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Erratum: Static strings in Randall-Sundrum scenarios and the quark-antiquark potential [Phys. Rev. D 73, 106006 (2006)]

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The lines that we considered as the geodesics in the article are not the correct ones for $L > L_{\rm crit}$. This is so because they do not generate the minimum world sheet area. The correct geodesics in this case correspond to the two halves of the curve at $L = L_{\rm crit}$, split in the middle point and connected by a straight line along the brane at $r = r_2$. Note that the shape of the curved parts of the geodesics do not vary with L for $L > L_{\rm crit}$, in contrast to what was considered in the article. Equation (8) must be replaced by

$$E_{RS}^{(+)} = \frac{r_2}{\pi\alpha'}[I_2(r_1/r_2) - 1] + \frac{r_2^2}{2\pi\alpha' R^2}(L - L_{\rm crit}) = \frac{r_2}{\pi\alpha'}[I_2(r_1/r_2) - I_1(r_1/r_2) - 1] + \frac{r_2^2}{2\pi\alpha' R^2}L, \tag{8}$$

where we used the definition of $L_{\rm crit}$ given by Eq. (4) with $r_0 = r_2$. According to the definition of the Randall-Sundrum space the quark brane is located at $r_1 = R$ in Eq. (8). This energy is a smooth function of the parameter L, in contrast to what is said in the article (including the abstract). So, Fig. 2 is wrong and must be disconsidered. Actually, even expression (8) in the article does not lead to a discontinuity in the derivative of the energy with respect to L.

Since there is no discontinuity in the energy derivative, it is not necessary to fix the infrared (IR) brane position r_2. The identification $r_2 = R$ has to be understood just as a particular choice which is consistently made in the rest of the article.

Equations (12) and (13) in the article are wrong and must be replaced by

$$E^{(+)} = \frac{R}{\pi\alpha'}[I_2(r_1/R) - I_1(r_1/R) - 1] + \frac{1}{2\pi\alpha'}L, \tag{12}$$

which corresponds to the new equation (8) with quark position $r_1 > R$ and IR brane position $r_2 = R$. This is the correct static string energy for $L \geq L_{\rm crit}$. This energy has the same asymptotic behavior as the incorrect expression presented in the article. That means, it behaves asymptotically as the heavy quark-antiquark Cornell potential. From Eqs. (11) and (12), using the Cornell parameters a and σ (with the choice $r_2 = R$), one finds that Eq. (15) must be replaced by

$$E = \begin{cases} \frac{4a}{3C_1^2}\frac{I_1(r_1/r_0)}{L}[I_2(r_1/r_0) - 1], & L \leq L_{\rm crit} \\ \sqrt{\frac{4a\sigma}{3C_1^2}}[I_2(r_1/R) - I_1(r_1/R) - 1] + \sigma L & L \geq L_{\rm crit}, \end{cases} \tag{15}$$

where $L_{\rm crit} = 2RI_1(r_1/R)$. When we take the quark position (r_1) going to infinity, Eq. (16) must be replaced by

$$E = \begin{cases} -\frac{4a}{3L}, & L \leq L_{\rm crit} \\ -4\sqrt{\frac{a\sigma}{3}} + \sigma L & L \geq L_{\rm crit}, \end{cases} \tag{16}$$

where $L_{\rm crit} = 2RC_1$. The identification of the static string energy in our model (without choosing a value for r_2) with the Cornell potential leads to the relations

$$2\pi\alpha' R^2\sigma = r_2^2, \qquad 2\pi\alpha' a = 3C_1^2 R^2.$$

That means: the identification with the Cornell potential does not imply a fixed value for the anti-de Sitter radius R. Equation (17) of the article has to be understood just as an effective value for R corresponding to the particular choice: $r_2 = R$.

