

M00Q.3—Emission of Alpha Particles

Problem

A massive particle X with spin 2 decays into a spin 0 particle with no orbital angular momentum and with the simultaneous emission of two alpha particles, each of which is known to be in a p -wave. Given an ensemble of unpolarized X particles at rest, what is the probability distribution in the angle between the directions at which the two alpha particles are emitted?

Note that you can simplify the problem by choosing an axis of quantization for the angular momenta, and then considering, in an ensemble of these objects, those cases in which the alpha particles both are discovered to be moving away from the decay at polar angle $\theta \sim \pi/2$ and at azimuthal angles ϕ_1 and ϕ_2 .