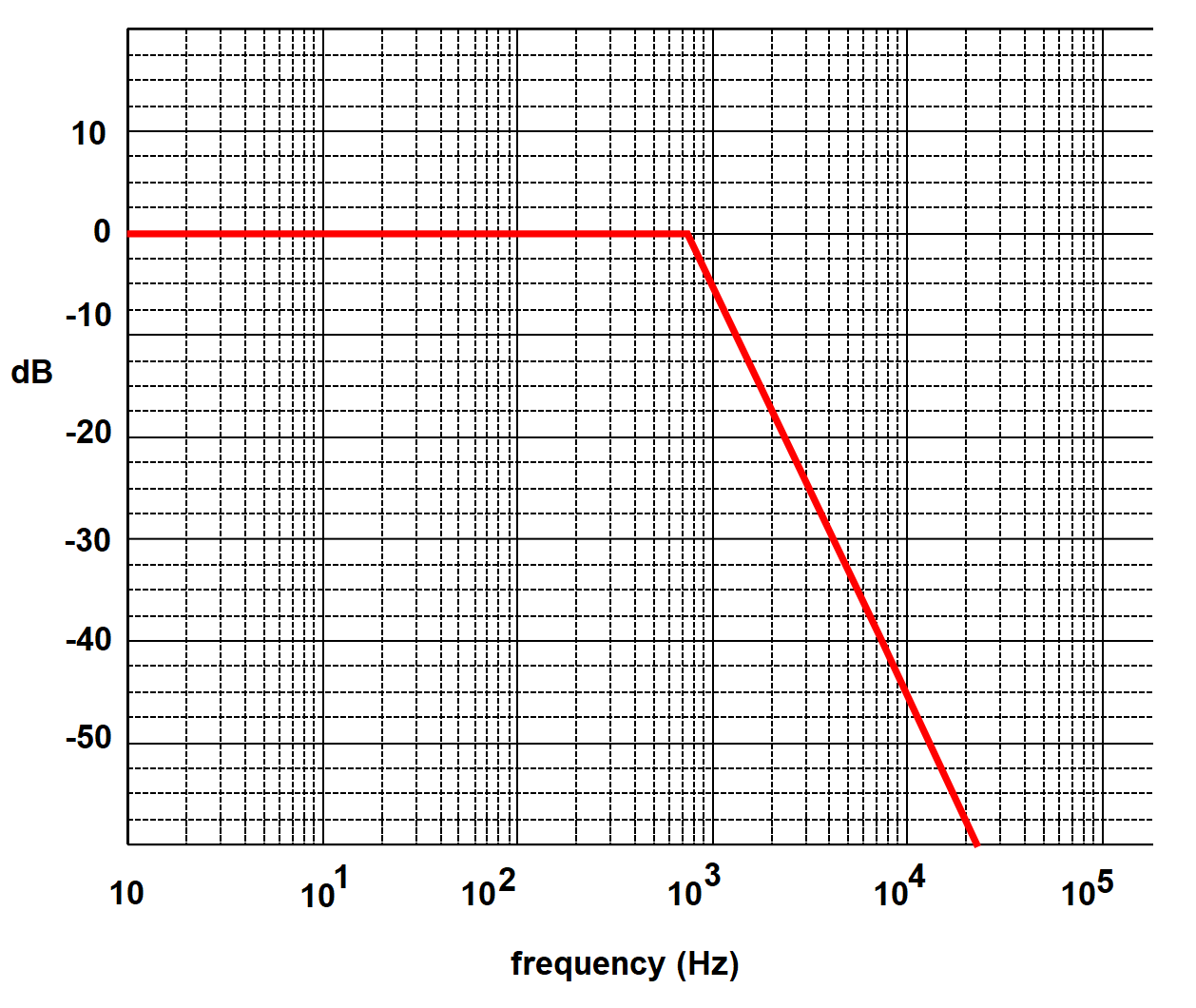
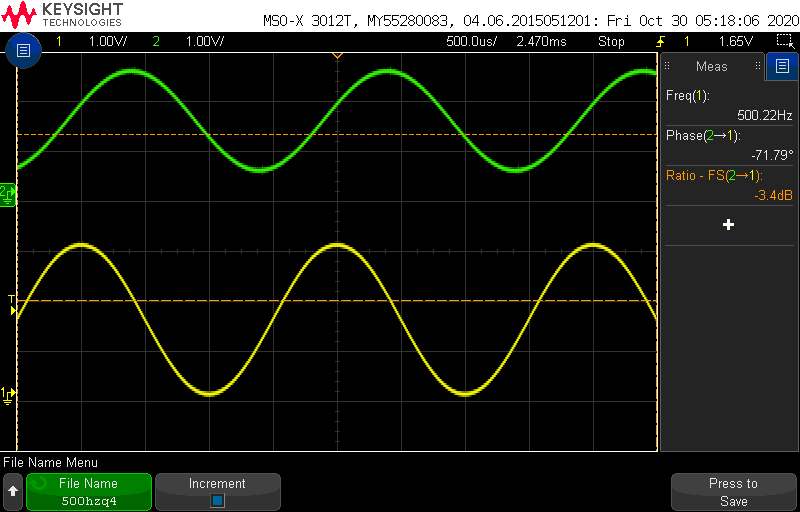
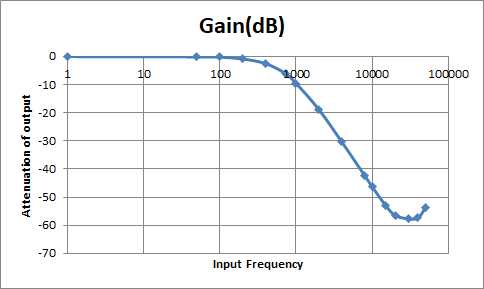
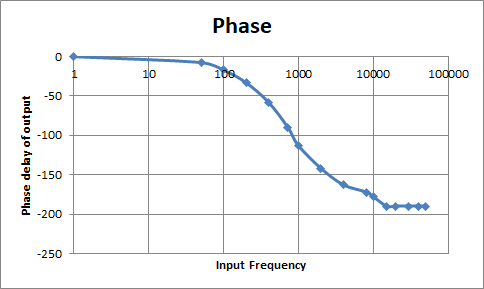
Zachary Gamble

Frankie Austin

InLab 10

1. The calculated corner frequency of our 2nd Order low pass filter is 723 Hz.
2. The following is the Bode plot showing the corner frequency 723 Hz.
3. The following diagram is the measured wave which was produced by the function generator at 500Hz. 
4. The following graphs are the gain and phase plots from the oscilloscope.

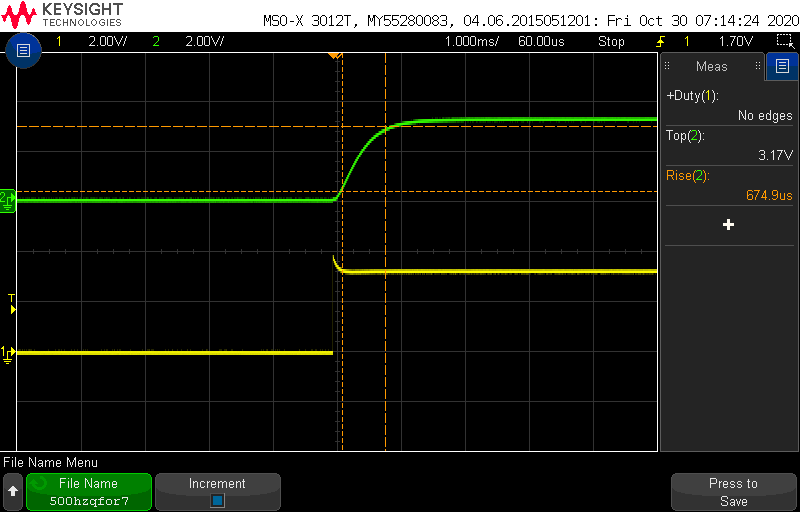




1. The following chart represents the values that were created by the PWM subsystem on the board. Each wave was modified via the “s” command. Each modification changed the 8-bit value used to set the PWM frequency.

|  |  |  |
| --- | --- | --- |
| Duty Cycle (%) | LoadDutyValue | LPF output(V) |
| 31 | 79 | 1.4 |
| 86 | 219 | 3.1 |
| 78 | 199 | 2.8 |
| 9 | 22 | 0.56 |
| 4 | 10 | 0.48 |
| 60 | 153 | 2 |

1. The rise time of the LPF output is 675 us.
2. The following is the image of the oscilloscope for the change duty cycle from 0% to 100%.



1. The theoretical rise time of the low pass filter 484 us: We are given the following equation:

t_{r} = \frac{2.2}{\omega_{0}}



![\omega_{0}

](data:image/gif;base64,R0lGODlhEQAMALMAAP///wAAAO7u7rq6uqqqqmZmZkRERIiIiMzMzDIyMpiYmNzc3HZ2dlRUVCIiIhAQECH5BAEAAAAALAAAAAARAAwAAARUEMhJBZ2DXFDMBseHJBuCTOdUAMhBhNpESoICeICiTwszKYJBQ4IwDCUFH0CwOqxYDwZDeHAcBgkL47l4LByPkOLhGEicxMeHIpQMcGvJbBcnunwRADs=) can be simplified to the following equation:

\omega_{0} = 2\pi f_{0}



Our value for ![f_{0}

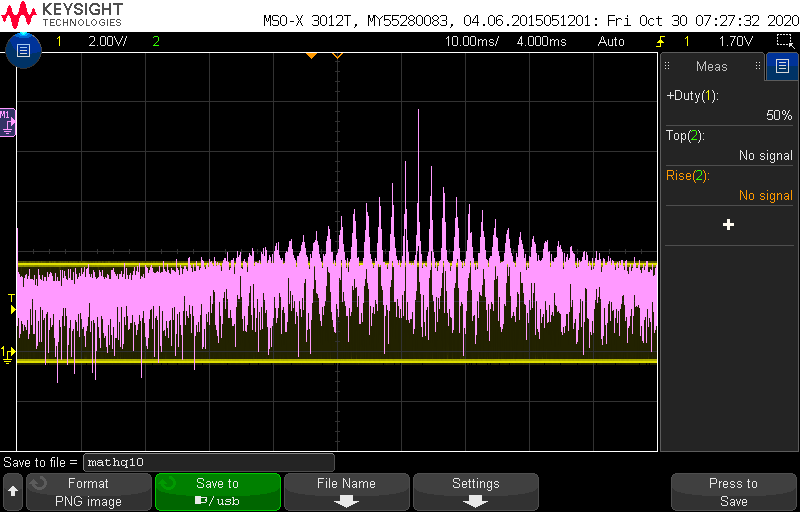
](data:image/gif;base64,R0lGODlhDwARALMAAP///wAAAIiIiJiYmKqqqiIiIszMzNzc3Lq6ujIyMu7u7nZ2dkRERBAQEFRUVGZmZiH5BAEAAAAALAAAAAAPABEAAARbEMgJxCA0yyFI0VlhHAg4HYGZEYkqKUuRLKXLDO7UGJPRCRlFasLY4CaIjwThkBiKE0FTIng4GxQHULKwAg5YHY/qNYQBQgpzWUQoCNNJCzDABRCPca+zMB5VEQA7) was 723 Hz. Therefore:

t_r=\frac{2.2}{2\pi f_{0}} = \frac{2.2}{2\pi(723Hz)} =  484 us

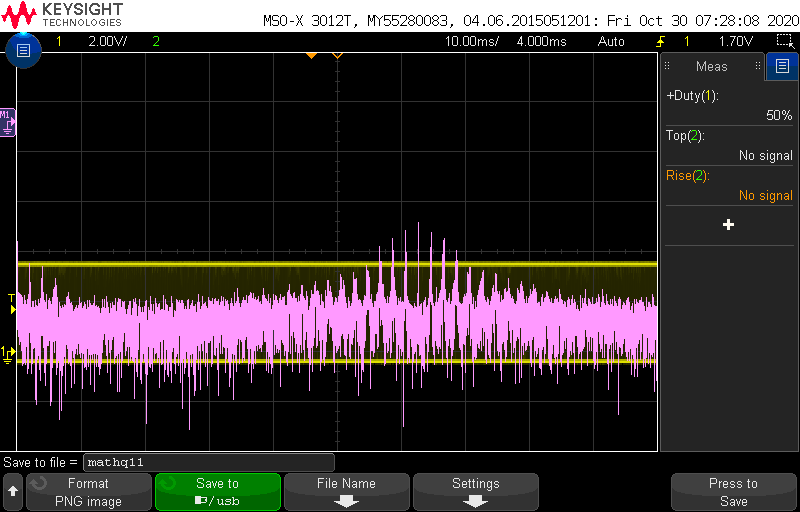
1. The percentage difference between the actual and theoretical rise time is 39.5%. The theoretical value was calculated in question 8: 484us. Our actual value was measured before to be 675. Therefore, the percent difference equation for these values is:

\left\lvert \frac{675 -  484}{484} \right\rvert \times 100 = 39.5% 

1. The following is the graph of the FTT with source channel 1, span 100kHz and center 50kHz.



1. The following is the graph of the FTT with source channel 2, span 100kHz and center 50kHz.

  
  
The filtered and unfiltered waveforms look different because the filter attenuates the input signal. So the output waveform is smaller because it is attenuated by about -60 dB at the largest frequencies and the corresponding amounts for the lower frequencies.

1. This an image of the FFT function on channel 2 with center 1kHz and span 2kHz.   
   