Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Noise-induced escape of modulated systems: synchronization and scalings DMITRI RYVKINE, MARK DYKMAN, Michigan State University —
We provide a complete solution of the Kramers problem of noise-induced escape in periodically modulated systems, including the previously discussed exponent[1] and the prefactor in the escape rate W. In the presence of modulation the prefactor is no longer given by an "attempt frequency". It is a strongly nonmonotonic function of the modulation amplitude A that displays several scaling regions. This behavior is related to the onset and ultimate loss of modulation-induced synchronization of escape events with increasing A. The loss of synchronization occurs as A approaches the bifurcational value A_c where the metastable state disappears. We identify a parameter range close to A_c where the synchronization is still pronounced and W scales as $W \propto (A_c - A)^{-1}$, whereas in the region where the synchronization is lost the scaling is totally different, $W \propto (A_c - A)^{1/2}$. In addition to the period-averaged escape rate we also find the instantaneous escape rate, which is given by the current away from the metastable state. The theory resolves the existing controversies. The results are supported by simulations.

[1]M.I. Dykman, B. Golding, and D. Ryvkine, Phys. Rev. Lett. **92**, 080602 (2004)

Dmitri Ryvkine
Michigan State University

Date submitted: 22 Nov 2004 Electronic form version 1.4