PACS: 81.05. –t

Broadband amplitude demodulator based on the photoelastic effect and optimization of its characteristics

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Received 19.01.2023; revised 30.01.2023; accepted 04.02.2023

The photoelastic effect is discussed in the context of demodulation of an amplitude modulated signal. A physico-mathematical interpretation of the physical processes of signal formation at the demodulator output has been developed. It is proved that when the parameters of the useful signal are matched with the parameters of the interacting optical and elastic waves, the signal at the output of the photodetector repeats the form of the message in the input amplitude-modulated signal. This statement is discussed in the frequency band below the cutoff frequency, which is formed by the diameter of the reading light beam and the propagation velocity of an elastic wave in a photoelastic medium. Theoretical and experimental methods for determining the cutoff frequency of an acousto-optic amplitude demodulator are described.

Keywords: photoelastic effect, amplitude-modulated signal, demodulator, light beam, elastic wave, cutoff frequency.

DOI: 10.51368/2307-4469-2023-11-1-81-87

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