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Electron localization in gapped bilayer graphenes with disorder MIKITO KOSHINO, Columbia University, Tokyo Institute of Technology — The bilayer graphene is a zero-gap semiconductor, and it is known that the width of energy gap can be controlled by the electric field perpendicular to the layer [1,2]. Even in zero magnetic field, the electronic states carry the non-zero Hall conductivity in presence of the gap, while the Hall currents cancel out in summation over two valleys (K and K' points). Here we numerically calculate the electronic states in gapped bilayer graphenes with the smooth disorder potential, and estimate the localization length as a function of the gap width Δ. We find that the conductivity at zero Fermi energy does not simply goes down as Δ increases, but has a maximum at a certain finite Δ, and the localization length diverges there. We show that this can be interpreted as a "Hall plateau transition" in each decoupled valley, even though the total Hall conductivity remains zero. [1] E. McCann Phys. Rev. B 74, 161403(R) (2006) [2] Eduardo V. Castro, et al, Phys. Rev. Lett. 99, 216802 (2007)

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