The uncertainty principle and the $\overline{\partial}$ problem (Part 1)

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Wien, 12/04/2016

This is the first of a couple of talks, whose goal is to discuss a few results I obtained in the context of the $\overline{\partial}$ problem in several complex variables, in which a key role is played by techniques that originated in mathematical physics. In the first talk I will preliminarily introduce a few topics in the theory of Schrödinger operators, namely:

1. the problem of spectral gap and discreteness of the spectrum for operators with non-negative electric potential (in particular Persson's theorem),
2. a version of the uncertainty principle in the spirit of Fefferman and Phong,
3. Agmon's technique to prove exponential decay of eigenfunctions associated to eigenvalues strictly smaller than the bottom of the essential spectrum,
4. the diamagnetic inequality.

In the second talk I will discuss the observation, going back to the '80s in the one-dimensional case, that a weighted version of the Kohn Laplacian of complex analysis may be viewed as a generalized Schrödinger operator. I will show that certain natural complex-analytic problems are related to the topics listed above when these are suitably, albeit non-trivially, generalized to Kohn Laplacians.

References

[1] Dall'Ara, G., *Pointwise estimates of weighted Bergman kernels in several complex variables*, Advances in Mathematics 285 (2015) 1706-1740.

[2] Dall'Ara, G., *Coercivity of Weighted Kohn Laplacians: the case of model monomial weights in* $\mathbb{C}^2$, to appear in Transactions of the American Mathematical Society.