Twisting *vs* bending in quantum waveguides

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Abstract

We show that twisting of an infinite straight three-dimensional tube with non-circular cross-section gives rise to a Hardy-type inequality for the associated Dirichlet Laplacian. As an application we prove certain stability of the spectrum of the Dirichlet Laplacian in locally and mildly bent tubes. Namely, it is known that any local bending, no matter how small, generates eigenvalues below the essential spectrum of the Laplacian in the tubes with arbitrary cross-sections rotated along a reference curve in an appropriate way. In the present talk we show that for any other rotation some critical strength of the bending is needed in order to induce a non-empty discrete spectrum. This result is based on a recent paper prepared in collaboration with T. Ekholm and H. Kovařík. We also recall some previous spectral results about infinite curved tubes, namely those established in the paper with B. Chenaud, P. Duclos and P. Freitas (to appear in Differential Geometry and its Applications).