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Splitting of critical energies in the $n=0$ Landau level of graphene driven by a random hopping disorder ANA L. C. PEREIRA, State University of Campinas (UNICAMP) — The lifting of the degeneracies of the states from the graphene $n=0$ Landau level (LL) was recently observed experimentally and is discussed in many theoretical works, with various different proposed explanations for the origins of the observed splittings. In this work, valley/sublattice symmetry breaking is investigated through a non-interacting tight-binding model with a random hopping disorder. A disorder-driven splitting of two bands and of two critical energies is observed by means of density of states and participation ratio calculations, elucidating the interplay of lattice and disorder effects on the splitting process. The analysis of the probability densities of the states within the $n=0$ LL shows that there is a region, for the states closer to $E=0$, where there is an important asymmetry in the distribution of the wave function amplitudes between the two sublattices (where there is no matching of the spatial positions of the amplitudes over both sublattices). Furthermore, it is shown that as the splitting is increased, the two split levels also get increasingly broadened, in such a way that the proportion of the overlapped states keeps approximately constant for a wide range of disorder or magnetic field variation.

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