1041-41-285 **Ozgur Yilmaz*** (`oyilmaz@math.ubc.ca`), 1984 Mathematics Road, Vancouver, BC V6T 1Z2, Canada. *Sobolev duals in frame theory and sigma-delta quantization.*

We introduce a new class of alternative dual frames in the setting of finite frames for R^d. The design of these dual frames (which we call Sobolev duals) provides a high precision linear reconstruction procedure for Sigma-Delta quantization of finite frames. We prove that the Sobolev dual frames minimize several matrix norms that are naturally related to Sigma-Delta algorithms. Our main results follows: "the use of Sobolev duals in the reconstruction enables stable rth order Sigma-Delta schemes to achieve deterministic approximation error of order $O(N^{-r})$ for a wide class of finite frames of size N, an asymptotic order not achievable with canonical duals". Moreover, we show that Sobolev-dual-reconstructions lead to minimal mean squared under the classical white noise assumption. This is joint work with J. Blum, M. Lammers, and A. Powell. (Received August 12, 2008)