

Ehrenfest'sches Paradoxon in cylindrical coordinates:

$$x^\mu$$

$$\begin{aligned}x^0 &= t, \\ x^1 &= r, \\ x^2 &= \phi, \\ x^3 &= z.\end{aligned}$$

$$g_{\mu\nu}$$

$$\begin{aligned}g_{00} &= -L^2(-1+r^2\omega^2), \\ g_{01} &= 0, \\ g_{02} &= -\frac{1+r^2\omega^2L-L}{\omega}, \\ g_{03} &= 0, \\ g_{10} &= 0, \\ g_{11} &= -1, \\ g_{12} &= 0, \\ g_{13} &= 0, \\ g_{20} &= -\frac{1+r^2\omega^2L-L}{\omega}, \\ g_{21} &= 0, \\ g_{22} &= -\frac{-1+2L+r^2\omega^2L^2-L^2}{\omega^2L^2}, \\ g_{23} &= 0, \\ g_{30} &= 0, \\ g_{31} &= 0, \\ g_{32} &= 0, \\ g_{33} &= -1.\end{aligned}$$

$$\sqrt{\hspace{0.1cm}} = \sqrt{-\det(g_{\mu\nu})}$$

$$\sqrt{\hspace{0.1cm}} = \sqrt{r^2}.$$

$$g^{\mu\nu}$$

$$\begin{aligned}g^{00} &= \frac{-1+2L+r^2\omega^2L^2-L^2}{r^2\omega^2L^2}, \\ g^{01} &= 0, \\ g^{02} &= -\frac{1+r^2\omega^2L-L}{r^2\omega}, \\ g^{03} &= 0, \\ g^{10} &= 0, \\ g^{11} &= -1, \\ g^{12} &= 0, \\ g^{13} &= 0, \\ g^{20} &= -\frac{1+r^2\omega^2L-L}{r^2\omega}, \\ g^{21} &= 0, \\ g^{22} &= \frac{L^2(-1+r^2\omega^2)}{r^2}, \\ g^{23} &= 0, \\ g^{30} &= 0, \\ g^{31} &= 0, \\ g^{32} &= 0, \\ g^{33} &= -1.\end{aligned}$$

$$\Gamma^\sigma_{\hspace{0.1cm}\mu\nu}$$

$$\begin{aligned}\Gamma^0_{00} &= 0, \\ \Gamma^0_{01} &= -\frac{-1+L}{r}, \\ \Gamma^0_{02} &= 0, \\ \Gamma^0_{03} &= 0, \\ \Gamma^0_{10} &= -\frac{-1+L}{r}, \\ \Gamma^0_{11} &= 0, \\ \Gamma^0_{12} &= -\frac{-1+L}{r\omega L}, \\ \Gamma^0_{13} &= 0, \\ \Gamma^0_{20} &= 0, \\ \Gamma^0_{21} &= -\frac{-1+L}{r\omega L}, \\ \Gamma^0_{22} &= 0, \\ \Gamma^0_{23} &= 0, \\ \Gamma^0_{30} &= 0, \\ \Gamma^0_{31} &= 0, \\ \Gamma^0_{32} &= 0, \\ \Gamma^0_{33} &= 0.\end{aligned}$$

$$\begin{aligned}\Gamma^1_{00} &= -r\omega^2L^2, \\ \Gamma^1_{01} &= 0, \\ \Gamma^1_{02} &= -r\omega L, \\ \Gamma^1_{03} &= 0, \\ \Gamma^1_{10} &= 0, \\ \Gamma^1_{11} &= 0, \\ \Gamma^1_{12} &= 0, \\ \Gamma^1_{13} &= 0, \\ \Gamma^1_{20} &= -r\omega L, \\ \Gamma^1_{21} &= 0, \\ \Gamma^1_{22} &= -r, \\ \Gamma^1_{23} &= 0, \\ \Gamma^1_{30} &= 0, \\ \Gamma^1_{31} &= 0, \\ \Gamma^1_{32} &= 0, \\ \Gamma^1_{33} &= 0.\end{aligned}$$

$$\begin{aligned}\Gamma_{00}^2 &= 0, \\ \Gamma_{41}^2 &= \frac{\omega L^2}{r}, \\ \Gamma_{02}^2 &= 0, \\ \Gamma_{23}^2 &= 0, \\ \Gamma_{10}^2 &= \frac{\omega L^2}{r}, \\ \Gamma_{21}^2 &= 0, \\ \Gamma_{12}^2 &= \frac{L}{r}, \\ \Gamma_{23}^2 &= 0, \\ \Gamma_{20}^2 &= 0, \\ \Gamma_{21}^2 &= \frac{L}{r}, \\ \Gamma_{22}^2 &= 0, \\ \Gamma_{23}^2 &= 0, \\ \Gamma_{30}^2 &= 0, \\ \Gamma_{31}^2 &= 0, \\ \Gamma_{32}^2 &= 0, \\ \Gamma_{33}^2 &= 0,\end{aligned}$$

$$\begin{aligned}\Gamma_{00}^3 &= 0, \\ \Gamma_{31}^3 &= 0, \\ \Gamma_{02}^3 &= 0, \\ \Gamma_{03}^3 &= 0, \\ \Gamma_{10}^3 &= 0, \\ \Gamma_{11}^3 &= 0, \\ \Gamma_{12}^3 &= 0, \\ \Gamma_{13}^3 &= 0, \\ \Gamma_{20}^3 &= 0, \\ \Gamma_{21}^3 &= 0, \\ \Gamma_{22}^3 &= 0, \\ \Gamma_{23}^3 &= 0, \\ \Gamma_{30}^3 &= 0, \\ \Gamma_{31}^3 &= 0, \\ \Gamma_{32}^3 &= 0, \\ \Gamma_{33}^3 &= 0.\end{aligned}$$

$$\boxed{R_{\mu\nu}}$$

$$\begin{aligned}R_{00} &= 0, \\ R_{01} &= 0, \\ R_{02} &= 0, \\ R_{03} &= 0, \\ R_{10} &= 0, \\ R_{11} &= 0, \\ R_{12} &= 0, \\ R_{13} &= 0, \\ R_{20} &= 0, \\ R_{21} &= 0, \\ R_{22} &= 0, \\ R_{23} &= 0, \\ R_{30} &= 0, \\ R_{31} &= 0, \\ R_{32} &= 0, \\ R_{33} &= 0,\end{aligned}$$

$$\boxed{R^\mu{}_\nu}$$

$$\begin{aligned}R^0{}_0 &= 0, \\ R^0{}_1 &= 0, \\ R^0{}_2 &= 0, \\ R^0{}_3 &= 0, \\ R^1{}_0 &= 0, \\ R^1{}_1 &= 0, \\ R^1{}_2 &= 0, \\ R^1{}_3 &= 0, \\ R^2{}_0 &= 0, \\ R^2{}_1 &= 0, \\ R^2{}_2 &= 0, \\ R^2{}_3 &= 0, \\ R^3{}_0 &= 0, \\ R^3{}_1 &= 0, \\ R^3{}_2 &= 0, \\ R^3{}_3 &= 0,\end{aligned}$$

$$\boxed{R}$$

$$R = 0.$$

$$\boxed{G^\mu{}_\nu}$$

$$\begin{aligned}G^0{}_0 &= 0, \\ G^0{}_1 &= 0, \\ G^0{}_2 &= 0, \\ G^0{}_3 &= 0, \\ G^1{}_0 &= 0, \\ G^1{}_1 &= 0, \\ G^1{}_2 &= 0, \\ G^1{}_3 &= 0, \\ G^2{}_0 &= 0, \\ G^2{}_1 &= 0, \\ G^2{}_2 &= 0, \\ G^2{}_3 &= 0, \\ G^3{}_0 &= 0, \\ G^3{}_1 &= 0, \\ G^3{}_2 &= 0, \\ G^3{}_3 &= 0,\end{aligned}$$

$$\boxed{G}$$

$$G = 0.$$

$$\boxed{G^\mu_{\nu\gamma\mu}=0}$$

$$G^\mu_{0\mu}=0.$$

$$G^\mu_{1\mu}=0.$$

$$G^\mu_{2\mu}=0.$$

$$G^\mu_{3\mu}=0.$$

$$\boxed{g^{\mu\nu}\,\Gamma^\lambda_{\mu\nu}=0?}$$

$$g^{\mu\nu}\,\Gamma^0_{\mu\nu}=0.$$

$$g^{\mu\nu}\,\Gamma^1_{\mu\nu}=r^3-r\omega^2L^4-\frac{r}{\omega^2L^2}+2\frac{r}{\omega^2L}-2rL^2+r^3\omega^4L^4+2r^3\omega^2L^2+2rL-\frac{r}{\omega^2}.$$

$$g^{\mu\nu}\,\Gamma^2_{\mu\nu}=0.$$

$$g^{\mu\nu}\,\Gamma^3_{\mu\nu}=0.$$