

Erratum: Nonrelativistic Holography from AdS₅/CFT₄ **[Phys. Rev. Lett. 133, 151601 (2024)]**

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Statement of error—The proposed nonrelativistic AdS/CFT correspondence was based on matching the on-shell symmetries of the Galilean electrodynamics (GED) theory computed in Ref. [1] with the Killing vectors of the nonrelativistic string theory. Recently, it has been found in Ref. [2] that most of what were identified in said article as on-shell symmetries are actually fully off-shell symmetries. Furthermore, the counting of symmetries when including the scalars was not complete. As a result, our discussion in section “A first test: matching symmetries” about mapping of symmetries is not valid and has been reworked in Ref. [2].

This result implies that the GED with five free scalars cannot be the holographic dual candidate. This error appears throughout the paper every time that we make a holographic statement between nonrelativistic string theory in string Newton-Cartan (SNC) AdS₅ × S⁵ and GED with five scalars defined on the Penrose conformal boundary.

Correction of error—The symmetries of the GED theory have been revisited in Ref. [2]. There, it has been found that the number of symmetries of the GED theory with five free scalars given in Eq. (11) is larger than the number of Killing vectors found for the bulk theory. For this reason, the proposed GED theory with five free scalars cannot be the holographic dual candidate.

As we discussed in endnote [34] of this Letter, there is a second consistent nonrelativistic limit that one can take on the gauge theory side. This leads to a Galilean Yang-Mills (GYM) theory with five nonabelian interacting scalars, whose Lagrangian was given in Ref. [3] as

$$\begin{aligned} \mathcal{L}_{\text{GYM}} = & -\frac{1}{2\pi g_s} \sum_{I=1}^{N^2} \left(\frac{1}{2} \sum_{I'=1}^5 \left[(D_a \phi^{I'I})^2 \mp \sum_{J,K=1}^{N^2} 2i f^{JK}{}_I \zeta^J \phi^{I'K} D_t \phi^{I'I} \right] \right. \\ & \left. - \sum_{J,K=1}^{N^2} \sum_{I' < J'} (f^{JK}{}_I \phi^{I'J} \phi^{I'K})^2 + \frac{1}{4} (F_{ab})^2 \pm F_{at} D_a \zeta^I - (D_t \zeta^I)^2 \right), \end{aligned} \quad (1)$$

where the $\pm$ sign originates from an ambiguity of the critical B field and it can be absorbed into a redefinition of the ζ^I field. The symmetries of this theory have been carefully analyzed in Ref. [2], and in contrast to endnote [34] of this Letter, they have been proven in this same article to be in a one-to-one correspondence with the Killing vectors evaluated at the Penrose boundary of the SNC metric of the bulk theory.

Therefore, the holographic claim that relates string theory in SNC AdS₅ × S⁵ with GED with five scalars defined on the Penrose conformal boundary is incorrect. The correct statement would be that the correspondence relates string theory in SNC AdS₅ × S⁵ with GYM with five scalars defined on the Penrose conformal boundary.

Impact on the conclusions of the article—Although the results of [2] invalidate the correspondence between nonrelativistic string theory in SNC AdS₅ × S⁵ and GED with five scalars, the conclusions of this Letter remain the same, provided we replace GED by GYM.

- [1] G. Festuccia, D. Hansen, J. Hartong, and N. A. Obers, Symmetries and couplings of non-relativistic electrodynamics, *J. High Energy Phys.* **11** (2016) 037.
- [2] A. Fontanella and J. M. Nieto García, Revisiting the symmetries of Galilean electrodynamics, *J. High Energy Phys.* **06** (2025) 058.
- [3] A. Fontanella and J. M. Nieto García, Constructing nonrelativistic AdS₅/CFT₄ holography, *Phys. Rev. D* **111**, 026003 (2025).

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