

Abstract Submitted
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Positive Energy Conditions in 4D Conformal Field Theory

VALENTINA PRILEPINA, MARKUS LUTY, KARA FARNSWORTH, University of California, Davis — I will discuss a local energy condition, the spacetime averaged weak energy condition (SAWEC), in the context of conformal field theory (CFT). This condition is a bound on the energy density with spacetime averaging over a region of length scale L , $\langle T^{00} \rangle \geq -C/L^4$, where C is a positive theory-dependent constant. We motivate this condition as a fundamental consistency requirement for any $4D$ quantum field theory. We argue that violation of this statement would have serious undesirable consequences for a theory. In particular, the theory would contain states indistinguishable from states of negative total energy by any local measurement, which would lead to unphysical instabilities. We apply the condition to $4D$ and $3D$ CFTs and derive bounds on the OPE coefficients of these theories. Interestingly, these conditions imply the positivity of the 2-point function of the energy-momentum tensor. Our $4D$ bounds are weaker than the “conformal collider” constraints of Hofman and Maldacena, which were recently rigorously established. All calculations have been carried out in momentum-space using Wightman correlation functions. These methods may also be interesting on their own.

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