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Unearthing the hidden link between composite fermions and the exciton condensate in quantum Hall bilayers[1] INTI SODEMANN, ITAMAR KIMCHI, Massachusetts Institute of Technology, CHONG WANG, Harvard University, T. SENTHIL, Massachusetts Institute of Technology — Particle-vortex dualities have been a powerful conceptual device to understand fractionalized phases of matter over the years. Very recently, a remarkable incarnation of particle-vortex duality has been applied to the compressible state observed in half-filled Landau levels. The basic idea is that the celebrated composite fermion is a vortex-like object with Dirac nature. Superconductors of these composite fermion vortices are found to correspond to insulators of physical electrons. We have constructed an extension of these ideas to quantum Hall bilayers. We will demonstrate that the experimentally realized exciton condensate at filling factor 1/2+1/2 in Gallium Arsenide bilayers has an equivalent dual description as a superconductor of composite fermions paired in a specific particle-hole invariant interlayer channel. We will discuss how various characteristic phenomena of the exciton condensate, such as its superfluidity for layer charge imbalance and its fractionally charged vortices, find a natural dual description in the composite fermion perspective.

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