Quantum Chaos of Bogoliubov Waves for a Bose-Einstein Condensate in Stadium CHUANWEI ZHANG, Department of Physics and Center for Nonlinear Dynamics, The University of Texas, Austin, Texas 78712-1081, USA, JIE LIU, Institute of Applied Physics and Computational Mathematics, P.O.Box 100088, Beijing, P. R. of China, MARK RAIZEN, Department of Physics and Center for Nonlinear Dynamics, The University of Texas, Austin, Texas 78712-1081, USA, QIAN NIU, Department of Physics, The University of Texas, Austin, Texas 78712-1081, USA — We investigate the possibility of quantum (or wave) chaos for the Bogoliubov excitations of a Bose-Einstein condensate in billiards. Because of the mean field interaction in the condensate, the Bogoliubov excitations are very different from the single particle excitations in a non-interacting system. Nevertheless, we predict that the statistical distribution of level spacings is unchanged by mapping the non-Hermitian Bogoliubov operator to a real symmetric matrix. We numerically test our prediction by using a phase shift method for calculating the excitation energies.

Chuanwei Zhang
Department of Physics and Center for Nonlinear Dynamics,
The University of Texas at Austin

Electronic form version 1.4