UNIVERSITI TEKNOLOGI MARA

ANALYSIS OF AUDIBLE ACOUSTO-OPTIC SIGNALS FOR DETECTION OF LOW VIBRATION SIGNAL USING 1mW LASER

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ABSTRACT

A new laser-safe optical microphone is designed to detect various changes in acousto-optic effect occurring due to small vibrating surfaces. The problem with the current optical microphone is that it uses Class III lasers in the range of 6 mW to 28 mW which is hazardous to the public. This device consists of a Class II 1 mW laser beam, which act as a sensing element directed to photo detector via a series of Fourier lenses followed with electronic circuit. Furthermore, the device could detect low audible frequency of 20 Hz with high clarity and able to detect low sound pressure amplitude of 65 dB. Results obtained shows significant detection of small vibration by recording the acoustic waves it releases with small traces of noises. Changes of amplitude, frequency, environment surrounding the vibration and simultaneous multiple source can be detected with significant signal to noise ratio of 6.70. Digital signal processing of acquired data involves filtering and amplification is done using MATLAB software and signal to noise ratio improved to 22.90 with sufficient amplitude to be directed to speaker for replaying purposes. This device find uses in stealth microphone, vibration sensor monitoring and characterizing sound profile in an area.

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