

Nuclear and Particle Physics - Problem Set 5

Problem 1)

- a) Collect as much information on the Φ meson as you can find (e.g., in the Particle Data Group website – see my 415 homepage). In particular, list its charge, strangeness, mass, its spin and parity, and its two most likely decay modes.
- b) What kind of quarks are contained in the particles that are most likely produced in the decay of a Φ meson?
- c) Given the information you have collected under a) and b), what is the most likely quark content of the Φ meson? In other words, if we assume that it is mostly made up of just one kind of quark and antiquark, which flavor will those have?
- d) What is the most likely arrangement of the quark spins inside the Φ meson? How about orbital angular momentum?

Problem 2)

Why is there no spin-1/2 “sibling” of the Ω^- baryon? List the relevant quantum numbers of the Ω^- baryon. What is its quark content? Why can't these 3 quarks be in a relative spin-1/2 state (assuming they are all in the $L=0$ orbital angular momentum ground state)?

Hint: You have to consider the overall symmetry of the 3-quark wave function.