

Physics 7810 Ultrafast Optics

Homework Set #4

- 1) Derive the third order ρ_{12} for a two level system including spontaneous emission. You can express your answer in terms of multiple integrals (quadruple for the spontaneous emission term). For extra credit, evaluate the integrals for δ -function pulses.
- 2) (a) For a 2-level system, draw the double sided Feynman diagrams for a transient absorption experiment in the time ordering that the probe pulse arrives after the pump pulse.

(b) Draw the double sided Feynman diagrams for the same experiment on a 3-level system with one lower state and two upper states. The pulses have sufficient bandwidth to excite both transitions from the lower to upper states.

(c) Now consider the same situation as (b), but the incident fields are CW with the one field resonant with the transition from the lower to one upper state and the other one resonant with the second transition. Physically, why is there a signal?