Isodiametric inequalities for eigenvalues

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Among optimization problems for eigenvalues od Euclidean domains, the most common geometric constraints which have been considered are the volume or perimeter constraints. Here in this talk we consider a constraint on the diameter. First, we consider the minimization of the Dirichlet eigenvalues. It is easy to see that the minimizer exists and is a convex domain of constant width. Then we prove that the disk is a local minimizer only for a finite (and explicit) list of indices. At last, we study the limit of the optimal domain for λ_k when $k \to \infty$. Then, we consider the problem of maximizing the k-th Steklov eigenvalue among convex domains. Existence of a maximizer is not difficult to prove. Even if the disk is always a critical point, we prove that it is never a maximizer. We also prove that, for the optimal domain, the eigenvalue is always multiple. In both cases, we present some numerical results. This is a joint work with Beni Bogosel, Ilaria Lucardesi, Abdelkader Al Sayed and Florent Nacry