On Self-affine Tiles and Spectral Sets

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A self-affine tile $T := T(A, \mathcal{D})$ in \mathbb{R}^n is generated by an $n \times n$ integral expanding matric A together with certain digit set $\mathcal{D} \subset \mathbb{Z}^n$. It has rich algebraic, analytic and geometric properties. In this talk, we will report some recent results on the number theoretic structure of \mathcal{D} for T to be a tile. We then apply them to consider the existence of exponential orthonormal basis on $L^2(T)$ (i.e. T is a spectral set), which is related to the well-known Fuglede problem on tiles and spectral sets.