5005-C1-50 **Jared Tanner***, University of Utah and, University of Edinburgh. *Phase transitions for the recovery of $k-$sparse signals using linear programming: finite dimensional bounds.*

Consider an underdetermined system of linear equations $y = Ax$ with known y and $n \times N$, matrix A with $n < N$ for $\delta \in (0, 1)$. We seek the sparsest solution, i.e., the x with fewest nonzeros satisfying $y = Ax$. In general this problem is NP-hard; however, for many matrices A there is a threshold phenomenon: if the sparsest solution is sufficiently sparse, it can be found by linear programming. Quantitative values for a strong and weak threshold will be presented. The strong threshold guarantees the recovery of the sparsest solution x_o, whereas a weaker sparsity constraint ensures the recovery of the sparsest solution for most x_o. Thresholds will be presented both in the asymptotic limit as $N \to \infty$ as well as for finite values of N. This work was joint with David L. Donoho. (Received July 03, 2007)