

Miniworkshop “From toric to hyperbolic”
University of Antwerp, Belgium
March 15-16, 2022

Universal local form of quaternionic slow-fast systems

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We construct an elementary quaternionic slow-fast Hamiltonian dynamical system with one formal control parameter and two slow degrees of freedom as half-integer spin in resonance 1:1:2 with two slow oscillators, and which we call "Quaternionic Dirac oscillator". Invariant under spin reversal and having a codimension-5 crossing of its fast Kramers-degenerate semi-quantum eigenvalues, our system is the dynamical equivalent of the spin-quadrupole model by *Avron, Sadun, Segert, and Simon* [*Commun. Math. Phys.* 124 (4), 595 – 627 (1989)], exhibiting non-abelian geometric phases. The equivalence is uncovered through the equality of the spectral flow between quantum superbands and Chern numbers c_2 computed by *Avron et al.*