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Spectral Integrability In Twisted N = 4 Super Yang-Mills Theory

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$\mathcal{N} = 4$ Super Yang-Mills theory has been hailed as the "hydrogen atom of the 21st century", owing to it's similarity to Quantum Chromodynamics (QCD) albeit with much larger symmetry allowing for simplification of otherwise extremely difficult computations.
The model is believed to be "Integrable", meaning that it is well behaved and solveable to all orders in pertubation theory, regardless of coupling strength (a property not shared by QCD).
My thesis examines this integrability in the γ_i-twisted limit where most of the super-symmetry is broken allowing for a less obstructed look at the (hopefully) integrable structure of the theory. Remarkably, the theory can be identified with a closed Heisenberg-like spin chain, relating this problem of theoretical particle physics to a very well-studied problem in condensed matter systems!
The emergent spin chains are analyzed through the lens of Random Matrix Theory (RMT), making for a merger of high-energy theory, condensed matter physics and good old statistics!

Field of study

Quantum Physics

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