NOISE PADA SISTEM KOMUNIKASI

SISTEM KOMUNIKASI
PRODI D3 TT

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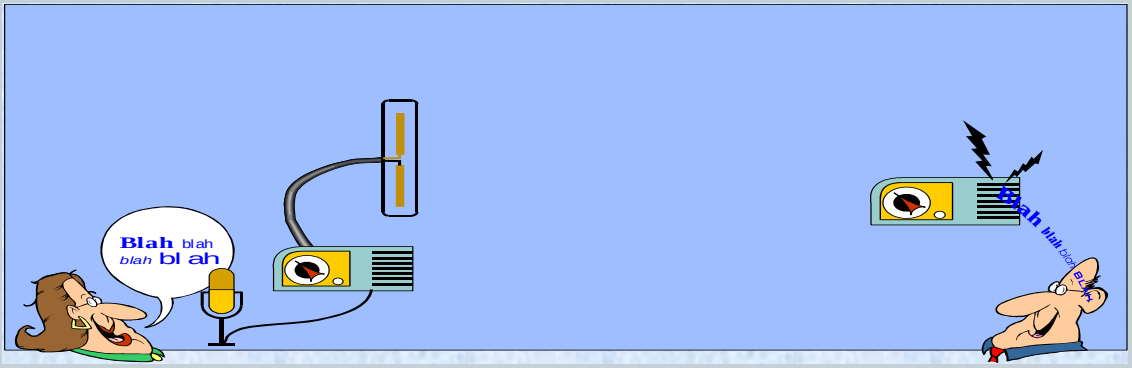
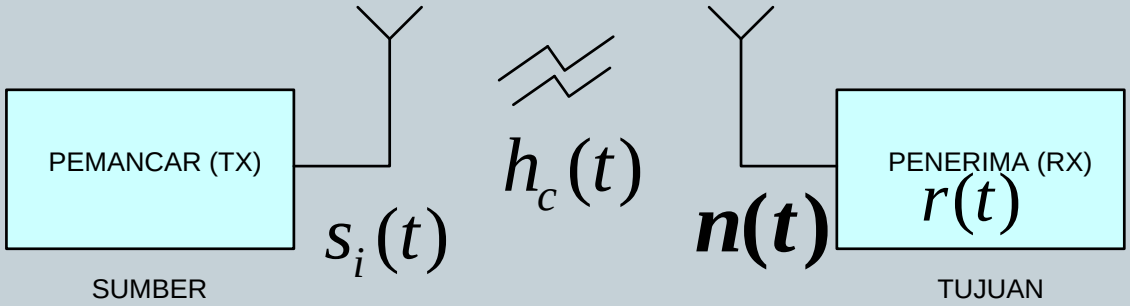
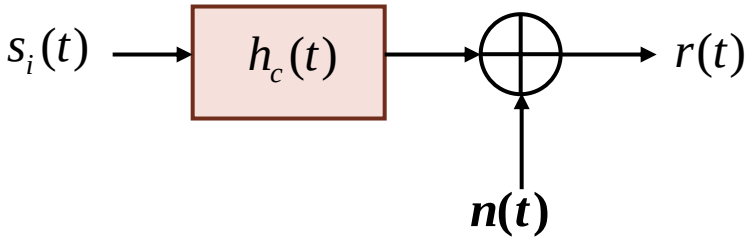
Model Komunikasi Radio





Model Sinyal Terima

- Model the received signal

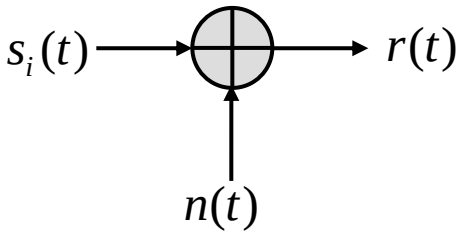


$$r(t) = s_i(t) * h_c(t) + n(t)$$

AWGN = Additive White Gaussian Noise

- Simplify the model:
  - Received signal in AWGN

Ideal channels
$h_c(t) = \delta(t)$



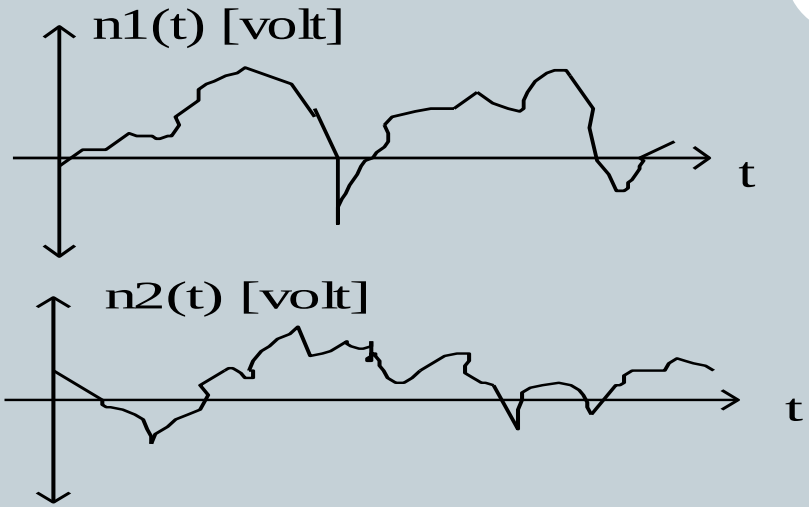
$$r(t) = s_i(t) + n(t)$$

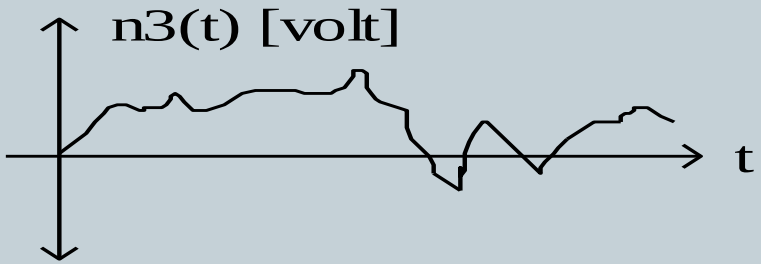
AWGN

Klasifikasi Noise

- Noise/Derau sebagai unsur pengganggu yang hampir selalu terlibat dalam Siskom memerlukan pemodelan yang representative untuk memudahkan keperluan analisis bagi penentuan kualitas ataupun kinerja Siskom.
- Klasifikasi noise berdasarkan sumbernya :
  - Dari luar system
  - Dari dalam system (umumnya paling dominan)
- Klasifikasi noise berdasarkan "equivalensi" dengan suhu:
  - Thermal-Noise
  - Non Thermal-Noise
- Klasifikasi noise berdasarkan model matematis/statistic :
  - Gaussian Noise
  - White noise
  - White Gaussian Noise

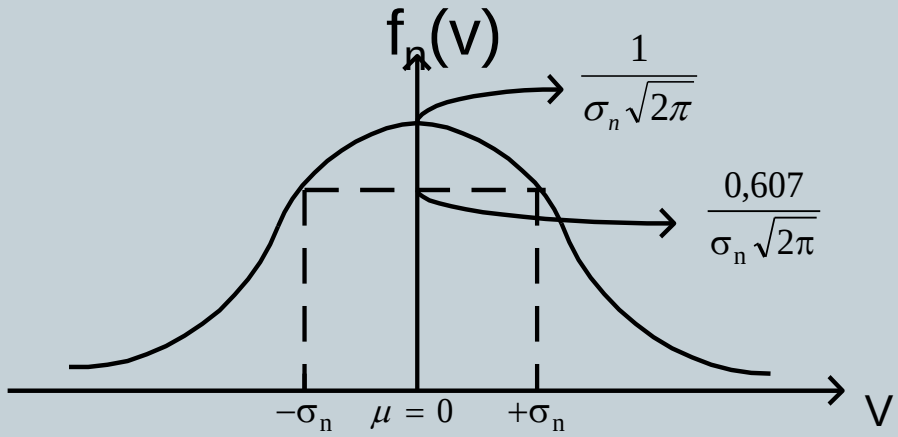
Gaussian Noise





- fungsi distribusi Gaussian :

$$f_n(v) = f_N(v) = \frac{1}{\sigma_n\sqrt{2\pi}} e^{-\frac{v^2}{2\sigma_n^2}}$$



Gaussian Noise

- dimana:
- σ_n = standar deviasi, dan $\mu \equiv$ mean = 0

$$\int_{-\infty}^{\infty} f_n(v)dv = \int_{-\infty}^{\infty} f_N(v)dv = 1$$

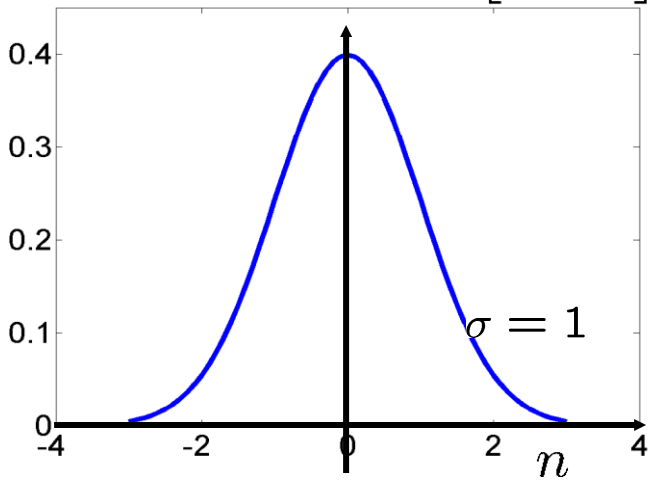
$$\sigma_n = \sqrt{VAR[N(t)]}$$ ≡akar daya rata-rata = tegangan r.m.s/efektif

- Tegangan r.m.s/eff. dapat diukur dengan " TRUE-RMS VOLT-METER", yang dapat berupa sinyal apa saja, termasuk NOISE.
- Tapi Voltmeter biasa hanya mengukur tegangan rata-rata sin/cos.

White Noise

- Its PSD is flat, hence, it is called white noise.

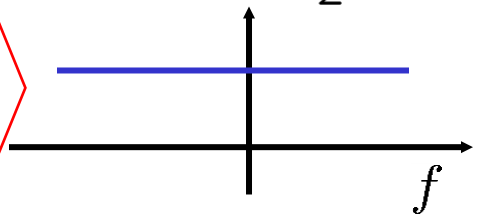
$$p(n) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{n^2}{2\sigma^2}\right]$$



Probability density function

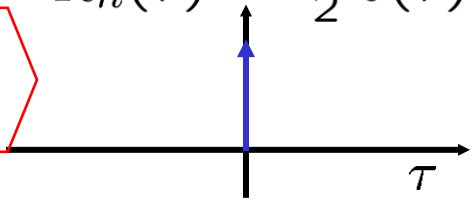
$$G_n(f) = \frac{N_0}{2} \text{ [w/Hz]}$$

Power spectral Density (PSD)



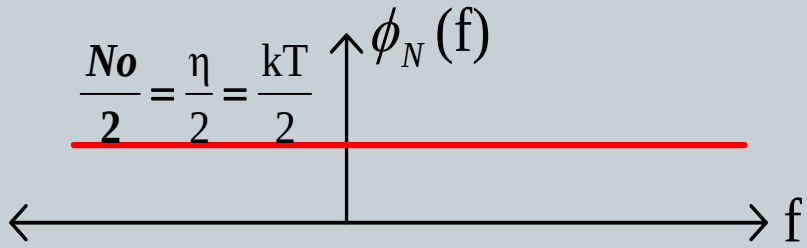
$$R_n(\tau) = \frac{N_0}{2}\delta(\tau)$$

Autocorrelation function

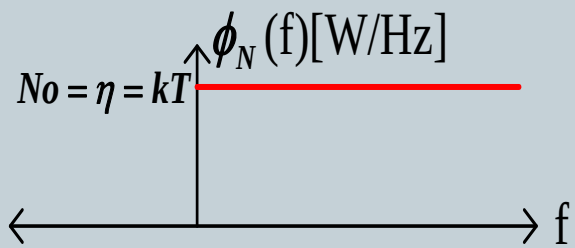


AWGN: Additive White Gaussian Noise

- Memiliki sifat gabungan antara Gaussian-noise dan white noise
- Berupa noise dalam/thermal noise :



Double sided



Single sided

$$k \equiv \text{konst.Boltzman} = 1{,}38.10^{-23} J/^{\circ}K[W/(Hz.^{0}K)]$$

- Rapat daya noise mempunyai ekuivalensi dengan thermal (T). Sehingga secara praktis dapat juga noise dinyatakan dalam thermal (ekivalensinya).

Contoh Soal:

- Berapa Besar Daya noise pada temperature (T) 100 derajat Kelvin dan Bandwith 10 Mhz?
- Apa pengaruh Noise terhadap sinyal yang informasi yang dikirimkan?
- Jelaskan apa yang dimaksud dengan noise AWGN (Penjelasan disertai gambar!)

Jawab:

- Daya noise (N)=No.B
  - Dimana No=k.T (Watt/Hz)
  - k=Konstanta Bolztman (W/H derajat K)
  - T= Temperatur (derajat Kelvin)
  - B= Bandwith (Hz)

THANK YOU