Physics 4410
Quantum Mechanics 2

Lecture 31

Fermi's golden rule

November 13, 2020

1. Review time-dependent perturbation theory.

2. Describe a harmonic perturbation.

3. How do we deal with our regulator?

4. Derive Fermi's golden rule.

Activity: Electron-phonon scattering.

Consider a free particle subject to the following oscillatory perturbation:

$$H_0 = \frac{p_x^2 + p_y^2 + p_z^2}{2m}, \qquad H'(t) = \epsilon \cos(kz - \omega t).$$

This is a crude model for the interaction of a free electron in a solid with a lattice vibration, or phonon. Which transitions are allowed by first order perturbation theory?