1094-46-39 **Peter G. Casazza*** (casazzap@missouri.edu), Department of Mathematics, University of Missouri, Columbia, MO 65211-1400, **Jameson Cahill** (jameson.cahill@gmail.com), Department of Mathematics, University of Missouri, Columbia, MO 65211-1400, **Jesse Peterson** (peterson.jesse.d@gmail.com), Department of Mathematics and Statistics, Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, OH 45433, and **Lindsey M. Woodland** (lmwvh4@mail.missouri.edu), Department of Mathematics, University of Missouri, Columbia, MO 65211-1400. *Phase retrieval by projections.*

The problem of recovering a vector from the absolute values of its inner products against a family of measurement vectors has been well studied in mathematics and engineering. A generalization of this phase retrieval problem also exists in engineering: recovering a vector from measurements consisting of norms of its orthogonal projections onto a family of subspaces. There exist semidefinite programming algorithms to solve this problem, but much remains unknown for this more general case. Can families of subspaces for which such measurements are injective be completely classified? What is the minimal number of subspaces required to have injectivity? How closely does this problem compare to the usual phase retrieval problem with families of measurement vectors? In this paper, we answer or make incremental steps toward these questions. We provide several characterizations of subspaces which yield injective measurements, and through a concrete construction, we prove the surprising result that phase retrieval can be achieved with $2M - 1$ projections of arbitrary rank in $\mathbb{H}_M$. Finally we present several open problems as we discuss issues unique to the phase retrieval problem with subspaces. (Received July 24, 2013)