$$\Pi(x) = \begin{cases} 1 & |x| < 1/2, \\ 1/2 & |x| = 1/2, \\ 0 & |x| > 1/2. \end{cases} \tag{14}$$

The limiting sequence of Eq. (13) fulfills the requirement of the definition of a null function of Eq. (12) for $c < 1$, those of Eq. (4) when $c \geqslant 0$, and, finally, for Eq. (5) when $c \equiv \frac{1}{2}$. Therefore, the null function $\delta^{1/2}(t)$ satisfies all the requirements imposed on $\mathbf{f}(t)$, namely,

$$\delta^{1/2}(x) = \begin{cases} 0 & x \neq 0, \\ \infty & x = 0, \end{cases} \tag{15}$$

$$\int_{-\infty}^{\infty} \delta^{1/2}(x)dx = 0, \tag{16}$$

$$\int_{-\infty}^{\infty} |\delta^{1/2}(x)|^2 dx = 1. \tag{17}$$

The last property to be investigated is whether the transform of $\delta^{1/2}(x)$ is zero. Application of Eq. (1) shows that

$$F(s) = \int_{-\infty}^{\infty} \delta^{1/2}(t) \exp(-i2\pi ts)dt = \int_{-\infty}^{\infty} \delta^{1/2}(t)dt = 0. \tag{18}$$

The results obtained in Eq. (9b) can be easily derived from the definition of Eq. (13) for $\delta^{1/2}$ since

$$\begin{aligned} \hat{A}(s) = \lim_{z \to 0} \Bigg(\Bigg\{ z^{-1/2} t^2 \sum_{k=0}^{k=\infty} r_2^{2k} \int_{-\infty}^{\infty} \Pi[(t - 2kd\,\mathbf{c}^{-1}] \\ \times \exp(-i2\pi ts)dt \Bigg\} \Bigg[z^{-1/2} \int_{-\infty}^{\infty} \Pi(tz^{-1})dt \Bigg]^{-1} \Bigg) \\ = (t_1 t_2) \sum_{k=0}^{k=\infty} r_2^{2k} \exp(-i4\pi skd\,\mathbf{c}^{-1}). \end{aligned} \tag{9b}$$

Also, note that the energy associated with the response of the etalon of Eq. (8) is finite:

$$\begin{aligned} \int_{-\infty}^{\infty} |a(t)|^2 dt = (t_1 t_2)^2 \sum_{k=0}^{k=\infty} r_2^{4k} \int_{-\infty}^{\infty} |\mathbf{f}(t)|^2 dt \\ = (1 - R)(1 + R)^{-1}. \end{aligned} \tag{19}$$

Therefore, the null function given by $\delta^{1/2}(t)$ is a suitable function to describe a short pulse of finite energy, as required in the investigation of instrumental functions by the optical transient response method.

This investigation was supported in part by AFOSR-ISSA-85-00037.

References

1. J. Connes, "Recherches sur la spectroscopie par transformation de Fourier," Rev. Opt. **40**, 231 (1961).
2. R. Bracewell, *The Fourier Transform and Its Applications* (McGraw-Hill, New York, 1965).
3. J. O. Stoner, Jr., "PEPSIOS: Purely Interferometric High-Resolution Spectrometer. III. Calculation of Interferometer Characteristics by a Method of Optical Transients," J. Opt. Soc. Am. **56**, 370 (1966).
4. M. Born and E. Wolf, *Principles of Optics* (Pergamon, Oxford, 1964).

Grazing incidence telescopes: a new class for soft x-ray and EUV spectroscopy; addendum

Michael C. Hettrick and Stuart Bowyer

University of California, Space Sciences Laboratory, Berkeley, California 94720.
Received 17 January 1985.
0003-6935/85/070929-01$02.00/0.

In our earlier Communication[1] we presented three types of grazing incidence telescope and illustrated the use of a Type I or a Type II in combination with spectrometers. It has recently been brought to our attention that the Type III, a nonfocusing collimating telescope, was previously presented in detail by Schmidtke[2] and by Schmidtke *et al.*[3] We regret this omission.

References

1. M. C. Hettrick and S. Bowyer, "Grazing Incidence Telescopes: a New Class for Soft X-Ray and EUV Spectroscopy," Appl. Opt. **23**, 3732 (1984).
2. G. Schmidtke, "Infrared-XUV Telescope for Multipurpose Applications," Appl. Opt. **16**, 244 (1977).
3. G. Schmidtke, P. Henneberg, K.-H. Hager, F. Busch, and D. Reinhardt, "Parabolic Telescope and Spectrometer Combination," Appl. Opt. **19**, 1822 (1980).

Partial achromatization of the self-imaging phenomenon

Enrique E. Sicre, Néstor Bolognini, and Mario Garavaglia

Centro de Investigaciones Opticas, Casilla de Correo 124, 1900 La Plata, Republic of Argentina.
Received 24 September 1984.
0003-6935/85/070929-0930$02.00/0.

Image formation and transmission in free propagation of light have been the subjects of many recent investigations. It is well known that a grating when illuminated with completely coherent light gives rise to a set of equally spaced images along the direction of light propagation. This phenomenon of self-imaging is called the Talbot effect.[1] Here the several orders diffracted by a periodical structure propagate at fixed angles, thus interfering with a phase relation varying along the transmission axis. The analysis of the amplitude pattern conducts to two sets of resonance maxima. One of them is associated with the Fourier images or self-images of the grating in the weak sense.[1–3] The other corresponds to the grating replicas known as Fresnel images, which are located at intermediate positions between Fourier images.[4] In this work, we only consider the former case. As established by Montgomery,[2] periodicity is enough to originate self-imaging, but it is not a necessary condition. He found that the general condition for self-imaging establishes that the Fourier spectrum of the object restricts its nonzero values to a set of concentric rings whose radii vary with the square root of the positive integers. Thus 1-D gratings represent only a special case.

If a spatially coherent but polychromatic source is employed for illuminating the object, the self-images corresponding to each wavelength value are focused at different locations. In