Transition From Fresnel to Fraunhofer Diffraction

(Top) Calculated irradiance in the region beyond an evenly illuminated two-level phase grating. (Bottom) Experimental irradiance data for this grating in a beam focused by a 250 mm focal length lens. Irradiance patterns, 260 in all, were taken at 1 mm increments, combined, and plotted as a two-dimensional array. (At 150 mm from the lens, the gain was reduced to limit the saturation in the data.) Close to the lens-grating combination, the pattern is that of the upper figure. Near the focal plane, however, the light pattern sorts itself into its Fraunhofer pattern, represented by the grating orders. The bottom figure demonstrates, in a compact manner, the transition from near-field Fresnel diffraction to the Fraunhofer limit.

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