Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Phase-amplitude formalism for shape resonances in single-channel scattering. Accurate computation of ultra-long tunneling lifetimes[1] I. SIMBOTIN, D. SHU, R. COTE, University of Connecticut, Storrs — We formulate a novel approach for computing phase shifts and resonance widths for the case of a potential barrier separating two classically allowed regions. Specifically, we extend the phase-amplitude framework pioneered by Milne such that it becomes possible to compute resonance widths (lifetimes) without any restriction; indeed, no matter how narrow a resonance is, we can compute its width accurately and easily. The success of our new method is ensured by two key ingredients; namely, we establish formal relationships between different solutions of the envelope equation and also for their corresponding phase functions, and we devise an optimization procedure for finding the smooth envelope inside each of the classically allowed region. We also make a connection with the Jost function formalism, which allows us to perform a strong test for the self-consistency and accuracy of our new approach.

[1]This work was partially supported by the National Science Foundation Grant No. PHY-1415560 (D.S.), and MURI Army Research Office Grant No. W911NF-14-1-0378 (I.S., R.C.).

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Date submitted: 15 Mar 2018 Electronic form version 1.4