

## Discontinuities of free theories on AdS<sub>2</sub>

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The zoom link will be sent separately.



The partition functions of free bosons as well as fermions on AdS<sub>2</sub> are not smooth as a function of their masses. For free bosons, the partition function on AdS<sub>2</sub> is not smooth when the mass saturates the Breitenlohner-Freedman bound. We show that the expectation value of the scalar bilinear on AdS<sub>2</sub> exhibits a kink at the BF bound and the change in slope of the expectation value with respect to the mass is proportional to the inverse radius of AdS<sub>2</sub>. For free fermions, when the mass vanishes the partition function exhibits a kink. We show that expectation value of the fermion bilinear is discontinuous and the jump in the expectation value is proportional to the inverse radius of AdS<sub>2</sub>. We then show the supersymmetric actions of the chiral multiplet on AdS<sub>2</sub> × S<sub>1</sub> and the hypermultiplet on AdS<sub>2</sub> × S<sub>2</sub> demonstrate these features. The supersymmetric backgrounds are such that as the ratio of the radius of AdS<sub>2</sub> to S<sub>1</sub> or S<sub>2</sub> is dialled, the partition functions as well as expectation of bilinears are not smooth for each Kaluza-Klein mode on S<sub>1</sub> or S<sub>2</sub>. Our observation is relevant for evaluating one-loop partition function in the near horizon geometry of extremal black holes.