1086-VN-2166 **Wing Hong Tony Wong*** (`tonywong@caltech.edu`), MC 253-37, Department of Mathematics, California Institute of Technology, Pasadena, CA 91125, and **Richard M Wilson** (`rmw@caltech.edu`), MC 253-37, Department of Mathematics, California Institute of Technology, Pasadena, CA 91125. *Diagonal forms for incidence matrices and zero-sum Ramsey theory.*

Let H be a t-uniform hypergraph on k vertices, with $a_i \geq 0$ denoting the multiplicity of the i-th edge, $1 \leq i \leq \binom{k}{t}$. Let $\mathbf{h} = (a_1, \ldots, a_{\binom{k}{t}})^\top$, and $N_t(H)$ the matrix whose columns are the images of $\mathbf{h}$ under the symmetric group S_k. We determine a diagonal form (Smith normal form) of $N_t(H)$ for a very general class of H.

Now, assume H is simple. Let $K_n^{(t)}$ be the complete t-uniform hypergraph on n vertices, and $R(H, \mathbb{Z}_p)$ the zero-sum (mod p) Ramsey number, which is the minimum $n \in \mathbb{N}$ such that for every coloring $c : E\big(K_n^{(t)}\big) \to \mathbb{Z}_p$, there exists a copy H' isomorphic to H inside $K_n^{(t)}$ such that $\sum_{e \in E(H')} c(e) = 0$. Through finding a diagonal form of $N_t(H)$, we reprove a theorem of Y. Caro that gives the value $R(G, \mathbb{Z}_2)$ for any simple graph G. Further, we show that for any t, $R(H, \mathbb{Z}_2)$ is almost surely k as $k \to \infty$, where k is the number of vertices of H.

Similar techniques can also be applied to determine the zero-sum (mod 2) bipartite Ramsey numbers, $B(G, \mathbb{Z}_2)$, introduced by Caro and Yuster. (Received September 24, 2012)