Dear authors,

Many thanks for implementing our suggestions and for providing replies to our comments — we agree with your answers. The committee has now completed its review of the second version of your manuscript. We feel that its reworking has made it very readable and that it is now in very good shape. We have a few very minor points (re-wording and typos) and feel that, once they're implemented, the paper can go directly to collaboration-wide review and that there is no need for round three.

Best wishes,
Daria, Andrea and Gabriel.

Comments:

Abstract
These asymmetries were extracted from data measured using ... (not "obtained" but "measured")

Paper

l. 92 asymmetry, define as: (add "define as:")
l. 139 my suggestion is to just write the k_\gamma^lab definition, and skip from "denotes ... with CM energy W".
l. 184 The beam asymmetry ALU was also extracted from the data, but was used only as a cross-check and is not presented here (i.e. in my opinion it is not necessary to underline that is less precise.)
l. 193 using the same dataset (data -> dataset)
l. 202 Rephrase: The original GDH sum rule [28,29], defined for real photons, is a fundamental prediction on the nucleon's spin structure ... anomalous magnetic moment.
l. 209 Add a dot: non-perturbative and the perturbative regime. The value of the ..
l. 211 Rephrase: The goal of the EG4 experiment is to test the chiral perburbation theory prediction and to compare the extrapolation to the Q2=0 point with the GDH sum rule of the real photon.
l. 226-229 Is it necessary to specify so? I suggest to simply remove these lines
l. 259: Each segment consists of (remove "of the new Cherenkov")
l. 287: Inside the cell, the crystals are immersed in liquid 4He at 1K. (Remove "to mantain its low temperature")
l. 321: Rephrase. Firstly, the beam hits, and thus depolarized, only the central part of the target with a smaller diameter than the cell cylinder, while the NMR measures the polarization of the whole target volume. Therefore, the NMR results...

Line 96: Put comma after "However"
Line 243: "composed by six" -> "composed of six"
Line 245: "tri-layer" -> "three-layer"

Fig 2: It's not clear why the new Cerenkov counter was necessary: it looks in the figure as if the old counter covered a much greater acceptance than then new. Could you please explain?

Line 285: “2-mm” -> add “2 mm sized”
Line 287: “maintain its” -> “maintain their”
Line 294: “can not” -> “cannot”
Line 308: “targets” -> “target”

Fig 4 caption: “Target insert using during EG4 experiment” -> “Target insert used during the EG4 experiment” (add “the”)
“A 1.0-cm long $NH_3$ and a 0.5-cm long $NH_3$ targets” -> “A 1.0-cm long $NH_3$ and a 0.5-cm long $NH_3$ target” (“target” should be singular here)

Line 319: “by a NMR system“ -> “by an NMR system“ (even though NMR starts with N, it’s pronounced as the acronym “en-em-arr”, so needs “an” in front of it)
Lines 359-360: Could you motivate that cut, please?

Lines 422 - 426: “The absolute beam helicity was determined using the 423 double-spin asymmetry of the $P_{33}(1232)$ resonance extracted from inclusive events, since the asymmetry of the $P_{33}(1232)$ is known to be negative for the low $Q^2$ range of this experiment.” This needs a reference.

Lines 465 - 467: “Finally, energy loss corrections were applied by adding the calculated average energy loss of each particle to its detected momentum”. Add a mention of energy loss through what — the target material?

Line 566: “imply problem” -> “imply a problem”

Lines 704, 806, 812, 832, 844, 865, 869, caption of Figs12, 13 and 14: W should be in GeV/c^2 as it’s a mass