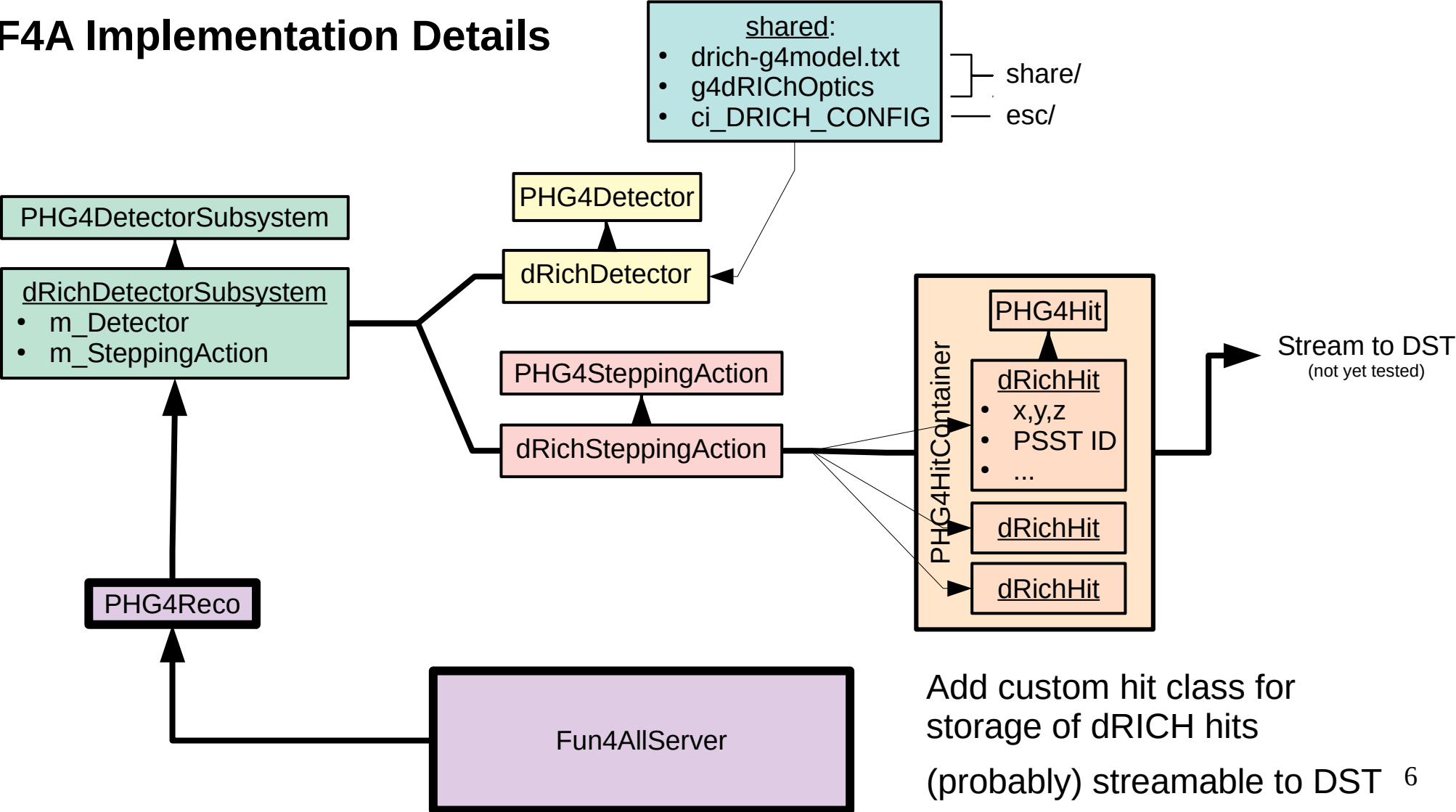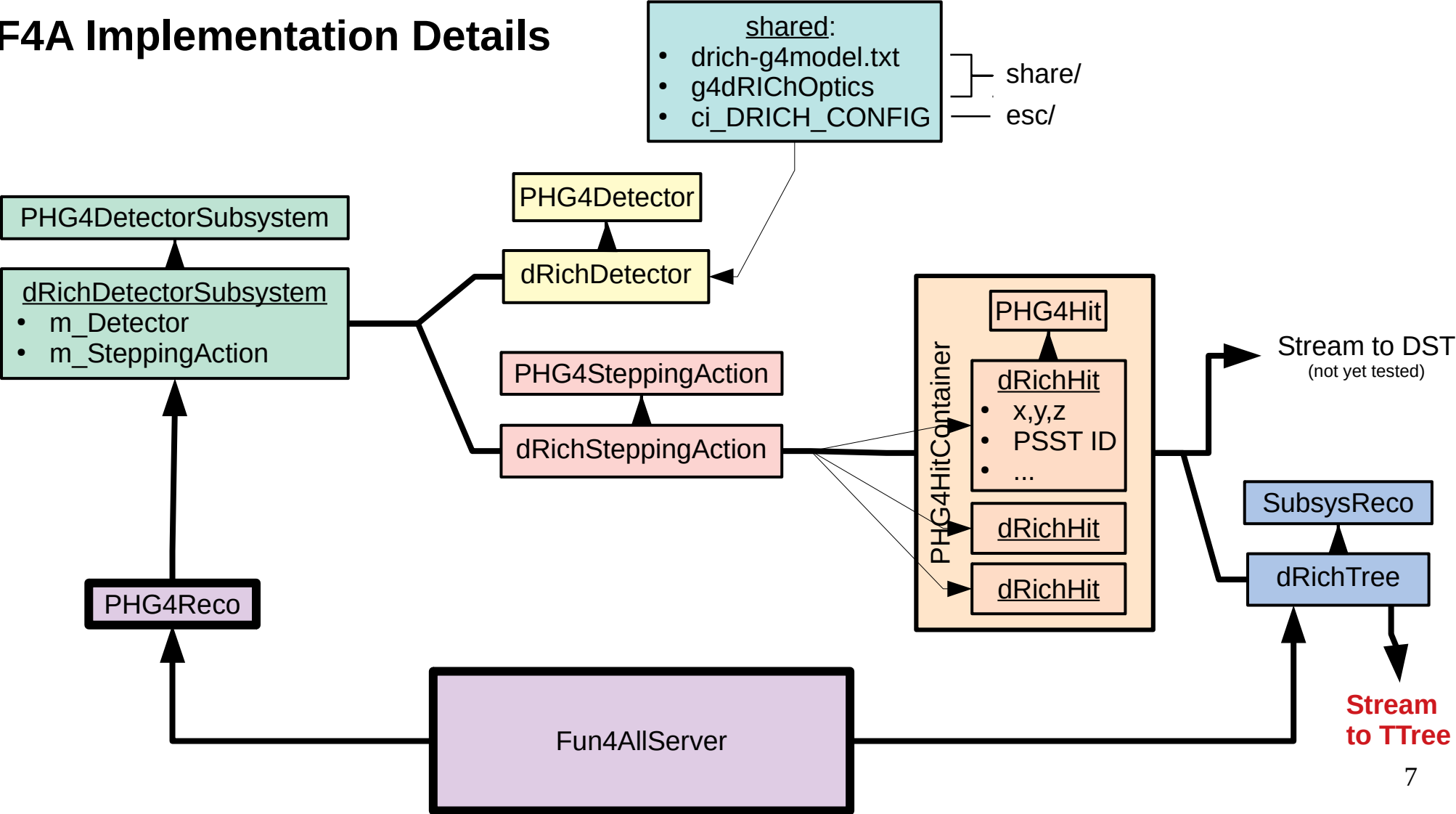Fun4AllServer

Geometry is implemented from a common text file, read by Geant4

Optics / material properties implemented in a shared class

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F4A Implementation Details

shared:
- drich-g4model.txt
- g4dRIChOptics
- ci_DRICH_CONFIG

share/
esc/

PHG4DetectorSubsystem

dRichDetectorSubsystem
- m_Detector
- m_SteppingAction

PHG4Detector

dRichDetector

PHG4SteppingAction

dRichSteppingAction

PHG4Reco

Fun4AllServer

PHG4HitContainer

PHG4Hit

dRichHit
- x,y,z
- PSST ID
- ...

dRichHit

dRichHit

Stream to DST
(not yet tested)

Add custom hit class for storage of dRICH hits

(probably) streamable to DST

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F4A Implementation Details

Diagram contents:

shared:
- drich-g4model.txt
- g4dRIChOptics
- ci_DRICH_CONFIG

— share/
— esc/

PHG4DetectorSubsystem

dRichDetectorSubsystem
- m_Detector
- m_SteppingAction

PHG4Detector

dRichDetector

PHG4SteppingAction

dRichSteppingAction

PHG4HitContainer

PHG4Hit

dRichHit
- x,y,z
- PSST ID
- ...

dRichHit

dRichHit

Stream to DST
(not yet tested)

SubsysReco

dRichTree

Stream to TTree

PHG4Reco

Fun4AllServer

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Some Early Plots

<u>dRichTree</u>

Simulation test: throw 1000 π^+s at the dRICH

- each pion thrown with the same momentum and direction, to accumulate statistics for a single type of event

- different things happen in each event, but in general we get a ring of Cherenkov photons on the photosensors

- some pions interact with the world volume prior to hitting the dRICH, causing secondary hits

Two types of hits are read out:

- Photosensor hits – primarily Cherenkov opticalphotons

- Incident hits – primarily the thrown pi$^+$s, though sometimes can be other secondaries from world interactions ("atypical" incident hits)

- evnum
- trackID
- hitType
- petal
- psst
- pdg
- particleName
- process
- parentID
- photHitPos
- photP
- photPdir
- photVtxPos
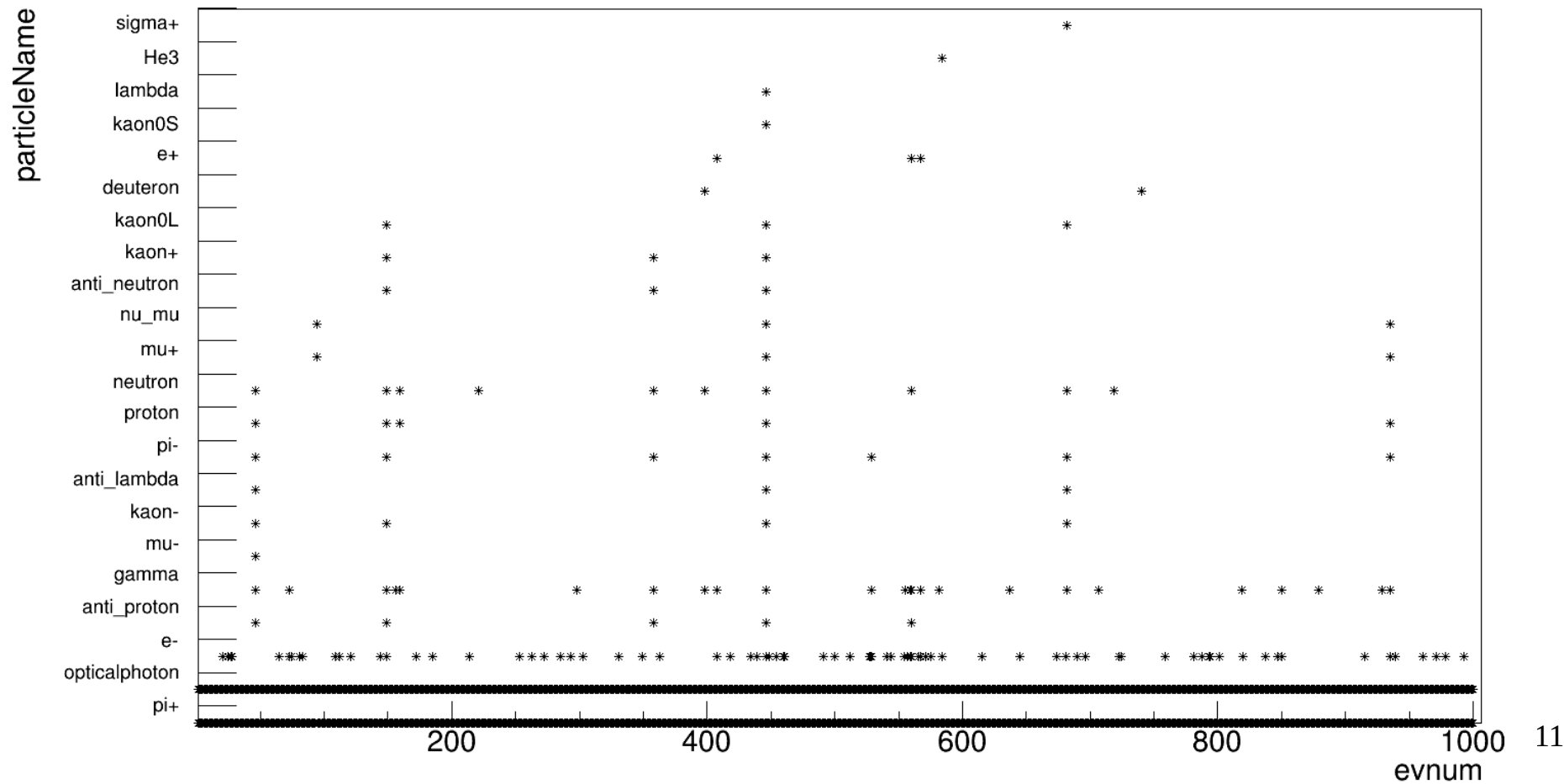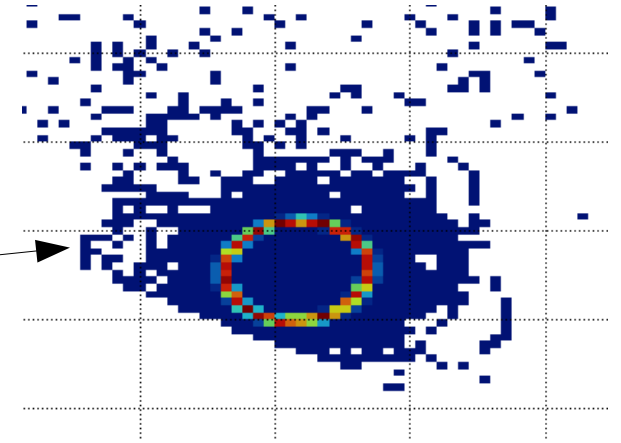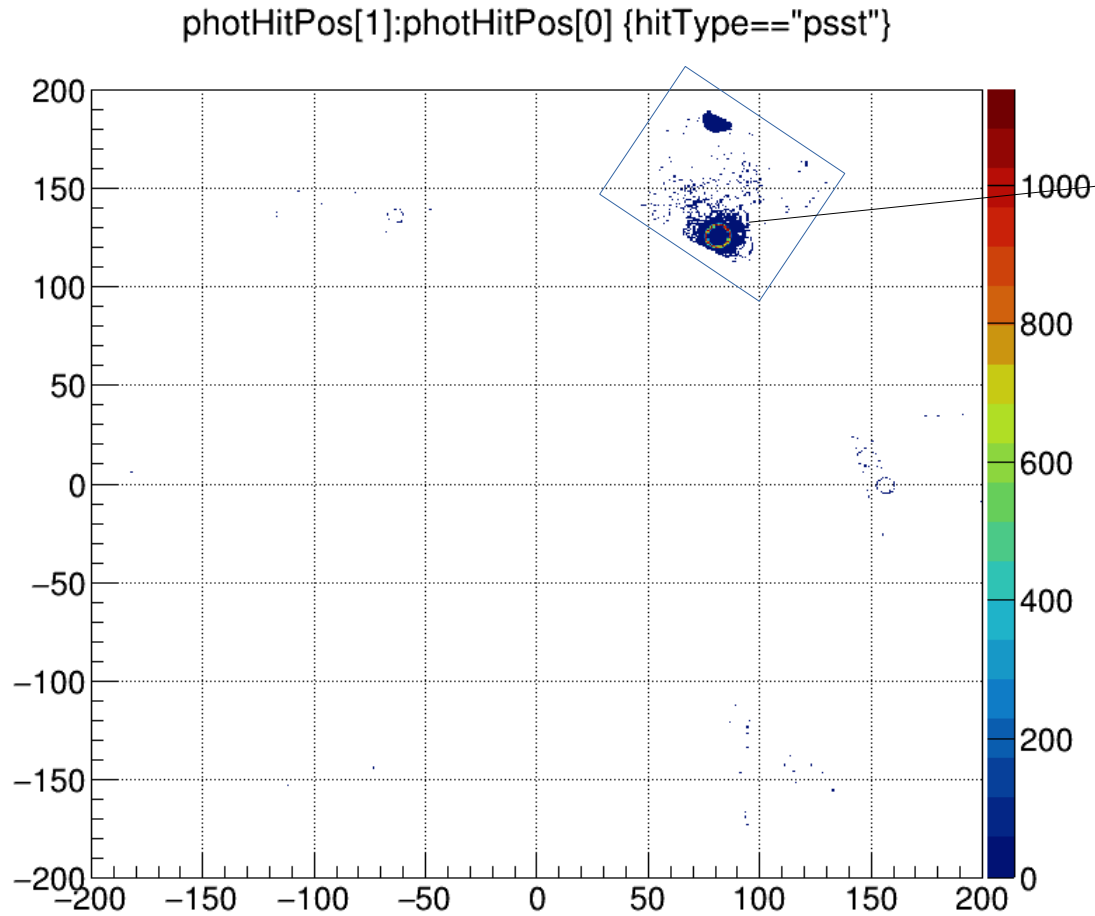- photVtxPdir
- photDeltaT

hitType:particleName
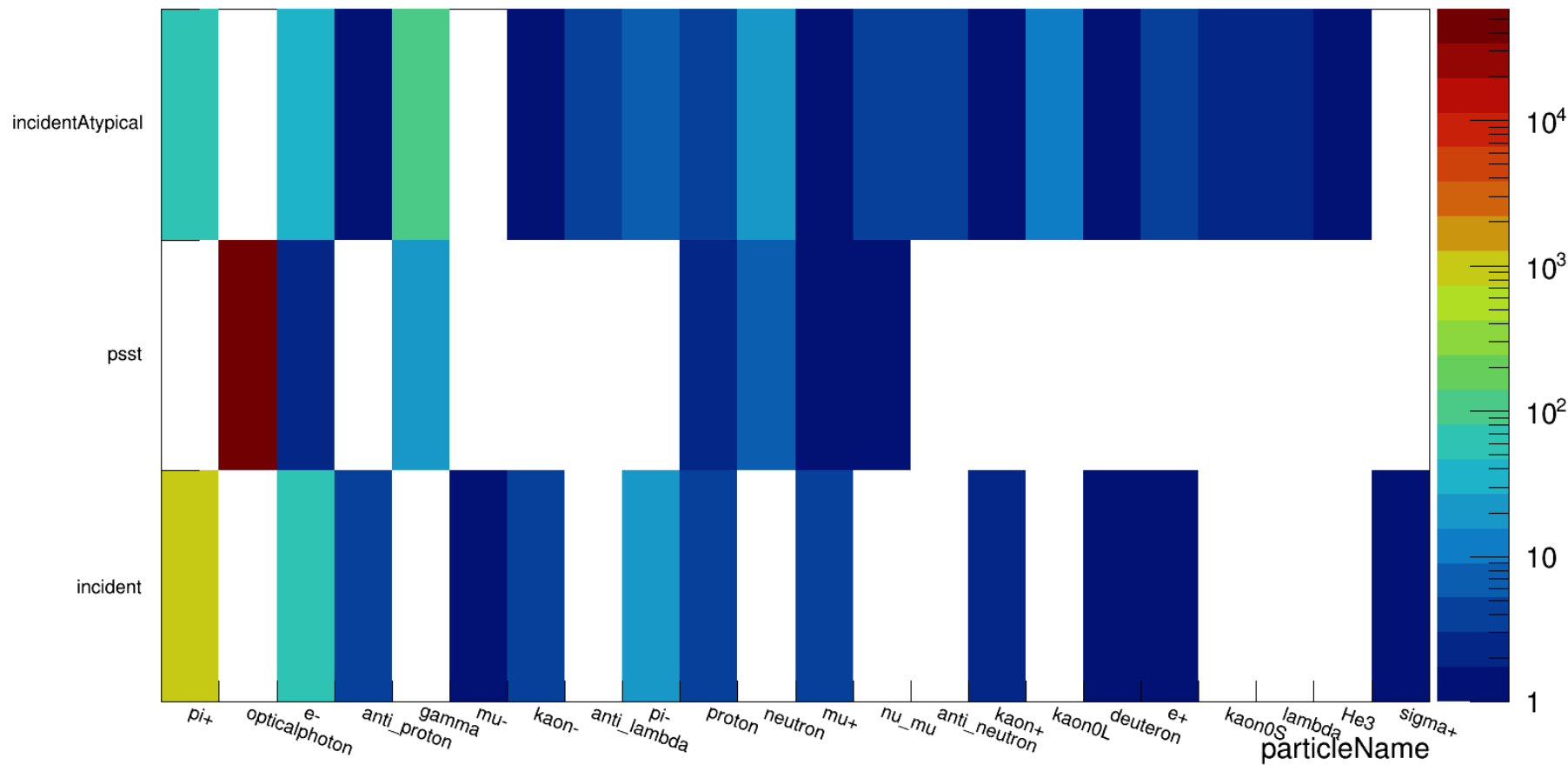
Some Early Plots

Some Early Plots

particleName:evnum

Photosensor Hit Distribution

photHitPos[1]:photHitPos[0] {hitType=="psst"}

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Outlook

- Continue developing and testing the stepping action and hit readout

- Integration with analysis code development