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Plasmon damping in a charged Bose-Einstein condensate model

Content

In this work we consider the calculation of the imaginary part of the dispersion relations of the prop- agating modes in a model of a charged scalar Bose-Einstein (BE) condensate, as well as the contribution to the imaginary part of the longitudinal component of the photon polarization tensor and the dielectric constant. In that model, two modes correspond to the transverse photon polarizations, while the other two modes are combinations of the longitudinal photon and the massive scalar field, which we denote as the ($\pm$) modes. The dispersion relations of the transverse modes have the usual form for transverse photons in a plasma, and we do not consider here any further. In a previous work we determined the real part of the dispersion relations of the ($\pm$) modes, as well as the real part of the longitudinal component of of polarization tensor and dielectric constant, which have some unique features. In the appropriate limit, those results reproduce the results obtained for the dielectric constant and dispersion relation in non-relativistic models of the BE condensation of charged scalars. Here we determine, in the same model, their imaginary part. The results can be useful in physical contexts involving the electrodynamics of a charged scalar BE condensate, and can serve as benchmark results for further exploration.

Summary

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