Lab 10 Report

FIR Filters

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Project 1: GUI-Based FIR Filter Design

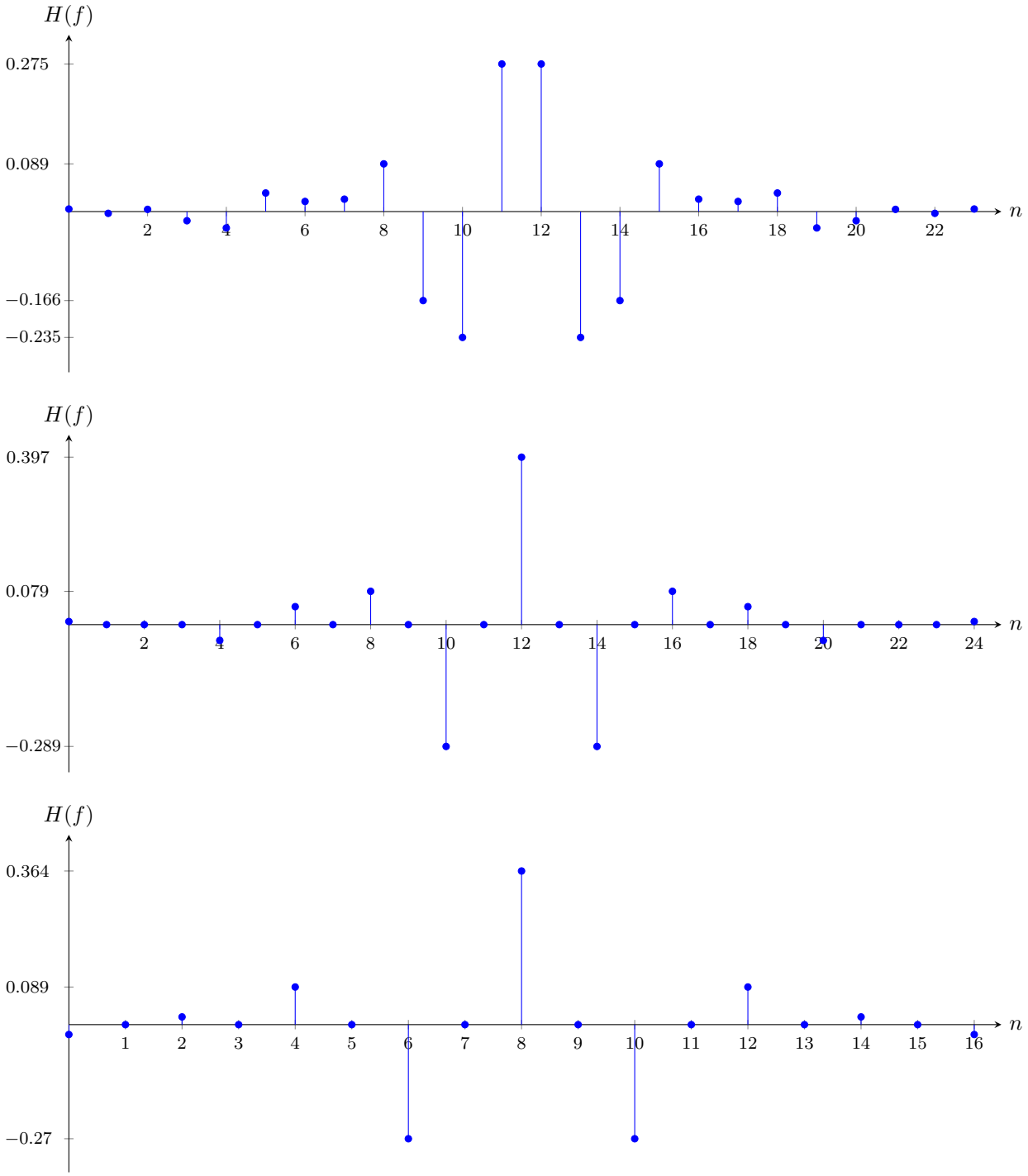

Figure 1: Impulse responses for each example filter.

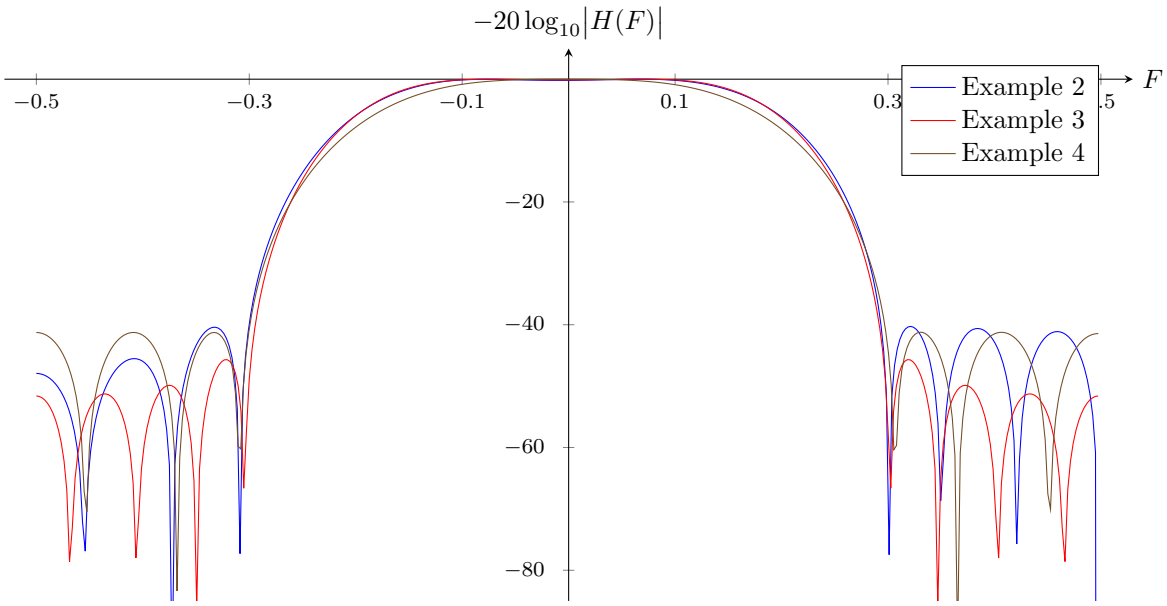

Figure 2: Bode plot of each filter.

Project 2: GUI-Based Multi-Band Filter Design

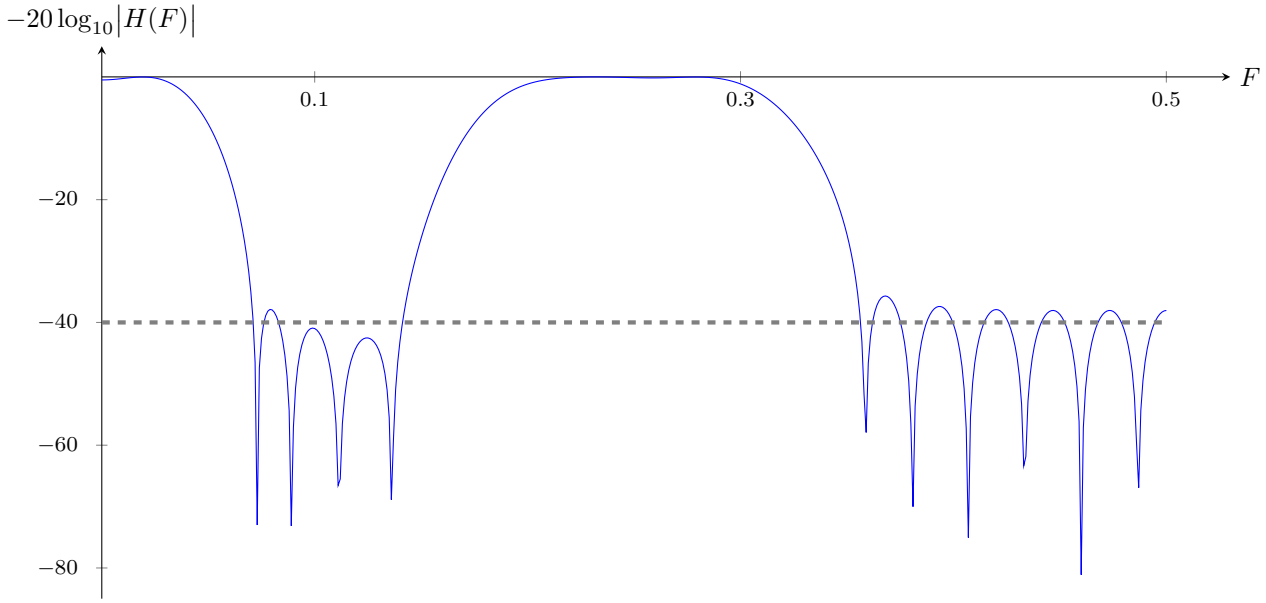

Figure 3: Bode plot of first attempt at designed filter. Note that it obviously does not meet stopband specs. To rememdy this, I will first try making passband 2 order 39.

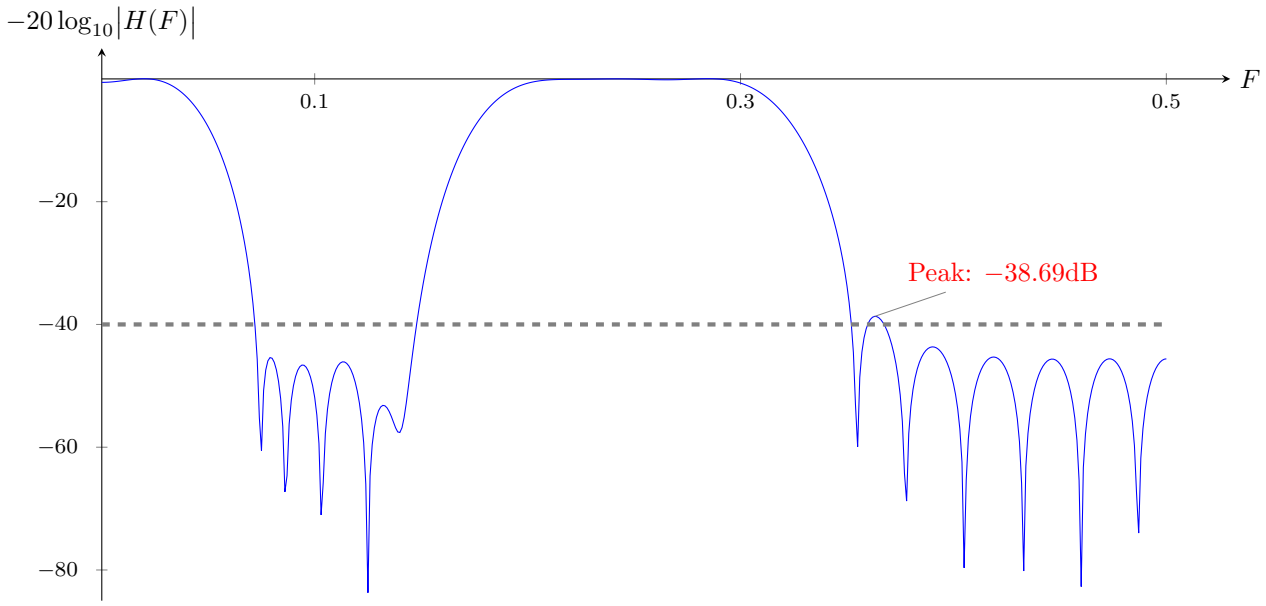

Figure 4: Bode plot of second attempt at designed filter. There is one problematic sidelobe which I will mitigate by changing $A_s = 40\text{dB} + 1.131\text{dB} = 41.131\text{dB}$.

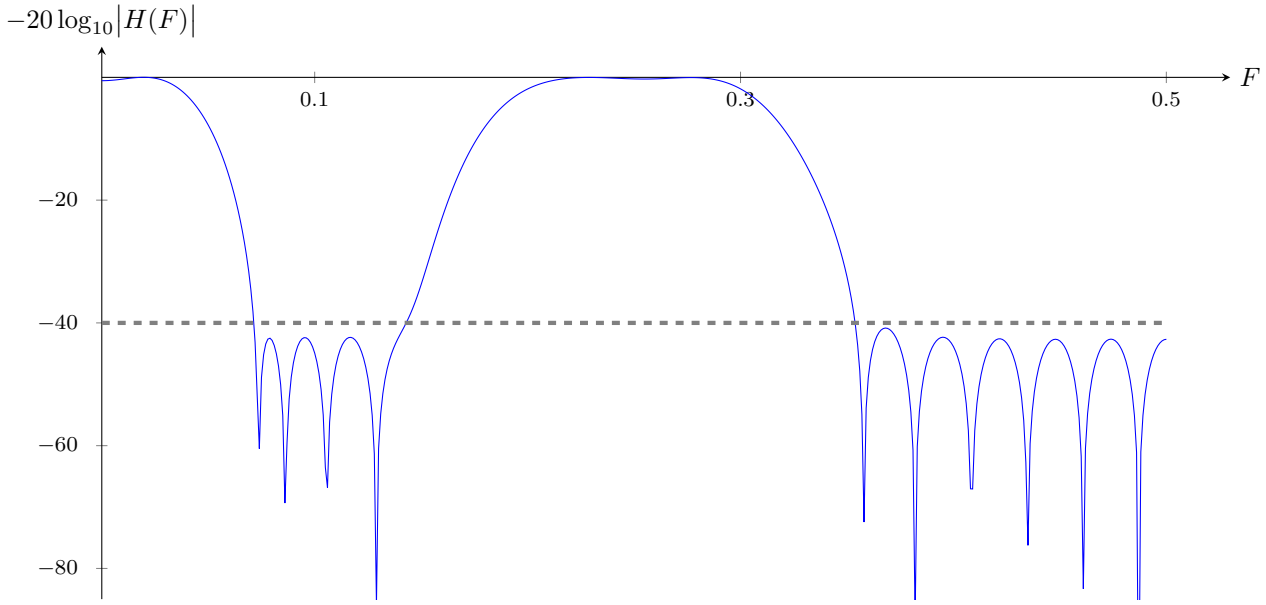

Figure 5: Third time's the charm! This filter meets specs.

Appendix: MATLAB Source Code

What follows is a listing of the MATLAB source code (Listing 1) and the text output of this code (Listing 2) used to generate the figures and other information presented in this report.

Listing 1: The MATLAB script used for this report, `Lab10_ahirzel.m`.

```
addpath ../../ClassWorkspace;
delete 'generated/diary.txt'; diary 'generated/diary.txt'; diary on


% Project 1: GUI-Based FIR Filter Design %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%dfirgui
%mysaveas('p1e2ir', 8, 8);
%mysaveas('p1e3ir', 8, 8);
%mysaveas('p1e4ir', 8, 8);

load p1designs
csvwrite('generated/p1e2ir.csv', p1e2ir');
csvwrite('generated/p1e3ir.csv', p1e3ir');
csvwrite('generated/p1e4ir.csv', p1e4ir');

csvwrite('generated/p1e2mag.csv', p1e2mag);
csvwrite('generated/p1e3mag.csv', p1e3mag);
csvwrite('generated/p1e4mag.csv', p1e4mag);


% Project 2: GUI-Based Multi-Band Filter Design %%%%%%%%%%%%%%%%%%%%%%%%%%%

evalztf = @(N, D, z) polyval(N, z) ./ polyval(D, z);
evalztfF = @(N, D, F) evalztf(N, D, exp(1j*2*pi*F));

%dfirgui
%mysaveas('p2band1', 8, 8);
%mysaveas('p2band2', 8, 8);

load p2design1
result = p2band1ir + [zeros(1,3) p2band2ir zeros(1,3)];
csvwrite('generated/p2attempt1.csv', ...
    -20*log10(abs(evalztfF(1, result, 0:0.001:0.5)))');

load p2design2
result = p2band1ir + p2band2ir;
csvwrite('generated/p2attempt2.csv', ...
    -20*log10(abs(evalztfF(1, result, 0:0.001:0.5)))');

load p2design3
result = p2band1ir + p2band2ir;
csvwrite('generated/p2attempt3.csv', ...
    -20*log10(abs(evalztfF(1, result, 0:0.001:0.5)))');

diary off
```

Listing 2: The output of listing 1, `diary.txt`.