

## Probing dark universe with gravitational Landau damping. Part II: numerics and extension to the beam-plasma system

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We present a numerical method able to treat the case of large thermal velocity of the background distribution in the integration of the plasma dielectric function previously introduced. We exploit this technique to give quantitative estimates of the expected damping for sub-horizon modes interacting with the cosmological dark matter medium in the early Universe. Then, we extend our analysis by considering the case of a gravitational beam-plasma system. We demonstrate the possibility of inverse Landau damping, in which the energy is conveyed from the medium to the wave, resulting in an amplitude growth for the latter.

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