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Metallic ground state in an ion-gated two-dimensional superconductor YOSHIHIRO IWASA, Quantum-Phase Electronics Center (QPEC) and Department of Applied Physics, The University of Tokyo, Japan, YU SAITO, QPEC and Department of Applied Physics, The University of Tokyo, Japan, YUICHI KASAHARA, Department of Physics, Kyoto University, Japan, JIANTING YE, Zernike Institute for Advanced Materials, University of Groningen, The Netherlands, TSUTOMU NOJIMA, Institute for Materials Research, Tohoku University, Japan — Ever since a discovery of insulator-superconductor transition in metallic thin films, the ground state of clean two-dimensional (2D) superconductors has been a long standing fundamental question. Recently emerging electric double layer transistors enabled researchers to realize electric-field-induced superconductivity in various substances, which provides us with new opportunities to investigate the ground state of 2D superconductivity. In this presentation, we report that the majority of the field-temperature phase diagram of electric-field-induced superconductivity in ZrNCl including T = 0 K is occupied by a metallic state with finite resistance due to the quantum tunneling of isolated vortices and flux flow caused by extreme two-dimensionality and weak pinning potential. These results imply that electric-field-induced superconductivity can be an ideal platform for accessing quantum vortex states in clean 2D superconductors.

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