Group 4: Samson Huang, Ervin Jerold Balancio Pedersen, Epifanio Benjamin Oliquino Salvador

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LAB5 Checks functionality of FIR window design Place this file in same directory as your rectfilt, hammingfilt and kaiserfilt functions.

Part 1: Check filter design

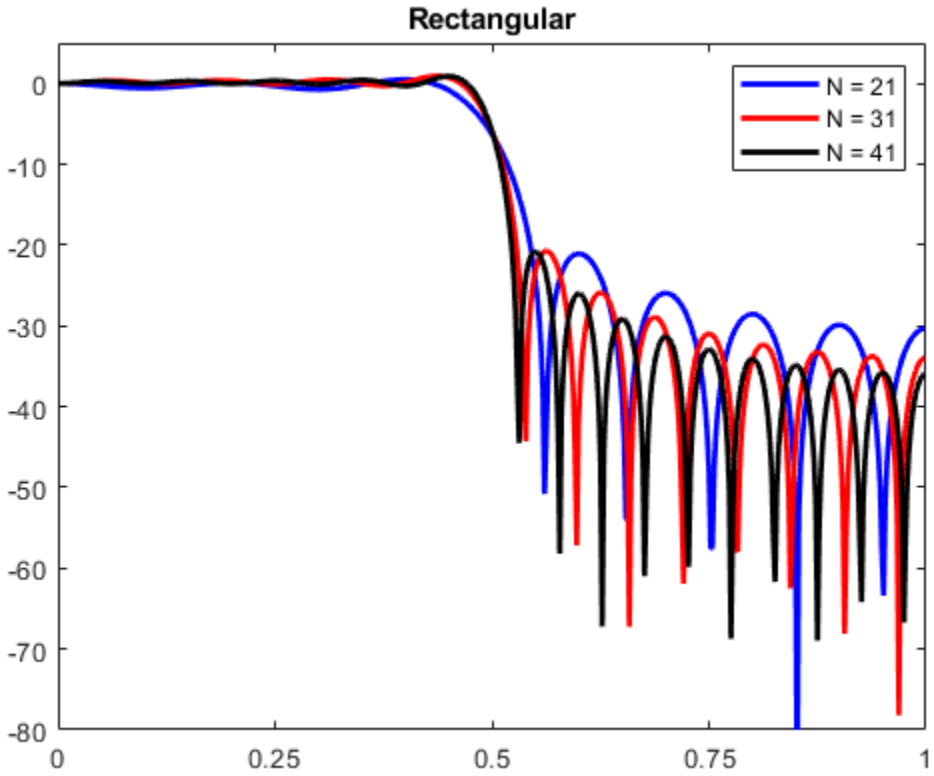
```
test_lab5a
```

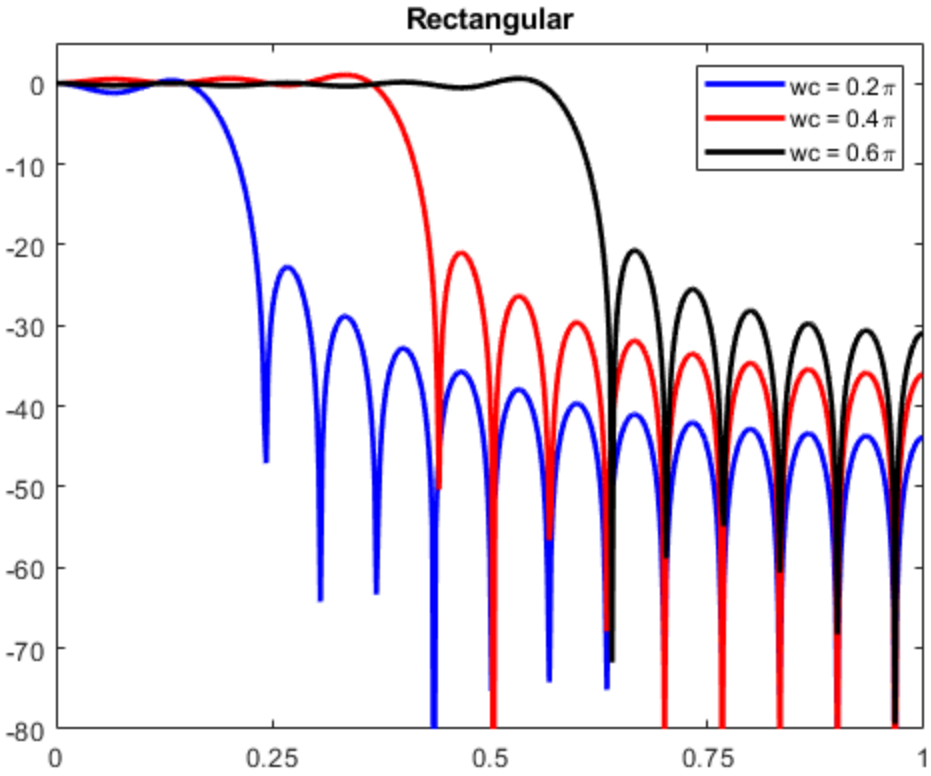
```
Testing 'rectfilt' with N=21 and wc=0.25: O.K.
Testing 'rectfilt' with N=31 and wc=0.25: O.K.
Testing 'rectfilt' with N=41 and wc=0.25: O.K.
Testing 'rectfilt' with N=21 and wc=0.50: O.K.
Testing 'rectfilt' with N=31 and wc=0.50: O.K.
Testing 'rectfilt' with N=41 and wc=0.50: O.K.
Testing 'rectfilt' with N=21 and wc=0.75: O.K.
Testing 'rectfilt' with N=31 and wc=0.75: O.K.
Testing 'rectfilt' with N=41 and wc=0.75: O.K.

Testing 'hammingfilt' with N=21 and wc=0.25: O.K.
Testing 'hammingfilt' with N=31 and wc=0.25: O.K.
Testing 'hammingfilt' with N=41 and wc=0.25: O.K.
Testing 'hammingfilt' with N=21 and wc=0.50: O.K.
Testing 'hammingfilt' with N=31 and wc=0.50: O.K.
Testing 'hammingfilt' with N=41 and wc=0.50: O.K.
Testing 'hammingfilt' with N=21 and wc=0.75: O.K.
Testing 'hammingfilt' with N=31 and wc=0.75: O.K.
Testing 'hammingfilt' with N=41 and wc=0.75: O.K.

Testing 'kaiserfilt' with deltaOmega=0.1, delta=0.01:
 N (45) is correct, beta (3.39532) is correct
 Checking wc=0.25: O.K.
 Checking wc=0.50: O.K.
 Checking wc=0.75: O.K.
Testing 'kaiserfilt' with deltaOmega=0.1, delta=0.00097:
 N (73) is correct, beta (5.68242) is correct
 Checking wc=0.25: O.K.
 Checking wc=0.50: O.K.
 Checking wc=0.75: O.K.
```

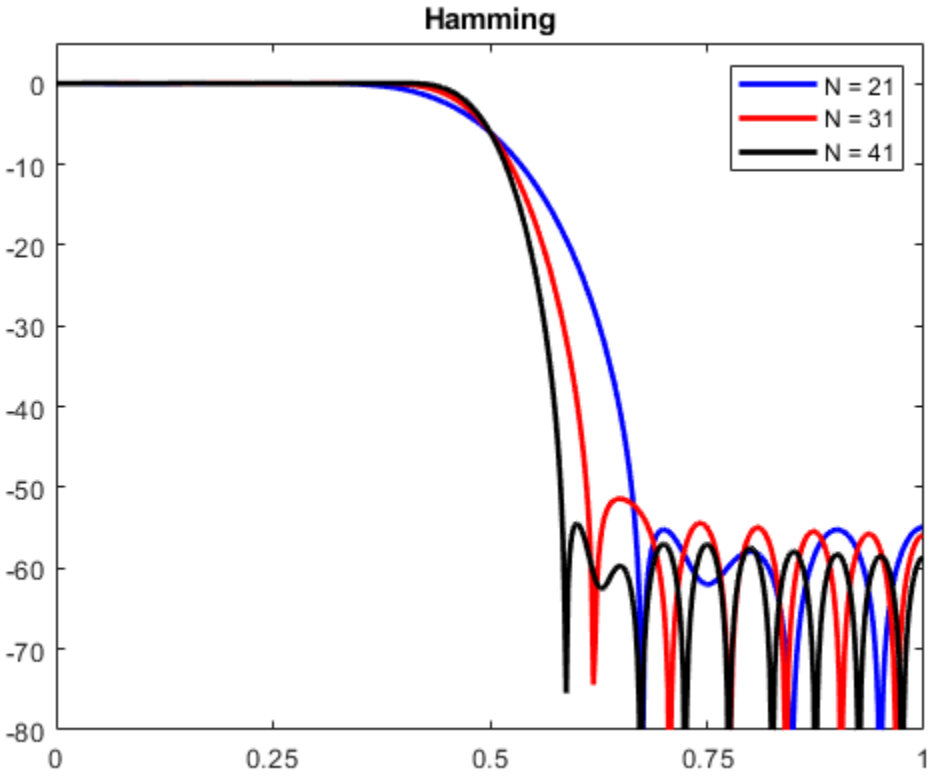
```
Testing 'kaiserfilt' with deltaOmega=0.1, delta=9.7e-05:
 N (101) is correct, beta (7.88642) is correct
 Checking wc=0.25: O.K.
 Checking wc=0.50: O.K.
 Checking wc=0.75: O.K.
Testing 'kaiserfilt' with deltaOmega=0.2, delta=0.01:
 N (23) is correct, beta (3.39532) is correct
 Checking wc=0.25: O.K.
 Checking wc=0.50: O.K.
 Checking wc=0.75: O.K.
Testing 'kaiserfilt' with deltaOmega=0.2, delta=0.00097:
 N (37) is correct, beta (5.68242) is correct
 Checking wc=0.25: O.K.
 Checking wc=0.50: O.K.
 Checking wc=0.75: O.K.
Testing 'kaiserfilt' with deltaOmega=0.2, delta=9.7e-05:
 N (51) is correct, beta (7.88642) is correct
 Checking wc=0.25: O.K.
 Checking wc=0.50: O.K.
 Checking wc=0.75: O.K.
```

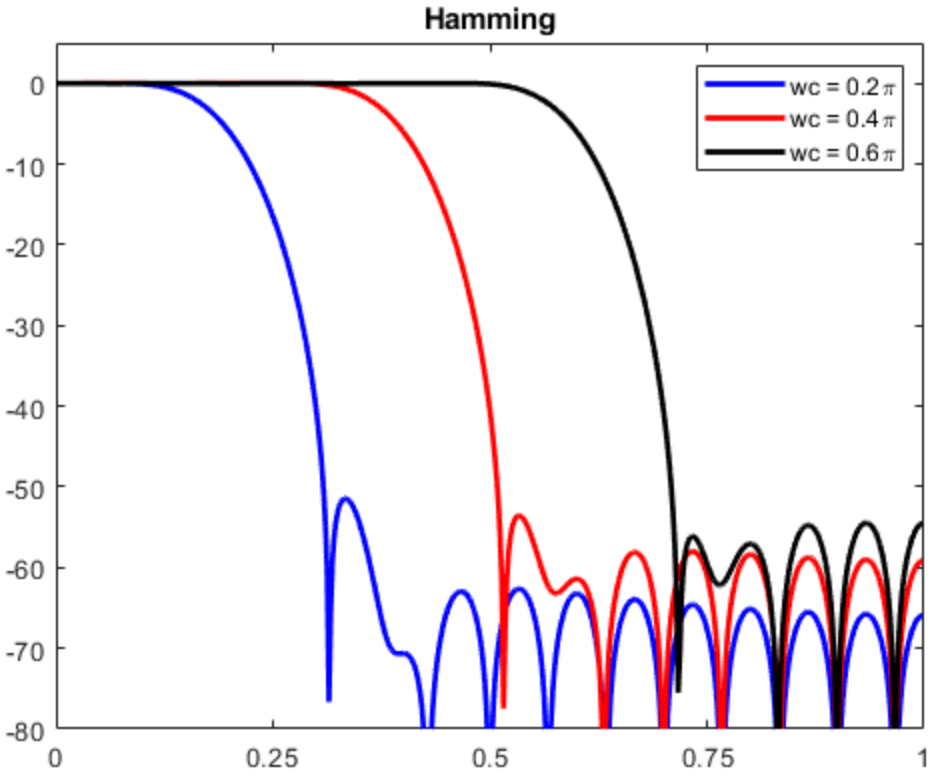
Part II: Comparative behavior of window filters

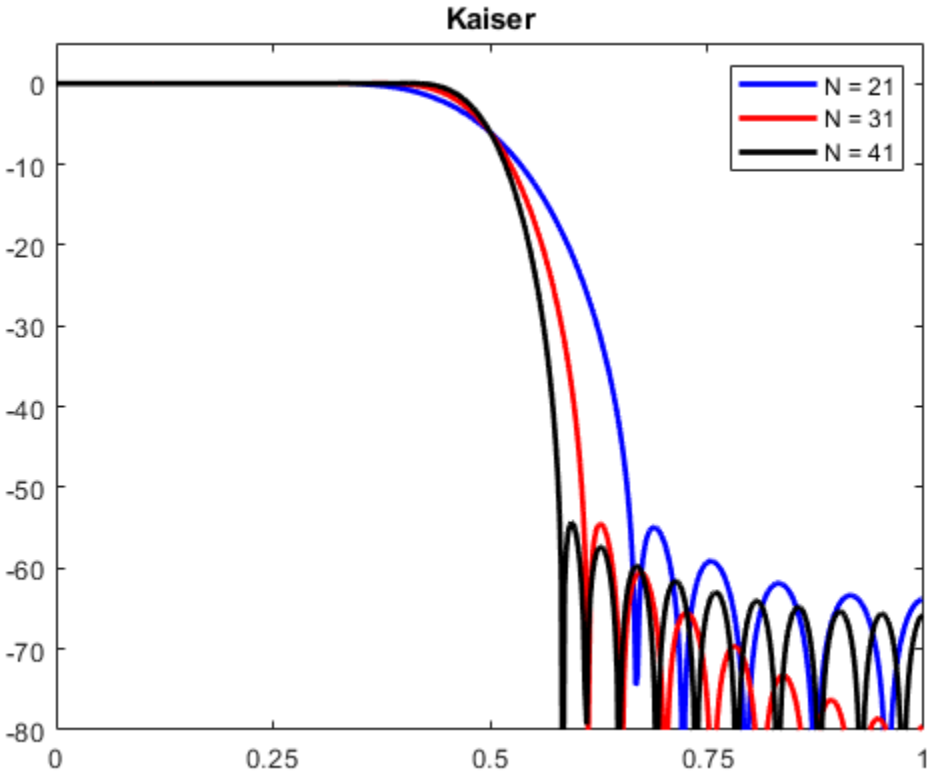
`test_lab5b`

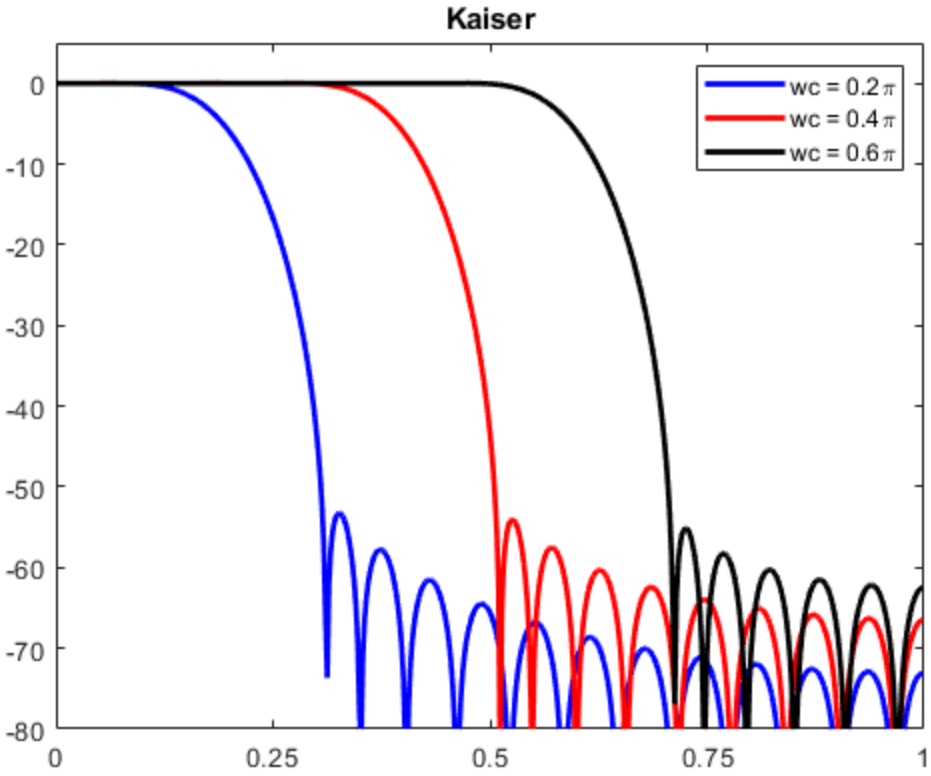


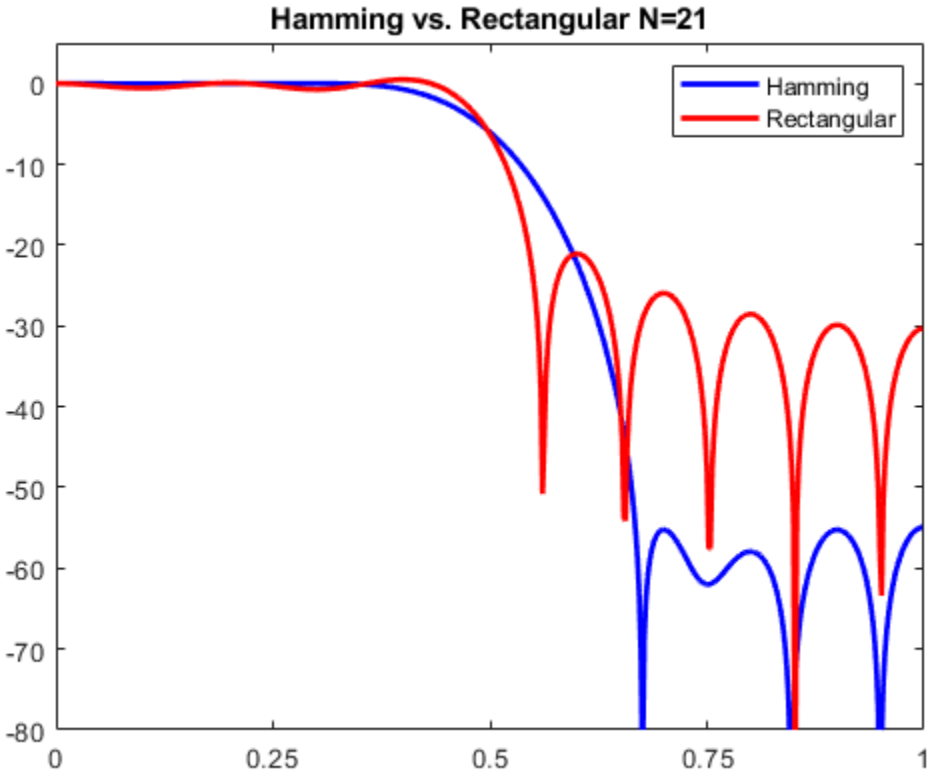

Rectangular
wc = 0.2π
wc = 0.4π
wc = 0.6π
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1

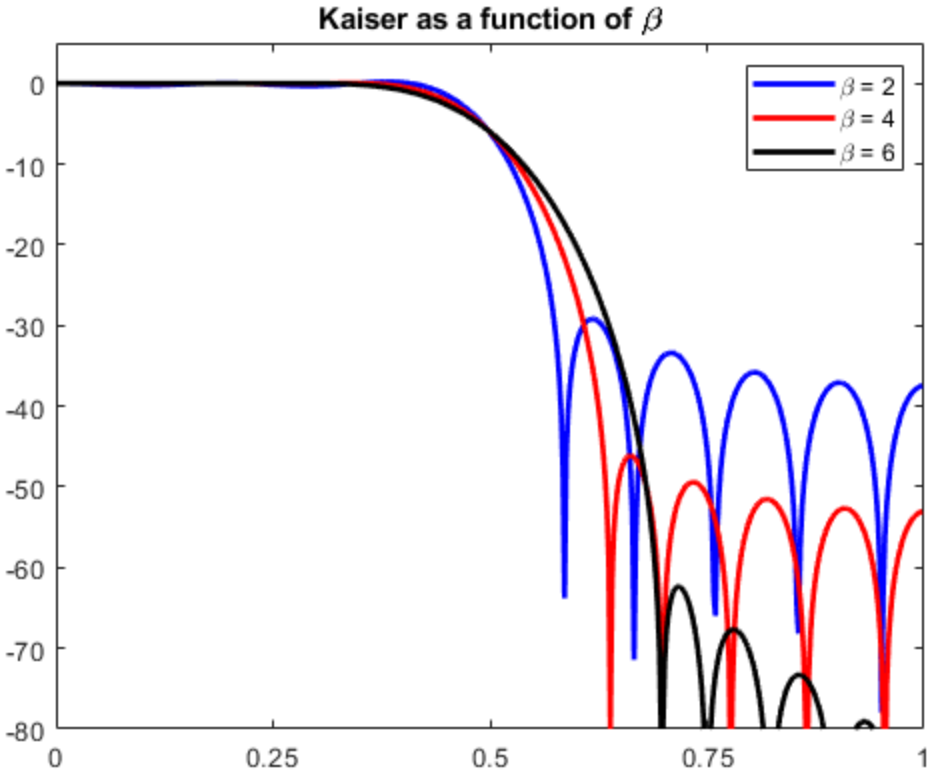

Hamming
N = 21
N = 31
N = 41
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1

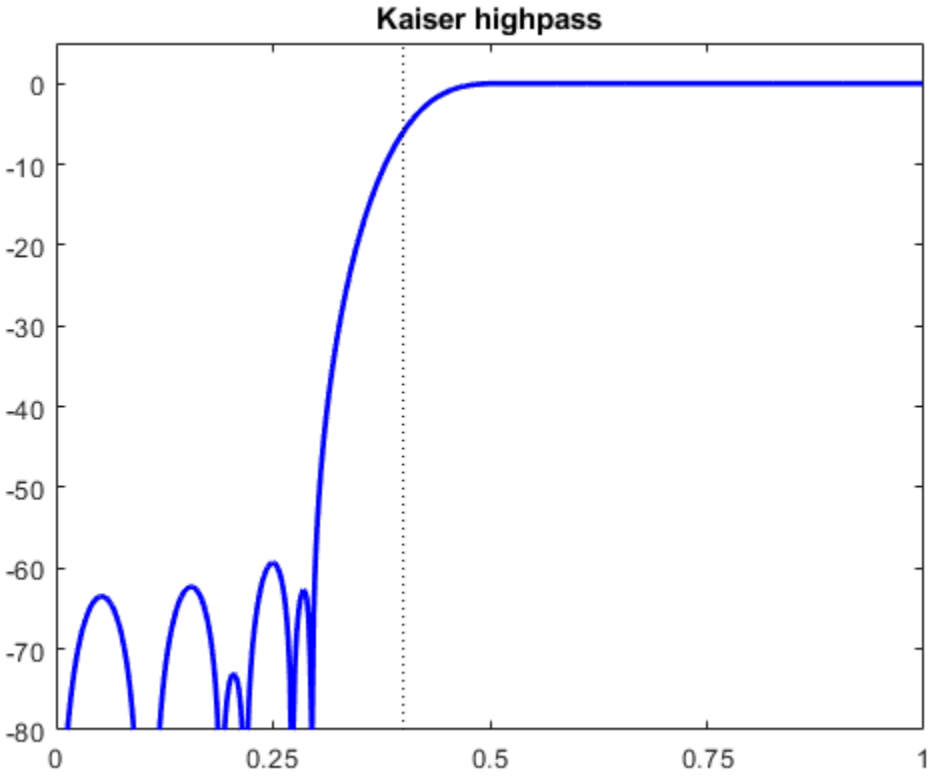

Hamming
wc = 0.2π
wc = 0.4π
wc = 0.6π
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1


Kaiser
N = 21
N = 31
N = 41
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1


Kaiser
wc = 0.2π
wc = 0.4π
wc = 0.6π
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1


Hamming vs. Rectangular N=21
Hamming
Rectangular
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1


Kaiser as a function of β
$\beta = 2$
$\beta = 4$
$\beta = 6$
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1


Kaiser highpass
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.25
0.5
0.75
1

Part III: Phone tones

```
test_lab5c
```

```
Signal to noise ratio of row tones: 49.5022
Signal to noise ratio of column tones: 42.8118
```

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