Draft email reply – referee comments in regular fonts, replies in *italic fonts*.

Report of Referee A -- LD14867/Wang

The paper reports on a measurement of parity violation in electron scattering on a deuteron target in the nucleon resonance region. Actually, the "nucleon resonance region" is a little vague as there are several resonance regions and perhaps this should be better defined for the non-specialist. In general the paper is reasonably understood and appropriate details of the analysis provided. It appears that the paper and results are valid. However, it will be important to archive in a longer paper, the calculation and application of all applied data corrections and errors.

Answer: The collaboration is writing a long, archival paper to document the details of the calculation and data analysis, including all systematic corrections and uncertainties.

The results are in agreement with quark/gluon duality, and the experiment is the first demonstration that duality holds on a nuclear target in the resonance region. It also provides information on the gamma-Z interference structure functions. The paper is important as a first observation in this energy/momentum transfer region, but how all this relates to QCD is probably lost to the non-specialist. Thus, a little more effort in justifying the impact of the results would have been helpful. A number of minor English corrections and expansions are needed (e.g. define HD).

Answer: While we appreciate the positive comments here, it is necessary to clarify that the results reported here are not "the first demonstration that duality holds on a nuclear target...". Experimentally, so far people have only observed duality in electromagnetic structure functions and spin asymmetries, etc., but never on electroweak observables. It should be noted that results reported here are the first evidence that duality holds for <u>electroweak</u> observables (in our case the parity violating asymmetry) in electron scattering off nuclear targets. There has not been any other evidence of duality in electroweak observables, in any energy/momentum transfer region, until now.

While we agree that how duality is related to QCD is an important topic, it is more a collective and long-term effort that has been pursued by many theorists and experimentalists, as can be seen from the review article of Ref.[14]. The manuscript here only aim to present an evidence that duality not only works for electromagnetic structure functions, but also for parity-violating asymmetries which are electroweak observables. And we would like to leave discussions on how this helps to unveil duality using first principles of QCD as part of the continuing effort on this topic.

The definition of HD has been provided in the revised manuscript.

This reviewer recommends publication, although the paper could have more impact if some of the issues raised above were addressed.

Report of Referee B -- LD14867/Wang

The results presented in the submitted paper are very interesting and important for the verification of quark-hadron duality in the nucleon electroweak \gamma-Z interference structure functions. This paper is sufficient to the publication in PRL after some clarifications of definitions and interconnections between the measured asymmetries.

My comments are below.

Page 2, left column, line 14. Reference on the first results of HERMES experiment in this field is needed, see A. Airapetian et al, PRL, 90, 9, 092002-1 (2003).

Answer: This reference has been added.

P.2, L, l -19. Could be mentioned that A is experimentally measured asymmetry.

Answer: we have modified the symbol here to A_{PV} to be consistent with the symbol for parity-violating asymmetries used hereafter. We have avoided the wording "experimentally measured asymmetry": as can be seen from the following descriptions of the data analysis, the "experimentally measured asymmetry" could refer to the raw asymmetry extracted directly from the DAQ, or the raw asymmetry with beam-related corrections applied, or the final asymmetry results after many background corrections are applied, and therefore is ambiguous by itself.

P.2, L, l -8 (from bottom). Here is the main set of questions. How asymmetry A is connected with A_PV described in Eq.1? How electromagnetic and \gamma-Z interference structure functions are measured?

Answer: we have added a couple of sentences to explain how A_PV is used to provide physics information. For our experiment, we did not measure or extract electromagnetic and/or gamma-Z interference structure functions. Instead, the structure functions were calculated using different models (see Tab. I) to provide predictions for the asymmetries, from which physics conclusions were made by comparing these predictions with our measured asymmetries.

P.2, R, l -20. \gamma-Z box diagram could be presented as a figure there or in another place. As it is mentioned in abstract and summary, the definition of the relevant diagram is needed for the clarification of the studied reaction.

Answer: To save space, we did not add any drawing for the gamma-Z box diagram, instead we added some explanation in the texts.

As for the "gamma-Z box corrections related to elastic PVES" mentioned in the abstract and the summary, although the results presented here will help to constrain models used in these calculations,

it is not the main focus of the manuscript and we have replaced the "gamma-Z box corrections to elastic PVES" to "background corrections to elastic PVES". Readers interested in this topic can always consult Ref.[36] for details.

P. 4, R, Table 1. How presented asymmetries are connected with each
other and final A_PV shown in Fig.1 and compared with calculations?
Some tuning of the text on pages 3 and 4 is quite desirable.

Answer: We have added a few sentences to explain how the asymmetry results in Fig.1 are connected with Table I. This involves some details of the DAQ and we hope the revised texts provided enough explanation.

In the case that some confusion might have arisen from the symbol "A_{corr}", which represents raw asymmetries corrected for beam parameters, but not the final asymmetry results, we have changed it to "A_{raw}^{bc}" where "bc" stands for "beam-corrected". The symbol for the final physics asymmetry results has been changed from "A_{phys}" to "A_{PV}^{phys}" to be consistent with the subscript used in Eq.(1).The "A_{PV}^{phys}" are the values that should be compared to the calculations "A_{calc}" in Table I, and this relationship of comparison is stated in both Table I and Fig.1 captions.

P.5, L, Fig.1. May be definition of ppm, given in the text above,
could be repeated here, but it is quite optional.

Answer: full definition of ppm has been added to Fig.1 caption. We have also revised the caption to be more consistent with the legends used in the graph.