MP 12: Quantum Mechanics

Time: Wednesday 17:50–18:15 Location: H7

MP 12.1 Wed 17:50 H7

Stability of quantum inequalities under scattering — •Henning Bostelmann[1], Daniela Cadamuro[2], and Gandalf Lechner[3] — [1]University of York, Department of Mathematics, York YO10 5DD, United Kingdom — [2]Universität Leipzig, Institut für Theoretische Physik, Brüderstraße 16, 04103 Leipzig — [3]School of Mathematics, Cardiff University, Senghennydd Road, CF24 4AG Cardiff, United Kingdom

Certain physical quantities that yield positive values in classical mechanics can have negative expectation values in quantum theory (e.g., the probability flux in the quantum backflow effect, or the averaged energy density in field theories). However, they typically possess a lowest negative eigenvalue. In other words, positive observables in classical theory often "quantize" to operators that are not necessarily positive, but bounded below ("quantum inequalities"). Here we investigate whether, for one quantum mechanical particle, such bounds are stable when the dynamics is perturbed by a scattering potential. This boils down to the question how fast the Møller operator Ω approaches the identity at high energies; more quantitatively, whether $\|(\Omega-1)(1+H_0)^\beta\| < \infty$ for suitable $\beta > 0$, where H_0 is the free Hamiltonian. We derive such bounds under generic assumptions on the free Hamiltonian and the scattering potential. In particular, $0 < \beta \leq 1/2$ is allowable for the Schrödinger Hamiltonian – independent of space dimension, and even in the matrix-valued case, i.e., when adding inner degrees of freedom.