
An isoperimetric inequality for the first Steklov-Dirichlet Laplacian eigenvalue of convex sets with a spherical hole

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In this paper we prove the existence of a maximum for the first Steklov-Dirichlet Laplacian eigenvalue in the class of convex sets with a fixed spherical hole under volume constraint. More precisely, if $\Omega = \Omega_0 \setminus \overline{B_{R_1}}$, where B_{R_1} is the ball centered at the origin with radius $R_1 > 0$ and $\Omega \subset \mathbb{R}^n$, $n \geq 2$, is an open bounded and convex set such that $B_{R_1} \Subset \Omega_0$, then the first Steklov-Dirichlet Laplacian eigenvalue $\sigma_1(\Omega)$ has a maximum when R_1 and the measure of Ω are fixed. Moreover, if Ω_0 is contained in a suitable ball, we prove that the spherical shell is the maximum.

This is a joint work with Nunzia Gavitone, Gloria Paoli and Gianpaolo Piscitelli.