SoLID Simulation Update

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Outline

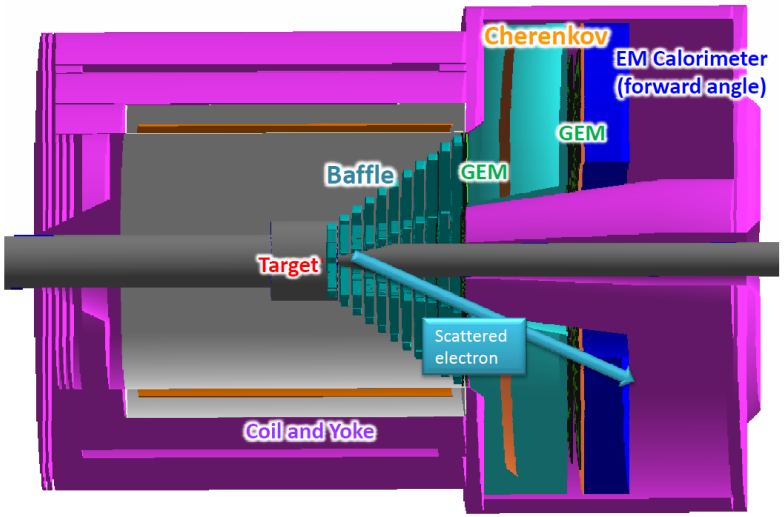
- Simluation Status
- Short Term (within one year) Goals
- Long Term Goals

Status

GEMC 1.x, 2.x

- Used for most of simulations, pCDR, tracking
- Maintained by Mauri, Hall B
- Digitization of gems available for 1.8

SoLID CLEO PVDIS

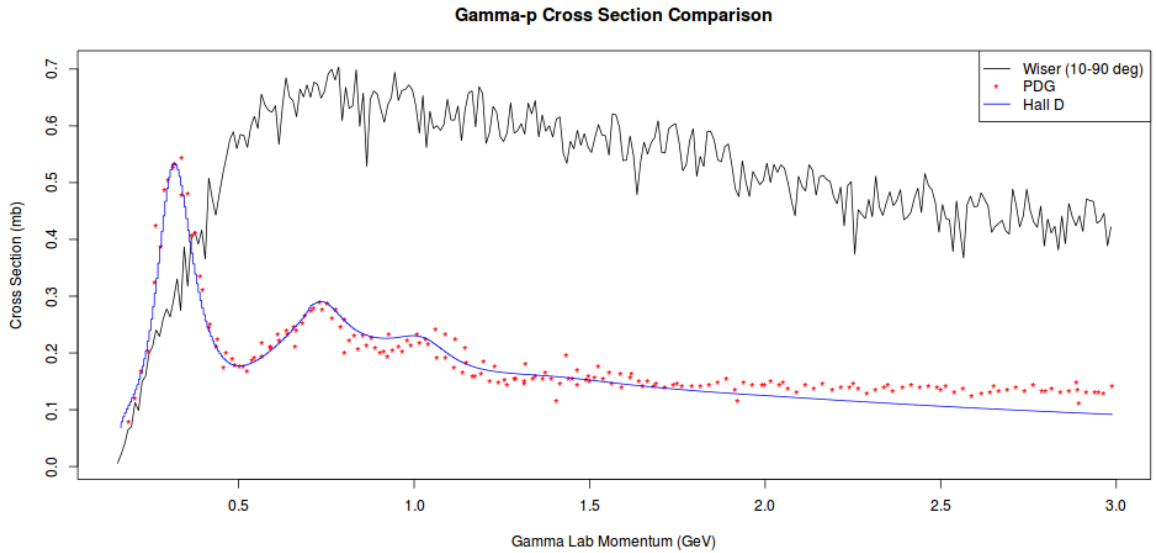


remoll

- Contains full versions of all detector systems
- Being used by Rakitha for ECal simulations
- Requested to have ROOT output files integrated to digitization for Ole

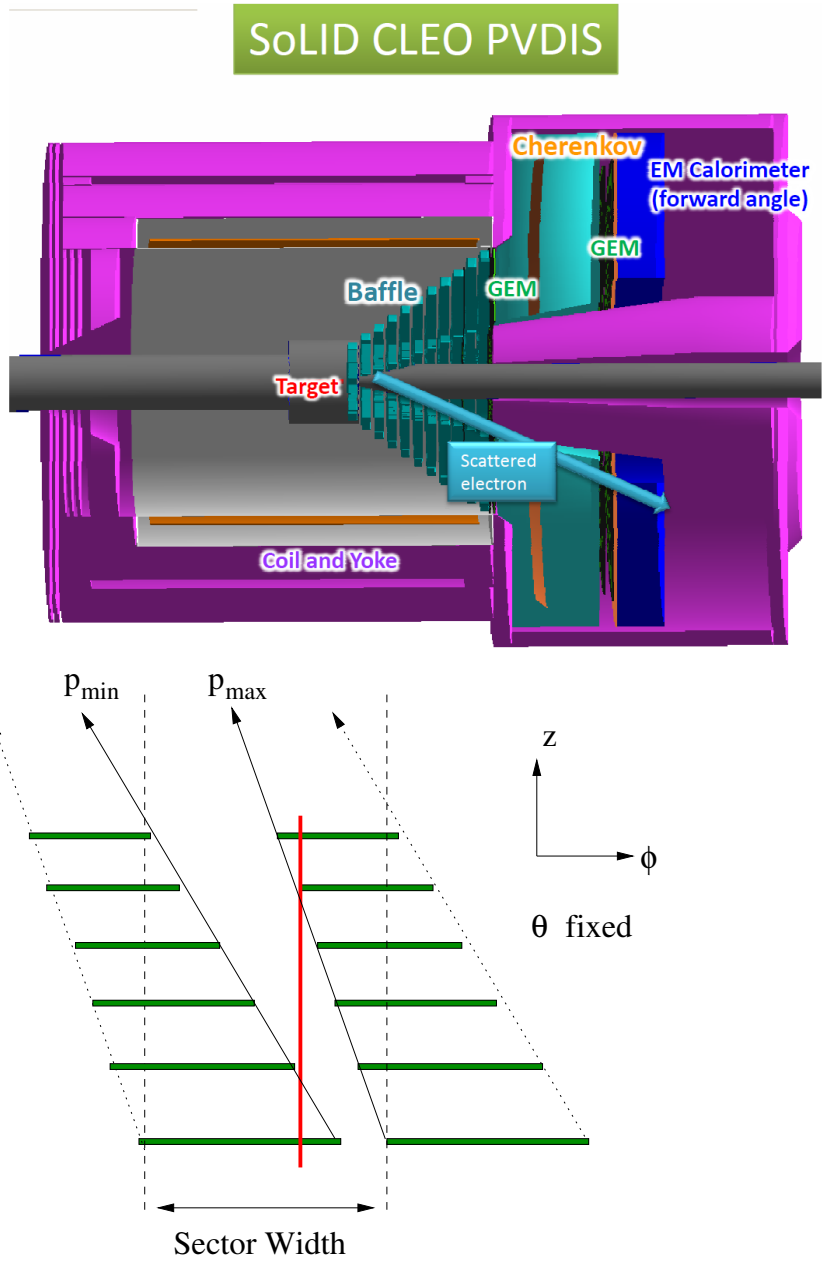
Short Term - Backgrounds

- Central issue is Wiser effectiveness for pion backgrounds in extrapolated phase space ($E_\gamma < 1$ GeV, $< 5^\circ$)
- This must be resolved ASAP - Rakitha will discuss
- Some new Generators/Methods:
  - Pythia
  - Hall D - SAID at low Q^2 + Pythia, just photoproduction
  - Tiator/Wright EPA (I think Paul has ruled this out
  - Geant4 processes



Short Term - Baffles

- Original BaBar baffles (but extended) still in use
- Optimization using analytic model insufficient for full background considerations
- Background driven optimization of broader phase space necessary
- Should continue with present framework and more fully explore phase space

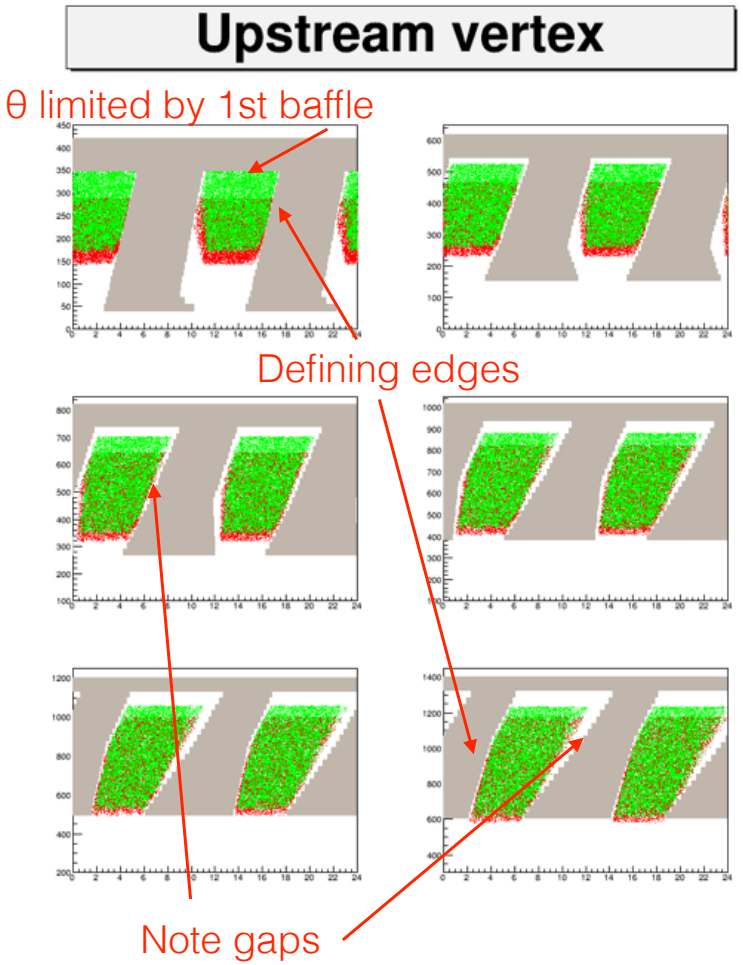


- From Rich Holmes

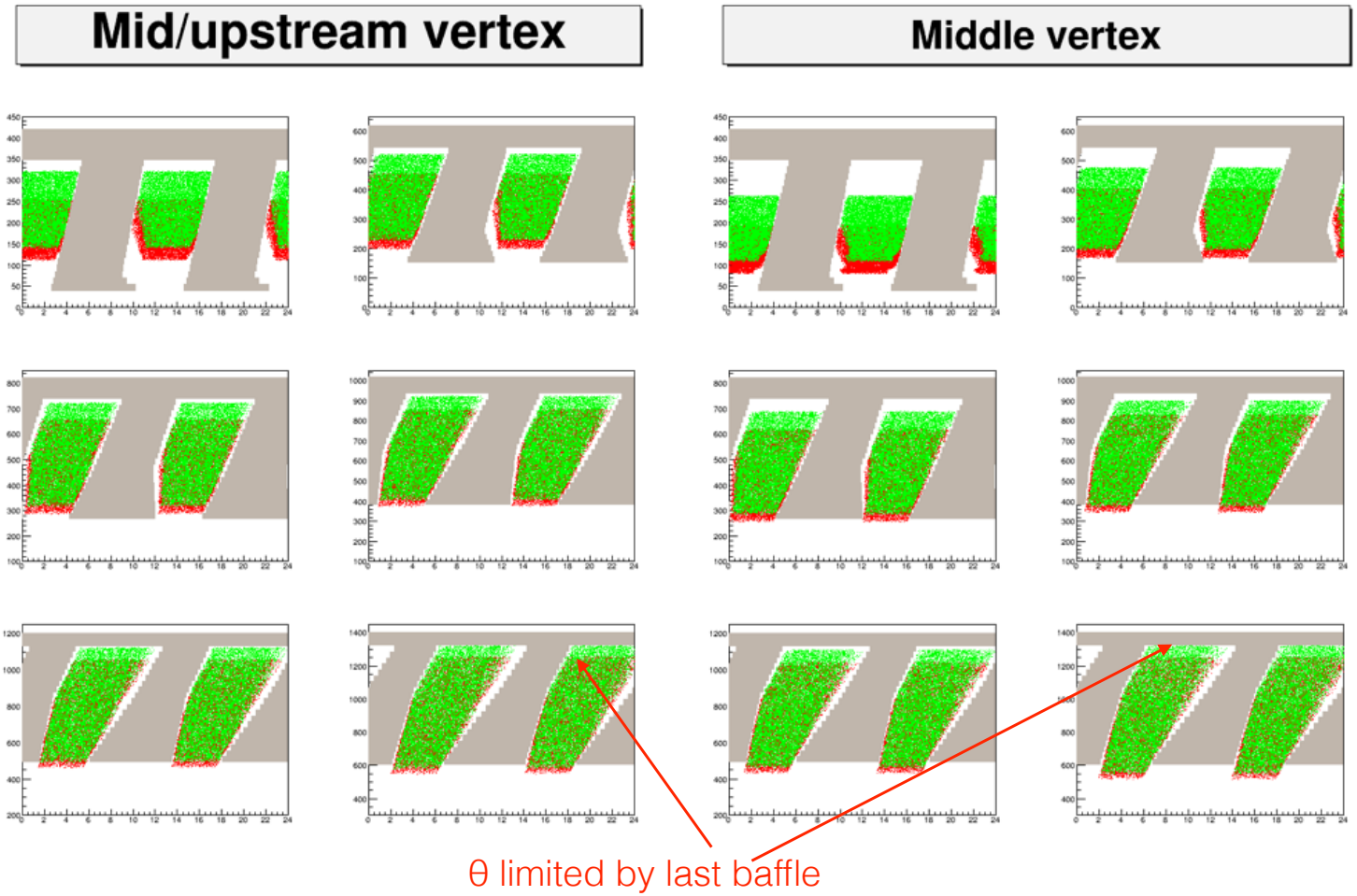
For these plots, e^- tracks generated uniform in p, θ, and ϕ

Same cuts imposed: $x_{Bj} > 0.55$, $W^2 > 4$ GeV^2, $Q^2 > 6$ GeV^2, $p > 2$ GeV/c^2

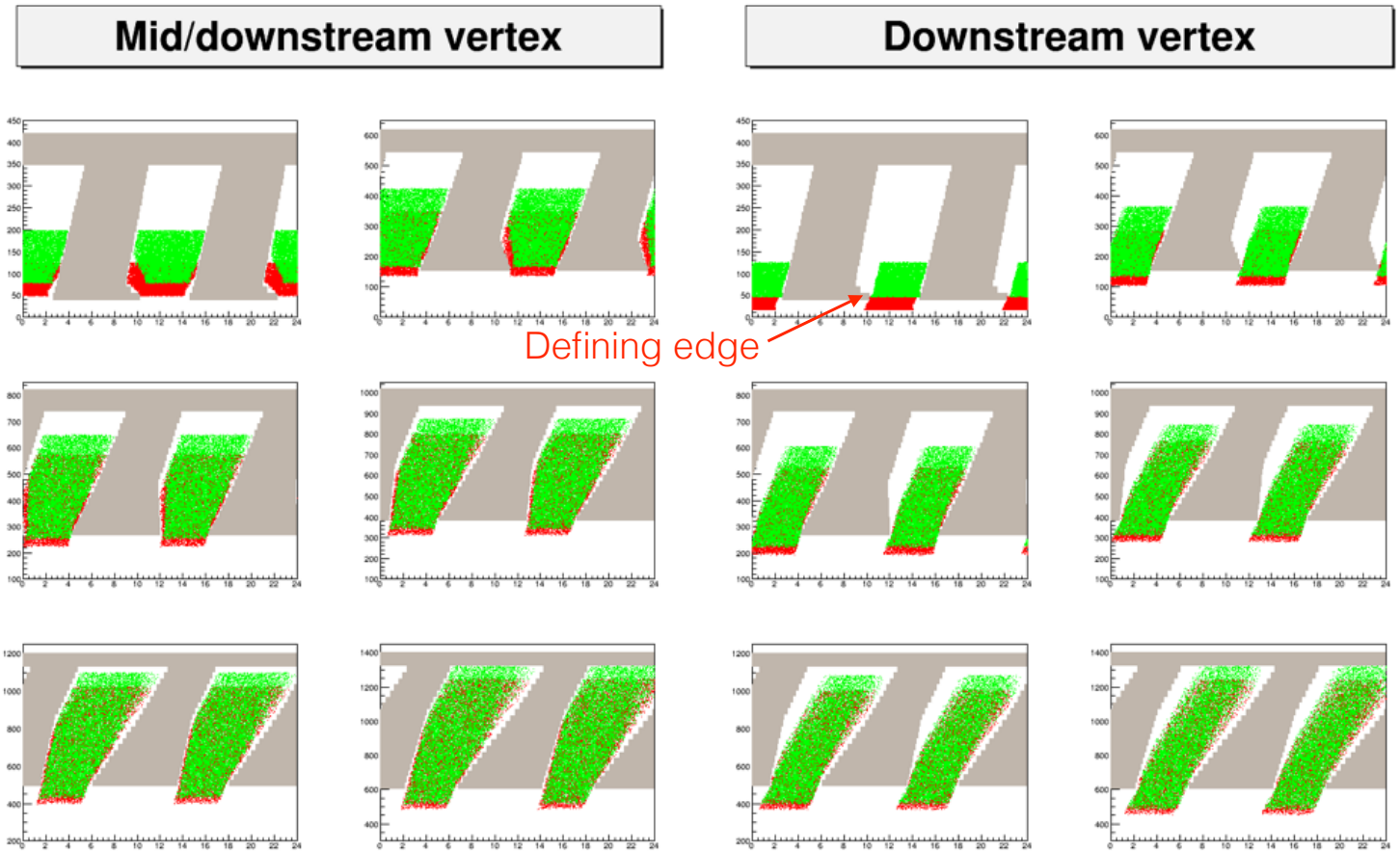
Plotted points are positions at front (red) and back (green) of each baffle plane *for only those tracks that get through all 11 Kryptonite baffles*



- Space in θ, ϕ not filled - needs to be broadened

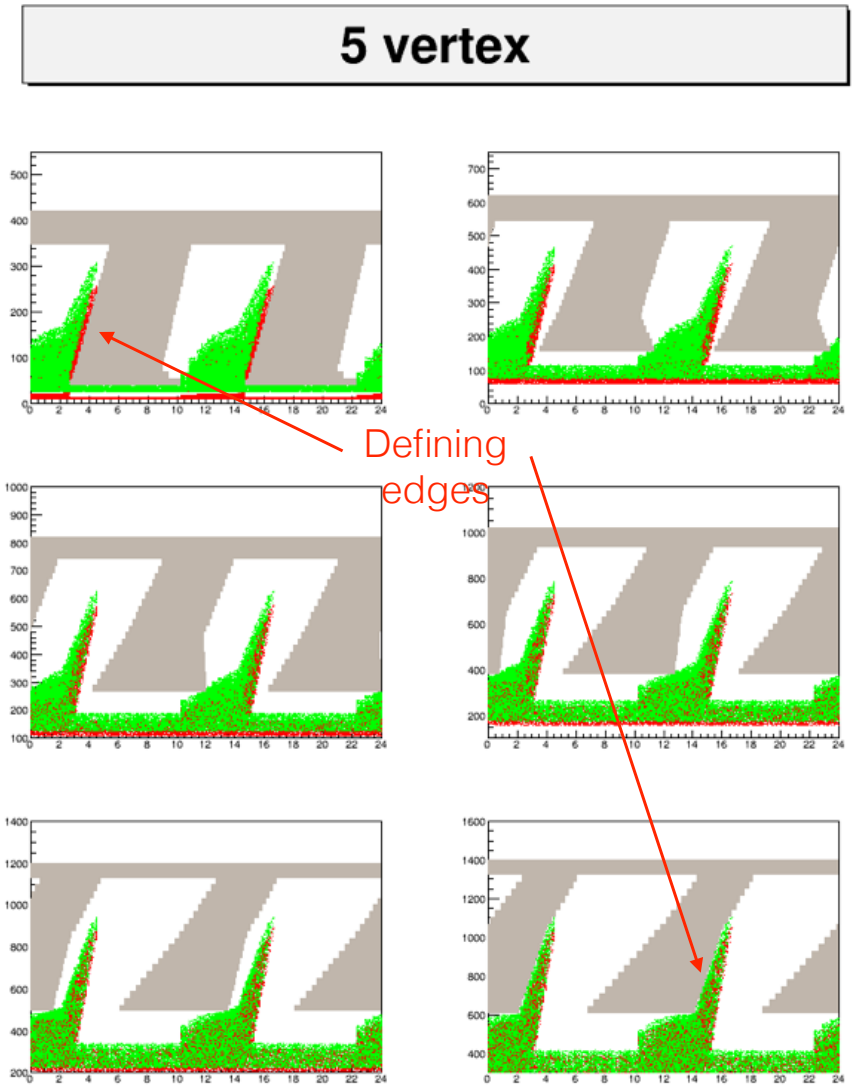


- Upstream being clipped



- Inner radius can likely be extended

Same for photons

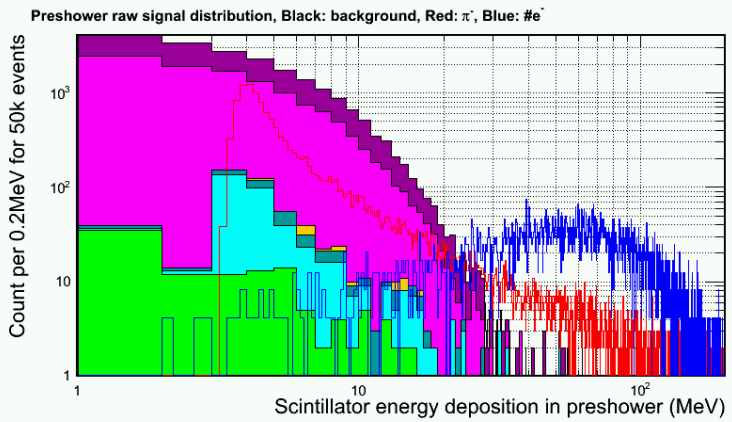


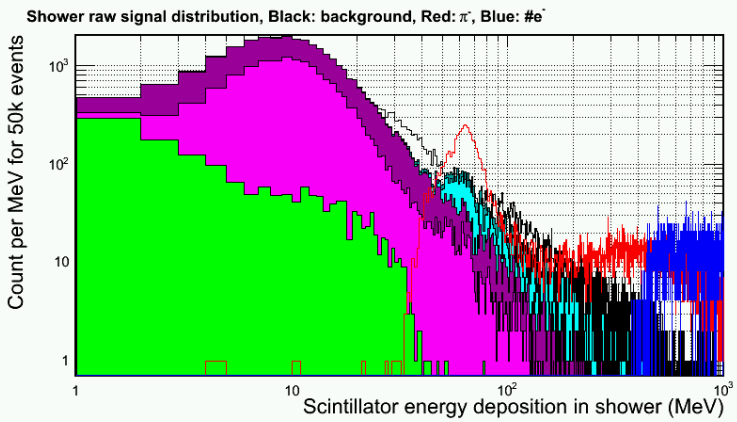
Baffles - Things to try

- Exploration of materials and combinations of materials necessary
- Polynomial parameterization of curves with minimal parameters would be useful
  - Variations in edges is useful
  - Consider sloping edges and different materials on edges
- Optimizing FoM including backgrounds for combinations of GEMs, Cerenkov, ECal
- Need to address Director's Review concerns of "proving" our design is optimal and we have explored all reasonable options

Short Term - Trigger and Digitization

- Single, coherent simulation with all detectors taken to next step critical - likely to take ∼year with single postdoc focused effort
- Should have "push button" digitized data of all detectors for groups (esp tracking) to test analysis
- DAQ bandwidth requirements should be more fully explored with present design
- Yuxiang will focus on this over the next several months





Long Term

- Software group is meeting to develop "end-to-end" simulation and analysis
- Requires careful planning, frequently underestimated
- Presently going over what other similar-size, large-scale projects have used: GlueX, CLAS12, PHENIX, etc
- Will produce specifications document with findings

- Exploring experimentation for best results
- After development, analysis will require testing and validation
- Scope and effort is on the same scale as detector development

Raw Totals

	undergrad.	grad. student	Post-doc	professor	staff scientist	technical assistant	research associate
2014	0.61	6.76	2.84	1.88	2.59	0.05	2.20
2015	1.42	9.58	3.45	1.86	2.50	0.05	2.70
2016	1.01	7.65	2.25	1.54	2.50	0.05	2.70
						total	**56.18**

Adjusted Totals

	undergrad.	grad. student	Post-doc	professor	staff scientist	technical assistant	research associate
2014	0.30	5.07	2.84	1.41	2.59	0.03	2.20
2015	0.71	7.18	3.45	1.39	2.50	0.03	2.70
2016	0.50	5.74	2.25	1.16	2.50	0.03	2.70
efficiency factor	0.5	0.75	1	0.75	1	0.75	1
						total	**47.31**

Long Term

- GlueX is estimating 15 FTEs each year for their own devlopment - we have similar needs

Big simulation projects:

Project	FTE	Group
Simulation framework / integration	9	Faculty, scientist 1.5 postdoc
Simulations (trigger, radiation, baffles)	4	0.5 faculty, postdoc