Workfest Introduction

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WILLIAM & MARY
CHARTERED 1693

Logistics

- Thanks everyone for coming!
- Talks/discussion each day at 9 am and 3 pm
  - Extra coffee at 1 pm as well
- F326 is reserved for the full day, so you're welcome to stay and work in groups
- Dinner tonight will be here (Mellow Mushroom) and tomorrow plan for trip to County Grill

R&D Team

- **Big picture**
  - Amplitude analyses require an accurate acceptance from MC
  - Measure efficiencies of event reconstruction/selection in data and MC to assure agreement
- **Ingredients**
  - Data/MC comparison of efficiency and resolution for single particle reconstruction vs p, θ, ϕ
  - Data/MC comparison of χ^2 and pull distributions for many channels vs kinematic variables
  - Once tools for these data/MC comparisons are in place we can investigate tuning MC parameters and covariance matrices

R&D Team

- **Big picture**
  - Amplitude analyses require an accurate acceptance from MC
  - Measure efficiencies of event reconstruction/selection in data and MC to assure agreement

R&D Team Tasks (Justin) [edit]

1) Comparison of track and shower efficiencies between data and MC (Simon, Alex A., Jon, Will M., Ahmed) [edit]

- **Suggested studies:** Missing particle in well-defined final states and measure efficiency of reconstruction
  - Possible reactions for tracking effic.: Missing π or proton in $\gamma p \to \pi^+\pi^-p$, $\gamma p \to \pi^+\pi^-\pi^0 p$, $\gamma p \to \pi^+\pi^-\pi^+\pi^- p$
    - Previous studies: Paul Mattione [1] [2] scripts Simon Taylor [3]
  - Possible reactions for shower effic.: Missing γ in $\gamma p \to \pi^+\pi^-\pi^0 p$ (FCAL), $\gamma p \to \pi^+\pi^-\pi^0\pi^0 p$ (BCAL?)
    - Previous studies: Jon Zarling [4], Cristiano Fanelli [5], Jake Bennett at BESIII [6]
- **Deliverable:** Initial evaluation of efficiency vs kinematic variables (p, θ, ϕ) for data and MC
- **Bonus points:** Initial evaluation of resolution (measured - missing particle KinFit) for kinematic variables (p, θ, ϕ)

2) Comparison of kinematic fit χ^2 between data and MC (Daniel, Alex B, Stuart, Mike M.) [edit]

- **Suggested studies:** Analysis of multiple final states with different constrains (P4, P4+vertex, P4+vertex with mass constraints)
  - Possible reactions: $\gamma p \to \pi^+\pi^- p$ (ρ and Δ^{++}), $\gamma p \to K^+K^- p$ (ϕ and $\Lambda(1520)$), $\gamma p \to \pi^+\pi^-\pi^0 p$ (ω and η), $\gamma p \to \pi^0\gamma p$ (ω), $\gamma p \to \pi^+\pi^-\eta p$ (η'), $\gamma p \to \pi^0\pi^0\eta p$ (η')
  - Previous studies: Alex Barnes [7] Daniel Lersch [8] [9] Pre-Studies
- **Deliverable:** background subtracted χ^2 and pull distributions for data and MC for charged, neutral, and mixed final states
- **Bonus points:** Prepare for tuning of MC parameters and/or covariance matrices to improve data/MC agreement

R&D Team: Track Efficiencies

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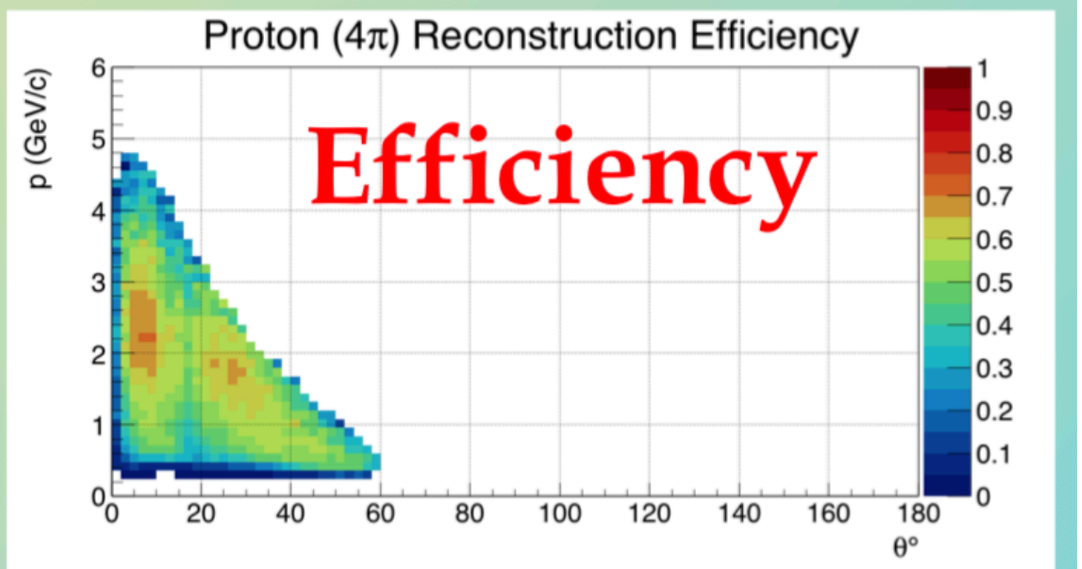
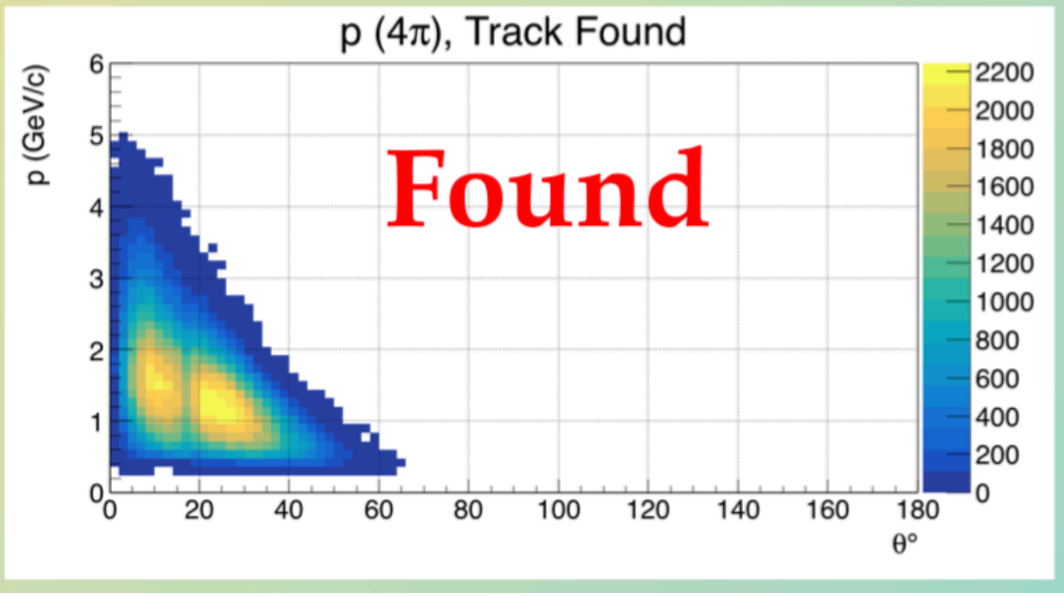
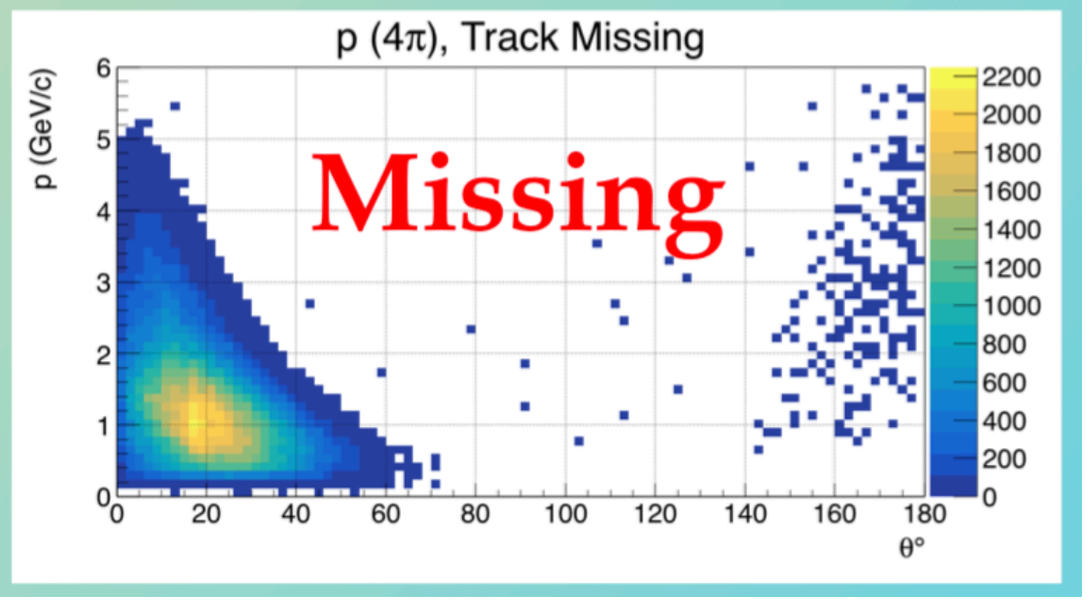
Efficiencies: p (4π)

* Efficiency fairly low:
  * 40% – 75%
  * Hole at 10° - 15°
  * < 400 MeV/c
* Hard to get recoil kinematics
  * Lots of background





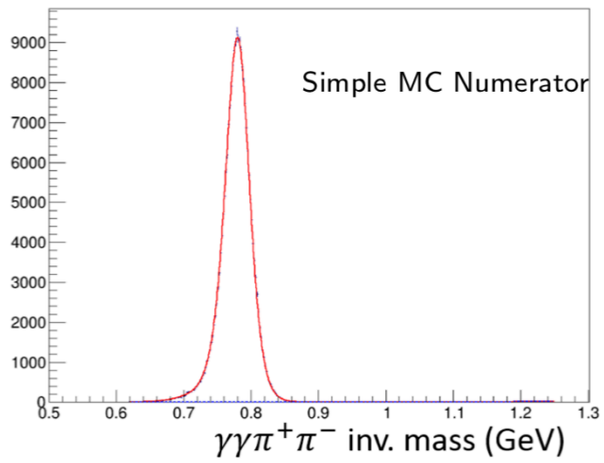


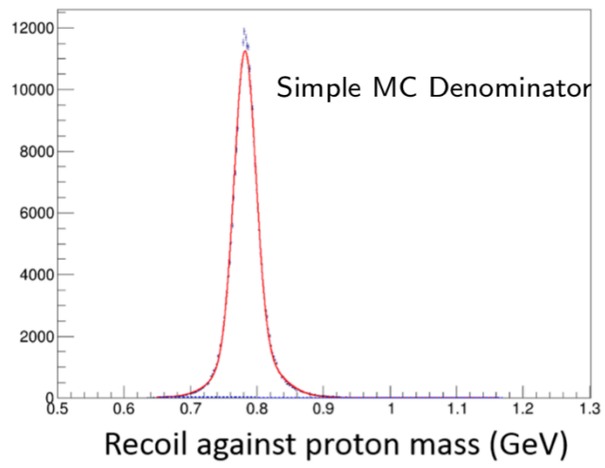
Paul Mattione: https://halldweb.jlab.org/doc-private/DocDB/ShowDocument?docid=3104

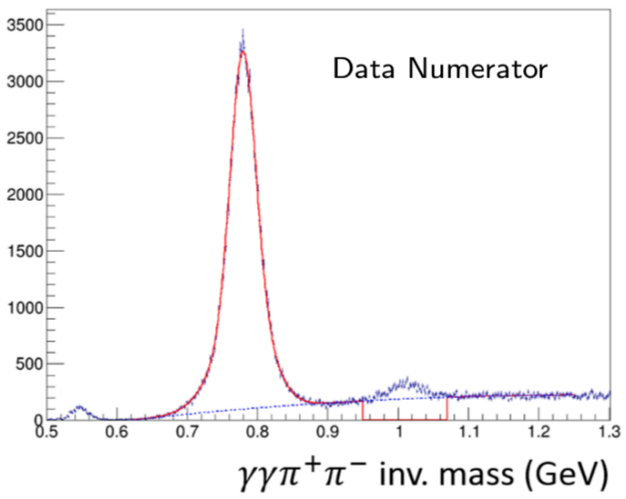
R&D Team: Shower Efficiencies

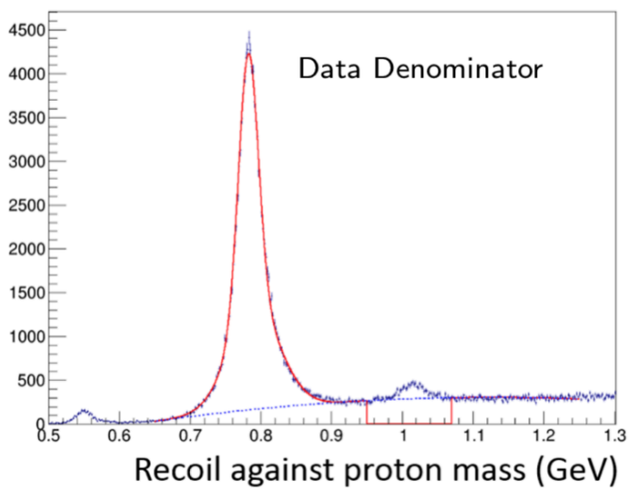
Efficiency Study in $\omega \to \pi^+\pi^-\pi^0, \pi^0 \to \gamma\gamma$ (J. Zarling)

- Goal: compare efficiency between the MC and data
  - Tune MC to match the data if needed
- Parameterize efficiency as: $\epsilon = \frac{inv.\ \omega\ yield}{missing\ \omega\ yield} = 0.806 \pm 0.002_{stat}$



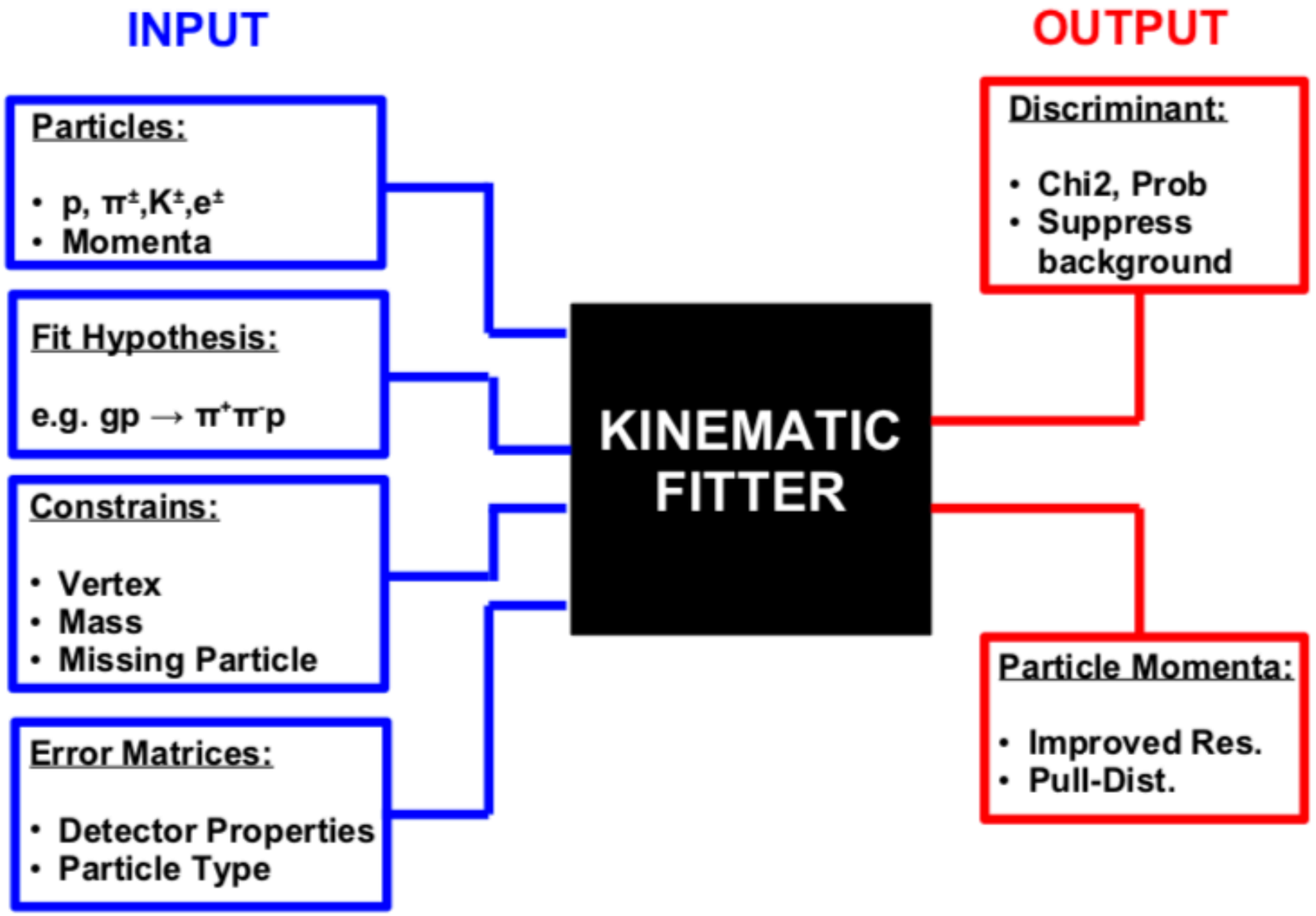






Jon Zarling: https://halldweb.jlab.org/doc-private/DocDB/ShowDocument?docid=3540

R&D Team: KinFit χ^2 and Pulls



Daniel Lersch: https://halldweb.jlab.org/doc-private/DocDB/ShowDocument?docid=3615

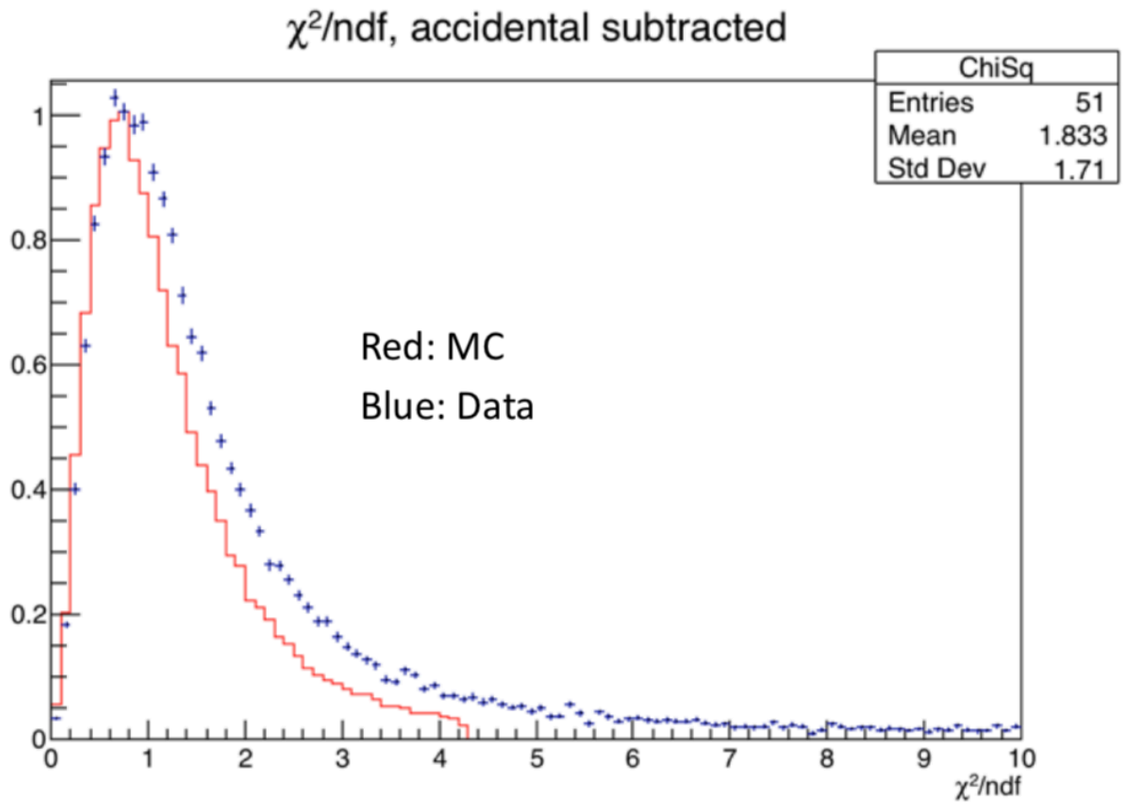
R&D Team: KinFit χ^2 and Pulls

Carnegie Mellon University

Jefferson Lab

MC vs Data χ^2

- Thomas created phi signal MC
- Ran analysis over MC
- Data includes accidentals subtraction
- MC only had 1 beam bucket
- χ^2 distributions have been scaled
- 1.005 to 1.040 GeV mass region for data and MC



Alex Barnes: https://halldweb.jlab.org/doc-private/DocDB/ShowDocument?docid=3537

Software logistics

Workfest Software and Conditions [edit]

Please use the branches specified below when checking in changes for workfest activities.

- version.xml: `/group/halld/www/halldweb/html/dist/version_workfest2018_baseline.xml`
- sim-recon branch: workfest2018
- hdds branch: workfest2018
- gluex_root_analysis branch: workfest2018

For generating and analyzing MC we'll use a special variation and timestamp as the default:

- calibration time: `calibtime=2018-05-08-08-00-00`
- calibration variation: `mc_workfest2018`

Add scripts, selectors, etc. to share on GitHub

Branch: **master** ▾ **gluex_workshops** / **workfest_2018** /

Create new file | Upload files | Find file | History

T-Britton Merge branch 'master' of https://github.com/JeffersonLab/gluex_workshops ··· Latest commit 54862f2 34 minutes ago

..		
batch	make username generic for batch script	4 days ago
plugins	Plugin to analyze gp->pi+pi- p and extract pull-distrbutions	18 hours ago
team_rd	DSelector to analyse trees with pull-distributions	18 hours ago
team_validation	Merge branch 'master' of https://github.com/JeffersonLab/gluex_workshops	34 minutes ago
.gitignore	add .gitignore for emacs temp files	8 days ago
README.md	add empty directories for workfest scripts	8 days ago
analysis_workfest.conf	Update analysis_workfest.conf	a day ago
setup.csh	add environment setup script and batch submission to run over REST files	4 days ago

Data sample

2017 Low Intensity Data [edit]

- 3 days at the end of Spring 2017 Low Intensity totaling ~4.5B events (~10% of the Spring 2017 data)
- Run numbers: 30730-30788
- EVIO location: `/cache/halld/RunPeriod-2017-01/rawdata/Run0307??/`
- REST location: `/cache/halld/offline_monitoring/RunPeriod-2017-01/ver33/REST/0307??/`
- Analysis TTree location: `/cache/halld/RunPeriod-2017-01/analysis/ver11/`

Analysis TTrees available for plugins and reactions specified at:

https://github.com/JeffersonLab/gluex_workshops/blob/master/workfest_2018/analysis_workfest.conf

Add new plugins to sim-recon under workfest2018 branch or

https://github.com/JeffersonLab/gluex_workshops/tree/master/workfest_2018/plugins

Request plugins for Analysis Launch by 3 pm today!

MC samples

MC Simulation Samples [edit]

Conditions [edit]

- Run number: 30730
- Background: random trigger
- Beam energy range: E_γ = 3 - 11.6 GeV, with coherent edge set at 8.8 GeV

Samples [edit]

Generator	Number of events (10^6)	Settings	Planned usage
bggen	10		General inclusive sample for many studies
gen_etaRegge	1	$\eta \to \gamma\gamma$	Branching Ratios, KinFit χ^2
gen_etaRegge	1	$\eta \to \pi^+\pi^-\pi^0$	Branching Ratios, KinFit χ^2
gen_etaRegge	1	$\eta \to \pi^0\pi^0\pi^0$	Branching Ratios, KinFit χ^2
gen_etaRegge	1	$\eta' \to \pi^+\pi^-\eta$	Branching Ratios, KinFit χ^2
gen_etaRegge	1	$\eta' \to \pi^0\pi^0\eta$	Branching Ratios, KinFit χ^2
gen_etaRegge	1	$\eta' \to \pi^+\pi^-\gamma$	Branching Ratios, KinFit χ^2
gen_2pi_amp	2.5	Physical distribution for $\rho \to \pi^+\pi^-$ and Phasespace	KinFit χ^2, Efficiencies, Cross section, ρ SDME
gen_omega_3pi	2.5	$\omega \to \pi^+\pi^+\pi^0$	Branching Ratios, KinFit χ^2, Efficiencies
gen_omega_radiative	2.5	$\omega \to \pi^0\gamma$	Branching Ratios, KinFit χ^2
gen_2k_amp	2.5	Physical distribution for $\phi \to K^+K^-$ and Phasespace	KinFit χ^2, Efficiencies, Cross section, ϕ SDME

Request additional samples by 3 pm each day!