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Microwave conductance of ferroelectric domain walls in lead titanate ALEXANDER TSELEV, YE CAO, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN 37831, PU YU, Department of Physics and Collaborative Innovation Center for Quantum Matter, Tsinghua University, Beijing 100084, China, SERGEI V. KALININ, PETRO MAKSYMOVYCH, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN 37831 — Numerous theoretical works predicted electronically conducting domain walls in otherwise insulating ferroelectric crystals. A number of recent experiments reported conducting walls, although conductivity itself and a conclusive proof of conductance mechanism remain elusive, largely due to the electrical contact problem. The latter can be overcome using high-frequency AC voltage. Here we will present our successful measurements of microwave conductance at 180^{o} domain walls in lead titanate using microwave microscopy. AC conducting domain walls can be repeatably reconfigured and have extraordinary stability in time and temperature. AC conductivity is detected even when DC is not. Quantitative modeling reveals that the conductance of domain walls is comparable to doped silicon. We will also present a new and robust mechanism to create charged domain walls in any ferroelectric lattice. Overall, this sets the stage for a new generation of local experiments on conducting domain walls, and furthers the prospects of their application in fast electronic devices. AT, YC, SVK, PM supported by Division of Materials Sciences and Engineering, Office of Science, Basic Energy Sciences, U. S. DOE. PY supported by the National Basic Research Program of China (2015CB921700).

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