

Abstract Submitted
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Quantum catastrophes and ergodicity in the dynamics of bosonic Josephson junctions¹ DUNCAN O'DELL, McMaster University — We study rainbow (fold) and cusp catastrophes that form in Fock space following a quench in a Bose Josephson junction [1]. In the Gross-Pitaevskii mean-field theory the rainbows are singular caustics, but in the second-quantized theory a Poisson resummation of the wave function shows that they are described by well behaved Airy functions. The structural stability of these Fock space caustics against variations in the initial conditions and Hamiltonian evolution is guaranteed by catastrophe theory. We also show that the long-time dynamics are ergodic. Our results are relevant to the question posed by Berry [2]: are there circumstances when it is necessary to second-quantize wave theory in order to avoid singularities?

[1] D.H.J. O'Dell, Phys. Rev. Lett. **109**, 150406 (2012)

[2] M.V. Berry, Nonlinearity **21**, T19 (2008)

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