SPECTRAL PROPERTIES OF THE LAPLACIAN IN DOMAIN WITH PERIODICALLY DISTRIBUTED TRAPS: OPENING OF GAPS AND CONTROL OF THEIR EDGES

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It is well-known that the spectrum of self-adjoint periodic differential operators has a band structure, i.e. it is a union of compact intervals called *bands*. The neighbouring bands may overlap, otherwise we have a *gap* in the spectrum. In general the existence of spectral gaps is not guaranteed.

For applications it is interesting to construct the operators with non-void spectral gaps since their presence is important for the description of wave processes which are governed by differential operators under consideration. Namely, if the wave frequency belongs to a gap, then the corresponding wave cannot propagate in the medium without attenuation. This feature is a dominant requirement for so-called photonic crystals which are materials with periodic dielectric structure attracting much attention in recent years.

In the talk we discuss the effect of opening of spectral gaps for the Laplace operator in $\mathbb{R}^n$ ($n \geq 2$) perforated by a family of periodically distributed traps on which we pose the Neumann boundary conditions. The traps are made from thin screens. We also discuss the question of the controllability of the gaps, i.e. how to make the gaps close to predefined intervals via a suitable chose of geometry of the traps.

The talk is based on the results obtained in [3, 4]. Similar results for other periodic differential operators were obtained by the author in [1, 2]. If time permits they will be also discussed.

References

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