Abstract

A characteristic action ΔS is defined whose magnitude determines the properties of the mean expectation value of a general displacement in phase space. These properties are related to the capability of a given environmental 'monitoring' system to induce decoherence in arbitrary quantum systems coupled to it by a broad kind of interactions. We show that according to this quantity the scale for effective decoherence is given by $\Delta S \geq \hbar$. This characteristic action is compared with another previously defined quantity, and its connection with the structure of the phase space representation of the environmental state is analyzed. The relevance of ΔS is illustrated both numerically and by analyzing a broad set of model quantum systems whose classical analog is chaotic, for which the Berry-Voros conjecture is valid, and where analytical expressions for the mean expectation value of the displacement are obtained explicitly.