Power Density Spectrum - Continuous Time

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October 7, 2019

Based on
Probability, Random Variables and Random Signal Principles,
P.Z. Peebles,Jr. and B. Shi

Outline

Definition

$$X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt$$

$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} x(\omega) e^{j\omega t} d\omega$$

Definition

$$x_T(t) = \begin{cases} x(t) & -T < t < T \\ 0 & otherwise \end{cases}$$

$$E(T) = \int_{-T}^{+T} x^2(t)dt$$

$$P(T) = \frac{1}{2T} \int_{-T}^{+T} x^2(t)dt$$

Definition

$$P(T) = \frac{1}{2T} \int_{-T}^{+T} x^2(t)dt$$

$$P_{XX} = \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{+T} E\left[x^2(t)\right] dt$$

$$= A\left[E\left[x^2(t)\right]\right]$$