1019-42-19        **Palle E. T. Jorgensen*** (`jorgen@math.uiowa.edu`), Department of Mathematics, 14 MacLean Hall, Iowa City, IA 52242. *Affine fractals and their harmonic analysis.*

We present results from two recent joint papers with Dorin Dutkay of Rutgers University. Moreover, the theorems we present extend earlier joint research with Steen Pedersen.

By "affine fractals" we mean iterative limits constructed from a finite family of (strictly) contractive affine mappings in Euclidean space $R^d$. The number $d$ is fixed.

But our results will depend on $d$, on the geometry of the fractals, and we examine the interplay between geometry and harmonic analysis as follows:

The limits are measures $\mu$ with compact support, and they may be obtained by Hutchinson's method. While this limit is unique, there is a related limit (which we call a "fractal in the large"), and it is a family of sets, in fact discrete subsets in $R^d$.

Our results concern the question of when $L^2(\mu)$ contains families of orthogonal complex exponentials $e_\lambda = exp(i\lambda x)$ for lambda in a suitable subset of $R^d$. Two classes of results will be presented: We identify invariants whose value serves to identify the possibilities for families of orthogonal complex exponentials; and when ONBs of orthogonal complex exponentials exist, we show that they are fractals in the large. (Received June 28, 2006)