Lecture 35

States of the Electromagnetic Field Again
The Pieces of the Course

- Wave particle duality
- Bound states of quantum mechanical potentials
- Quantum mechanical states of optical radiation field
- Interaction of quantized light and matter
Summary of the quantum postulates

- There is a (normalized) state vector
- Unitary evolution of the state vector is generated by a Hamiltonian
- Measurements are represented by Hermitian operators that place the system in a measurement eigenstate
- A composite state vector is represented in a basis that is an outer product of the basis sets of its component state vectors
This quarter in Schleich

• More states of the EM field including the states of Schrodinger’s cat (C11)
• Q and P functions to go with Wigner functions (C12)
• Beam splitters and interferometers (C13)
• Atom-field interactions (C14)
• The JCP model and its solution (C15)
• Preparing entangled states (C16)
Last Wednesday’s Topics

• Problem set 4
• Raising and lowering operators for a field in a cavity
• The Hamiltonian as a function of a and a^(+)
• Number states
• The coherent state as an eigenstate of the lowering operator
This Friday’s Topics

• Problem set 5
• Anything that was left from Wednesday
• Schrodinger’s cat and our own cat
• Q and P functions
• Expansions of arbitrary states in terms of coherent states
Today’s Topics

- Number states
- The thermal state density operator in terms of n state operators
- The eigenstate of the field operator and its unitary evolution
- The coherent state as eigenstate as well as displaced vacuum state
- Coherent state statistics