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# Tensor renormalization group of two-dimensional U(1) lattice gauge theory with a θ term

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We make an analysis of the two-dimensional U(1) lattice gauge theory with a θ term by using the tensor renormalization group.
Our numerical result for the free energy shows good consistency with the exact one at finite coupling constant. The topological charge density generates a finite gap at θ=π toward the thermodynamic limit.
In addition finite size scaling analysis of the topological susceptibility up to V=1024×1024 allows us to determine the phase transition at θ=π is the first order.

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