Some Applications of Incidence Matrices of $t$-subsets and Hypergraphs

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Given a set $\mathcal{H}$ of $t$-uniform hypergraphs (possibly complete hypergraphs), we consider the 0-1 incidence matrices $N$ with rows corresponding to all $t$-subsets of a $v$-set and columns corresponding to the subhypergraphs of the complete $t$-uniform hypergraph on the $v$ points that are isomorphic to a member of $\mathcal{H}$. We are interested in the $p$-ary code generated by the rows of $N$ and the convex cone generated by the columns of $N$. Applications are given to a zero-sum Ramsey-type problem modulo 2 and to inequalities concerning $t$-wise balanced designs.