RIPASSO COMUNICAZIONI ELETTRICHE

BANDA OCCUPATA

$B_{DSB} = 2B$ (AM)

$B_{SSB} = B$

$B_{FM} = 2(f_\Delta + 2B)$

$B_{PM} = 2(\phi_\Delta + 1)B$

$B_{VSB} = B + B_V$

SNR$_i$
SNR$_u$

RAPPORTO SEGNALE - RUMORE demodulatori

FM - PM $\left(\frac{S_i}{N_i}\right) = \frac{\frac{A_0^2}{2}}{N_0 B_{AM}}$ FM, PM $\qquad P_{FM} = P_{PM} = \frac{A_0^2}{2}$

FM $\left(\frac{S_u}{N_u}\right) = \frac{3\frac{A_0^2}{2} f_\Delta^2 P_m}{N_0 B^3}$ **PM** $\left(\frac{S_u}{N_u}\right) = \frac{3\frac{A_0^2}{2} \phi_\Delta^2 P_m}{N_0 B^3}$

$$\frac{\left(\frac{S_u}{N_u}\right)_{FM}}{\left(\frac{S_i}{N_i}\right)_{FM}} = \frac{3 B_{FM} f_\Delta^2 P_m}{B^3}$$

Rapporto impresa-uscita elevato, dipende dal rapporto tra B_{FM} e B

DSB $\left(\frac{S_i}{N_i}\right) = \frac{P_x}{4 N_0 B}$ $\qquad \left(\frac{S_u}{N_u}\right) = 2\left(\frac{S_i}{N_i}\right) = \frac{P_x}{2 N_0 B}$ OK

SSB $\left(\frac{S_i}{N_i}\right) = \frac{P_x}{4 N_0 B}$ $\qquad \left(\frac{S_u}{N_u}\right) = \left(\frac{S_i}{N_i}\right) = \frac{1}{2}\left(\frac{S_u}{N_u}\right)_{DSB}$

AM $\left(\frac{S_i}{N_i}\right) = \frac{\frac{A_0^2}{2}(1 + \mu^2 P_m)}{2 N_0 B}$ → Questa è formula potenza AM $\qquad \left(\frac{S_u}{N_u}\right) = \frac{A_0^2 \mu^2 P_m}{2 N_0 B}$

$P_{DSB} = \frac{A_0^2 P_x}{2}$ $\qquad P_{DSB} = \frac{A_0^2 + P_x}{2}$

$P_{SSB} = \frac{P_x}{4}$ $\qquad P_{SSB} = \frac{A_0^2}{2} + \frac{P_x}{4}$

EFFETTO SOGLIA
pag. 81

$$P(t) = \sqrt{[A_R + A_R \mu m(t) + n_c(t)]^2 + n_s^2(t)}$$

→ $A_R + A_R \mu m(t) + n_c(t)$

→ Tratt. non lineare di $m(t)$

Potenza sinusoide: $\frac{A_0^2}{2}$

Potenza di una δ: A^2 → in effetti altezza della δ è la metà

DIZI SEGNALI

$x_{AM}(t) = A_0[1 + \mu\, m(t)]\cos(2\pi f_0 t) = A_0\cos(\,) + A_0\,\mu\, m(t)\cos(\,)$

$x_{DSB}(t) = A_0 \mu\, m(t)\cos(2\pi f_0 t)$

$x_{SSB}(t) = A_0\, m(t)\cos(2\pi f_0 t) \mp A_0\, \hat{m}(t)\,\text{SEN}(2\pi f_0 t)$

$x_{VSB}(t) = A_0\, m(t)\cos(2\pi f_0 t) \mp A_0 [m_1(t)]\,\text{SEN}(2\pi f_0 t)$

↓ un qualunque filtro passivo

$x_{PM}(t) = A_0 \cos[2\pi f_0 t + \phi_\Delta \cdot m(t)]$

$x_{FM}(t) = A_0 \cos\left[2\pi f_0 t + 2\pi f_\Delta \int_{-\infty}^{t} x(\tau)\, d\tau\right]$

Modulatore FM - PM in frequenza

$X_M(f) = \frac{A_0}{2}\delta(f - f_0) + j\frac{A_0}{2}\Phi(f - f_0)$ — banda stretta pag. 91

↓ trasformata di $\Phi(t)$

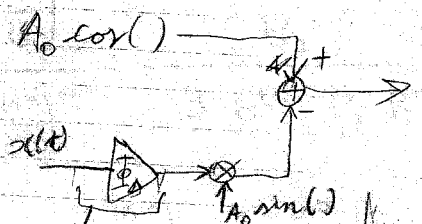
$\Phi(t) = \begin{cases} [\Phi_\Delta \cdot x(t)] & \text{PM} \\ \left(2\pi f_\Delta \int_{-\infty}^{t} x(\alpha)\, d\alpha\right) & \text{FM} \end{cases}$

La stessa nel tempo

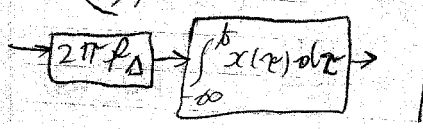
$x_M(t) = A_0 \cos(2\pi f_0 t) - A_0\, \Phi(t) \sin(2\pi f_0 t)$

Modulatore banda stretta pag. 91 slides

PM:

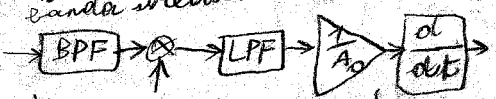


se è FM, qui ci va



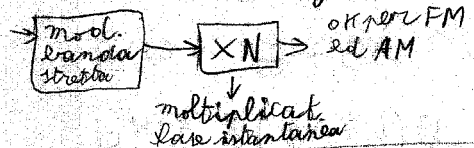
Demod. FM pag. 102

banda stretta



Demod. PM

Mod. Banda larga



Oppure Voltage Controlled Oscillator (solo per FM) pag. 95 disp.