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
- Schrödinger’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