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SEMICLASSICAL SPECTRAL ANALYSIS OF DISCRETE WITTEN LAPLACIANS

ABSTRACT. We consider a discrete Schrödinger operator $H_\varepsilon = -\varepsilon^2\Delta_\varepsilon + V_\varepsilon$ on $\ell^2(\varepsilon\mathbb{Z}^d)$, where V_ε is defined in terms of a general multiwell energy landscape f on $\mathbb{R}^d$. This operator can be seen as a discrete analog of the semiclassical Witten Laplacian of $\mathbb{R}^d$. Moreover it is unitarily equivalent to a type of discrete diffusion arising in the context of disordered mean field models in Statistical Mechanics, as e.g. the Curie-Weiss model.

In this talk I will present results on the bottom of the spectrum of H_ε in the semiclassical regime $\varepsilon \ll 1$, including the fine asymptotics of the tunnel effect between wells. These results require minimal regularity assumptions on f, are based on microlocalization techniques and permit to recover the Eyring-Kramers formula for the metastable tunneling time of the underlying stochastic process.