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Theory of optical responses in the bilayer and trilayer graphene in the quantum Hall regime TAKAHIRO MORIMOTO, Riken, MIKITO KOSHINO, Tohoku University, HIDEO AOKI, University of Tokyo — In the graphene physics, there are growing interests toward bilayer and trilayer graphene, whose electronic structures are distinct from that of monolayer graphene. It is then interesting to ask how the variety of low-lying electronic structures will affect optical responses, i.e., optical longitudinal and optical Hall conductivities, where the former describes the absorption while the latter the Faraday and Kerr rotations. Thus we study the optical conductivities in bilayer and trilayer graphene systems. We shall show for bilayer graphene that the Lifshitz transition associated with the trigonal warping greatly affects the resonance structures in Faraday rotation not only on low-energy scale where Dirac cones emerges but also in the higher-energy range with parabolic bands as a sequence of satellite resonances. For trilayer graphene, on the other hand, we shall show that the optical conductivities are dominated by the difference in the stacking order. In ABA trilayer, the resonance spectrum is a superposition of effective monolayer and bilayer contributions with band gaps, while ABC trilayer exhibits a distinct spectrum peculiar to the cubic-dispersed bands. In the latter, the trigonal warping effect becomes strong with a larger Lifshitz transition energy ($\sim$10 meV).

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