A quasi-exactly solvable spin chain with near-neighbors interactions

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May 9, 2007

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In this talk we present a new type of spin chain with position-dependent near-neighbors interactions, which is intermediate between the well-known Heisenberg chain (constant near-neighbors interactions) and the spin chains of Haldane–Shastry (HS) type (position-dependent long-range interactions). The chain has been shown to possess several remarkable properties. For instance, if the number of spins is sufficiently large the chain sites are normally distributed. More importantly, by an argument along the lines of the usual freezing trick, one can exactly determine a certain number of eigenvalues and their corresponding eigenfunctions. Remarkably, the eigenvalues thus computed are all integers, and in fact appear to be the only integer eigenvalues of the chain. This fact suggests that this chain can be regarded as a finite-dimensional analog of the class of quasi-exactly solvable Schrödinger operators. Finally, using the so-called method of moments we have shown that the density of eigenvalues follows a Wigner-like law. A comparison of the previous properties with the corresponding ones for the Heisenberg and the HS chains has been also performed.

References

[1] A. Enciso, F. Finkel, A. González-López and M.A. Rodríguez, arXiv:0704.3046v1 [hep-th].