

GEANT4 MINI-COURSE

Lesson 5 - Radioactive Decay

Radioactive decay

The Decay example has several isotopes which will decay through different modes

Let's study the decay of Ne24 in more detail

- □ What type of decay is this?
 - Use <u>/tracking/verbose 1</u> to get step-by-step information and simulate a few events one by one with <u>/run/beamOn 1</u>
 - Look at the output and identify the particles resulting from the decay
- **Estimate the half-life of the decay**
- □ Plot the energy spectra of the electron

Beta decay



Ne-24 undergoes ß decay

Half-life: 3.38 min 10 Ne14 2,561 3.4mir 8r0+ ß .10 β-1 1,98 .350 0,878 0.564 0.472 t_{1/2}~0.02sec 0.4 15hr A ₩ 4,122 β⁻ 4,17 β-~6 E2 2.754 1.368 £2 1.368 STABLE 12 Mg 12



Radioactive decay

Am241 undergoes alpha decay, try it

 \Box also get the energy spectrum of the alpha particles and the half life

Now try Na22 — what kind of decay is this? (some of you may remember this as one of the sources used in the gamma spectroscopy lab work in Nuclear Physics)

Add a 1 cm³ cube of water around the source

- What do you expect to happen?
- □ Get the energy spectrum of the gammas that leave the water cube

GEANT4 also simulates entire decay chains:

 \Box Try Cs137, U238, Th232 — the laboratory cannot be in vacuum, use air

Am-241 decay scheme



Na-22 decay scheme



7

Long Decay Chains

http://metadata.berkeley.edu/nuclear-forensics/Decay%20Chains.html



