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Superconformal field theory and supersymmetric sine-Gordon model with Dirichlet boundary conditions

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The supersymmetric sine-Gordon model is known as a perturbation from the N=1 c=3/2 superconformal field theory. The connection between these two theories has been studied by taking the ultraviolet limit of the supersymmetric sine-Gordon model. The N=1 superconformal field theory is the theory of a free Majorana fermion and a free boson, whose Hilbert space therefore consists of a tensor product of the fermionic part and the bosonic part.
There exist three independent sectors in the fermionic part, each of which is obtained as a descendant of three different primary fields characterized by different conformal weights h=1, 1/2, and 1/16. The sectors of h=1 and h=1/2 can be combined into one superconformal sector named the Neveu-Schwarz sector. The h=1/16 sector is called the Ramond sector. The supersymmetric sine-Gordon model is also obtained from a scaling limit of the spin-1 XXZ model with alternating inhomogeneity. Although it has been pointed out that only the h=1 Neveu-Schwarz sector of the supersymmetric sine-Gordon model can be realized from the spin chain under the periodic boundary condition, we found that imposing the Dirichlet boundary conditions on both ends and computing the conformal dimension through the ultraviolet limit let us obtain the other sectors with the proper choice of boundary parameters. In the context of the corresponding spin chain, the phase transition between the Neveu-Schwarz sector and the Ramond sector is obtained in a plot of magnetic fields with respect to a boundary parameter as the separation into two sectors with different periodicity.

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