Erratum: On the supersymmetric solutions of the Heterotic Superstring effective action

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As pointed out in ref. [1], our paper contains an important error and a minor typo, both of which do not change the main conclusions. The error, though, is relevant because it affects one of the conditions a field configuration must satisfy in order to be supersymmetric.

Eq. (3.16) is wrong and, as a result, eq. (3.17) is also wrong and, once one takes into account that, in the coordinates and frame we have chosen, $\omega_{-mn} = -\omega_{mn-}$, it should be replaced by

$$\Omega^{(+)}_{-mn} = H_{-mn} . \quad (1)$$

Then, eq. (3.18) does not follow immediately, although, in the end, it holds true: using the above result in the $a = -$ component of eq. (3.14a), we get

$$\partial_- \Omega_{m_1 m_2 m_3 m_4} = H_{-m_1}{}^n \Omega_{n m_2 m_3 m_4} , \quad (2)$$

and, using the same properties as in the case of the $a = +$ component (eqs. (3.23) and (3.24)), we get

$$H^{(-)}_{-mn} = \frac{1}{24} \Omega_m{}^{s_1 s_2 s_3} \partial_- \Omega_{n s_1 s_2 s_3} . \quad (3)$$

Then, eq. (3.31b) proves (3.18).

Since eqs. (3.16) and (3.17) are reproduced as eqs. (3.41a) and (3.41b), taking into account other results, these two equations should be replaced by

$$\Omega^{(+)}_{[ab]-} = 0 , \quad (4a)$$

$$\Omega^{(+)}_{am-} = 0 , \quad (4b)$$

$$\Omega^{(+)}_{-mn} = H^{(+)}_{-mn} . \quad (4c)$$

Accordingly, in the paragraph after eq. (3.27), the sentence “Via eqs. (3.16) they also determine the H_{ab-} components of the Kalb-Ramond field strength.” should be amended and replaced by “Via eqs. (3.15) they also determine the H_{am-} components of the Kalb-Ramond field strength.”

Above eq. (3.47) it should be said that we use the supersymmetry conditions eqs. (3.13) and (3.15) and the fact that, in the basis we are using, $\Omega^{(+)}_{++-} = \omega_{++-} = 0$ in order to simplify the gravitino KSE and reduce it to eq. (3.47).

Furthermore, eq. (3.17) was used to solve the $-$ gravitino KSE. Using the old eq. (3.17) one would get eq. (3.49). Indeed, one gets that equation, but only after using the property (A.46a) and the projection eq. (3.44b):

$$\left(\partial_- - \frac{1}{4}H^{(+)}_{-mn}\Gamma^{mn}\right)\epsilon = \partial_- \epsilon = 0. \quad (5)$$

Finally, there is small typo in eq. (3.47): the term $\partial_m \phi$ should be replaced by $\Gamma^m \partial_m \phi$.

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References

- [1] P.A. Cano, Á. Murcia, P.F. Ramírez and A. Ruipérez, *On small black holes, KK monopoles and solitonic 5-branes*, *JHEP* **05** (2021) 272 [[arXiv:2102.04476](https://arxiv.org/abs/2102.04476)] [[INSPIRE](https://inspirehep.net/literature/1900000)].