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Measuring and Modeling the Conductivity of Highly Insulating Materials DAVID KING, BRIAN WOOD, JR DENNISON, Utah State University, UTAH STATE UNIVERSITY MATERIALS PHYSICS GROUP TEAM — Higher resolution conductivity measurements of very high resistivity polymeric highly disordered insulating materials (HDIM) have been made. Recent modifications of the Constant Voltage Conductivity (CVC) chamber of the Utah State University Materials Physics Group reduce power supply noise and increase the resolution by one to two orders of magnitude, allowing measurements to $<10^{-22}$ $(\Omega\text{-cm})^{-1}$. A multi-process, physics-based model of the time dependent conductivity is presented to model the conductivity of HDIM. The conductivity of low density polyethylene (LDPE), polyimide (PI), and radiated PI were measured and fit with this model to test its viability, to test the underlying theory of charge transport within HDIM, and to extract properties of the microscopic spatial and energy distribution of trap states inherent in that theory. The conductivity data were also analyzed to investigate subtle variations and trends in the conductivity that were previously not observable due instrumentation limits, including temperature and radiation effects.

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