Fundamentals of Signals and Transmission Reference

1 Trasformata di Fourier

1.1 Definition

$$H(f) = \int_{-\infty}^{\infty} h(\tau) e^{-j2\pi f t} \, \mathrm{d}\tau \tag{1}$$

$$h(t) = \int_{-\infty}^{\infty} H(f) e^{j2\pi f t} \, \mathrm{d}f \tag{2}$$

1.2 Properties

- **Dualità**: $x(t) \longleftrightarrow X(f)$ $X(f) \longleftrightarrow x(t)$
- **Scala**: $x(\alpha t) \longleftrightarrow \frac{1}{|\alpha|} X(\frac{f}{\alpha})$
- **Simmetria**

1.3 Trasformate notevoli

2 Energy

$$E = \int_{-\infty}^{\infty} |x(t)|^2 \, \mathrm{d}t = \int_{-\infty}^{\infty} |x(f)|^2 \, \mathrm{d}f \tag{3}$$

3 Power

$$\lim_{T \to \infty} \frac{1}{T} \int_{-\frac{T}{2}}^{\frac{T}{2}} |x(t)|^2 \, \mathrm{d}t \tag{4}$$

4 Serie di Fourier

$$\sum_{n=-\infty}^{\infty} C_n e^{j2\pi \frac{n}{T_0} t} \tag{5}$$

C_n sono i coefficienti di Fourier