

EXPERIMENT NO.2

DETERMINATION OF THE VELOCITY OF ULTRASONIC WAVES IN LIQUIDS.

PRINCIPLE:

The Principle employed for the determination of the velocity of ultrasonic waves of known frequency (f) is based on the measurement of their wavelength (λ) by the STATIONARY WAVE.

METHOD: Ultrasonic waves, generated by a quartz crystal tuned in resonance with a high frequency (f) (2 MHz) for our set up), travel in the liquid medium under investigation and are made to reflect by a moveable metallic plate kept parallel to the quartz crystal. Acoustic resonance in the liquid when the position of the reflector is so adjusted that vibrating crystal and reflector act as antinode and node respectively of the stationary waves set up in the liquid. This acoustic resonance gives rise to an electrical reaction in the generator driving the quartz crystal and the anode current of the generator becomes maximum. If the reflector is now moved towards or away from the crystal, anode current registers maximum values for displacement exactly equal to one-half wavelength (λ) or multiple of it. From the knowledge of wavelength, velocity (v) of ultrasonic waves can be easily obtained by the relation:

$$v = f\lambda$$


(1)

APPARATUS:

The Ultrasonic Interferometer is used for the measurement of wavelength of ultrasonic waves by the stationary wave method. It consists of two parts:

- a) The high frequency generator
- b) The measuring cell

a) High Frequency Generator is designed to excite the quartz crystal (fixed at the bottom of the measuring cell) at its resonant frequency to generate ultrasonic waves in the experimental liquid filled in the measuring cell. A microammeter to observe the changes in anode current and two controls, 'Adj' and 'Gain' for the purpose of sensitivity regulation and initial adjustment of the microammeter are provided on the panel of the High Frequency Generator. With knob marked 'Adj', the position of the needle on the microammeter is adjusted and the knob marked 'Gain' is used to increase the sensitivity of the instrument for greater deflection, if desired.

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