Control of the Edge-State in Quantum Spin Hall System with a Transverse Electric Field and Edge-Functionalization.[1] HYEONJIN DOH, HYOUNG JOON CHOI, Yonsei University — The Kane-Mele model is one of the typical model for the quantum spin Hall system. The edge state of the Kane-Mele model has a finite width depending on the energy, the momentum, and the various parameters including spin-orbit coupling and sub-lattice potential. Here, we systematically study the effect of the in-plane transverse electric field to the edge and the edge-functionalization on the edge-state width in the Kane-Mele model. We calculate the edge-state width for the semi-infinite honeycomb lattice with a zigzag- and an armchair-edge. Our results show the edge-state width is increased by the edge-functionalization and by the transverse electric field regardless of its direction. We discuss the control of the edge-state gap with the relation between the sample size and the edge-state width by comparing with the results of the honeycomb nano-ribbon results.

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