

Linearized QSD Equations

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In generality, the linearized QSD equation for a state $|\psi\rangle + |a\rangle$ is:

$$\begin{aligned} |da\rangle = & \sum_j \left[\langle\psi| \hat{L}_j^\dagger |\psi\rangle \hat{L}_j |a\rangle + \langle\psi| \hat{L}_j^\dagger |a\rangle \hat{L}_j |\psi\rangle + \langle a| \hat{L}_j^\dagger |\psi\rangle \hat{L}_j |\psi\rangle - \frac{1}{2} \hat{L}_j^\dagger \hat{L}_j |a\rangle \right. \\ & - \frac{1}{2} \left(\langle\psi| \hat{L}_j^\dagger |\psi\rangle \langle\psi| \hat{L}_j |\psi\rangle |a\rangle + \langle\psi| \hat{L}_j^\dagger |\psi\rangle \langle\psi| \hat{L}_j |a\rangle |\psi\rangle + \langle\psi| \hat{L}_j^\dagger |\psi\rangle \langle a| \hat{L}_j |\psi\rangle |\psi\rangle + \right. \\ & \left. \left. \langle\psi| \hat{L}_j^\dagger |a\rangle \langle\psi| \hat{L}_j |\psi\rangle |\psi\rangle + \langle a| \hat{L}_j^\dagger |\psi\rangle \langle\psi| \hat{L}_j |\psi\rangle |\psi\rangle \right) \right] dt \\ & + \left[\hat{L}_j |a\rangle - \langle\psi| \hat{L}_j |\psi\rangle |a\rangle - \langle\psi| \hat{L}_j |a\rangle |\psi\rangle - \langle a| \hat{L}_j |\psi\rangle |\psi\rangle \right] d\xi \quad (1) \end{aligned}$$