Schrödinger operators with a parameter-dependent spectral transition

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In this talk we are going to discuss several classes of Schrödinger operators with potentials that are below unbounded but their negative part is localized within narrow channels. A prototype of such a behavior can be found in the so-called Smilansky-Solomyak model devised to illustrate that an an irreversible behavior is possible even if the heat bath to which the systems is coupled has a finite number of degrees of freedom. We review its properties and analyze several modifications of this model, with regular or strongly singular potentials, or a magnetic field, as well as another system in which $x^p y^p$ potential is amended by a negative radially symmetric term. All of them have the common property that they exhibit an abrupt parameter-dependent spectral transition: if the coupling constant exceeds a critical value the spectrum changes from a below bounded, partly or fully discrete, to the continuous one covering the whole real axis. We also discuss resonance effects in such models. The results come from a common work with Diana Barseghyan, Andrii Khrabustovskyi, Jiří Lipovský, Vladimir Lotoreichik, and Miloš Tater.

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