

Winter Quarter 2018 – Physics 24 Midterm

Problem 1

A nucleus of mass M initially at rest absorbs a gamma ray of energy W . Find the mass of the nucleus after the gamma ray has been absorbed.

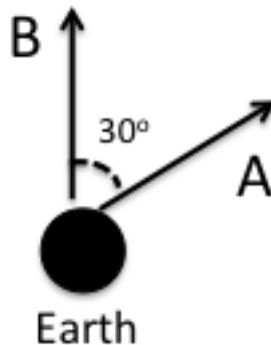
Problem 2

Two spaceships have the same proper length L . The 1st spaceship travels away from the earth at a speed V . The 2nd spaceship follows in the same direction at a speed $2V$ and eventually passes the 1st. How long does the 2nd spaceship take to pass the 1st? Assume that the passing begins at the instant the nose of the 2nd spaceship is even with the tail of the 1st spaceship, and passing is completed when the tail of the 2nd spaceship reaches the nose of the 1st.

- Give the time in the reference frame of the earth.
- Repeat the calculation in the rest frame of the 1st spaceship.

Problem 3

Spaceships A and B leave the earth in directions at 30° to each other (see Figure). The speeds of B and A measured from the earth are $0.5c$ and $\frac{c}{\sqrt{3}}$ respectively. What is the speed of A as seen by an observer in B (or, equivalently, the speed of B as seen by an observer in A).



Problem 4

A particle of mass M decays at rest into two identical particles of mass m . What is the momentum of each one of the two particles.