

Obstacle problems for fractional powers of the Laplacian

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Abstract: In this talk we will discuss a two-penalty boundary obstacle problem for a singular/degenerate elliptic operator naturally arising in the extension procedure for the fractional Laplacian $(-\Delta)^s$ when $1 < s < 2$. Our goals are to establish regularity properties of the solution and an Almgren-type monotonicity formula, which in turn will be employed to study the structure of the free boundary. To this end, we combine classical techniques from PDEs and the calculus of variations with more modern methods, such as the localization of the operator and monotonicity formulas. In particular, we will emphasize the striking differences with the cases $0 < s < 1$ and $s = 3/2$. This is joint work with A. Haj Ali (University of Michigan) and G. Gravina (Loyola University - Chicago).