MAFIA - the seminar you can't refuse

Improved Hardy-Rellich inequalities

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Abstract: We investigate about Hardy-Rellich inequalities for perturbed Laplacians. In particular, we show that a non-trivial angular perturbation of the free operator typically improves the inequality, and may also provide an estimate which does not hold in the free case. The main examples are related to the introduction of a magnetic field: this is a manifestation of the diamagnetic phenomenon, which has been observed by Laptev and Weidl in [LaWe] for the Hardy inequality, later by Evans and Lewis in [EvLe] for the Rellich inequality, whereas for the so called Hardy-Rellich inequality was still open. Our approach is strongly based on the new recent proof of classical Hardy-Rellich inequalities developed by Cazacu in [Ca]. The seminar is based on a joint work with B. Cassano and L. Fanelli.

[Ca] C. Cazacu, A new proof of the Hardy–Rellich inequality in any dimension, Proceedings of the Royal Society of Edinburgh: Section A Mathematics, 150 (2020), no. 6, 2894–2904

[EvLe] W. D. Evans, and R. T. Lewis, On the Rellich inequality with magnetic potentials, Math. Z., 251 (2005), no. 2, 267–284

[LaWe] A. Laptev, and T. Weidl, Hardy inequalities for magnetic Dirichlet forms, Oper. Theory Adv. Appl. 108 (1999), 299–305