

PHYS-3301 Homework 11 Due 30 Nov 2011

This homework is due in class on the due date. If you wish to turn it in ahead of time, you may email a PDF or give a hardcopy to Dr. Frey.

1. **3-Body Kaon Decay** *essentially Barton 11.3(a)*

A K particle (*aka* a “kaon”) of mass $M = 494 \text{ MeV}/c^2$ can decay into three identical π particles (“pions”) of mass $m = 140 \text{ MeV}/c^2$. Suppose that a resting kaon decays with one of the final pions also at rest. First, argue that the other two pions have the same energy. Then find that energy (in terms of m and M and in terms of MeV).

2. **Doppler Broadening** *based on Barton 13.4*

The sun emits a spectral line of wavelength λ . When we observe the sun, this line is broadened because some parts of the sun rotate toward the earth and some rotate away. What is the ratio of the difference in wavelengths observed from opposite points on the sun’s equator to the line’s emitted wavelength? The circumference of the solar equator is $4.4 \times 10^6 \text{ km}$, and the sun’s equator rotates once every 25 days. You may make any appropriate approximations and work to 2 significant figures.