The Heisenberg XXZ chain, the six-vertex model and the Lorentz mirror model with loop weight 2

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The Lorentz mirror model is a model of random loops on $\mathbb{Z}^2$: each vertex is independently assigned either has a north-west oriented mirror, a north-east oriented mirror, or no mirror. Loops bounce off mirrors if they are present and pass straight through vertices with no mirror. A longstanding open problem is to prove that there are no infinite loops almost surely.
When one re-weighs this measure by a factor $2^{\#loops}$, the same behaviour is expected, but one also has a very simple coupling to the six-vertex model. Using the recently proved delocalisation of the height function of the six-vertex model, as well as a new coupling, we prove that the probability that two points are connected by a loop decays polynomially fast.
We will also see how this can be used to prove two statements in the 1D quantum Heisenberg XXZ model: that finite-volume, finite-temperature states converge to an infinite volume ground state, and that spin-spin correlations in this ground state decay polynomially fast.