

Elementary Particle Physics: Assignment # 11

Due Thursday April 25 before class

- 1 Imagine a theory in which there is a weak CC interaction with a vertex $\gamma^\mu(g_V - g_A\gamma^5)$ and still short range (ie due to a very massive charged gauge boson).

(2.1) Write the amplitude for the process $\mu^- \rightarrow e^- \bar{\nu}_e \nu_\mu$ in this theory assuming that the mass of the gauge boson is much heavier than the mass of the muon.

(2.2) Compute the energy dependence of the emitted e^- in that theory and evaluate the ratio of electrons produced with $E > m_\mu/4$ over those with $E < m_\mu/4$. Is this ratio different for V-A interaction ($g_V = g_A$) than for a vector interaction ($g_A = 0$)?. If so which interaction gives the larger number of more energetic electrons?

- 2 Draw the dominant diagrams for the decay of a D^0 meson ($D^0 = (c\bar{u})$ meson) in the following channels: $D^0 \rightarrow K^- \pi^+$, $D^0 \rightarrow K^+ \pi^-$.

Derive the expected ratio of the decay branching ratios in these channels neglecting mixing with the third generation. Compare with results in the review of Particle Data Group.