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ДИФРАКЦИЯ СВЕТА НА ВОЛОКОННЫХ СВЕТОВОДАХ

С. В. КОРОНЕЦ
Научный руководитель В. И. БОРИСОВ, д-р физ.-мат. наук, проф.
Консультант Е. Н. МЕЛЬНИКОВА
БЕЛОРУССКО-РОССИЙСКИЙ УНИВЕРСИТЕТ

An optical fiber is a glass fiber cable used to transmit large quantities of information by light impulses. Data transmission in an optical fiber is based on the phenomenon of total internal reflection.

Currently, optical fibers are widely used as information channels in optical fiber communication lines with the high speed data transmission. They are essential elements in the construction of fiber-optic cables.

The design of a single optical fiber is quite simple. The core of optically denser materials is surrounded by a cladding with a lower reflective index, and everything is covered with a protective jacket.

Single-mode and multimode optical fibers are the types of fibers which are now widely used for transmitting signals. The core diameter in single mode optical fibers is about 8-10 microns that is comparable with the wavelength of light. In this geometry, only one ray can propagate in the optical fiber.

To ensure low radiation losses in optical fibers the preset geometrical parameters must not be changed during fiber drawing.

Due to the small diameter of the fiber, the most applicable methods for their control are optical methods.

One way to solve this problem is to use laser diffraction on the lateral surface of the fiber, followed by analysis of the diffraction pattern, from which we can draw conclusions about the stability of the geometrical parameters of optical fibers. To solve this important task, experimental studies of the diffraction pattern depending on the parameters of different types of fibers must be carried out.

For these purposes, an experimental device for registration of the diffraction pattern of laser radiation on optical fiber has been developed. The device operates as follows. Light from the laser passes through the modulator and reaches the optical fiber core, where diffraction phenomenon occurs. Then, the resulting diffraction pattern is recorded by a photodetector moving along the arc, the received signal is amplified and processed by the digital oscilloscope, and then goes to a personal computer for further analysis.

After a series of measurements it was observed that diffraction pattern is different for different types of optical fibers. Thus, some conclusions on the dependence of the diffraction pattern on the geometric parameters of optical fibers can be made.