Chiral supercurrent in quantum Hall Josephson junctions

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Hybridizing superconductivity with the quantum Hall effects has major potential for designing novel circuits capable of inducing and manipulating non-Abelian states. In this talk I will present our recent results on quantum Hall Josephson junctions based on graphene nanoribbons. I will show that with suitably designed junctions, a robust supercurrent can develop on the quantum Hall plateau of normal state resistance $h/2e^2$ and withstand up to 8 teslas. The particular feature of those junctions is a chiral supercurrent with an unusual $2\Phi_0=h/e$ flux periodicity, indicating that the Andreev bound states propagate in a chiral fashion via the quantum Hall edge channels and form a loop along the sample periphery. The key parameters that limit the supercurrent in the quantum Hall regime and their consequences for more exotic quantum Hall states will also be discussed.