The critical Ising model on a torus with a defect line

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Abstract:

The Ising model in two dimensions with the peculiar toroidal boundary conditions is analysed. This boundary condition, which we call the duality twisted boundary conditions, may be interpreted as inserting specific defect line ("seam") in the system, along non contractible circles of the cylinder, before closing it into a torus. We derive [1] exact expressions for the eigenvalues of the transfer matrix for the critical ferromagnetic Ising model on the M x N square lattice wrap on torus with specific defect line ("seam"). As result we have obtain analytically the partition function for the Ising model with such boundary condition. In the limit $N\to\infty$ we obtain the asymptotic expansion of the free energy and the inverse correlation lengths for infinitely long cylinder of circumference M with duality twisted boundary conditions.

[1] A. Poghosyan, R. Kenna and N. Izmailian, EPL111 (2015) 60010