
The Weyl Criterion for the Spectrum

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Abstract

The essential spectrum of the Laplacian on functions over complete noncompact manifolds has been extensively studied. It is known that on hyperbolic space a spectral gap appears, whereas it has been conjectured that on manifolds with uniformly subexponential volume growth and Ricci curvature bounded below the essential spectrum is the nonnegative real line.

In our work with Zhiqin Lu we prove a generalization of Weyl's criterion for the spectrum of a self-adjoint and nonnegative operator on a Hilbert space. We then apply this generalized criterion to expand the set of manifolds over which the essential spectrum of the Laplacian on functions is the nonnegative real line. We also use our criterion to compute the essential spectrum of complete shrinking Ricci solitons and weighted manifolds. Finally, we apply our criterion to study the spectrum of the Laplacian on k -forms under a continuous deformation of the metric. The results that we obtain allow us to compute the essential spectrum of the Laplacian on k -forms for an asymptotically flat manifold.

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