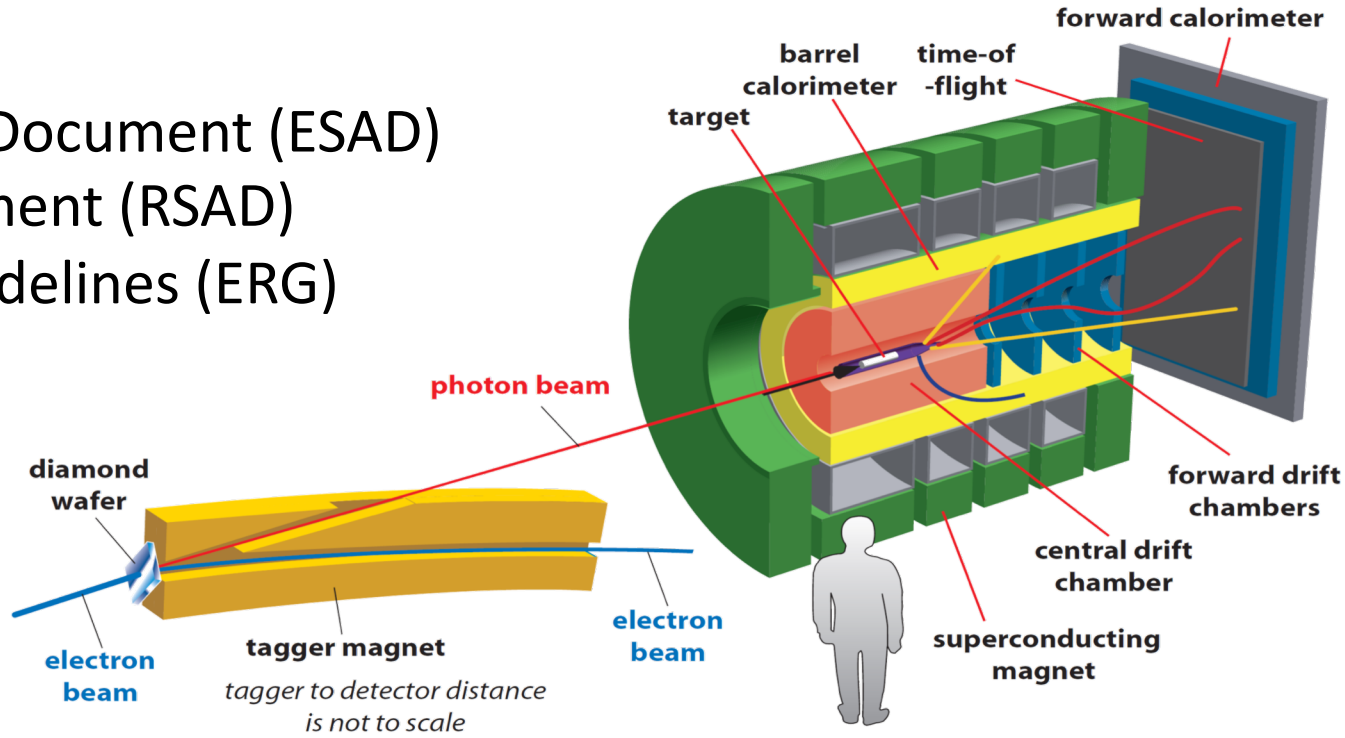
GlueX SRC Experiment Update - 12Feb20

Expect ERR Charge around 21 Feb, ERR planned for last week of March (23-27?)

Some things we need to plan:

- Run conditions
- Radiation
- Man power (analyses and shifts)
- Documentation:
  - Run wiki or website
  - Experiment Safety Assessment Document (ESAD)
  - Radiation Safety Analysis Document (RSAD)
  - Hall D Emergency Response Guidelines (ERG)
  - Conduct of Operations (COO)

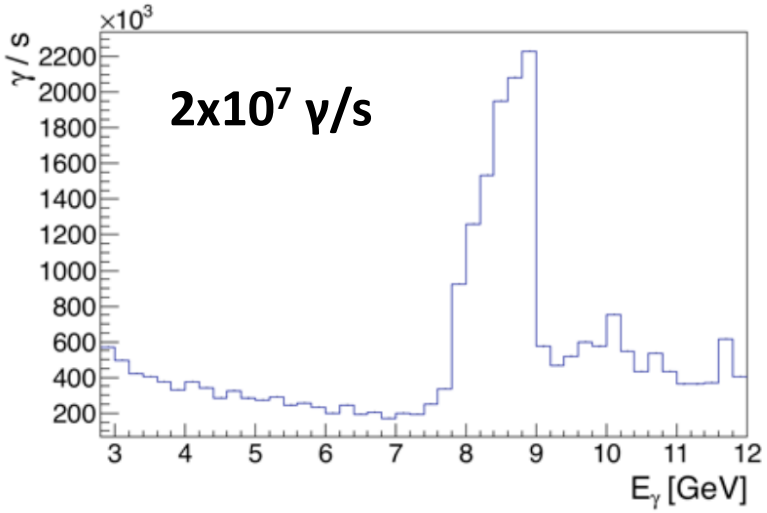


Proposed 30 days on H, D, ^{4}He, ^{12}C

Proton Reactions	Neutron Reactions
$\gamma + p \to \pi^0 + p$	$\gamma + n \to \pi^- + p$
$\gamma + p \to \pi^- + \Delta^{++}$	$\gamma + n \to \pi^- + \Delta^+$
$\gamma + p \to \rho^0 + p$	$\gamma + n \to \rho^- + p$
$\gamma + p \to K^+ + \Lambda^0$	$\gamma + n \to K^- + \Lambda^0$
$\gamma + p \to K^+ + \Sigma^0$	$\gamma + n \to K^0 + \Sigma^0$
$\gamma + p \to \omega + p$	—
$\gamma + p \to \phi + p$	—

Target	$\gamma + n \to \pi^- p$		$\gamma + n \to \rho^- p$		PAC Days
	MF	SRC	MF	SRC	
D	13,600	750	57,000	3,000	5
^{4}He	16,000	840	68,000	3,500	10
^{12}C	8,900	2,800	37,000	11,000	12
Calibration, commissioning, and overhead:					3
				Total PAC Days:	30

Target	Thickness [cm] / % X_0	Atoms/cm^2 for the given target thickness	EM bkg. rel. to GlueX	Neutron bkg. rel. to GlueX
D	30 / 4.1	1.51×10^{24}	0.5	1.3
^{4}He	30 / 4	5.68×10^{23}	0.5	1
^{12}C	1.9 / 7	1.45×10^{23}	1	0.8
LH	30 / 3.4	1.28×10^{24}	1	1*



Approved for 15 days

How do we want to use the 15 days?

- What physics do we hope to accomplish?
- Deuterium is useful for all calibrations, normalizations, etc
- Carbon is good for exploring nuclear targets (for future experiments)
- 4He has some overall density normalization issues-maybe not a problem for us?

	Low XS		High XS		
Target	$\gamma + n \to \pi^- p$		$\gamma + n \to \rho^- p$		PAC Days
	MF	SRC	MF	SRC	
D	13,600	750	57,000	3,000	5
^{4}He	16,000	840	68,000	3,500	10
^{12}C	8,900	2,800	37,000	11,000	12
Calibration, commissioning, and overhead:					3
Total PAC Days:					30

Possibility:

- 5 days on D
- 2 shifts for target change to 4He
- 4 days 4He including Compton calibration
- 1 day to change to 12C
- 4 days on 12C

Run Conditions Considerations

- Calibrations:
  - Empty target done with prior experiment
  - Photon flux and luminosity done with prior experiment
  - Assume detector calibrations done for us
  - If 4He, might need Compton run to determine density
- Overhead:
  - Solid->liquid targets: 1 day of shifts
  - Liquid->liquid targets: 1-2 shifts
  - 4He requires some extra Cu shielding installed around target
- Equipment: standard Hall D configuration
- Targets

Radiation:

- Neutron backgrounds biggest issue to address. Problem for SiPM in Hall D.
- Coordination with Pavel in RadCon. Previous experience for PrimEx with He target and FLUKA simulations. We are about 4x higher rate.
- Bottom line: monitor neutron bg, if problem, lower luminosity or change target. Deuterium is anticipated to be biggest issue.

Man power: Analyses

Study BRs and compare for free/QE to bound:

- Short Range Correlations
- Mean Field
- Color transparency (PLC)

Good to mention/emphasize students:

- MIT, GWU, others?
- Invite GlueX collaborators to brings students

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$\gamma + p \to \omega + p$	—
$\gamma + p \to \phi + p$	—

Might be good to mention which analyses we will do first. At least good for us to know our plan.

Man power: Operations

Physics Division Liasion: Will be assigned soon*
Run Coordinators: Sasha, Holly, Jackson?, Others?
Expert (subdetector systems) duties: Hall D staff, will receive a list of names*
Shifts:

- Our group: MIT, GWU, ODU, TAU (keep in mind, Hall B is also running concurrently)
- GlueX members*

Ultimately, the experiment will be approved as a GlueX experiment, but the process is long. For now, we involve the collaborators and allow opt-out.

Documentation:

Wiki page on Hall D site: https://halldweb.jlab.org/wiki/index.php/Short-Range_Correlations_and_CT

Physics Division Liasion:

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PAC concerns:

1. In contrast to the case of the cross section for eN->e'N, little is known about the cross section for γN->Nπ with an off-shell incoming nucleon. While it may be possible to take ratios or to consider normalized rates (in which the γN->Nπ cross section is expected to cancel), this limits the ability to explore absolute predictions of the factorization formalism.
2. The intricacies of photo-production are well known in numerous other environments. In the present case, arguments may be made that meson exchange contributions and final-state interactions should be suppressed, but this has not been backed up by any detailed studies.
3. In a similar vein, the photon may interact as a hadron, converting to a ρ meson prior to the interaction. It may again be argued that such contributions are "parametrically" suppressed, but this requires further study.

The PAC thus recommends exploratory studies with 15 days of beam time, ideally with the ^{12}C target.