1056-42-1513 **Michael Christ*** (mchrist@math.berkeley.edu), Department of Mathematics, University of California, Berkeley, CA 94720. *Upper Bounds for Multilinear Sublevel Sets.*

Let $\ell_j : \mathbb{R}^d \to \mathbb{R}^{d_j}$ be surjective linear transformations, let $P : \mathbb{R}^d \to \mathbb{R}$ be a real-valued polynomial, let B be a ball in $\mathbb{R}^d$. The associated sublevel sets are

$$E_\varepsilon(P, g_1, \cdots, g_n) = \big\{y \in B : |P(y) - \sum_{j=1}^{n} g_j(\ell_j(y))| < \varepsilon\big\},$$

where $g_j : \mathbb{R}^{d_j} \to \mathbb{R}$ are arbitrary measurable functions. We study upper measure bounds of the form

$$\big|E_\varepsilon(P, g_1, \cdots, g_n)\big| \le \rho(\varepsilon)$$

which are uniform over all measurable functions g_j, with $\rho(\varepsilon) \to 0$ as $\varepsilon \to 0$. Such bounds would be implied by conjectured multilinear oscillatory integral inequalities. We prove the sublevel set bounds under the natural nondegeneracy hypothesis on P, supplemented by an auxiliary rationality hypothesis. The analysis involves an alternative notion called finitely witnessed nondegeneracy, and relies on a variant of Szemeredi's theorem due to Furstenberg and Katznelson. (Received September 22, 2009)