THE APPLICATION OF FRESNEL FRINGES TO THE DETERMINATION OF THE LOCAL FILAMENT DIAMETER IN AN ELECTRON BIPRISM

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suppose that the intensity distribution in the geometrical shadow of the filament corresponds to interference phenomena produced by two coherent sources situated in the place of the filament, their separation being

$$2r' = \frac{\lambda b}{2\Delta l}$$

where $2\Delta l$ is the separation of neighbouring fringes occurring in the region of the geometrical shadow. The distance $2\Delta l$ (i.e. the distance of two first minima on both sides from the axis of symmetry of the diffraction pattern) determined from the picture of the diffraction phenomenon (Fig. 1) or from a photometric record (curve (a) in Fig. 3) is $2\Delta l = 2.4 \times 10^{-4}$ mm. Corresponding value $2r' = 5.6 \times 10^{-4}$ mm). In this region the value $2r'$ is more than 10% greater than the filament diameter $2r$ (compare Fig. 4 in [2]) and therefore we may expect the actual filament diameter $2r$ to be about 0.5 μm. That is why we have calculated the intensity distribution $I$ for several values of the filament diameter $0.45 \mu m \leq 2r \leq 0.52 \mu m$.

Fig. 2. Graph of the function $I/I_0 = f(2r, l)$. $I/I_0$ — quantity proportional to the intensity, $2r$ — filament diameter, $l$ — distance from the symmetry axis of the diffraction pattern.