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Optical Hall conductivity for the graphene QHE in the honeycomb lattice model TAKAHIRO MORIMOTO, University of Tokyo, YASUHIRO HATSUGAI, University of Tsukuba, HIDEO AOKI, University of Tokyo — We have previously revealed from a numerical study that the Hall plateaus are retained in the optical Hall conductivity $\sigma_{xy}(\omega)$ in the ac ($\sim$ THz) regime in both of the ordinary two-dimensional electron gas and the massless Dirac model in the quantum Hall regime, although the plateau height in ac deviates from the quantized values. The effect remains unexpectedly robust against a significant strength of disorder, which we attribute to an effect of localization [1]. Here we extend the calculation to graphene, for which we should go back to the honeycomb tight-binding model rather than the Dirac model. We have found that, when the disorder is chiral-symmetric as in bond disorder and random magnetic flux which should represent the effect of ripples, the step structure in the optical Hall conductivity is anomalously sharp for the N=0 Landau level. We expect the structure to be observable in clean, suspended graphene samples through the Faraday rotation of the order of the fine-structure constant α.

[1] T. Morimoto et al., PRL **103**, 116803 (2009).

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