

We [2–7] apply a semiclassical approach to study the dynamics of coherence loss and revival in a Bose-Josephson dimer. The phase-space structure of the bi-modal system in the Rabi, Josephson, and Fock interaction regimes, is considered, and the prescription for its WKB quantization is specified. The local density of states (LDOS) is then deduced for any given preparation from its semiclassical projection onto the WKB eigenstates. The LDOS and the non-linear variation of its level-spacing are employed to construct the time evolution of the initial preparation and study the temporal fluctuations of interferometric fringe visibility. The qualitative behavior and characteristic timescales of these fluctuations are set by the pertinent participation number, quantifying the spectral content of the preparation. We have employed this methodology to study the Josephson-regime coherence dynamics of several initial state preparations, including a Twin-Fock state and three different coherent states that we denote as 'Zero', 'Pi', and 'Edge' (the latter two are both on-separatrix preparations, while the Zero is the standard ground state preparation). We find a remarkable agreement between the semiclassical predictions and numerical simulations of the full quantum dynamics. Consequently, a characteristic distinct behavior is implied for each of the different preparations.

[1] Links to papers and PDF of the talk can be found in http://www.bgu.ac.il/~dcohen