# Spin Orbit Interaction in III-V Semiconductor 2DEG and Layered Semiconductor GaSe

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Electron spins have been hailed as a novel degree of freedom in semiconductors as well as quantum materials such as atomic layer materials and topological insulators because utilization of both the electrons' charge and spin in two dimensional system and edge states expects the realization of fast- and low-power devices in atomic scales. In order to control spin states in these material systems, spin orbit interaction (SOI) plays an important role. Since the SOI acts as an effective magnetic field for moving electrons, it enables us to realize various spin functionalities without using external magnetic fields and magnetic materials. In III-V semicondcutor quantum wells, since the induced effective magnetic fields are inplane and controlled by the external gate, we have demonstrated spin generation [1], spin manipulation [2] and long spin transport [3-5] by electrical control of SOIs. I will also present the quantum interference effect in layered semiconductor GaSe. Since the GaSe exhibits unique characteristics such as a direct band gap and perpendicular effective magnetic field to the surface, the gate control of SOI in GaSe would be a key for future quantum material devices.

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