

Abstract Submitted  
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**Exact example of backreaction of small scale inhomogeneities in cosmology** STEPHEN GREEN, University of Guelph, ROBERT WALD, University of Chicago — We construct a one-parameter family of polarized vacuum Gowdy spacetimes on a torus. In the limit as the parameter  $N$  goes to infinity, the metric uniformly approaches a smooth “background metric.” However, spacetime derivatives of the metric do not approach a limit. As a result, we find that the background metric itself is not a solution of the vacuum Einstein equation. Rather, it is a solution of the Einstein equation with an “effective stress-energy tensor,” which is traceless and satisfies the weak energy condition. This is an explicit example of backreaction due to small scale inhomogeneities. We comment on the non-vacuum case, where we have proven in previous work that, provided the matter stress-energy tensor satisfies the weak energy condition, no additional backreaction is possible.

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