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Borel resummation and perturbative series in supersymmetric gauge theories

Friday, 21 July 2017 10:00 (1 hour)

Perturbative series in quantum field theory is typically divergent.

There is a standard way to resum divergent series called Borel resummation. While perturbative series in typical field theory is expected to be non-Borel summable, it is natural to ask when perturbative series is Borel summable and if it is non-Borel summable, what is a correct way to resum the perturbative series. In my talk I will first discuss that we can show Borel summability of perturbative series in 4d N=2 and 5d N=1 supersymmetric gauge theories with Lagrangians for various observables. It turns out that exact results in these theories can be obtained by summing over the Borel resummations with every instanton number. I also discuss perturbative series in general 3d N=2 supersymmetric Chern-Simons matter theory, which is given by a power series expansion of inverse Chern-Simons levels. We prove that the perturbative series are always Borel summable along imaginary axis. It turns out that the Borel resummations along this direction are the same as exact results. I will also give physical interpretations of singularities in Borel plane for this class of theories. [PRL116,no.21,211601(2016), PRD94, no.2, 025039 (2016) and upcoming paper(s)]

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