Power Spectrum of Complex Processes

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

Outline

Definition

$$S_{ZZ}(\omega) = \int_{-\infty y}^{+\infty} R_{ZZ}(\tau) e^{-j\omega\tau} d\tau$$

$$R_{ZZ}(\tau) = \frac{1}{2\pi} \int_{-\infty y}^{+\infty} S_{ZZ}(\omega) e^{+j\omega\tau} d\omega$$

$$\widehat{S}_{ZZ}(\omega) = \int_{-\infty y}^{+\infty} \widehat{R}_{ZZ}(\tau) e^{-j\omega\tau} d\tau$$

$$\widehat{R}_{ZZ}(\tau) = \frac{1}{2\pi} \int_{-\infty y}^{+\infty} \widehat{S}_{ZZ}(\omega) e^{+j\omega\tau} d\omega$$

Definition

$$S_{Z_mZ_n}(\omega) = \int_{-\infty y}^{+\infty} R_{Z_mZ_n}(\tau) e^{-j\omega\tau} d\tau$$

$$R_{Z_mZ_n}(\tau) = \frac{1}{2\pi} \int_{-\infty y}^{+\infty} S_{Z_mZ_n}(\omega) e^{+j\omega\tau} d\omega$$

$$R_{Z_mZ_n}(\tau) \Longleftrightarrow S_{Z_mZ_n}(\omega)$$

Definition

$$\widehat{S}_{Z_m Z_n}(\omega) = \int_{-\infty y}^{+\infty} \widehat{R}_{Z_m Z_n}(\tau) e^{-j\omega\tau} d\tau$$

$$\widehat{R}_{Z_m Z_n}(\tau) = \frac{1}{2\pi} \int_{-\infty y}^{+\infty} \widehat{S}_{Z_m Z_n}(\omega) e^{+j\omega\tau} d\omega$$

$$\widehat{R}_{Z_m Z_n}(\tau) \Longleftrightarrow \widehat{S}_{Z_m Z_n}(\omega)$$