

JEF Task List

Non-rare decays $\eta \rightarrow \pi^+\pi^-\pi^0$ or $3\pi^0$ (uses existing GlueX setup)

Assist with optimizing charged particle reconstruction:

- tracking efficiency and resolution
- PID
- understand and minimize extra tracks

Assist with optimizing photon reconstruction:

- efficiency and resolution of π^0 , $\eta \rightarrow 2\gamma$
- understand and minimize extra showers
- Improve shower reconstruction algorithm
- FCAL gain calibration

Simulation:

- understand backgrounds from data challenge

Analysis:

- Invariant mass distributions $m_{3\pi}$ (with or without recoil proton detection)
- Kinematic fitting of $\eta \rightarrow \pi^+\pi^-\pi^0$ or $3\pi^0$ data
- Manage a very large dataset
- Need a simulation with even higher statistics than the data

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Rare neutral decay program (requires new PbWO₄ calorimeter)

Calorimeter “Design”:

- Revisit PMT choice
- Base design
- Magnetic shield design(confirm B field of course with direct measurements)
- Hybrid simulations with lead tungstate in middle of FCAL
- a small Prototype PWO detector to test the radiation hardness of PWO
- Partition of tasks between stakeholders

Procurement/Construction:

- Crystals
- Bases
- Magnetic shields
- Stand
- Temperature Control
- Gain monitoring system?
- Cabling
- ADCs

Quality Control:

- crystals (mechanical dimensions, transmission, resolution, etc.)
- bases
- Cabling
- ADCs

Assembly:

- Manpower
- Schedule

Electronics/DAQ

Monte Carlo simulation to address the PAC questions:

- Coincidental rate for GlueX phase IV for beam energy ranges of 8.4-9.0 GeV and 9.0-11.7 GeV
- EM background study for 3-gamma and 4-gamma final states with the GlueX running conditions
- Hadronic background study for 3-gamma and 4-gamma final states with the GlueX running conditions
- Hybrid configuration for shower reconstruction

Theoretical inputs:

- The cross section of $\gamma + p \rightarrow \pi^0 \pi^0 + p$ non-resonance production at ~ 10 GeV
- Physics of η'