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Electronic Phase Exhibits Attraction Between Like Net Charges

THOMAS MANZ, New Mexico State Univ — A new electronic phase transition was observed in thin plastic films metallized with gold, optionally with an additional layer of aluminum metallization. This phase transition occurred only when the dielectric layers of two metallized films faced each other. When charged to high voltage magnitudes and then grounded, an electronic phase transition occurred during the discharge step that led to a strong attraction between the paired metallized films, even though the films carried like net charges. The resulting electronic phase (and its attractive force) persisted for several days with no apparent decay at ambient temperatures (c. 25 C). After rotating the films along an axis not parallel to the films, the magnetic field due to rotational motion of the charge carriers relative to the thin films persisted for seconds before dissipation. This demonstrates free current lifetimes lasting seconds. Computations and experiments were performed that show the underlying mechanism for the attraction of like net charges is scattering of electromagnetic waves by an electric field cusp at the charged interfaces. Scattering theory calculations reveal this scattering should be most prevalent in the infrared and microwave regions. This has potential applications for shielding electronic circuits from electromagnetic noise at these wavelengths.

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