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The Symplectic Geometry of Penrose Rhombus Tilings

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Abstract

The purpose of this article is to view Penrose rhombus tilings from the perspective of symplectic geometry. We show that each thick rhombus in such a tiling can be naturally associated to a highly singular 4-dimensional compact symplectic space M_R, while each thin rhombus can be associated to another such space M_r; both spaces are invariant under the Hamiltonian action of a 2-dimensional quasitorus, and the images of the corresponding moment mappings give the rhombuses back. The spaces M_R and M_r are diffeomorphic but not symplectomorphic.