

$$\begin{aligned}
 \log P(y|s_k) = & \\
 \frac{1}{2(1-\rho^2)} & \left\{ \frac{(\Re(y) - \mu_{k,\text{real}})^2}{\sigma_{k,\text{real}}^2} + \frac{(\Im(y) - \mu_{k,\text{imag}})^2}{\sigma_{k,\text{imag}}^2} \right. \\
 - 2\rho_k & \left. \left(\frac{\Re(y) - \mu_{k,\text{real}}}{\sigma_{k,\text{real}}} \right) \left(\frac{\Im(y) - \mu_{k,\text{imag}}}{\sigma_{k,\text{imag}}} \right) \right\} \\
 - \log & \left(2\pi\sqrt{1-\rho^2}\sigma_{k,\text{real}}\sigma_{k,\text{imag}} \right)
 \end{aligned}$$