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Universal and Non-universal Behavior at the Metal Insulator Transition.[1] ERIK HELGREN, LI ZENG, DAMIEN QUERLIOZ, FRANCES HELLMAN, DEPT. OF PHYSICS, UC BERKELEY TEAM — A metal-insulator transition in amorphous metal semiconductor alloys is known to exist at dopant concentrations much higher ($\sim$ 12 at. %) than their crystalline counterparts[1]. We have studied the MIT in alloys grown using MBE for a series of semiconductor matrices, Si, Ge and both C and H-C (hydrogenated carbon) for various dopants (magnetic Gd and non-magnetic Y and Nb), as a function of concentration and magnetic field tuning. We compare the temperature dependence of the DC conductivity in the magnetically doped systems to the non-magnetic systems and to crystalline doped semiconductors (i.e. Si:P). Results are discussed in terms of a theoretical model that incorporates both disorder and electronic correlations[2]. This model correctly describes many universally observed aspects including the remarkably similar temperature dependence of the metallic and insulating DC conductivity of crystalline and amorphous systems, despite the vastly different disorder and electron concentration. There are however very significant variations in the prefactors that control the magnitude of the conductivity, which we correlate with the microscopic physics of each system. [1] F. Hellman et al. PRL 77, 4652 [2] Lee and Ramakrishnan RMP 57, 287

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Erik Helgren
Dept. of Physics, UC Berkeley

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