Abstract Template

Integer and fractional quantum anomalous Hall effects in 2D semiconductor moiré superlattices

(Oral)

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The interplay between strong correlations and topology can lead to the emergence of intriguing quantum states of matter. Two-dimensional (2D) semiconducting transition metal dichalcogenide (TMDc) moiré superlattices have emerged as a highly tunable platform for exploring correlated and topological quantum phases of matter. We have successfully achieved highly tunable topological flat bands in both TMDc heterobilayer and TMDc homobilayer moiré superlattices. Specifically, we have observed the integer quantum anomalous Hall (IQAH) effect in AB-stacked $WSe_2/MoTe_2$. Furthermore, both the IQAH effect and the long-sought fractional quantum anomalous Hall (FQAH) effect have been realized in twisted bilayer $MoTe_2$. The band topology of TMDc moiré superlattices is highly tunable by external electric field and magnetic field, which enable us to realize novel topological quantum phase transitions. Our studies pave the way for further investigations of fractionally charged excitations and anyonic statistics at zero magnetic field based on 2D semiconductor moiré superlattices.