1011-94-291 **David Grant*** (grant@boulder.colorado.edu), Department of Mathematics, University of Colorado at Boulder, Boulder, CO 80309-0395, and **Mahesh K Varanasi** (varanasi@colorado.edu), Dept. of Electrical and Computer Engineering, University of Colorado at Boulder, Boulder, CO 80309-0425. *Duality Theory for Space-Time Codes over Finite Fields.*

A space-time code S is a finite subset of the $M \times T$ complex matrices used to describe the amplitude-phase modulation of a radio frequency carrier signal in a frame of T symbols received over M transmit antennas. Bounding the pair-error probability of decoding one codeword C_1 into another C_2 leads to different metrics d on matrices, depending on the channel model. Examples are:

(1) Fast-fading Rayleigh channels with Gaussian noise, where $d(C_1, C_2)$ is the number of non-zero columns of $C_1 - C_2$; (2) Quasi-static fading Rayleigh channels with Gaussian noise, where $d(C_1, C_2)$ is the rank of $C_1 - C_2$; (3) A combination of (1) and (2), a multi-block fading channel with Gaussian noise, which is quasi-static for each of I blocks. Then a codeword N consists of I matrices $\{N_i\}_{i=1}^{I}$, and $d(C_1, C_2)$ is the sum of the ranks of the $(C_1)_i - (C_2)_i$.

Each metric makes sense for matrices over finite fields, where the analogous codes have a rich theory: we show each such linear code has a notion of a dual, and in (1) and (2), a weight enumerator that satisfies a MacWilliams-type identity relating it to the weight enumerator of its dual. In (3) there is a complete weight enumerator that satisfies a MacWilliams-type identity. (Received August 30, 2005)