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Hardy Spaces, Singular Integrals and the Geometry of Euclidean Domains

We study the interplay between the geometry of Hardy spaces and functional analytic properties of singular integral operators (SIO's), such as the Riesz transforms as well as Cauchy-Clifford and harmonic double layer operator, on the one hand and, on the other hand, the regularity and geometric properties of domains of locally finite perimeter. Among other things, we give several characterizations of Euclidean balls, their complements, and half-spaces, in terms of the aforementioned SIO's.

Joint work with Steve Hofmann, Salvador Perez-Esteva, Marius Mitrea and Michael Taylor.