ABSTRACT

In order to perform optical imaging and crystallography, one needs to examine the diffraction pattern produced by various samples. Light diffracted by many slits interferes and produces a pattern enshrouded by one diffraction envelope. In this paper we report a careful analysis of diffraction-interference patterns and investigate the energy conservation using a few adjacent slits and nettings. Theory based on the wave characteristic of light suggests that the energy distributed within the central maximum of diffraction is re-distributed among the interference fringes enshrouded by this diffraction envelope. Due to the renewed interest in accurate optical imaging and crystallography, as well as for fundamental science where the interference phenomenon is used as evidence for a wave characteristic, including matter waves, we re-analyze the energy conservation problem comparing the wave theory with our accurate measurements [1]. The topic of energy conservation in interference patterns was recently addressed with an interesting suggestion that dark energy could be responsible for redistributing the electromagnetic energy in the double slit interference pattern [2]. Our research project was done under a NSF-DUE-sponsored program called STAIRSTEP [3], which engages STEM undergraduate students in high-quality research in several fields of science, including physics.

