

Proposal Number:

PR12-20-012

Hall: C

Title: Deeply Virtual Compton Scattering Using a Positron Beam in Hall C

Contact person: Carlos Munoz Camacho

Beam time request:

Days requested for approval:	77 days
Tune up included in beam time request:	No

Beam characteristics:

Energy:	6.6,8.8 and 11 GeV
Current:	5 μ A (positrons)
Polarization:	No

Targets:

Nuclei:	10cm LH2 target
Rastering:	Not indicated
Polarized:	No

Spectrometers:

HMS	Yes
SHMS	No
Other	Neutral Particle Spectrometer

Special requirements/requests:

- Positron beam

Summary:

This proposal aims to produce accurate measurements of the Deeply-Virtual Compton Scattering (DVCS) reaction using a positron beam covering $0.2 < x_{bj} < 0.6$ and $2.0 (\text{GeV}/c)^2 \leq Q^2 \leq 6 (\text{GeV}/c)^2$, with beam energies up to 11 GeV. The use of a positron beam allows the (cleaner) separation of the Bethe-Heitler (BH)-DVCS interference term from the DVCS-squared contribution to the photon electro-production cross section, when combined with electron-beam data (from other experiments) in the analysis. Higher-twist effects are explored by scanning the Q^2 dependence of these terms. Additionally, the measurement will provide improved constraints on the Compton Form Factors and significantly reduce the correlations in the terms.

Technical Comments:

Positron Beam

- The technical challenges of building a positron beam compatible with CEBAF operations is very difficult and expensive, possibly on the order of \$20–30M USD, and possibly up to \$50–100M USD if modifications have to be made to transport a larger-emittance beam through CEBAF. However, this could very well be justified for the future if a strong JLab physics program using positron beams is developed.
- The authors note that the (thousands of) accelerator magnet polarities need to be flipped in order to accept a positron beam, and that an engineered solution is the optimal approach. While not explicitly indicated, a detailed discussion and assessment of the feasibility and cost of such device(s) with the JLab Accelerator and Magnet Divisions is essential.
- There is another proposal for using a positron beam in Hall B. The feasibility of delivering positrons to multiple halls is not discussed in this proposal, which will pose an additional engineering challenge.
- The beam current request is somewhat confusing; throughout, the authors assume a beam current of 5 μA (e.g., Table II indicates a “maximum expected positron beam current (5 μA)”); however, the final sentence in the Summary requests “77 days of (unpolarized) positron beam ($I > 5 \mu\text{A}$)”.

Systematic Uncertainties

- There is minimal discussion of the systematic uncertainties which are derived from previous Hall A and C equipment and experiments.

