$$\begin{aligned}\langle x_2|\rho_2|x_2\rangle &= \int_{-\infty}^{\infty} dx_1 f(x_1,x_2) f^*(x_1,x_2) \\ &= Ce^{-\Gamma_a(ct-|x_1|)}\frac{1-e^{-\Gamma_b|x_1|}}{\Gamma_b}\theta(ct-|x_1|) \\ &= Ce^{-\Gamma_a(ct-|x_1|)}|x_1|\theta(ct-|x_1|)\end{aligned} \tag{1}$$