Erratum: Vacuum decays around spinning black holes

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The published work relies on the diagonalized metric shown in eq. (3.7), and it was mentioned that eq. (3.7) is obtained by the transformation $d\phi \rightarrow d\psi - \tilde{g}_{\phi t}/\tilde{g}_{\phi\phi}d\lambda$. However, the diagonalized metric is not exactly obtained by the transformation but is valid approximately, which was missed in the original paper. This does not affect our results and conclusion as is explained below.

The angular velocity, $\omega \equiv -\tilde{g}_{\phi t}/\tilde{g}_{\phi\phi}$ has r and θ -dependence, and therefore, the correct transformation should be $d\phi \rightarrow d\psi + \omega d\lambda + (\partial_r\omega)\lambda dr + (\partial_\theta\omega)\lambda d\theta$. The last term is strongly suppressed by $\partial_\theta\omega \sim -4Ma^3\Delta/r^7$, which leads to negligible corrections to $\tilde{g}_{\mu\nu}$ outside the horizon. The dr -term in the transformation also gives a negligible correction, C , to the induced metric in eq. (3.11):

$$ds^2 = (-1 + C)d\tau^2 + g_{\theta\theta}d\theta^2 + g_{\psi\psi}d\psi^2, \quad (1)$$

$$\text{with } C \sim 4R^2\omega(\partial_r\omega)\dot{R}\lambda \sim -48M^2a^2\dot{R}\lambda/R^5, \quad (2)$$

where $|C| \ll 1$ holds for $R \geq R_{\min}$. Note that although $R \sim M$ for $R \simeq R_{\min}$, $\dot{R} \simeq 0$ suppresses the factor C there. We should also emphasize that $\lambda \lesssim R_{\max}$ is assumed since only one Euclidean period is taken into account in the calculation of the Euclidean action.

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