Abstract Submitted
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Landau level spectroscopy of incompressible quantum hall states in BN/bilayer graphene/NbSe2 heterostructures DMITRI EFETOV, CLEVIN HANDSCHIN, LEI WANG, Columbia University, CORY DEAN, CCNY, JAMES HONE, PHILIP KIM, Columbia University — Inducing Superconductivity (SC) via proximity effect into the topological edge states of a 2-dimensional (2D) conductor in the Quantum Hall Regime (QHE) has been a long standing proposition which has recently reinvigorated attention. Such devices would allow to study the proximity effect in the ballistic 2D limit, where predictions go as far as specular Andreev Reflections and formation of Andreev Edge States in strong magnetic fields. Here we present a new route of fabrication of such devices made entirely out of cleanly stacked layered van der Waals materials BN/Graphene/$NbSe_2$. Electric contact between $NbSe_2$ and high mobility BN/graphene channels allows us to perform the Andreev reflection spectroscopy in the fully developed Quantum Hall states. We find that the NbSe2/graphene superconductor-normal metal interface (SN) has a very high transparency with extremely low electrical resistances of R$\sim$100Ohm and gives rise to Andreev reflections in graphene below the critical superconducting transition temperature. The high mobility of the graphene on h-BN and the relatively high upper critical magnetic field of NbSe2 provide a wide magnetic field range where the SC and the QHE coexist. We observe a clear enhancement of the Andreev Reflection probability when Cooper Pairs are injected into the incompressible Quantum Hall states.

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