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Quasiparticles for quantum dot array in graphene and the associated Magnetoplasmons GODFREY GUMBS, Hunter College of CUNY, OLEG BERMAN, New York City College of Technology of CUNY, PEDRO ECHENIQUE, Donostia International Physics Center (DIPC) — We calculate the low-frequency magnetoplasmon excitation spectrum for a square array of quantum dots on a two-dimensional (2D) graphene layer. The confining potential is linear in the displacement from the center of the quantum dot. Consequently, the corresponding Klein-Gordon equation may be solved analytically for the single-particle eigenstates since they are given by a simple harmonic oscillator operator. The electron eigenstates in a magnetic field and confining potential are mapped onto a 2D plane of electron-hole pairs in an effective magnetic field without any confinement. The tight-binding model for the array of quantum dots leads to a wavefunction with inter-dot mixing of the quantum numbers associated with an isolated quantum dot. It is verified that our tight-binding wave function obeys the Bloch-Peierls condition in the Landau gauge, For chosen confinement, magnetic field, wave vector and frequency, we plot the dispersion equation as a function of the period d of the lattice. We obtain those values of d which yield collective plasma excitations. For the allowed transitions between the valence and conduction bands in our calculations, we obtain plasmons when $d < 100\mathring{A}$.

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