

# Measuring Intraocular Pressure Using Soundwaves from a Smartphone

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## Abstract

Early detection of increasing values of intraocular pressure (IOP) due to glaucoma can prevent severe ocular diseases and ultimately, prevent loss of vision. Currently, the need for an accurate, mobile measurement of intraocular pressure is unmet within the modern healthcare practices. There is a potential to utilize soundwaves as a mobile measurement method and therefore, the relationship between IOP and the reflection coefficient of sound waves is investigated. Simulations are conducted using COMSOL Multiphysics to provide theoretical confirmation of the worthiness of the experiment. An experimental demonstration is presented to further investigate the relationship between the internal pressure of an object and its acoustic reflection coefficient. The experiment exploits the use of hydrostatic pressure to determine internal pressure, and the reflection coefficient is measured and analyzed. An initial experiment is conducted to identify the resonant frequency of the object and the optimal frequency for maximizing reflection. The experiment shows comprehensively that there is a relationship between the internal pressure of an object and its acoustic reflection coefficient, providing a confirmation of the theory that would allow mobile measurements of IOP to be conducted with the use of a smart phone.

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