

# Open Quantum Systems Theory behind Quantarhei Package

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In this document, we summarize the theory of open quantum systems as it is implemented in the Quantarhei package.

# I. BATH CORRELATION FUNCTIONS AND SPECTRAL DENSITIES

Bath correlation function

$$C(t) = \frac{1}{\hbar^2} \text{Tr} \{ U_B^\dagger(t) \Delta V U_B(t) \Delta V w_{\text{eq}} \} \quad (1)$$

Fourier transform of the bath correlation function

$$\tilde{C}(\omega) = \int_0^\infty dt C(t) e^{i\omega t} \quad (2)$$

Spectral density

$$J(\omega) = \sum_\xi |g_\xi|^2 \delta(\omega - \omega_\xi) \quad (3)$$