

Free energy and defect C-theorem in free theory

Tuesday, 23 November 2021 16:15 (15 minutes)

We describe conformal defects of p dimensions in a free theory on a d -dimensional flat space as boundary conditions on the conformally flat space $\mathbb{H}^{p+1} \times \mathbb{S}^{d-p-1}$. We classify two types of boundary conditions, Dirichlet type and Neumann type, on the boundary of the subspace \mathbb{H}^{p+1} which correspond to the types of conformal defects in the free theory. We find Dirichlet boundary conditions always exist while Neumann boundary conditions are allowed only for defects of lower codimensions. Our results match with a recent classification of the non-monodromy defects, showing Neumann boundary conditions are associated with non-trivial defects. We check this observation by calculating the difference of the free energies on $\mathbb{H}^{p+1} \times \mathbb{S}^{d-p-1}$ between Dirichlet and Neumann boundary conditions. We also examine the defect RG flows from Neumann to Dirichlet boundary conditions and provide more support for a conjectured C-theorem in defect CFTs.

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Session Classification: Short talks