

CHAPTER OVERVIEW

5: The Density Matrix

The density matrix or density operator is an alternate representation of the state of a quantum system for which we have previously used the wavefunction. Although describing a quantum system with the density matrix is equivalent to using the wavefunction, one gains significant practical advantages using the density matrix for certain time-dependent problems—particularly relaxation and nonlinear spectroscopy in the condensed phase.

[5.1: Introduction to the Density Matrix](#)

[5.2: Time-Evolution of the Density Matrix](#)

[5.3: The Density Matrix in the Interaction Picture](#)

Thumbnail: measured density matrix of a thermal state. (CC SA-BY 3.0 unported; measured density matrix of a thermal state).

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