Lecture 38

Wigner Functions, WKB And Problem Set 5

A set of quantum postulates

- There is a (normalized) state vector
- Unitary evolution of the state vector is generated by a Hamiltonian
- Measurements give eigenvalues of Hermitian operators and place the system in the associated eigenstate with its probability
- A composite state vector is represented in a basis that is an outer product of the basis sets of its component state vectors

Coming after Tgiving

- Q interference in Shor's algorithm
- The Q beamsplitter and teleportation using an interferometer
- Problems Set 6
- Factoring 15=5 times 3 using Q interference
- HW problems and exam review

Wednesday's Topics: From Problem Set 5

- CNOT, Bell States, and Bell state measurements
- Properties of the density operator
- Schrodinger's cat
- Tracing out Bell States
- State Reconstruction
- Qubit self-interference

Today's Topics: from Problem Set 5

- Wigner functions in general
- Phase reconstruction for pure and mixed states
- Wigner for coherent, squeezed and cat states
- WKB approximations and SHOs
- Squeezing of SHO states

Wigner Functions

- Definition
- Properties of density matrices for pure and mixed states
- Properties of Wigner functions
- The coherence function

Phase Reconstruction

- Problem 4.3 and reference
- The Fourier imaging problem
- Transient waveform analysis
- Pure states and coherence functions
- Coherent and squeezed states

Some Specific Wigner Functions

- The coherent state as a displacement
- Gaussian integrals
- Rotating second order phase plane densities
- Coherent state representations
- Squeezed state representations on plane and as overlap
- Cat states, conditioning number sums and overlaps

WKB and SHOs

- The classical probability
- Bohr Sommerfeld quantization
- The simple harmonic oscillator phase trajectories
- The simple harmonics oscillator wave functions
- The SHO Wigner function