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Square functions, densities, and rectifiability

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In this talk I will explain a recent joint work with Chousionis, Garnett and Le where we show that an Ahlfors-David regular n-dimensional measure μ on R^d is uniformly n-rectifiable if and only if for any ball $B(x_0, R)$ centered at $\text{supp}(\mu)$

$$\int_0^R \int_{x \in B(x_0, R)} \left| \frac{\mu(B(x, r))}{r^n} - \frac{\mu(B(x, 2r))}{(2r)^n} \right|^2 d\mu(x) \, \frac{dr}{r} \le c \, R^n.$$

This can be considered as a square function version of a celebrated theorem of Preiss which characterizes rectifiable measures in terms of the existence of densities. I will also review other related results.