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Magnetic field-tuned superconductor-insulator transition in quenched-condensed ultrathin Be films[1] ZUXIN YE, WENHAO WU, Texas A & M University — We quenched condensed ultrathin Be films onto glass slides inside a dilution refrigerator with the substrates held near 10 K. The films were first tuned from insulating to superconducting by increasing the thickness in fine steps. The thickness-tuned transition occurs at a normal state sheet resistance $R_N \sim$ 13 k-Ohm measured at 10 K. For superconducting films of various thickness, the field-tuned superconductor-insulator transition was then investigated. Remarkably, the critical resistance of the field-tuned transition was found to be $R_C = h/4e^2$, independent of the thickness for films of R_N ranging from 11 to 6 k-Ohm, critical temperature T_C ranging from 1.3 to 5.2 K, and critical field B_C ranging from 1 to 8 T. This result is a strong evidence for a duality quantum phase transition from a vortex glass in the superconducting state to a Bose glass in the field-induced insulating state. For thicker films with $R_N < 5$ k-Ohm, the critical resistance no longer remained at $h/4e^2$ but was nearly equal to R_N. This observation suggested that these thick films were no longer in the vicinity of the quantum critical point.

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