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**Approach to criticality in disorder-tuned antiferromagnetic manganese thin films**[1] SIDDHARTHA GHOSH, SANAL BUVAEV, ARTHUR HEBARD, University of Florida — Using a specialized high vacuum deposition/characterization chamber, we study the *in situ* temperature-dependent conductivity $\sigma(T,R_0)$ of thin magnetic films ( Gd, Cr & Mn) prepared at different stages of disorder where disorder is characterized by the sheet resistance $R_0$ measured at $T = 5$ K. The temperature dependence of normalized conductivity in these thin-films follows power-law dependence of the form, $\sigma(T,R_0) = A + BT^P$. The fitting parameters $A$, $B$ and $P$ vary systematically with increasing disorder. For Mn the parameter $A$ asymptotically approaches zero but always remains positive on the metallic side of a possible metal-insulator transition (MIT) for this material. In contrast, for Gd the parameter $A$ crosses from positive (metal) to negative (insulator) values at critical disorder ($A = 0$) with a critical disorder strength $R_0 = R_C = 22.67$ kΩ at the MIT. The behavior of Mn is strikingly different when compared with Gd, where the MIT occurs before granularity emerges. Most likely this difference of behavior occurs because the inelastic phase breaking length $L_\phi$ is not sufficiently high in antiferromagnet Mn to reach the 3D limit where $L_\phi$ is less than the film thickness $b$.

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