

Special Problem 3.H-6

A lossless, passive, linear 2-port microwave **filter** has the scattering parameter:

$$S_{21}(\omega) = \left(\frac{4\pi^2 \times 10^{12}}{\omega^2 + 4\pi^2 \times 10^{12}} \right)^{1/2} e^{-j(10^{-10} \omega^2 + 10^{-6} \omega)}$$

- A.** Determine the phase **delay** of this filter at signal frequency $\omega = 10^4$ *rad / sec*.
- B.** Is this a low-pass, high-pass, band-pass, or band-stop filter? Provide explicit **justification** for your answer!