1012-42-60 **H.-Q. Bui** and **R. S. Laugesen*** (Laugesen@uiuc.edu). *Approximation and spanning in the Hardy space, by affine systems.*

We begin with the approximate identity $f = \lim_{\varepsilon \to 0} f * \psi_\varepsilon$, where $\psi \in L^1$ and $\widehat{\psi}(0) = 1$. Discretizing the convolution and then averaging over a sequence of dilations yields a scale averaged approximation formula of the form:

$$f(x) = \lim_{J \to \infty} \frac{1}{J} \sum_{j=1}^{J} \sum_{k \in \mathbb{Z}^d} c_{j,k} \psi(a_j x - k) \qquad \text{in } H^1,$$

for each $f \in H^1$. Here $\{a_j\}$ is an arbitrary lacunary sequence (such as $a_j = 2^j$) and the coefficients $c_{j,k}$ are local averages of f.

This works, for example, when ψ is Schwartz class or when ψ has compact support and $\psi \in L^p$ for some $1 < p < \infty$.

The approximation implies a new affine decomposition of H^1 in terms of differences of ψ.

Analogous results for L^p and Sobolev space will be mentioned as time permits. (Received September 01, 2005)