Classical behavior and quantization of chaotic billiards with discrete rotational symmetry

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In this work we study a family of chaotic billiards, with the main characteristic of presenting only rotational symmetries, whose geometry follows the bases of the C_3 symmetry system proposed in 1996 [1]. Classical and quantum analyses are being carried out on billiards with rotational symmetry Cn (the billiard repeats itself under rotations of $2\pi/n$), where here, n is called the symmetry parameter. From a classical point of view, preliminary results for low values and regardless of the parity of n, indicate that chaotic behavior is not affected. Furthermore, the final shapes of the billiards allow subregions to be visited more by a chaotic orbit than others. This effect is known as stickiness. Regarding the quantization of these systems, the analyzed spectra can be divided into singlet and doublet subspaces due to selected symmetries. It is observed that the superposition of spectra of different subspaces follows formulas only tested in the context of the Random Matrices Theory (RMT) [2]. It is observed that the parity and the value of n are directly linked to the number of singlet and doublet subspectra. We are currently investigating whether there is any relation between the classical behavior and changes in the energy spectra of these billiards, similarly to what we have presented before [3].

References

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