

(11)

$$-\frac{1}{2\sqrt{2}\beta} (\alpha e^{-i\Omega t} + \alpha^* e^{i\Omega t}) \langle (-\alpha)e^{-i\Omega t} | 1 - \alpha e^{-i\Omega t} \rangle$$

$$-\frac{i}{2\sqrt{2}\beta} (\alpha e^{-i\Omega t} - \alpha^* e^{i\Omega t}) \langle (-\alpha)e^{-i\Omega t} | \alpha e^{-i\Omega t} \rangle$$

$$+\frac{i}{2\sqrt{2}\beta} (\alpha^* e^{i\Omega t} - \alpha e^{-i\Omega t}) \langle \alpha e^{-i\Omega t} | (-\alpha)e^{-i\Omega t} \rangle$$

Usando:

$$\langle \alpha e^{-i\Omega t} | \alpha e^{-i\Omega t} \rangle = \langle \alpha' e^{-i\Omega t} | \alpha' e^{-i\Omega t} \rangle = 1$$

$$\begin{aligned} \langle (-\alpha)e^{-i\Omega t} | \alpha e^{-i\Omega t} \rangle &= \exp(-2|\alpha|^2) \\ &= \langle \alpha e^{-i\Omega t} | (-\alpha)e^{-i\Omega t} \rangle \end{aligned}$$

le tiene finalmente:

$$\langle X(t) \rangle = \frac{1}{2\sqrt{2}\beta} (\alpha e^{-i\Omega t} + \alpha^* e^{i\Omega t}) - \frac{1}{2\sqrt{2}\beta} (\alpha e^{-i\Omega t} + \alpha^* e^{i\Omega t})$$

$$+ \frac{i}{\sqrt{2}\beta} e^{-2|\alpha|^2} (\alpha^* e^{i\Omega t} - \alpha e^{-i\Omega t})$$

$$= \frac{2}{\sqrt{2}\beta} e^{-2|\alpha|^2} \operatorname{Im}(\alpha e^{-i\Omega t})$$