

1. Find the time dependent probability of the transition of a kaon into an anti-kaon particle when CP is conserved and violated. Choose one out of four possibilities of the form:

$$P(\bar{K}^0, t) = |\langle \bar{K}^0 | K^0(t) \rangle|^2$$

2. Check by direct substitution that the following time dependent states:

$$|K_S^0(t)\rangle = e^{-\frac{i}{\hbar}(m_S - \frac{i}{2}\gamma_S)t} |K_S^0\rangle$$

$$|K_L^0(t)\rangle = e^{-\frac{i}{\hbar}(m_L - \frac{i}{2}\gamma_L)t} |K_L^0\rangle$$

are indeed solutions of the effective Schrodinger equation describing two state kaon system:

$$i\hbar \frac{\partial |\psi(t)\rangle}{\partial t} = \mathcal{H}_{eff} |\psi(t)\rangle$$

3. Calculate the e-values and e- states of the Hamiltonian matrix describing two state system of decaying kaons. Hint: use the partially finished calculation shown during the lecture.
4. What is the interpretation of off-diagonal elements of the Hamiltonian matrix.