Exploring Network Communication in Classroom Using a Homemade Optical Fiber System

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Abstract: We designed a device that converts sound into light through an optoelectronic circuit including a blue LED connected to a single optical fiber in order to discuss fast and long distance communication in classroom.

Experimentation in Physics Teaching brings great possibilities for students to have good use of it in classroom, but it is not only the academic efficiency that has a positive influence in them with this kind of methodoloy. There is also a fruitful object for the technological development of the country because, making use of experiments in laboratory lessons, the students´ creativity is stimulated and become part of the final product which is knowledge. This work aims to motivate students to discuss themes about Modern Optics, inspired by the Newtonian tradition of studying the light from the analysis and understanding of real experiences [1], that could provide a clear connection between the theory of refraction and reflection of light and one of its direct applications in networks communication [2]. An apparatus for transmission of data, as seen in Fig. 1**,** was built during a workshop organized by OSA Campina Student Chapter UEPB in the Physics Department held in Universidade Estadual da Paraíba. The device consists of three parts: an emitting system, a propagation medium and an optical detector; which enabled to show students that the sound waves are converted in luminous signal making use of a blue LED that, after passing through the optical medium, represented by a single optical fiber, the signal is again converted into sound when detected by a photodiode, which collects the light and retrieves the associated electrical signal to sound waves using the binary code (where a light pulse indicates bit 1 and its absence indicates bit 0).

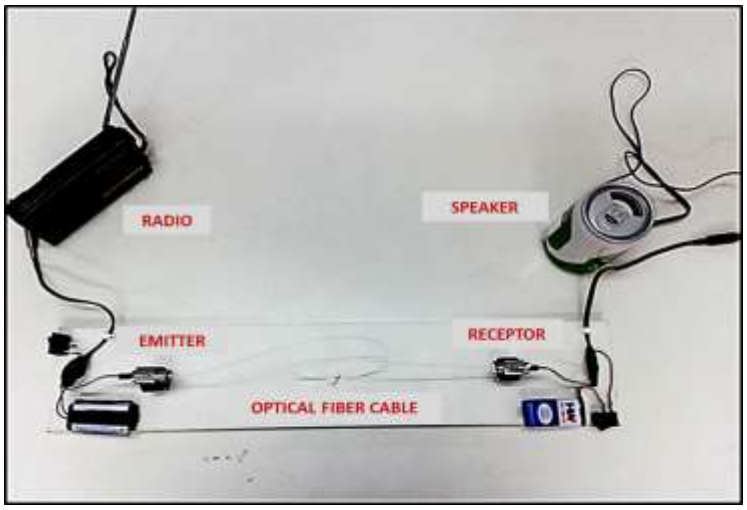

Fig. 1. Optical fiber system for transmission of data built during a workshop organized by OSA Campina Student Chapter in Department of Physics held in UEPB. A blue led, responsible for converting sound into light signal is enclosed in the emitting circuit.

The device presented here can be reproduced from the disponible audio/music of a mobile device. Therefore, simply connect the phone to the input connector of the emitter in order to the electrical signal associated with audio be converted into light signal when passing through the blue LED. Then the signal is transmitted by the optical fiber by successive total reflections and is collected by the photodiode in the receptor. Hence it is converted into an

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electrical signal and the sound waves associated with music are retrieved by connecting the output of the receiver circuit to the speaker. By means of the workshop the students improved their reasoning about the theme as long as they work in teams and notice the importance of having distinct points of view put together. Moreover they learned some fundamentals of optoelectronics [3] (multidisciplinar field that is present in many technologies associated with Optics and Photonics) in a qualitative way, which contributed to motivate them to approach Physics in a creative and no less important way than that used in traditional lessons.

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