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## Recent developments in sharp semiclassical bounds

### Abstract:

As Mark Kac pointed out, according to Weyl's law one can hear the area and the perimeter in the high tones of the drum. Moreover, the Berezin and the Li-Yau inequalities use the area via the first term in Weyl's asymptotic formula to state uniform spectral bounds on partial eigenvalue sums. I will report on various attempts to improve these bound by taking even terms of lower order into account. In particular, I will sketch some recent results on the magnetic Laplacian and on the Heisenberg Laplacian, respectively.

1. H. Kovarik, T. Weidl: "Improved Berezin-Li-Yau inequalities with magnetic fields". Proceedings of the Royal Society of Edinburgh, 145A, 145-160, 2015
2. H. Kovarik, B. Ruzkowski, T. Weidl: "Melas-type bounds for the Heisenberg Laplacian on bounded domains". to appear in Journal of Spectral Theory.
3. D. Barseghyan, P. Exner, H. Kovarik, T. Weidl: "Semiclassical bounds in magnetic bottles". to appear in Reviews in Mathematical Physics, 28 (1), 2016.