Diffraction at a double slit (P 5.3.1.2)

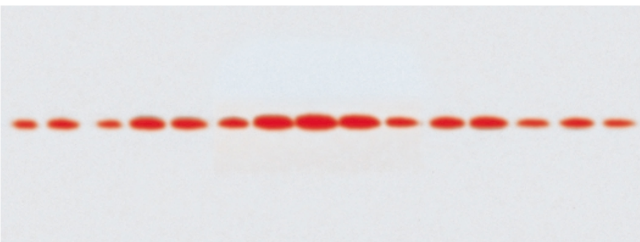
P 5.3.1
Diffraction

P 5.3.1.1 Diffraction at a slit, at a post and at a circular iris diaphragm

P 5.3.1.2 Diffraction at a double slit and at multiple slits

P 5.3.1.3 Diffraction at one- and two-dimensional gratings

Cat. No	Description	P 5.3.1.1	P 5.3.1.2	P 5.3.1.3
469 91	Diaphragm with 3 single slits	1		
469 96	Diaphragm with 3 circular holes	1		
469 97	Diaphragm with 3 fine lines	1		
469 84	Diaphragm with 3 double slits		1	
469 85	Diaphragm with 4 double slits		1	
469 86	Diaphragm with 5 multiple slits		1	
469 87	Diaphragm with 3 gratings			1
469 88	Diaphragm with 2 wire-mesh gratings			1
471 830	He-Ne laser 0.2/1 mW max., linearly polarized	1	1	1
460 22	Holder with spring clips	1	1	1
460 01	Lens, f = + 5 mm	1	1	1
460 02	Lens, f = + 50 mm	1	1	1
460 32	Precision optical bench, standardized cross section, 1 m	1	1	1
460 370	Optics rider, H = 60 mm/W = 34 mm	4	4	4
441 53	Translucent screen	1	1	1
300 11	Saddle base	1	1	1



The first experiment looks at the intensity minima for diffraction at a slit. Their angles φ_k with respect to the optical axis for a slit of the width b is given by the relationship

$$\sin \varphi_k = k \cdot \frac{\lambda}{b} \quad (k = 1; 2; 3; \ldots)$$

λ: wavelength of the light

In accordance with Babinet's theorem, diffraction at a post produces similar results. In the case of diffraction at a circular iris diaphragm with the radius r, concentric diffraction rings may be observed; their intensity minima can be found at the angles φ_k using the relationship

$$\sin \varphi_k = k \cdot \frac{\lambda}{r} \quad (k = 0.610; 1.116; 1.619; \ldots)$$

The second experiment explores diffraction at a double slit. The constructive interference of secondary waves from the first slit with secondary waves from the second slit produces intensity maxima; at a given distance d between slit midpoints, the angles φ_n of these maxima are specified by

$$\sin \varphi_n = n \cdot \frac{\lambda}{d} \quad (n = 0; 1; 2; \ldots)$$

The intensities of the various maxima are not constant, as the effect of diffraction at a single slit is superimposed on the diffraction at a double slit. In the case of diffraction at more than two slits with equal spacings d, the positions of the interference maxima remain the same. Between any two maxima, we can also detect N-2 secondary maxima; their intensities decrease for a fixed slit width b and increasing number of slits N.

The third experiment investigates diffraction at a line grating and a crossed grating. We can consider the crossed grating as consisting of two line gratings arranged at right angles to each other. The diffraction maxima are points at the "nodes" of a straight, square matrix pattern.