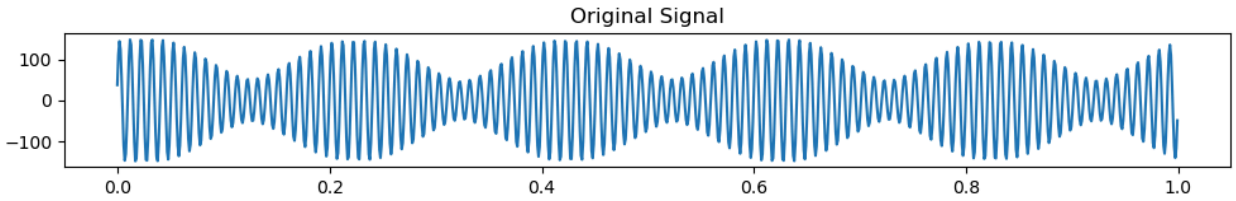
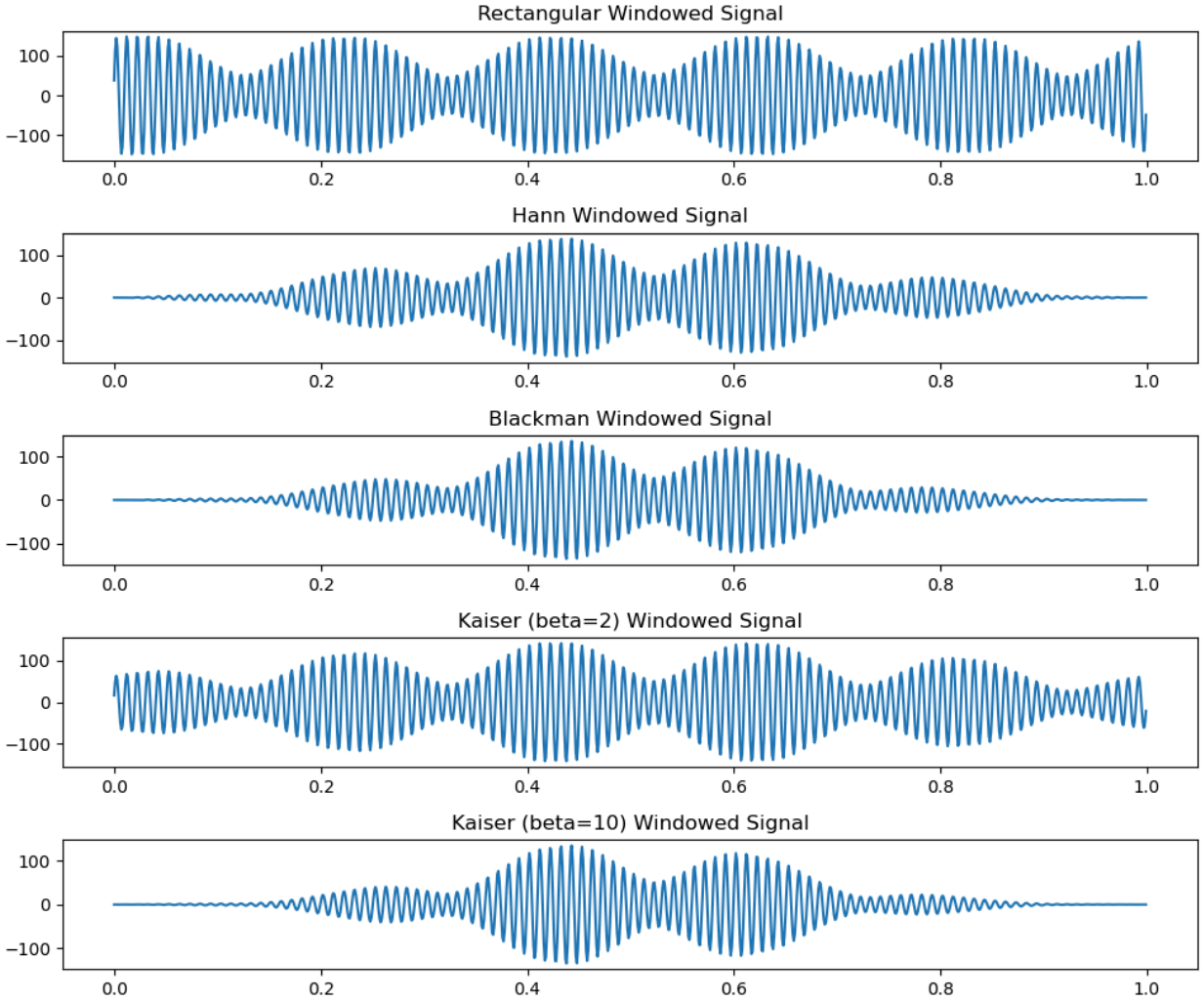
Carson Sager

Coding Project 3

1) Signal Over Time Duration of 1 Second with Sampling Rate of 1000 Hz



2) 5 Separate Windowed Versions



3) Rectangular, Hanning, Blackman- Harris window function domain resolution.

```
Solved Rectangular Resolution: 2.000000, Solved Hann Resolution: 4.004004, Solved Blackman Resolution: 6.006006
```

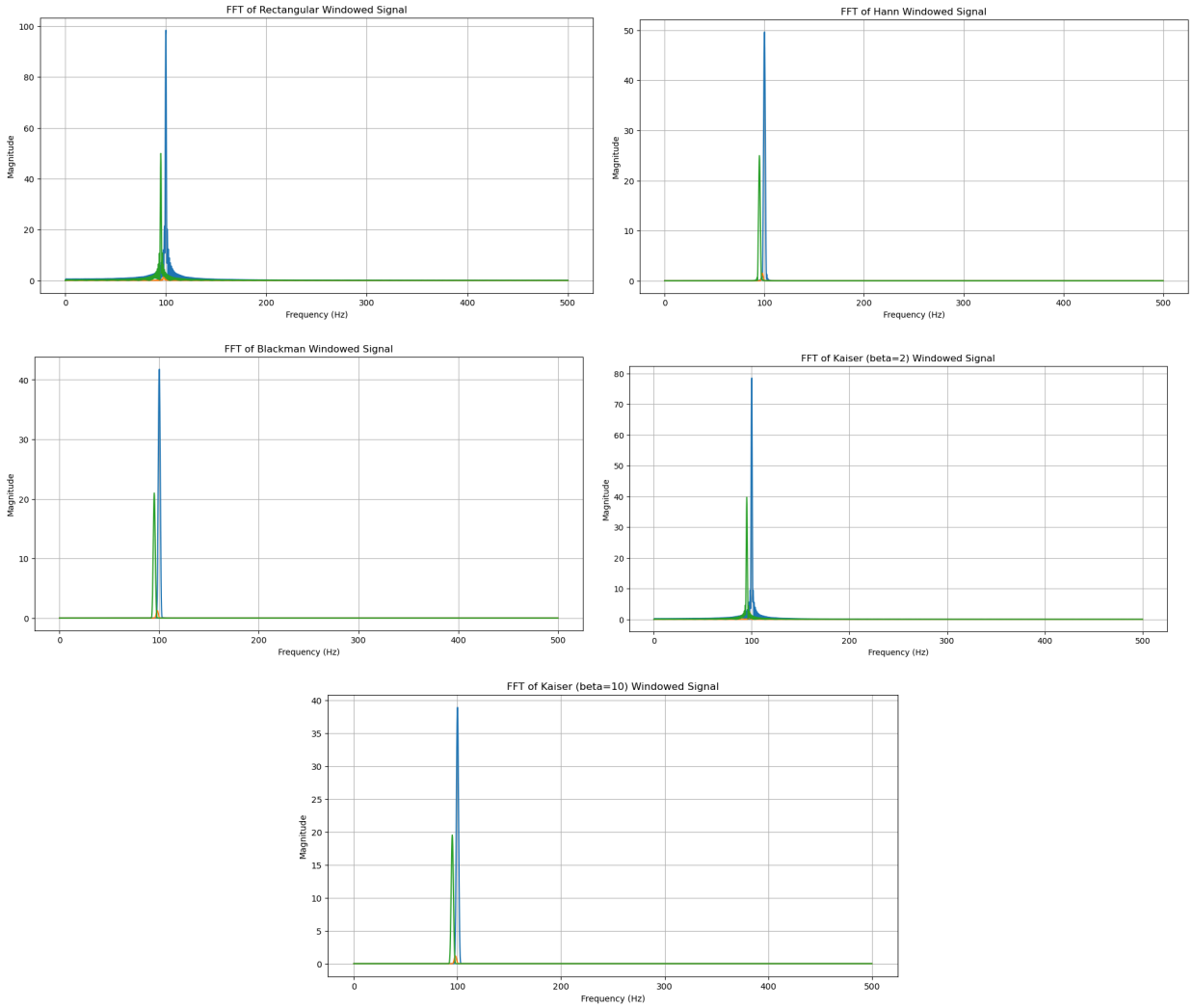
4) Kaiser Bessel Windows Side Lobe Amplitudes:

Beta = 2: `Solved Asl2: 18.493960` Beta = 10: `Solved Asl10: 74.098778`

Frequency Resolution:

```
Solved ml2: 2.358464, Solved ml10: 6.659053
```

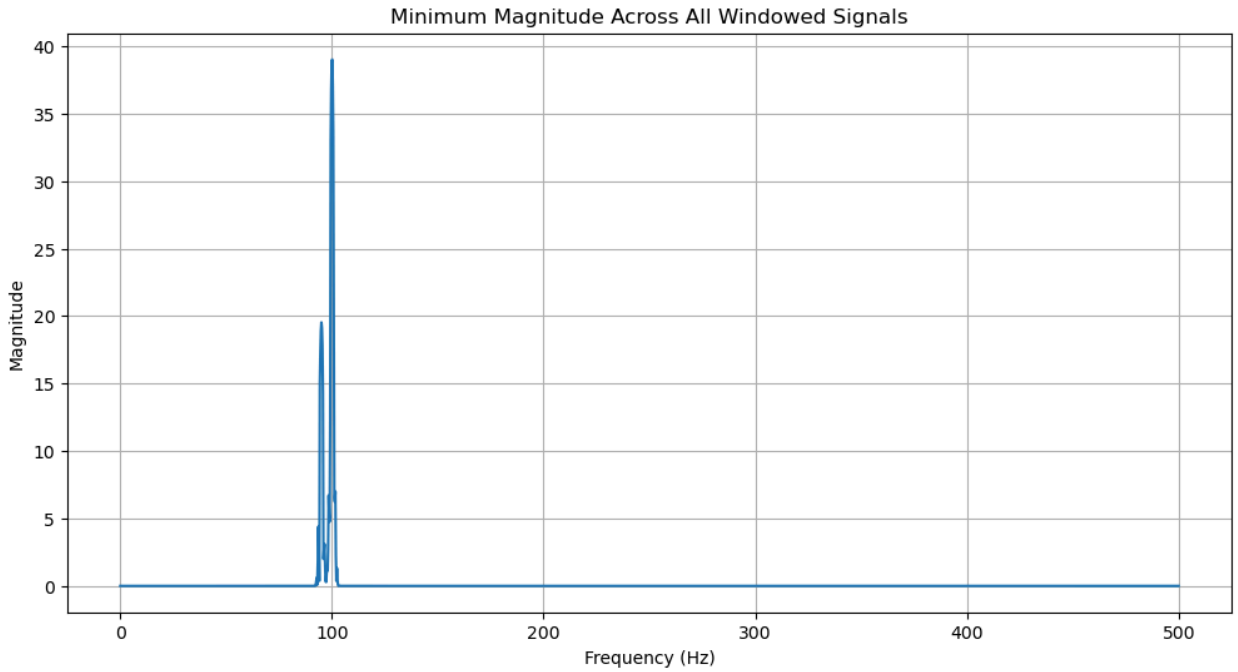
5) Windowed Signals Calculated Separately:



(1) Despite each peak being visible when we separate the sinusoids apart from one another, you cannot clearly see all 3 peaks in any of the graphs whenever the full signals are present. The 95 Hz and 100 Hz waves are visible, but the 98 Hz wave is somewhat overtaken by the 100 Hz wave in each of the plots.

(2) As mentioned, you cannot differentiate between a peak of 98 Hz and a side lobe from a peak at 100 Hz in any of these cases.

6) Minimum Values of all 5 FFT Functions at Each Frequency Index



(1) This method allows for generally better resolution, along with less side lobe interference (greater distance from main lobe) than the above windowing methods.

(2) This method performs better than the previous methods since it is basically a combination of all of the advantages of each individual method. Taking the minimum of each allows for better resolution as well as lower sidelobes. For example, the rectangular window has better resolution but higher side lobes, while the Blackman window has worse resolution with lower sidelobes.

(3) While this method works for the analysis of the magnitude in this case, it will bring phase distortion when trying to analyze the phase characteristics of signals and will result in inaccurate phase measurements. However, the method should still work when analyzing magnitude components in most other cases, as long as the application requirements are still being met.