

Abstract Submitted
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The GSL implies the ANEC on Null Lines¹ ARON WALL, University of Maryland — A null line is a lightlike geodesic which is complete (i.e. infinite in both directions) and achronal (i.e. it goes from point to point faster than any timelike curve). I describe work showing that the averaged null energy condition (ANEC) holds on null lines as a consequence of the generalized second law (GSL) of thermodynamics in semiclassical gravity, given certain auxiliary assumptions. This is done by thinking of the null geodesic itself as being an “observer” lying on its own past and future horizons. If the future horizon obeys the GSL and the past horizon obeys the time-reverse of the GSL, then the ANEC must hold on the null line. In curved spacetimes, the ANEC can be violated on general geodesics. But even if the ANEC only holds on null lines, theorems by Sorkin, Penrose and Woolgar, and by Graham and Olum imply that semiclassical gravity should satisfy positivity of energy, topological censorship, and should not admit closed timelike curves. These results can thus be seen as consequences of the GSL. However, these theorems break down when gravitational fluctuations are taken into account. I will suggest a generalization of the ANEC for use in this case.

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