Shubnikov-de Haas oscillation of KTaO₃ based electron gases
LUDI MIAO, RENZHONG DU, QI LI, The Pennsylvania State University, QI LI’S LAB TEAM — Two-dimensional electron gases (2DEGs) at transition metal oxide (TMO) surfaces and interfaces have attracted much attention due to their exotic properties such as superconductivity, and ferromagnetism. Recently, 5d TMOs are hotly investigated due to their strong spin-orbit coupling (SOC), an indispensable element for topological insulating states. Among them, KTaO₃ not only hosts 2DEGs but also involves strong SOC. We have created KTaO₃ based electron gases, with low temperature mobility as large as 8000cm²V⁻¹s⁻¹. Shubnikov de Haas oscillations in magnetoresistance have been observed at 1.8 K for field applied along various directions. Contributions from $d_{xy}$ and $d_{xz/yz}$ bands are both seen. These oscillation curves exhibit a field direction dependence with 4-fold symmetry, revealing the cubic symmetry of Fermi surface of KTaO₃ based electron gases. Moreover, the intercept of oscillation indices is close to 0.5, a typical value for systems that involve strong SOC. Our results provide unique insights into the electronic structures of KTaO₃ based electron gases via magnetotransport measurements.