

Physics 201, Fall 2018

Problem Set #5 (due Friday, Oct. 12)

Each problem is 10 points.

Problems from Serway, Moses and Moyer:

3.8, 3.12, 3.18, 5.4, 5.6, 5.20, 5.27, 5.28

Additional problem:

A1: In class we discussed a 50:50 beam splitter: an optical device that splits a laser beam into two beams of equal intensity. Suppose that now I have produced an 80:20 beam splitter, which produces two beams with the intensities in this proportion. If a single photon falls into such beam splitter, write a possible wave function for the output state.

A2: A single photon is sent into a system of mirrors and beam splitters which has 4 possible outputs, labeled 1 through 4.

The wave function of the output photon is: $|\psi\rangle = 0.45|\psi_1\rangle - 0.70|\psi_2\rangle + 0.55i|\psi_4\rangle$ where $|\psi_i\rangle$ is the wave function describing the i^{th} output. What are the detection probabilities for each of four outputs?