Invited Talk 7

Dynamics of Quantum Observables: Time Series and Network Analysis

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The dynamics of quantum observables may vary in general from very regular behavior to chaos. We use generic models describing light-matter interactions in quantum optics to examine the dynamics of field quadrature variables, the mean photon number etc. We show that if the initial state of light that passes through a nonlinear atomic medium departs from coherence, a wide range of ergodicity properties can be expected in the dynamics of quantum observables. The Lyapunov exponents, and other quantifiers of chaotic behavior reveal this aspect clearly. A recurrence network analysis clarifies many aspects of the dynamics on different time scales.