

$$\begin{aligned}
& \int_{\mathcal{F}} d\mu \, \tau_2^{-\lambda/2} \sum_{P_L, P_R} \rho(P_L \sqrt{\tau_2}, P_R \sqrt{\tau_2}) \, q^{\frac{1}{4} P_L^2} \bar{q}^{\frac{1}{4} P_R^2} \mathcal{F}(s, \kappa, w) \\
&= (4\pi\kappa)^{1+\lambda/2} \int_0^\infty dt \, t^{2+\frac{2d+k}{4}-2} {}_1F_1\left(s - \frac{2\lambda+2d+k}{4}; 2s; t\right) \rho\left(P_L \sqrt{\frac{t}{4\pi\kappa}}, P_R \sqrt{\frac{t}{4\pi\kappa}}\right) \sum_{BPS} e^{-t P_L^2/4\kappa}
\end{aligned}$$