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Introduction to Sensors, Instrumentation, and Measurement

03/18/2024

Lab Eight: Ballistocardiograph

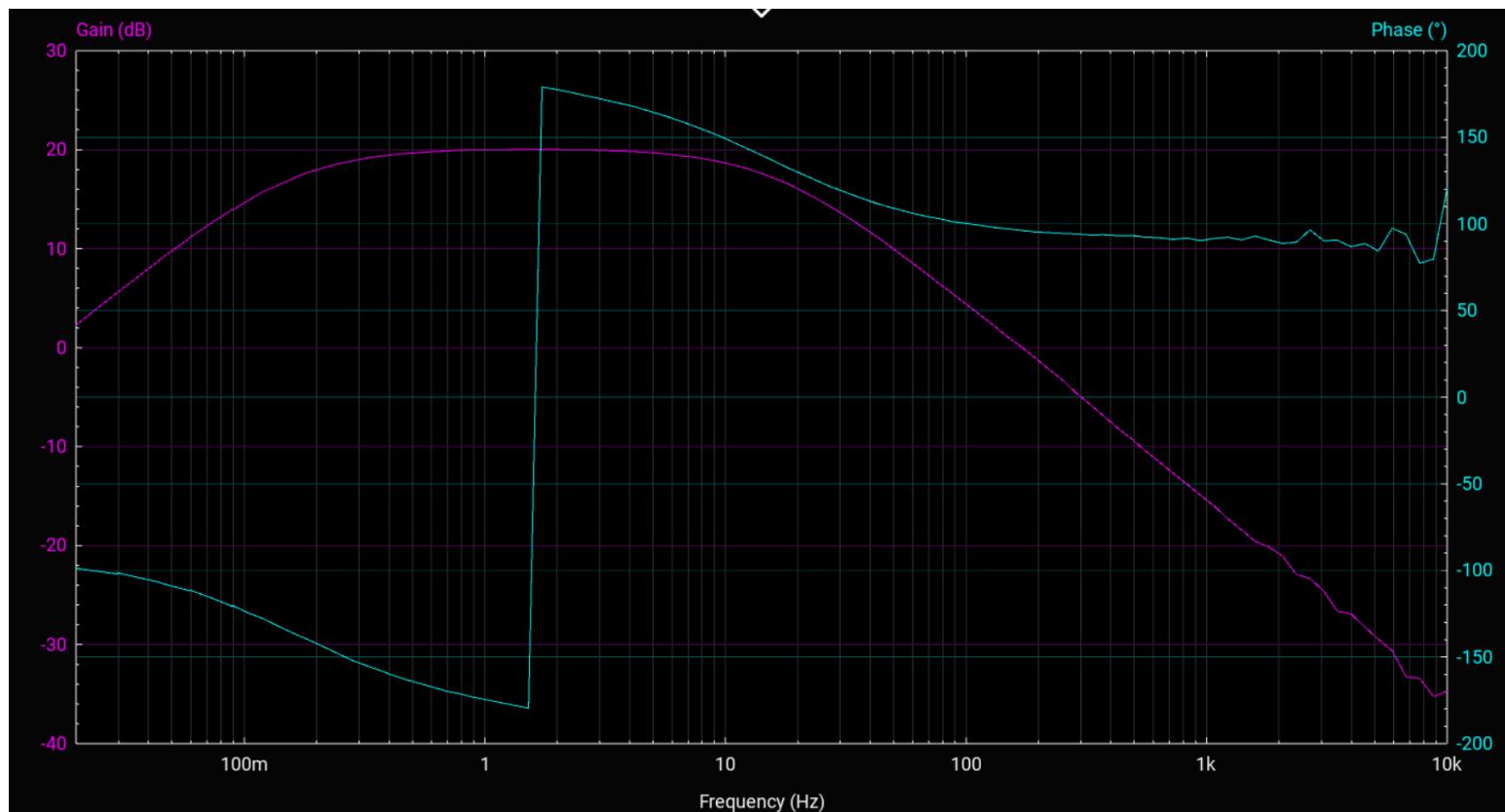
Purpose:

Build and test a ballistocardiograph from strain gauges, op-amps and second-order filters.

Results:

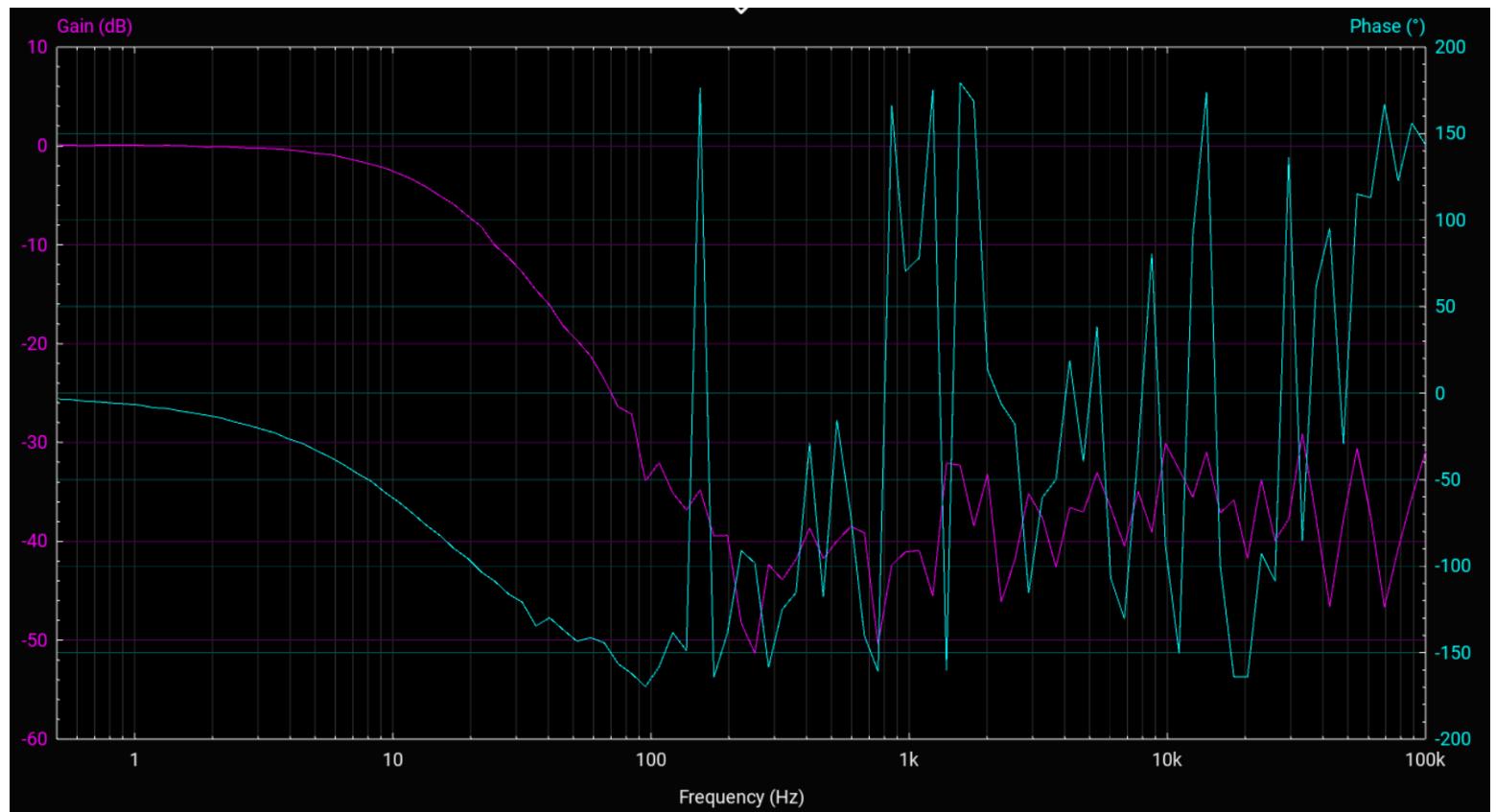
- 1.) 2 points. The Bode plots of the filter stages.

Bandpass filter/amplifier Bode Plot



Bode plot of a bandpass filter with cutoff frequencies of 0.5 and 16 Hz and a gain of -10. In my circuit, two of these are included in series. The bode plot is run from 10mHz to 10kHz at an amplitude of 200mV.

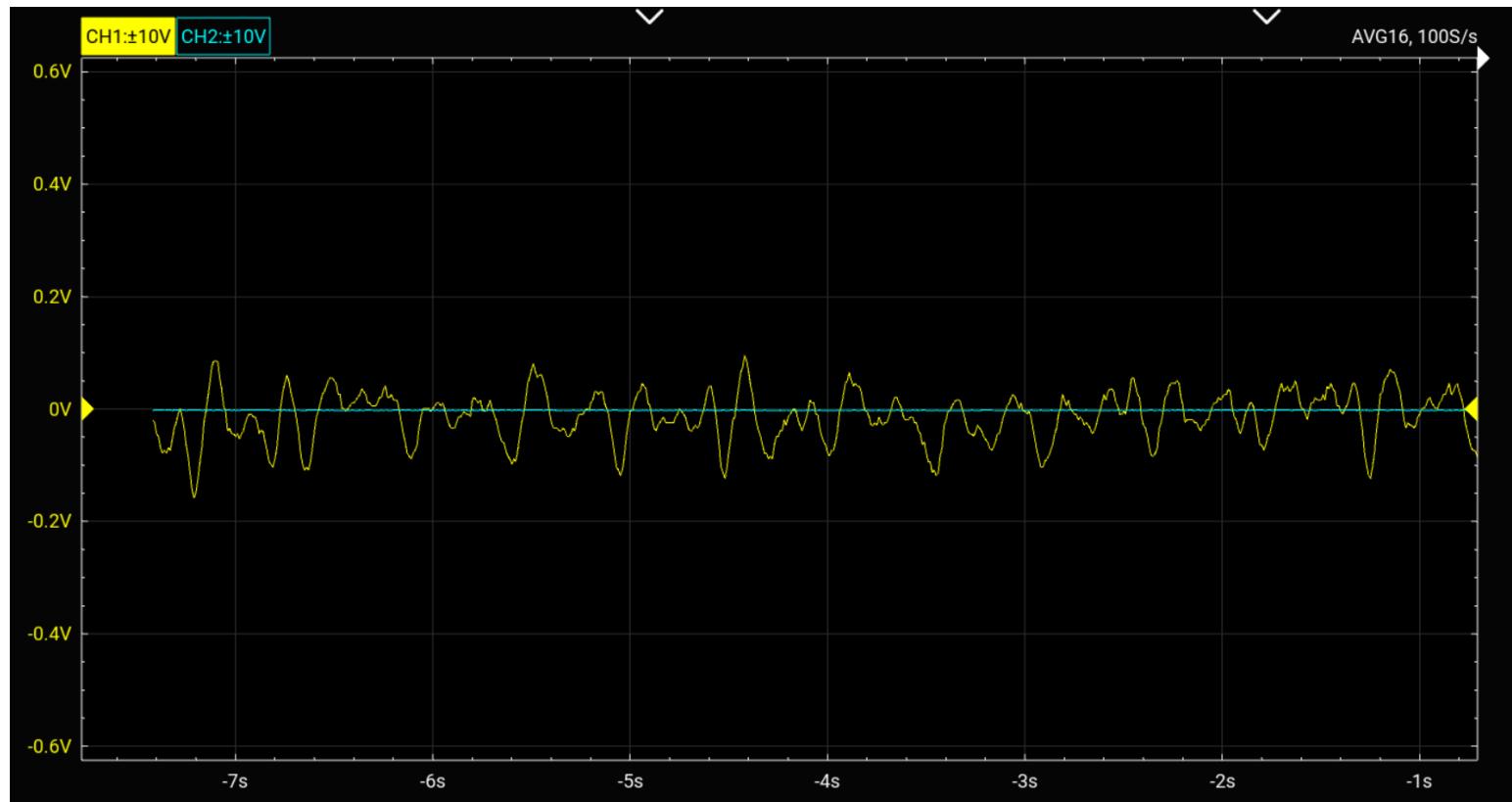
Second Order Low-pass filter Bode Plot



Second order low-pass filter with a cutoff frequency of 16 Hz. The bode plot is run from 500mHz to 100kHz at an amplitude of 200mV.

2.) 1 point. A good, clean BCG trace, similar to what is shown in Figure 1 (without the EKG).

Heartbeat Recoil Force (measured with voltage over time)



My pulse is measured using a ballistocardiograph. The ballistocardiograph and integrated circuit contains an instrument amplifier with a gain of 101, two band pass filters and amplifiers (0.5Hz to 16Hz, gain of -10), and a second order low pass filter (cutoff frequency of 16Hz).

3.) 1 point. A legible sketch of your complete circuit with labeled components and a picture of your circuit.

