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Expectations for photo-excitation-induced oscillatory magnetoresistance in graphene[1] RAMESH MANI, Georgia State University — Microwave/mm-wave/terahertz photoexcitation of high quality quasi-2D electron systems based on GaAs/AlGaAs heterostructures results in large amplitude "1/4 cycle shifted" magnetoresistance oscillations.[1] Most remarkably, at the lowest temperatures under modest photo-excitation, the deepest resistance minima saturate into zero-resistance states in the vicinity of $4/[(4j+1)B_f]$ with j =1,2,3,... of the characteristic field $B_f = 2\pi$ f m*/e, where f is the electromagnetic-wave frequency, m* is the effective mass ratio, and e is the electronic charge.[1] Analogous photo-excited magnetoresistance studies of atomic layer 2D systems such as monolayer and bilayer graphene could potentially unveil new science and applications. However, the theoretical device response for these materials is not known and such phenomena have not been observed thus far in the graphene system. Thus, we examine here the possible response of monolayer and AB-bilayer graphene arising from the (a) linear and quadratic dispersion laws at the K(K′) symmetry points, respectively, and (b) dissimilar magnetic Landau level dispersions in a quantizing magnetic field B >0. [1] R. G. Mani et al., Nature 420, 646 (2002).

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