In this work, we study the backreaction of high-frequency gravitational waves on cosmological backgrounds. To describe the wave, we use the Isaacson formalism, specifically the WKB approximation, which allows us to express the backreaction through an effective stress-energy tensor of the gravitational wave.

First, we consider the inhomogeneous cosmological model of Charach and Malin, which contains gravitational waves and a massless scalar field minimally coupled to gravity. We show that although this is a spatially compactified solution, it is possible to add a high-frequency perturbation and solve Einstein's equations with the effective stress-energy tensor in a consistent way. The bacreaction is of the same order as the influence of the scalar field.

Second, we add multiple incoherent high-frequency waves to the homogeneous Kasner background, and discuss the relation to the late-time limit of the Gowdy (vacuum Charach and Malin) model.