

$$G(s) = \frac{5}{s(s+1)(0,25s+1)}$$

$$M_F = 60^\circ \quad K_V = 10$$

$$K_V = \lim_{s \rightarrow 0} s \cdot \frac{K \cdot 5}{s(s+1)(0,25s+1)} = \lim_{s \rightarrow 0} \frac{Ks}{(s+1)(0,25s+1)} = 5K$$

$$K_V = 5K$$

$$10 = 5K$$

$$K = 2$$

$$\text{Bode}(f_t) \rightarrow f_t = \frac{10}{s(s+1)(0,25s+1)} = \frac{10}{0,25s^3 + 1,25s^2 + s}$$

$$W_1 = 2 \frac{\text{rad}}{s}$$

$$Z_{lag} = 0,1(W_1) = 0,1(2) = 0,2$$

$$\frac{1}{T_2} = Z_{lag} \rightarrow T_2 = \frac{1}{Z_{lag}} = 5 \text{ s}$$

$$\text{Bode (FE)} \rightarrow FE = \frac{10}{s(s+1)(0,25s+1)} = \frac{10}{0,25s^3 + 1,25s^2 + s}$$

$$W_1 = 22 \frac{\text{rad}}{s}$$

$$Z_{\text{lag}} = 0,1(W_1) = 0,1(22) = 2,2$$

$$\frac{1}{T_2} = Z_{\text{lag}} \rightarrow T_2 = \frac{1}{Z_{\text{lag}}} = 0,45$$

$$\phi_{\text{lead}} = 60^\circ 15'$$

$$\beta = \frac{-(\sin \phi_{\text{lead}} + 1)}{\sin \phi_{\text{lead}} - 1} = 20,34$$

$$\frac{1}{\beta T_2} = \text{lag} \rightarrow \frac{1}{20,34(5)} = 0,009832$$

$$\text{Compensador de atraso} = G_{\text{lag}}(s) = \frac{s + 0,2}{s + 0,009832}$$

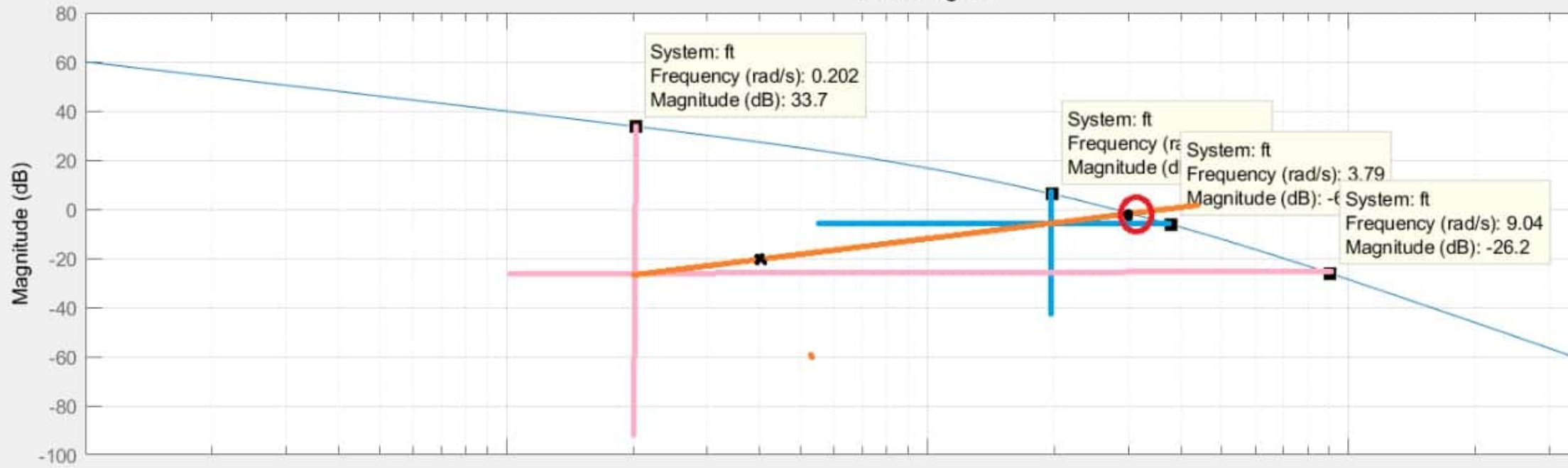
$$\text{Bode (FE)} \rightarrow \text{mide } G \rightarrow W_1$$

$$G = 5,98 \text{ dB} \quad -20 \text{ dB}$$

$$Z_{\text{lead}} = \frac{s + 0,495}{s + 5,51}$$

$\underbrace{\hspace{1cm}}_{W_1}$
 0 dB

Bode Diagram



Bode Diagram

