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Projective 2-designs for reconstruction from magnitudes of frame coefficients.

We derive fast algorithms for the linear or quasi-linear signal reconstruction of vectors from magnitudes of frame coefficients. This problem is important for several areas of research in signal processing, especially speech recognition technology, as well as state tomography in quantum theory. We give linear reconstruction algorithms for frames associated with projective 2-designs in finite-dimensional real or complex Hilbert spaces, including discrete chirps. The number of operations required for reconstruction with such frames grows at most as the cubic power of the dimension of the Hilbert space. Moreover, we present a very efficient algorithm which gives reconstruction on the order of d operations for a d -dimensional Hilbert space. (Received January 16, 2008)