

The sampling process or *analog-to-digital conversion* for the signal $x(t)$ produces the digitalized signal $x_d(t)$ is:

$$x_d(t) = R \left\lfloor \frac{x(t)}{R} \right\rfloor \quad t = T, 2T, \dots$$

We call R the resolution of the measurement and T the period.

Definition 1 (Stationary Conditions). The assumption that a signal's stochastic basin mechanism does not change over time. Usually as a result of measurements of indepent random variables.

Definition 2 (Time average of signals). For analog (time-continuous) signals:

$$AV_x = \lim_{T \rightarrow \infty} \frac{1}{T} \int_0^T x(t) dt$$

and for digital (discrete) signals:

$$AV_x = \frac{1}{N} \sum_{n=0}^{N-1} x(nT)$$

Definition 3 (Energy of a signal). The energy of a signal:

$$EN_x = \int_0^\infty |x(t)|^2 dt, \quad \sum_{n=0}^\infty |x(nT)|^2 T$$

Definition 4 (Power of a signal). For analog (time-continuous) signals:

$$AV_x = \lim_{T \rightarrow \infty} \frac{1}{T} \int_0^T |x(t)|^2 dt$$

and for digital (discrete) signals:

$$AV_x = \lim_{N \rightarrow \infty} \frac{1}{N} \sum_{n=0}^{N-1} |x(nT)|^2$$