



Contribution ID: 101

Type: not specified

The F-theorem in the melonic limit

Monday, 25 July 2022 17:20 (1h 15m)

The F-theorem states that in three dimensions the sphere free energy of a field theory must decrease between ultraviolet and infrared fixed points of the renormalization group flow, and it has been proven for unitary conformal field theories (CFTs). We consider here the long-range bosonic $O(N)^3$ model on a spherical background, at next-to-next-to-leading order of the $1/N$ expansion. The model displays four large- N fixed points and we test and confirm the F-theorem holds in this case. This is non-trivial as one of the couplings is imaginary, and therefore the model is non-unitary at finite N . Despite this, several tests indicating that the large- N CFTs are in fact unitary have been performed: for instance all the OPE coefficients computed so far in the large- N limit are real, and the spectrum of bilinear operators is real and above unitarity bounds. Our result, namely that the F theorem holds at large N , can be viewed as further indication that such theories are unitary. As an added bonus, we show how conformal partial waves expansions in conformal field theory can be used to resum infinite classes of vacuum diagrams. Non-perturbatively, the jump in the value of the free energy has the interpretation of the inclusion at the ultraviolet fixed point of an extra non-normalizable contribution in the conformal partial wave expansion. This can be seen in perturbation theory as the reversal of the sign of an infinite class of diagrams due to the flow of a coupling constant.

Presenter: LETTERA, Davide

Session Classification: Poster