

It is known in the physics literature that "high-frequency weak limits" of solutions to the Einstein vacuum equations are not necessarily vacuum solutions, but may have a non-trivial stress-energy-momentum tensor, which can be viewed physically as "effective matter fields" arising from back-reaction of high frequency gravitational waves. Burnett conjectured that these limits are isometric to solutions to the Einstein-massless Vlasov system, and moreover suggested all solutions to the Einstein-massless Vlasov system arise as such limits. We will discuss some results about these questions assuming that the solutions admit a polarized $U(1)$ symmetry. This is a joint work with Cecile Huneau.