Comment on "Hunting long-lived gluinos at the Pierre Auger Observatory"

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A Comment on the article by Anchordoqui *et al.* "Hunting long-lived gluinos at the Pierre Auger Observatory" [L. A. Anchordoqui, A. Delgado, C. A. García Canal, and S. J. Sciutto, Phys. Rev. D **77**, 023009 (2008)].

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Anchordoqui *et al.* [1] claim that the "10^6 GeV 'Centauro' events detected at Mt. Chacaltaya might be suggestive of gluino-induced showers." For this statement the authors [1] use an article published in 1980 [2].

The authors [1] apparently ignore the fact that the description of the Centauro events made by [2] is no longer valid. The authors [1] omit to mention and fail to credit recent findings regarding the Centauro events that significantly changed the whole experimental situation (see [3–5] and references therein). There were five Centauro events [1]. It was shown in [3–5] that the event Centauro-I does not exist in the form described by [2], and even the name Centauro in the sense of the man-horse analogy became redundant there. Centauro-II and Centauro-III were detected at the film edges (see [5] and references therein). It is worth adding that Centauro-II,III,IV were detected in the same chamber, during the same exposition [2,5]. It was shown in [5] that the identification of electromagnetic and hadronic components was essential source of many related problems.

Describing the Centauro events reported by [2], the authors asserted that "in these events, the ratio of hadronic to electromagnetic components is about 50:1." This is not a correct statement. Figure 1 shows the ratio of electromagnetic and hadronic components reported by [2]. The numerical data were taken from Table 11 titled "Arriving hadrons and '(e, γ)' bundle in Centauro events" [2]. Figure 1 also illustrates the detector features [5].

According to the authors [1], the ratio "about 50:1" contradicts the "expectation of dominance of the electromagnetic component in vertical baryon-induced showers." This statement is incomplete. It reflects rather limited expectation from the real cosmic ray events. One should not ignore primary composition of cosmic rays. The hadronic component can be dominant in case of the events initiated by heavy nuclei [6], particularly in case of "exotic" cosmic ray observations [7].

According to the authors [1], "the most carefully considered explanation to date is" paper [8]. According to the Webster dictionary, the word "careful" implies "attentiveness and cautiousness in avoiding mistakes." The "most careful" argument creates an unwarranted impression of the widespread acceptance of the obsolete Centauro events description [2]. The question is in "date." The statement

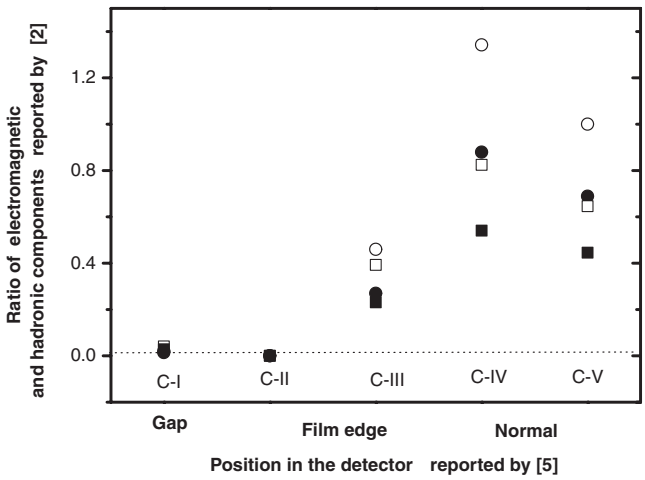

FIG. 1. Diagram of the detector features described by [5] and the ratio of electromagnetic and hadron components reported by [2]. A character C stands for Centauro. It was shown in [3–5] that the event Centauro-I does not exist in the form described by [2]. The numerical data were taken from Table 11 [2]. Open circles: $N_{\gamma\text{-est}}/N_{h\text{-obs}}$, solid circles: $N_{\gamma\text{-est}}/N_{h\text{-est}}$, open squares: $E_{\gamma\text{-est}}/E_{h\text{-obs}}$, solid squares: $E_{\gamma\text{-est}}/E_{h\text{-est}}$, where $N_{\gamma\text{-est}}$ is the estimated [2] number of electromagnetic showers at the chamber top, $E_{\gamma\text{-est}}$—estimated [2] electromagnetic energy at the chamber top, $N_{h\text{-obs}}$—observed [2] number of hadrons, $N_{h\text{-est}}$—estimated [2] number of hadrons at the chamber top, $E_{h\text{-obs}}$—observed [2] total hadronic energy, $E_{h\text{-est}}$—estimated [2] total hadronic energy at the chamber top. The dotted line shows the ratio " 1:50." It is based on the statement from [1]: "in these events, the ratio of hadronic to electromagnetic components is about 50:1." The "Normal" position means that the exact pattern of showers was available.

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[1] might have been true in the past, but it is quite misleading at present. The numerous details and information on the Centauro events have been extensively and very informatively presented in many papers (see, for instance, references in [5]). In 1996 [4,5], it became evident that better understanding of the detector was needed. Of course, some very significant pieces of information were scattered among variety of presentations and were not explicitly addressed. It appeared that for a long time some detector features (gaps) were absent in many discussions and were not taken into account in well-known simulations. After explicit presentation [3,4] in 2002–2003, we found that the readers familiar with the topic still believed that only the earliest event was questioned. In 2006 we analyzed [5] the Centauro events with an eye to what is missing or wrong that might distort the reader's conclusions. Putting the available details together, we arrived at the solution.

We noticed that the authors [1] did not consider that the ''null results'' from accelerator experiments [1] are explained by a mundane solution [3–5].

It is remarkable that only the misrepresented and misinterpreted cosmic ray events appeared to be ''suggestive'' of ''guilty'' gluinos in the ''finely tuned universe''[1]. Nevertheless, it is worth noting that the Earth based standard physics activity requires correct description of the experimental signal and attention to details, particularly in the research where one little error can cause large problems with significant consequences.

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