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Stachó, L. L.

On curvature measures.

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In this paper, the author proves a result analogous to Federer's theorem on curvature measures. Let A be a closed subset of Euclidean n-space $\mathbf{R}^n$ with nonempty boundary. The prenormals of A are those subsets $L \subset \mathbf{R}^n$ for which there is a point $p \in \text{boundary}\, A$ and a unit vector $k \in \mathbf{R}^n$ such that $L = \{x \in \mathbf{R}^n \setminus A$: the projection of x on A is $\{p\}$ and $(x-p)\cdot(\|x-p\|)^{-1} = k\}$. Let $d^+A = \{(y,k) \in \mathbf{R}^n \times \mathbf{R}^n \colon y \in \text{boundary}\, A,\ \|k\| = 1$ and there is a prenormal L of A with $L \supset y + (0, \text{length}\, L)\cdot k\}$, and for $(y,k) \in d^+A$ let $h(y,k)$ denote the length of the prenormal of A issuing from y in the direction of k. Main result: There exist a Borel measure μ over d^+A and μ-measurable functions $a_0, \cdots, a_{n-1}$ such that for any Lebesgue integrable function $\varphi \colon \mathbf{R}^n \setminus A \to \mathbf{R}^n$, $\int_{\mathbf{R}^n \setminus A} \varphi \, d\, \text{vol}_n = \int_{d^+A} \int_0^{h(y,k)} \varphi(y+\rho k) \sum_{j=0}^{n-1} a_j(y,k)\rho^j \, d\rho d\mu(y,k)$.

Reviewed by *G. Freilich*