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Constraints on the spectrum of W algebras

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A conformal field theory is a quantum field theory whose symmetries are extended from the Lorentz group to the conformal group, thus putting more constraints on the theory than what we normally have in regular quantum field theory. In 2 dimensions, the conformal symmetries are infinite dimensional so it is easier to characterize the properties of 2d CFTs than it is in higher dimensions. Extensions of these symmetry algebras that include higher spin generators in addition to the energy-momentum tensor have been built a long time ago and they have found applications in string theory, statistical mechanics and holography. In this talk I will discuss a way of constraining the spectrum of operators in unitary representations of these so called W algebras. In particular, I will study the $W(2,4)$ algebra, which has an extra spin 4 generator, and I will search for representations with negative norm states. This will give various new constraints on the scaling dimensions and charges of the states in the theory. This kind of results can be translated to higher spin theories of gravity using the AdS/CFT correspondence and give new insights on the allowed theories.

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