Assignment for the 2nd part of Project

Dec. 4, 2021

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【1】 Calculate the Fourier transform for the following wave forms.

$$f_0(T) = \operatorname{sech} T \tag{1}$$

$$f_0(T) = \exp(-T^2) \tag{2}$$

$$f_0(T) = \begin{cases} 1 & \text{for } |T| \le \frac{1}{2} \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

(rectangular-shape pulse)

Fourier Transformation can be defined by

$$\tilde{f}_0(\omega) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f_0(T) \exp(i\omega T)\, dT . \tag{4}$$

【2】 Solve the following equations with initials conditions shown in Eq. (1) – (3).

$$i\frac{\partial f}{\partial Z} + \frac{1}{2}\frac{\partial^2 f}{\partial T^2} = 0 \quad \text{(anomalous dispersion case)} \tag{5}$$

$$i\frac{\partial f}{\partial Z} - \frac{1}{2}\frac{\partial^2 f}{\partial T^2} = 0 \quad \text{(normal dispersion case)} \tag{6}$$

$$i\frac{\partial f}{\partial Z} + \frac{1}{2}\frac{\partial^2 f}{\partial T^2} + |f|^2 f = 0 \quad \text{(anomalous dispersion plus nonlinearity case)} \tag{7}$$

$$i\frac{\partial f}{\partial Z} - \frac{1}{2}\frac{\partial^2 f}{\partial T^2} + |f|^2 f = 0 \quad \text{(normal dispersion plus nonlinearity case)} \tag{8}$$

→ You may use numerical code (MATLAB) shown in Appendix B (pp. 516–518)

→ You may show the solution as Fig. 3.4 or Fig. 3.7.

Report submission deadline : 31 December 2021

end