Dear Michael et al,

Greetings Dan

I have read through your draft of the g12 pi0 production analysis and include my comments below. The paper certainly needs work to improve the grammar and the style. Hopefully I have managed to capture everything below. If you have any questions, let me know.

Not sure if "certainly" is the definition here, as most of your comments refer to style rather than grammar (IMO the overuse of the word "the" is being requested when grammatically most of the sentences already in place are "commands of observance" and do not require the word "the"), however we sincerely appreciate your comments.

Regards,

Daniel

---------------------------------------------------------------------------

**General:**

- Spell out acronyms the first time that you use them. These include QCD, pQCD, DVCS, CM, etc.

Done.

We removed ref on DVCS upon Volker's suggestion.

We could not find reference to CM, while c.m. and definition is done on line 10

- You are not consistent with your energy notation. Sometimes you use "E" for the photon energy

and sometimes you use "E\_\gamma". I prefer the later for clarity.

We agree, edited all references of E to $E\_\gamma$

- If this paper is to be accepted into PRL, it must be written with the idea to make it broadly

interesting to both experts and non-experts. There are several notable areas where the discussion

is too esoteric and specialized. I point out some examples below.

We replaced a para in summary

- Be consistent with usage of "handbag" vs. "Handbag".

Replaced all "handbag" with "Handbag"

- As written, there is no physics conclusion from this paper. Your message is that you have

performed a measurement using a different final state and that your data compare better with one

model approach over another. This is not satisfying for the reader.

We replaced a para in summary

- The figure captions should not be "centered", but left justified.

Done

- Sometimes you write $\gamma p \to p \pi^0$ and sometimes $\gamma p \to \pi^0 p$. Be consistent

throughout.

Changed all references of $\gamma p \to\pi^0p$ to $\gamma p\to p\pi^0$.

**Page 1**:

- **Abstract**:

- Line 2. Use "... decay and the $e^+e^-$ pair ...".

This addition of "the" does not fit here as it would infer the e+e- pair conversion mode is the clause of the "on a hydrogen.." After reading this several times, I do not like the wording here as the pi0 decays via the Dalitz decay (\gamma\* \gamma) and its \gamma \gamma mode , which then one photon undergoes pair conversion. We should word this differently. I have made a suggestion in the draft, however I do not like the two "the measurement was performed..." sentences that back-to-back. **Suggestions Jim or Moskov**?

- Line 3. Use "... CLAS detector at the Thomas ...".

Added "the"

- Line 6. Use "The final state particles $p$, $e^+$, and $e^-$ were detected in CLAS, whereas the

...".

Semicolons help connect closely related ideas when a style mark stronger than a comma is needed. By using semicolons effectively, you can make your writing sound more sophisticated. This is an accepted grammatical practice. However, the author understand that this is a "new" style, and will not subject readers to this.

- Line 7. Use "... sample has quadrupled the ...".

"has" is a verb, a 3rd person singular present indicative of "[have](http://www.dictionary.com/browse/have)". In the style in which we are writing is the 3rd person singular past. Therefore, it would be grammatically incorrect to place the word "has" in this sentence.

- Line 8. Use "... $E = 2$~GeV, and appear to favor ...".

Changed the wording as per a request from Volker Burkert.

- Final sentence has no physics content. What does this imply and why is this statement

important?

We added some text to the final wording of the abstract.

- Line 13. Use "... models, and QCD.".

That is bad grammar, thanks for noticing the need for a comma.

- Line 17. Use "... production regime and the ...".

OK

- Line 27. Use "... [3], as well as ...".

Done

- Line 35. Use "... $t$-channel $J^{PC}$ quantum ...".

Done

- Line 46. Use "... $t$-channel ... numbers, along with ...".

Done

- Line 56. Use "... zeroes in the Regge residues.".

Done

- Line 60. What is a "nonsense wrong signature zero"? This is definitely jargon. It needs a

reference and a sentence of explanation/context.

NWSZ is introduced here. We added some more content and added a reference.

- Line 62. Use "... in the $\pi^0$ data.".

Done

- Line 69. Use "However, to explain the lack of a dip at $t \approx -0.5$~GeV$^2$ in $\eta$

photoproduction, they removed the standard wrong signature zero in an ad hoc manner." What is

a "standard wrong signature zero"? This is jargon.

Added "i.e., the NWSZ"

- Line 72. Use "... $t$-channel ... \omega$, and $b\_1^0$ exchange, but not ...".

Done

- Line 74. What do you mean with the notation "$\rho \times$ Pomeron cuts" and

"$\rho \times f\_2$ cuts"?

The convolution of rho with a Pomeron...convolution of rho with a f\_2. Is this correct, **Gary**?

**Page 2**:

- Line 77. Use "$u$-channel".

Done

- Line 79. Use "$t$-channel".

Done

- Line 88. Use "complementary".

Done

- Line 95. Use "... measurement of the beam spin asymmetry ...". Actually, I am not sure why you

are bringing up this measurement here. It does not seem relevant.

Agreed, sentence was removed

- Line 100. Use "... transverse momentum, which corresponds to ...".

Done

- Line 101. What is this angle theta? It needs to be defined.

Defined

- Line 102. Use "... may extend to the ... case proposed in [10]."

Done

- Line 106. Use "... the production cross section.".

Done

- Line 107. Use "Binary reactions in QCD with large ...".

Thanks for noticing that comma.

- Line 108. Use "... between the colliding ...".

Adding the word "the" to colliding causes the reader to ask: "Which colliding particles?", while without the word "the" its inferred that particles are colliding.

- Line 110. Use "... [3] provide a simple recipe ...".

Done

- Line 114. Use "... of these counting rules ...".

Done

- Line 115. Use "As was first observed at SLAC by Anderson {\it et al.} [13], the ...".

Done

- Line 118. Do not put [13] here but earlier as I suggest.

Agreed

- Line 119. Use "$s = 6$~GeV$^2$ ...".

Done

- Line 121. Use "$s = 10$~GeV$^2$.".

Done

- Line 124. I do not understand your notation of $d \sigma/dt(\vert t \vert)s$. This is not standard.

Modified

- Line 127. Use "... p \pi^0$ for 2.0 ...".

This was supposed to be a set of phrases, with the second not essential to the meaning of the sentence. Therefore, we added the comma where the clause was to be separated.

- Line 129. Again, this odd notation for the cross section appears again.

Modified

- Line 132. Use "... range of exclusive ...".

I think this line needs work. I first thought that this line is correct as it reads. The comma that is asked to be removed separates the phrase "bridging the nucleon... " from the object "...exclusive cross-section", but the sentence is not correct because the sentence without phrase in the commas is incorrect. However, if we remove this comma, then the sentence is again grammatically incorrect, as the first comma is not in proper place, and without a comma, it is a run-on sentence.   
**Suggestions**?

- Line 140. Your units here should be GeV not MeV.

Corrected and inexcusable

- Line 147. Use "$E = 2$~GeV".

Was already there. Latex formatting?

- Line 151. Use "... the CLAS detector at Jefferson Laboratory using a ...". Be sure to include the

CLAS reference here (B.A. Mecking {\it et al.} ...}.

Done

- Line 152. Use "... from a 5.72~GeV ...".

Done

- Line 155. Use "$g12$".

OK

- Line 159. Use "... decay into an ...".

Done

- Line 161. What do you mean by "$\pi^0 \to \gamma^\* \gamma$"?

The Dailtz decay is defined as a decay into a photon and virtual photon pair. The accepted nomenclature for this is $\gamma^\ast\gamma$, where $\gamma^\ast -> e^+e^-$ and since it is virtual, the $e^+e^-$ invariant mass has a distribution with information of the structure of the meson.

- Line 163. Use "... tracks, $p$, $e^+$, $e^-$, as ...".

See response to this in abstract response.

- Line 164. Use "... which imposed limitations ...".

Both are grammatically correct. However, we removed the comma.

- Line 169. Use "... for $p$, $\pi^+$, and $\pi^-$ tracks, ...".

Done

- Line 172. The statement of "standard $g12$ calibration" is not meaningful for the reader. A

reference is necessary here.

The reference is there, as the "standard $g12$ calibration" and fiducial cuts both fall under the reference [21]. See next comment.

- Line 173. Put [21] at the end of this sentence.

Done

- Line 181. Use "mass of the $e^+e^-(\gamma)$ to be the $\pi^0$ mass.".

Authors like how the sentence is written. The suggested amendment would have to be written   
"squared invariant mass of the $e^+e^-(\gamma)$ to be the $\pi^0$ mass squared.".  
Too many squares for us "young'ins"

- Line 182. Use "... using the statistical ...".

Done

- Line 185. Do not begin a new paragraph with this sentence. It belongs with the previous

paragraph.

Thanks, we missed that formatting error

- Line 186. Use "... between the $g12$ ...".

Done

- Line 194. Use "... off the proton, $M\_x^2(p) = (P\_\gamma + P\_p - P'\_p)^2$, in terms of the

four-momenta ...".

**Page 3**:

- Fig. 1:

- The plots need to have the color z-scale include.

Done

- Caption.

- Line 1. Use "(Color online) (Left panel) $M\_E(pe^+e^-)$ vs. $M\_x^2(p)$. (Right panel)

M\_x^2(pe^+e^-)$ vs. $M\_x^2(p)$. The top-right (bottom-right) panel shows the distribution

before (after) applying the $M\_E(pe^+e^-) < (>) 75$~MeV cut.".

Caption was changed per another request.

- Fig. 2 caption.

- Line 2. Use "... in the proton missing mass squared for events ...".

Done

- Line 195. Use "... proton, and final ...".

Done

- Line 196. Use "... proton, respectively, and the ...".

Done

- Line 198. Use "... the $\pi^+\pi^-$ ...".

Done

- Line 206. Use "... by the red solid line.".

Done

- Line 207. Use "... 0.0179$~GeV$^2$ with a Gaussian width ...".

Done

- Line 208. Use "... asymmetric cut about the measured value was placed ...".

Done

- Line 210. Include units on mass squared range.

Done

- Line 216. "Overall the systematic uncertainty varied ..." Systematic uncertainty on what quantity?

Be clear.

Modified sentence

- Line 221. Use "$z$-vertex".

- Line 222. What do you mean by the systematic uncertainty on the "sector-to-sector"?

All systematic uncertainties and their determinations are described in line 226 in Ref. [23].

- Line 224. What do you mean by the systematic uncertainty on the "1C pull probability"?

All systematic uncertainties and their determinations are described in line 226 in Ref. [23].

- Line 227. Use "The new CLAS high statistics $\gamma p \to \pi^0 p$ cross sections from

this analysis are compared in Figs.~3 and 4 with data from previous CLAS~[19], DESY

[add ref.], CEA~[add ref.], SLAC~[add ref.], and Cornell~[add ref.] measurements, as

well as lower c.m. energy MAMI A2 measurements~[26]."

Modified, but the reference to [18] was a unit for 3 measurements. So, some parts of the sentence remained.

- Line 238. Use "... scaling at fixed $t/s$ as expected ...". This is also a bit of jargon that the non-

expert will not understand.

We do not feel that a reader of this paper would find t/s cargo as it is a standard term

- Line 241. Use "... leading to $n = 6.89\pm0.26$."

Done

**Page 4**:

- Fig. 3 caption.

- Line 1. Use "... cross sections for $\gamma p ...". Write cross section in math mode.

Done

- Line 3. Use "... tagged photon data ...".

Done

- Line 4. Use "The black open filled ...".

Must be a typo here, how can you be open and filled?

- Line 5. Use "$E$ = 2~GeV [18]. The plotted ...".

Done

- Line 6. Use "The black dot-dashed ...".

Done

- Line 7. Use "... with $n = 6.89 \pm 0.26$, ... The pion production ...".

Done

- Line 8. Use "... The Regge results [4,9] are given by the black dotted and blue dash-dotted lines,

respectively.".

Done

- General: The Regge results are very difficult to even find on these plots.

We revised plot.

- Line 243. Put "s" in math mode.

Done

- Line 249. Do not begin a new paragraph with this line. It belongs with the previous sentence.

Done

- Line 251. Put "E" in math mode.

Done

- Line 253. What is the angle theta? When it is first introduced make this clear.

We already made this definition elsewhere

If it is the pi0 CM angle, I would suggest using throughout "$\cos \theta\_{\pi}^\*$".

Great suggestion. Done

**Mike**, everywhere? I have to modify Fig 5, **IS**.

- Line 256. Use "... of these dips. Note that ...".

Done

- Line 259. Put "E" in math mode.

Done

- Line 260. Awkward phrasing. I suggest "... 2.6~GeV$^2$ and evidence of structure around ...".

We are not claiming that this is a new structure, so we kept this phrase as is.

- Line 262. Put "E" in math mode.

Done

- Line 268. Use "... at the largest $\vert t \vert$ ...".

Done, but we see no difference

- Line 275. This paragraph is a bit of a misplaced orphan. Move it to the end of the paragraph

beginning on line 281.

Done

- Line 282. Use "... based on the $\pi^0$ Dalitz decay mode.".

Done, but the Dalitz decay is not only for the pi0, eta and eta' have Dailtz decays with identical decay products

**Page 5**:

- Fig. 4 caption.

- The energy variables "E" and "W" in the caption (lines 2, 3, 4, 6) should be written in math

mode, i.e., "$E$" and "$W$".

Done

- Line 4. Use "... CLAS $g12$ measurements (red ...".

Done

- Line 7. "... indicated on each panel.". There are no energy values indicated on any of the panels.

This is pedantic, as the panels are labeled with letters which are defined in the caption, therefore "indicated".

- Line 290. Use "... covered by the "resonance" ...".

Done

- Line 293. Use "... here have quadrupled ...".

Keeping style in 3rd person past, therefore not placing "have".

- Line 294. Use "... above $E$ = 2~GeV ...".

Done

- Line 296. The main conclusion sentence "By comparing this new and greatly ..." does not make

any physics statement. This needs some attention as it is far from satisfying.

Done

- Line 302. Use "Ph.D.".

Done

Page 6:

- Ref.[7]. Add a comma after "Ostrick".

Done

- Ref.[18]. Remove extra space before final period.

Done

- Ref.[19]. Add "[CLAS Collaboration]".

Done

- Ref.[23]. Remove extra space after "ACAT".

Done

Best Regards

Team π paper