

Frequency Domain Behavior

From the model of the isolation system dynamics, it can be seen that a second order pole (“resonance”) and second order zero (“anti-resonance”) are added. Their frequencies are f_R and f_A respectively.

$$f_R = \frac{1}{2\pi} \sqrt{K/M_B}, \quad f_A = \frac{1}{2\pi} \sqrt{K/(M_B + M_L)}$$

Typically, $M_B \gg M_L$, so the two frequencies are very close, yet $f_A > f_R$.

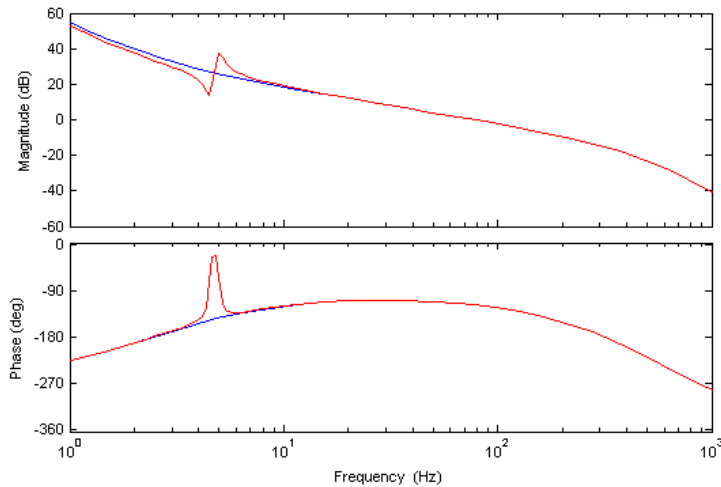


Figure: Effect of isolation system dynamics on the Bode plot of a system

The figure shows the open loop Bode plot of a system controlled by a PIV filter [2]. The blue plot describes the system without the isolation system dynamics. The red plot shows the effect of the isolation system dynamics. The additional resonance and anti-resonance are clearly observed with the introduction of phase lead. Note that the effect in the frequency domain is not significant; however, the effect on time domain performance can be crucial.