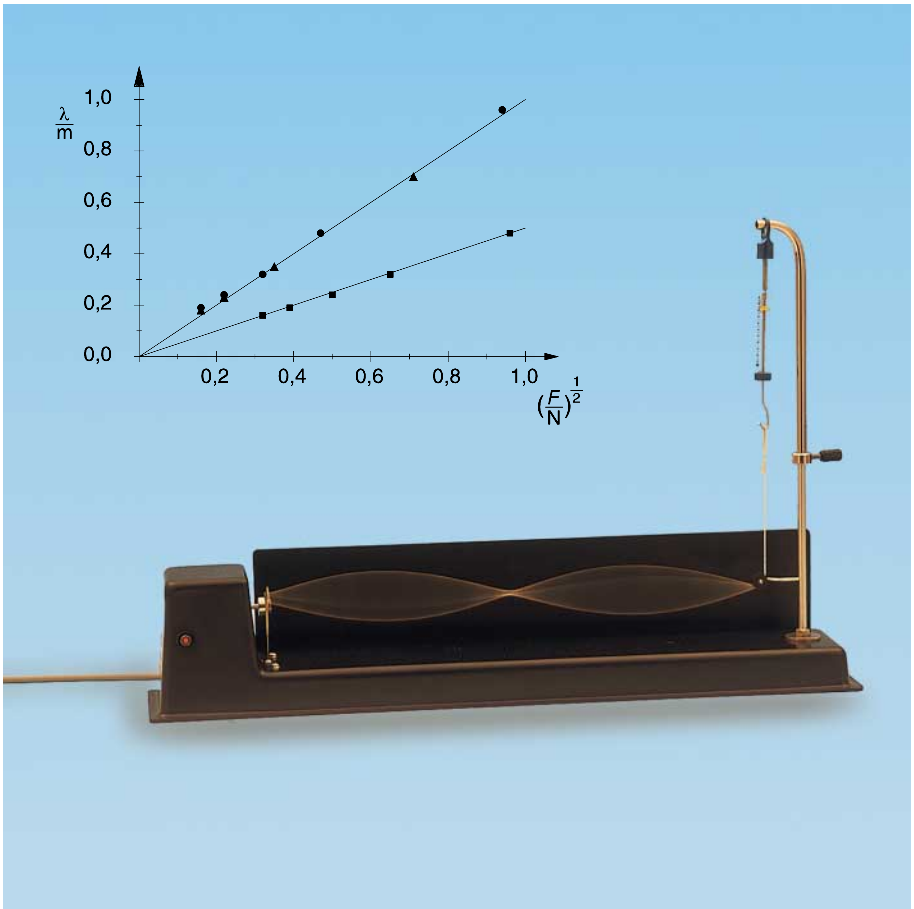
P 1.6.3

Circularly polarized waves

P 1.6.3.1 Investigating circularly polarized string waves in the experiment setup after Melde

P 1.6.3.2 Determining the phase velocity of circularly polarized string waves in the experiment setup after Melde



Investigating circularly polarized string waves in the experiment setup after Melde (P 1.6.3.1)

The experiment setup after Melde generates circularly polarized string waves on a string with a known length s using a motor-driven eccentric. The tensioning force F of the string is varied until standing waves with the wavelength

$$\lambda_n = \frac{2s}{n}$$

n: number of oscillation nodes

appear.

In the first experiment, the wavelengths λ_n of the standing string waves are determined for different string lengths s and string masses m at a fixed excitation frequency and plotted as a function of the respective tensioning force F_m. The evaluation confirms the relationship

$$\lambda \propto \sqrt{\frac{F}{m^*}}$$

with the mass assignment

$$m^* = \frac{m}{s}$$

m: string mass, s: string length

In the second experiment, the same measuring procedure is carried out, but with the addition of a stroboscope. This is used to determine the excitation frequency f of the motor. It also makes the circular polarization of the waves visible in an impressive manner when the standing string wave is illuminated with light flashes which have a frequency approximating that of the standard wave. The additional determination of the frequency f enables calculation of the phase velocity c of the string waves using the formula

$$c = \lambda \cdot f$$

as well as quantitative verification of the relationship

$$c = \sqrt{\frac{F}{m^*}} \ .$$

Cat. No.	Description	P 1.6.3.1	P 1.6.3.2
401 03	Vibrating thread apparatus	1	1
311 77	Steel tape measure, 2 m	1	1
451 281	Stroboscope, 1…330 Hz		1
315 05	School and laboratory balance 311, 311 g		1