

A simple experimental demonstration of a counterintuitive property of photons for an introduction of quantum physics to high school students

Nowadays, quantum physics is a basic knowledge for developing many modern/novel applications. In order to introduce it to high school students, a demonstration kit is developed. This kit, which is an extension of Malus's law demonstration kit in classical optics, consists of one lamp (or a laser pointer), three polarizers and a screen. First, an introduction of the polarization property of light to students can be done by using a setup with only two polarizers (Malus's law demonstration kit). Then, a concept of photons, i.e., a quantum/discrete nature of light particles, can be qualitatively introduced. Insertion of the third polarizer between the previously installed polarizers can show the weirdness property of photon, i.e., the indetermination of its polarization (quantum) state when the basis is changed. State description in quantum physics, e.g. by using of the Dirac bra-ket notation, can be further introduced based on the experimental fact. This work will enhance a basic knowledge in physics education of high school students.

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