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Alice Chan, Martin S. Copenhaver, Sivaram K. Narayan, Logan Stokols and Allison Theobold* (atheobol@mavs.coloradomesa.edu). *Combinatorial Structure of Finite Frames*. Preliminary report.

A *frame* in an n -dimensional Hilbert space H_n is a possibly redundant collection of vectors $\{f_i\}_{i \in I}$ that span the space. A *tight* frame is a generalization of an orthonormal basis. A frame $\{f_i\}_{i \in I}$ is said to be *scalable* if there exist nonnegative scalars $\{c_i\}_{i \in I}$ such that $\{c_i f_i\}_{i \in I}$ is a tight frame. Here we study the combinatorial structure of frames and their decomposition into tight or scalable subsets. We prove conditions which these decompositions must satisfy and use these to fully determine when a frame in H_2 exists with a given tight subframe decomposition. We also study when a frame can be scaled to have a given tight subframe decomposition. This research was done as part of the Central Michigan University REU program. (Received August 02, 2013)