The Physics Experiments of Robert Wichard Pohl (1884–1976)

For decades, Robert Wichard Pohl taught his famous lectures of introductory physics in the old lecture hall of the Physics Institute at Goettingen University. These lectures became the foundation for three volumes entitled „Introduction into Physics". Now, using Professor Pohl's original instruments in the same lecture hall in which he taught, this set of videos captures his extraordinary ingenuity and once more brings to life Pohl's great experimental skills.

Transverse normal modes of a stretched rubber band

Video title: Transverse normal modes of a stretched rubber band

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Series title: The Physics Experiments of Robert Wichard Pohl (1884-1976)

Abstract: A rubber band clamped at its two ends can be excited to a large number of normal modes of transverse vibrations. These modes can also be described as superposition of two equal waves travelling in opposite directions, forming standing waves.

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Key words: Acoustics, normal modes, standing waves

Goal of the experiment: A rubber band clamped at its two ends can be excited to a large number of normal modes of transverse vibrations. These modes can also be described as superposition of two equal waves travelling in opposite directions, forming standing waves.

Experimental setup: A rubber band, approximately 1.5 m long, is stretched horizontally between two clamps. Transverse vibrations are excited by an eccenter coupled with a vertical string to a spot close to one of the clamped ends. The reading of a projection meter is proportional to the exciting frequency. The oscillations can be observed well in shadow projection.

Experiment: At the lowest frequency of excitation (3 divisions on the projected scale), the rubber band vibrates in its first normal mode, also called its fundamental mode, with a maximum of the amplitude (antinode) in the center. Doubling the frequency (to 6 divisions) excites the second normal mode, with two antinodes, and so on as the frequency increases. As many as eight normal modes are shown.

This experiment also shows the superposition of two identical waves travelling in opposite directions, resulting in what is also called a standing wave. The distance between two nodes (or two antinodes) equals one half a wavelength.

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