1016-94-116 **Daniel H. Sikora***, dsikora@umich.edu, and **Anna Gilbert**. *Using lattice packings to create extended codebooks.*

Mathematical coding theory is used to quickly and accurately transmit information. One goal of coding theory is to create "optimal" codes. One method of finding improved codes is extending existing codes.

In recent work, A.C. Gilbert and J.A. Tropp describe a method of doing this. Let Λ be the set of points in a m-dimensional sphere-packing and let C_B be a d-dimensional code with at least m codewords. Our extended codebook is created by using the coordinates of each lattice point as coefficients in a sum of all m-term subsets of C_B. In other words, create a m x n matrix M with exactly m distinct words from C_B as its rows. The corresponding new codeword is the product of a lattice point λ with M. Using all lattice points and all possible m-term permutations of the words in C_B in this way yields the new codebook.

I considered codes extended from a d-dimensional canonical basis with a n x ... x n lattice constructed from m m-dimensional basis vectors. I derived the asymptotic behavior of the average power of each code as the values of d, m or n varied. I implemented algorithms to construct lattice packings and calculate the rate, average power, and maximum power of the constructed codes. (Received February 07, 2006)