

5.4 Quantenfeldtheorie

von Neumann $-\frac{\hbar}{i} \frac{\partial \rho}{\partial t} = [H, \rho]$

$$\text{Erw}(A) = M(A) = \text{Sp}\{\rho A\}$$

$$\begin{aligned} -\frac{\hbar}{i} \frac{d}{dt} M(A) &= \text{Sp}\{\rho [H, A]\} = \text{Sp}\{\rho HA\} - \text{Sp}\{\rho AH\} \\ &= \text{Sp}\{\rho [A, H]\} = \text{Sp}\{\rho AH\} - \text{Sp}\{\rho HA\} \\ &= \text{Sp}\{AH\rho\} - \text{Sp}\{A\rho H\} = \text{Sp}\{A[H, \rho]\} \\ &= -\frac{\hbar}{i} \text{Sp}\{A \frac{\partial \rho}{\partial t}\} \end{aligned}$$

$$\frac{d}{dt} M(A) = \text{Sp}\left\{\frac{\partial \rho}{\partial t} A\right\} \quad \text{Schrödinger-Bild}$$