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Collective Excitations in Graphene in a Strong Magnetic Field
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Graphene, a two-dimensional form of carbon, has become famous for its wide range of unusual properties, both fundamental and applicable. Both theory and experiment indicate the relevance of many body interactions to the magneto-optical response of graphene. Neutral collective excitations of pristine graphene in a strong perpendicular magnetic field have already been studied theoretically. In this work, we consider graphene with a low impurity density and determine the neutral magnetoplasmons, which become localised on an impurity. Two impurity types are considered: a screened Coulomb impurity and a δ-function scatterer due, e.g., to a neutral foreign atom on one of the lattice sites. We assume Zeeman and valley splitting of Landau levels (LLs) n=0 and $n = \pm 1$, so that these LLs have four sublevels; we consider various integer fillings of the zeroth LL. For both impurity types, we predict the existence of optically active bound states above and below the magnetoplasmon continuum for high enough impurity strengths [1]. Our results indicate that polarisation-resolved magneto- optical spectroscopy can be an effective tool for discriminating between different types of impurities in graphene. [1] A. M. Fischer, A. B. Dzyubenko, and R. A. Rö mer, PRB **80**, 165410 (2009)

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