

Nearest-Neighbor Distributions and Tunneling Splittings in Interacting Many-Body Two-Level Boson Systems

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(Submitted on 24 Nov 2009)

We study the nearest-neighbor distributions of the k -body Embedded Ensembles of Random Matrices for n bosons distributed over two-degenerate single-particle states. This ensemble, as a function of k , displays a transition from harmonic oscillator behavior ($k=1$) to Random Matrix type behavior ($k=n$). We show that a large and robust quasi-degeneracy is present for a wide interval of values of k when the ensemble is time-reversal invariant. These quasi-degenerate levels are Shnirelman doublets which appear due to the integrability and time-reversal invariance of the underlying classical systems. We present results related to the frequency in the spectrum of these degenerate levels in terms of k , and discuss the statistical properties of the splittings of these doublets.

Comments: 12 pages (double column), 7 figures some in color. The movies can be obtained under request with the authors

Subjects: **Chaotic Dynamics (nlin.CD)**

Cite as: **arXiv:0911.4702v1 [nlin.CD]**

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[v1] Tue, 24 Nov 2009 19:47:48 GMT (948kb)

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