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The Absorption of Light Passing through Deep Slits as a Function of the Length and Depth of the Slits and of the Wave Length of the Light

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THE ABSORPTION OF LIGHT PASSING THROUGH DEEP SLITS AS A FUNCTION OF THE LENGTH AND DEPTH OF THE SLITS AND OF THE WAVE LENGTH OF THE LIGHT

(Abstract)

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As indicated by Rayleigh, [1] practically every slit is a "Deep" slit, and a "Thin" slit can be obtained only with the greatest difficulty. Rayleigh used for the latter a fine scratch in a thin silver film deposited upon glass. In the present work [2] experiments were made with a series of slits with steel jaws, varying in depth from that of the thin safety razor blades to approximately 2.5 cm. The intensity of the transmitted light was experimentally determined as a function of the width and depth of the slits, and of the wave length of the light. For narrow slits, the narrowness depending upon the depth and wave length, practically complete polarization, with the electric vector parallel to the length of the slit, was noted, but exact measurements were deferred to a later work. On the basis of diffraction, multiple reflections, and the alteration of the ratios of the two electric vectors due to the latter, a simple theory is developed, the results of which agree well with the experimental results. The chief fact derived from the experiments is that for narrow slits the total amount of light transmitted is not, even approximately, proportional to the opening, and that therefore the use of such slits for photometric purposes will lead, unless proper corrections are made, to erroneous values for the intensity of the transmitted light.

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1 Roy. Soc. Lond. Proc. A, 89, 1913-14, p. 194.
2 Full report in May, 1921, number of Jour. of Opt. Soc. of Amer.