Existence of persistence exponent for Gaussian stationary functions

Abstract:

Let $Z(t)$ be a Gaussian stationary function on the real line, and fix a level $L > 0$.

We are interested in the asymptotic behavior of the persistence probability: $P(T) = P( Z(t) > L, \text{ for all } t \in [0,T] )$.

One would guess that for "nice processes", the behavior of $P(T)$ should be exponential. For non-negative correlations this may be established via sub-additivity arguments. However, so far, not a single example with sign-changing correlations was known to exhibit existence of the limit of $\{ \log P(T) \}/T$, as $T$ approaches infinity (that is, to have a true "persistence exponent").

In the talk I will present a proof of existence of the persistence exponent, for processes whose spectral measure is monotone on $[0,\infty)$ and is continuous and non-vanishing at 0. This includes, for example, the sinc-kernel process (whose covariance function is $\sin(t)/t$).

Joint work with Ohad Feldheim and Sumit Mukherjee.