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Andreev reflection at a graphene-high-temperature superconductor interface in the quantum Hall regime. DA WANG, EVAN TELFORD, AVISHAI BENYAMINI, JAMES HONE, CORY DEAN, ABHAY PASUPATHY, Columbia Univ — At metal-superconductor interfaces Andreev processes occur where an electron tunneling into the superconductor carries with it a second electron, effectively reflecting a hole with opposite momentum back into the metal. This is due to the superconducting gap, which, at low energies, only allows the formation of cooper pairs inside the superconductor, representing an accessible way to measure Cooper-pair tunneling phenomena. An important requirement for strong Andreev processes is a clean interface with a high transmission probability. Graphene is a promising candidate for achieving an extremely clean interface to superconductors, however recent results show achieving a transparent interface is non-trivial. In the quantum hall regime, chiral edge states open new possibilities to measure novel Andreev processes. In this work, we use controlled assembly in a well-controlled inert atmosphere to create high-quality interfaces between monolayer and bilayer graphene and high-temperature superconductors. Due to the high critical field of these superconductors, we are able to reach the quantum hall state in the graphene layer while preserving superconductivity, and we describe the resultant Andreev processes observed at such interface.

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