A Simple Model to Explain A Photon

MAAJIDA MURDOCK

RANDALLSTOWN HIGH SCHOOL

MORGAN STATE. UNIVERSITY
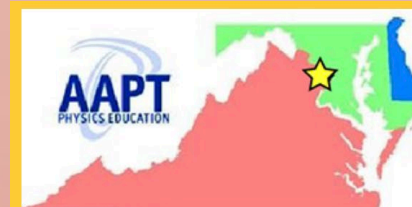
Abstract

- I will present a model that illustrates the behavior of photons for K-12 students. The model of the photon I used combines both the 'wave' and 'particle' nature of light. We will incorporate a hands-on activity using pipe cleaners to represent the wave properties, while play dough will symbolize energy. We will share our experiences teaching this model and highlight some observations we made with students in grades 6 to 12. Additionally, we will demonstrate how this model utilizes the matching photon properties and discuss its limitations.

Art
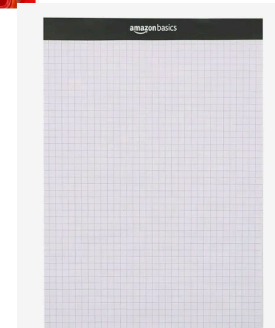Picture:

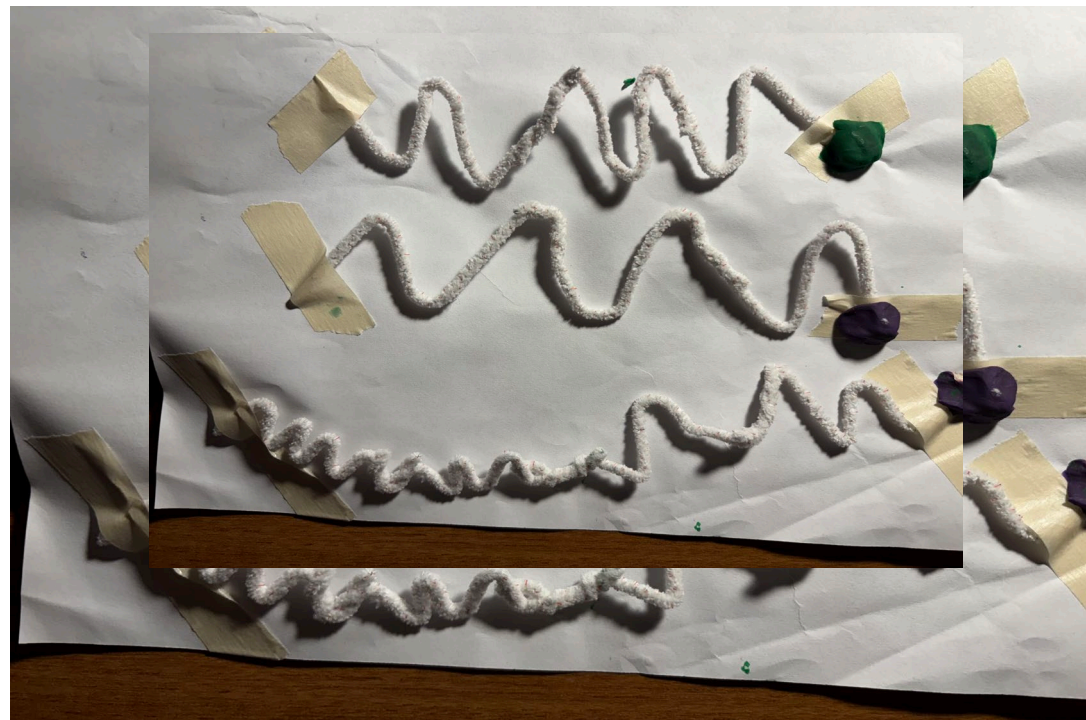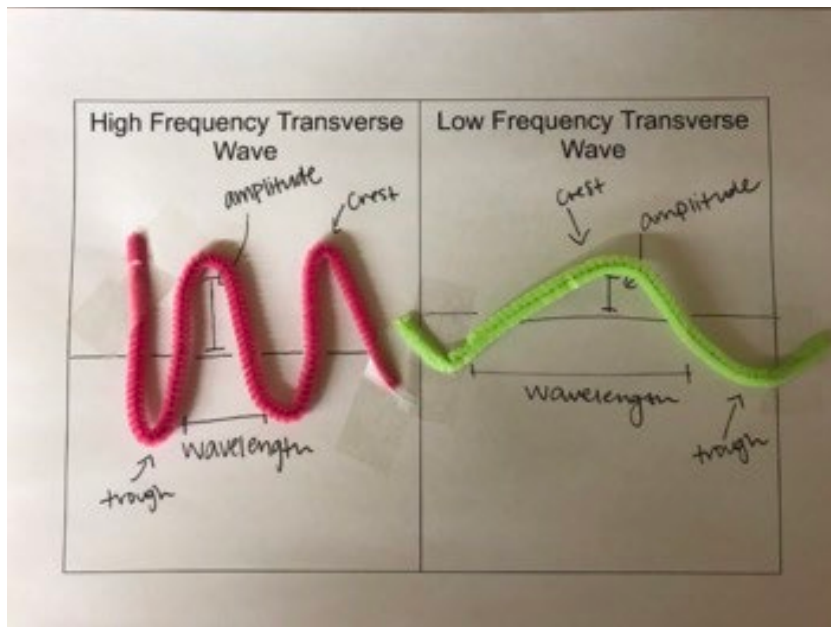Two image/
One picture

Materials

➢Pipe cleaners

➢Hair Beads

➢Tape

➢Graph Paper

The simple model of the nature of a photon combines both the "waviness" and "bulletiness"

Model Observation	Photon Property	Limitation
The pipe cleaner has a wave shape	Photons have a waviness	• Photon waviness while similar to classical waves • Instead the waviness is a description of the probability of interaction with a photon
Hair Bead has a mass	Photons have bulletiness	• Photon bulletiness is not contained in a localized position • Photon bulletiness is related to photon momentum • Photons have no rest mass • Photon momentum is completely defined by their energy • Photon's energy is related to the frequency
The waviness and bulletiness are inversely related	Increasing the wavelength of the photon decrease the photon energy	• Student can visualize the inverse relation • Wavelength = 1/energy
Models with the same wavelength can have a different amplitude	The amplitude of photon waviness is not related to the bulletiness	• The students can choose the amplitude of the pipe cleaner. • Amplitude of the waviness does nor affect th model photon's properties. • Larger the amplitude direct propotion to the probability

Thank you

Acknowledgment