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Excahnge and correlation energy of electrons dressed with circularly-polarized light in graphene and three-dimensional topological insulators ANDRII IUROV, Hunter College and Graduate Center, CUNY, GODFREY GUMBS, Hunter College, CUNY — We have formulated a theory for investigating the conditions which are required to achieve entangled states of electrons on graphene and three-dimensional (3D) topological insulators. We consider the quantum entanglement of spins by calculating the exchange energy. A gap is opened up at the Fermi level between the valence and conduction bands at zero doping when graphene as well as 3D topological insulators are irradiated with circularly-polarized light. This energy band gap is dependent on the intensity and frequency of the applied electromagnetic field. The electron-photon coupling also gives rise to a unique energy dispersion of the dressed states which is different from either graphene or the conventional two-dimensional electron gas (2DEG). In our calculations, we obtain the dynamical polarization function for imaginary frequencies. The polarization function is determined by both the energy dispersion and the overlap of pseudo-spin wave functions. The correlation energy is calculated in the random phase approximation (RPA). The application of the derived results to quantum computation will be discussed.

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