Static strings in Randall-Sundrum scenarios and the quark anti-quark potential: Erratum

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We correct the energy of the static strings in [1] for large quark anti-quark separation. This energy is a smooth function of the quark separation for any position of the infrared brane. The asymptotic behavior of this energy is that of the Cornell potential as stated in the article. However, this identification does not fixes the AdS radius. Equations (12) and (13) in the article are wrong and must be replaced by

\[ E^{(+)_{RS}} = \frac{R}{\pi \alpha'} \left[ I_2(r_1/R) - I_1(r_1/R) - 1 \right] + \frac{1}{2\pi \alpha'} L , \quad (12) \]

that 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 \( L \geq L_{\text{crit}} \). This energy has the same asymptotic behavior as the incorrect expression presented in the article. That means, it behaves asymptotically as the heavy quark anti-quark Cornell potential. From equations (11) and (12), using the Cornell parameters \( a \) and \( \sigma \) (with the choice \( r_2 = R \) ), one finds that equation (15) must be replaced by

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

where \( L_{\text{crit}} = 2R I_1(r_1/R) \). When we take the quark position \((r_1)\) going to infinity, equation (16) must be replaced by

\[ E = \begin{cases} 
\frac{4a}{3L}, & L \leq L_{\text{crit}} \\
-4 \sqrt{\frac{a \sigma}{3}} + \sigma L, & L \geq L_{\text{crit}}
\end{cases} \]

where \( L_{\text{crit}} = 2RC_1 \). 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

\[ 2\pi \alpha' R^2 \sigma = r_2^2 , \quad 2\pi \alpha' a = 3C_1^2 R^2 . \]
That means: the identification with the Cornell potential does not imply a fixed value for the AdS radius $R$. Equation (17) of the article has to be understood just as an effective value for $R$ corresponding to the particular choice: $r_2 = R$.

[1] H. Boschi-Filho, N. R. F. Braga and C. N. Ferreira, Phys. Rev. D 73 (2006) 106006, [arXiv:hep-th/0512295].