Josephson junctions as on-chip noise detectors

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Currently, there are experimental efforts at various laboratories to measure higher order current noise cumulants of electronic nanostructures. A promising strategy employs on-chip Josephson junctions as noise detectors. The non-Gaussian nature of the noise generated by the electronic nanostructure modifies the switching rate of the Josephson junction out of the zero voltage state, and the noise cumulants are hoped to be extracted from this modification. The data analysis requires a detailed understanding of the escape rate from a metastable well in presence of non-Gaussian noise. In the classical limit, when the escape arises from thermal activation over the barrier top, the modification of the Arrhenius law caused by non-Gaussian noise can be determined from a path integral representation based on a generalized Onsager-Machlup functional [1]. In the quantum limit, when the system escapes from the metastable well by quantum tunnelling, the rate modification can be investigated by means of an extended CaldeiraâLeggett approach [2]. These methods are outlined and the associated strategies to measure the third and forth noise cumulants are discussed.