P 5.3.4

Michelson interferometer

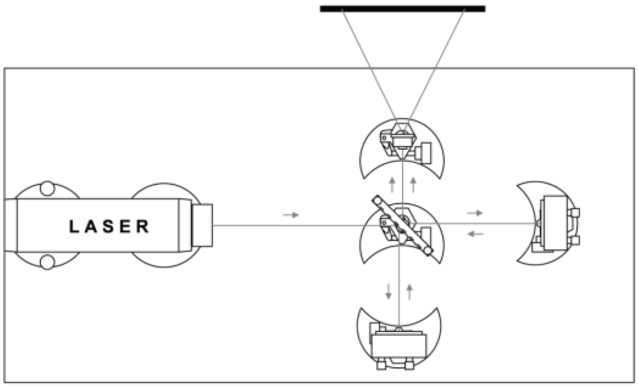
P 5.3.4.1 Setting up a Michelson interferometer on the laser optics base plate

P 5.3.4.2 Determining the wavelength of the light of an He-Ne laser using a Michelson interferometer

Setting up a Michelson interferometer on the laser optics base plate (P 5.3.4.1)

In a Michelson interferometer, an optical element divides a coherent light beam into two parts. The component beams travel different paths, are reflected into each other and finally recombined. As the two component beams have a fixed phase relationship with respect to each other, interference patterns can occur when they are superposed on each other. A change in the optical path length of one component beam alters the phase relation, and thus the interference pattern as well.

Thus, given a constant refractive index, a change in the interference pattern can be used to determine a change in the geometric path, e.g. changes in length due to heat expansion or the effects of electric or magnetic fields. When the geometric path is unchanged, then this configuration can be used to investigate changes in the refractive index due to variations e.g. in pressure, temperature and density.



In the first experiment, the Michelson interferometer is assembled on the vibration-proof laser optics base plate. This setup is ideal for demonstrating the effects of mechanical shocks and air streaking.

Cat. No.	Description	P 5.3.4.1	P 5.3.4.2
473 40	Laser optics base plate	1	1
471 830	He-Ne laser 0.2/1 mW max, linearly polarized	1	1
473 411	Laser mount	1	1
473 421	Optics base	4	5
473 432	Beam divider 50 %	1	1
473 431	Holder for beam divider	1	1
473 461	Planar mirror with fine adjustment	2	2
473 471	Spherical lens, f + 2.7 mm	1	1
473 48	Fine adjustment mechanism		1
441 53	Translucent screen	1	1
300 11	Saddle base	1	1
311 03	Wooden ruler, 1 m long	1	1

In the second experiment, the wavelength of an He-Ne laser is determined from the change in the interference pattern when moving an interferometer mirror using the shifting distance Δs of the mirror. During this shift, the interference lines on the observation screen move. In evaluation, either the interference maxima or interference minima passing a fixed point on the screen while the plane mirror is shifted are counted. For the wavelength λ, the following equation applies:

$$\lambda = 2 \cdot \frac{\Delta s}{Z}$$

Z: number of intensity maxima or minima counted