Table of Contents


```
% LAB4-2024 Checks functionality of FIR window design
%      Place this file in same directory as your
%      rectfilt, hammingfilt and kaiserfilt functions.
```

Part 1: Check filter design

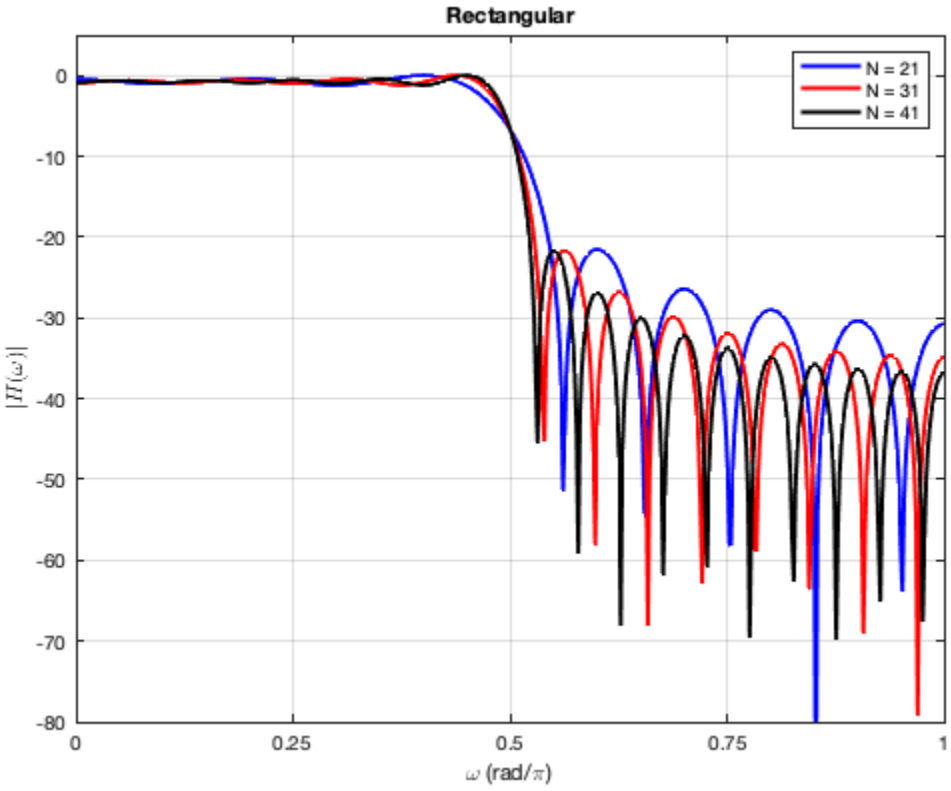
```
test_lab4a
```

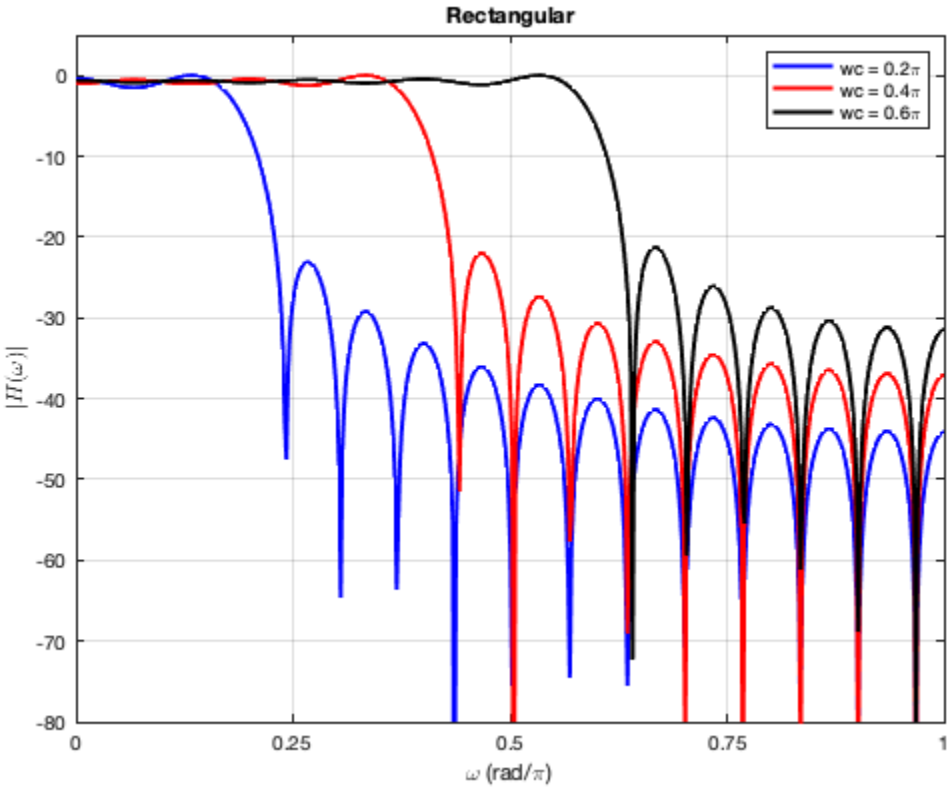
```
Testing 'rectfilt' with N=21 and wc=0.25: O.K.
Testing 'rectfilt' with N=31 and wc=0.25: O.K.
Testing 'rectfilt' with N=41 and wc=0.25: O.K.
Testing 'rectfilt' with N=21 and wc=0.50: O.K.
Testing 'rectfilt' with N=31 and wc=0.50: O.K.
Testing 'rectfilt' with N=41 and wc=0.50: O.K.
Testing 'rectfilt'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

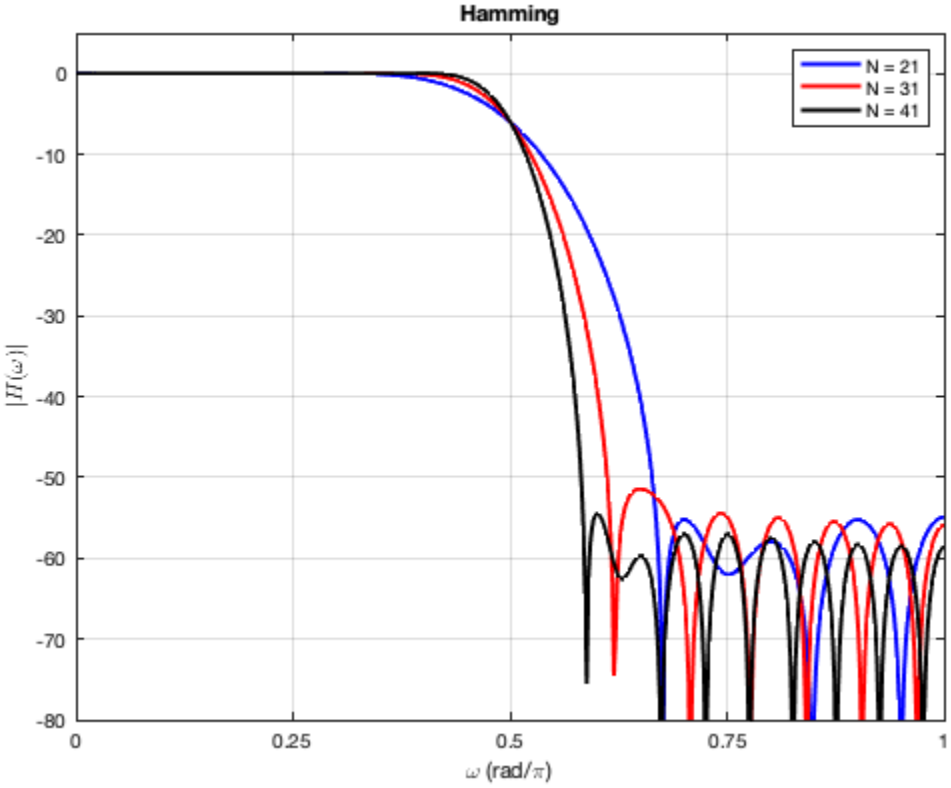
```
Testing 'kaiserfilt' with deltaOmega=0.2, delta=0.01:
    N (23) is correct, beta (3.39532) is correct
    Checking wc=0.25: O.K.
    Checking wc=0.50: O.K.
    Checking wc=0.75: O.K.
Testing 'kaiserfilt' with deltaOmega=0.2, delta=0.00097:
    N (37) is correct, beta (5.68242) is correct
    Checking 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.
```

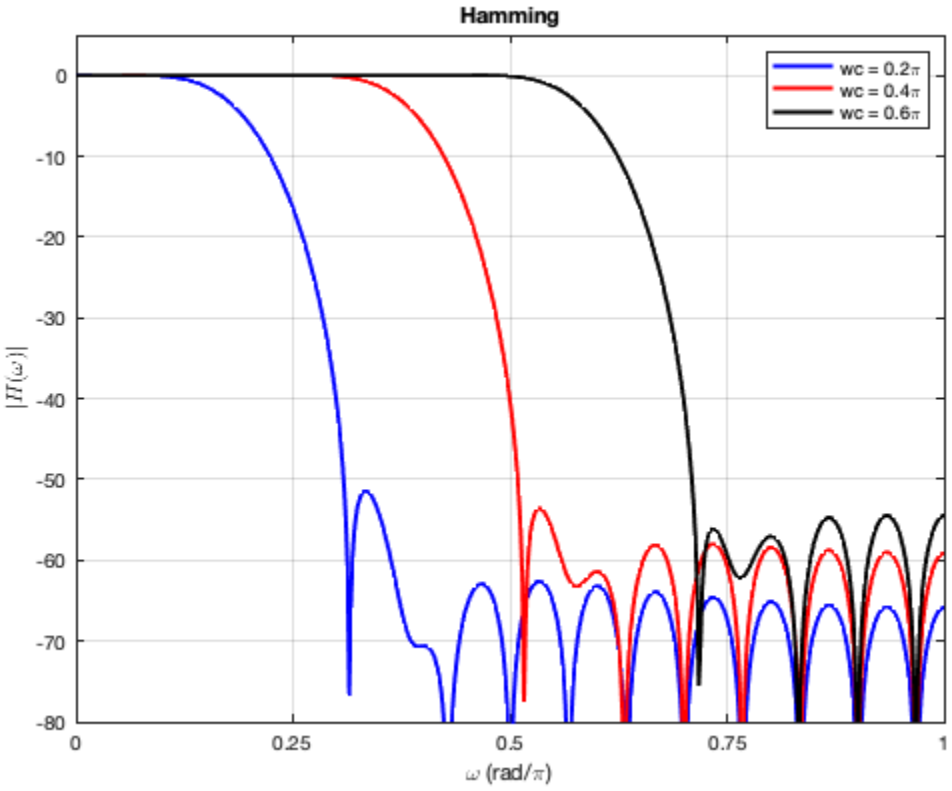
Part II: Comparative behavior of window filters

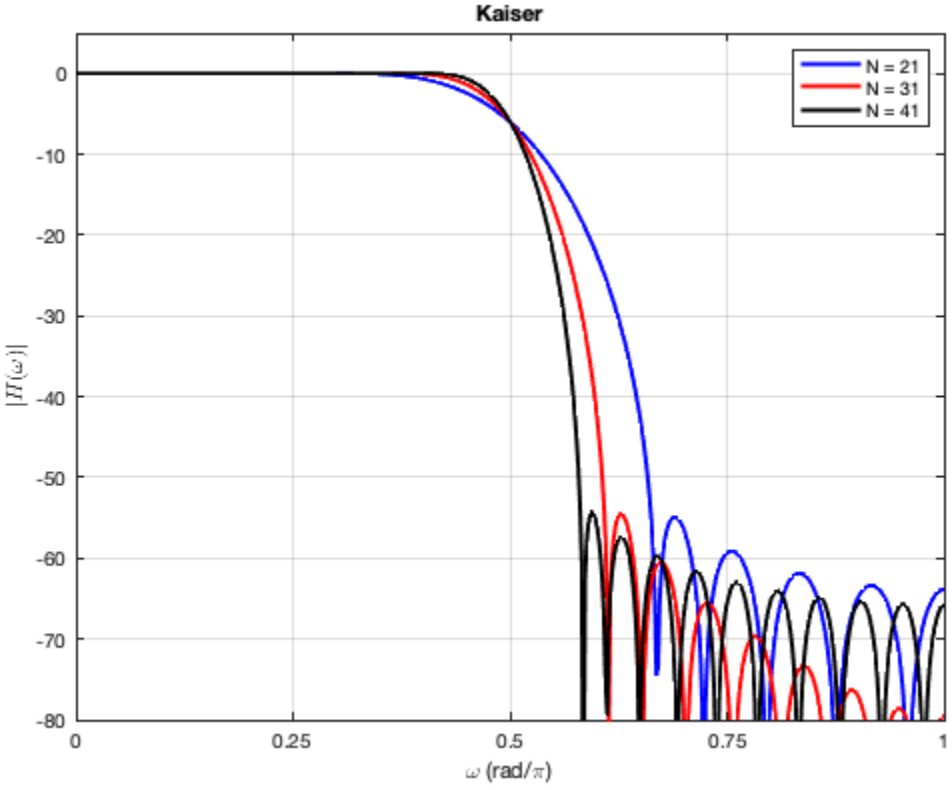
`test_lab4b`

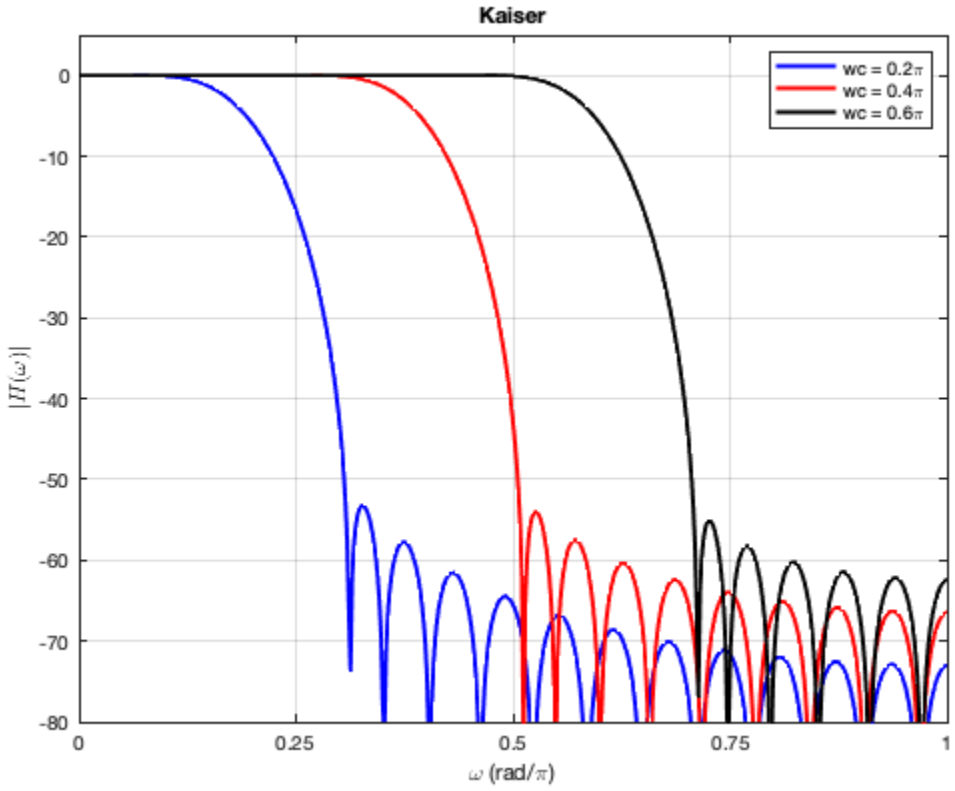


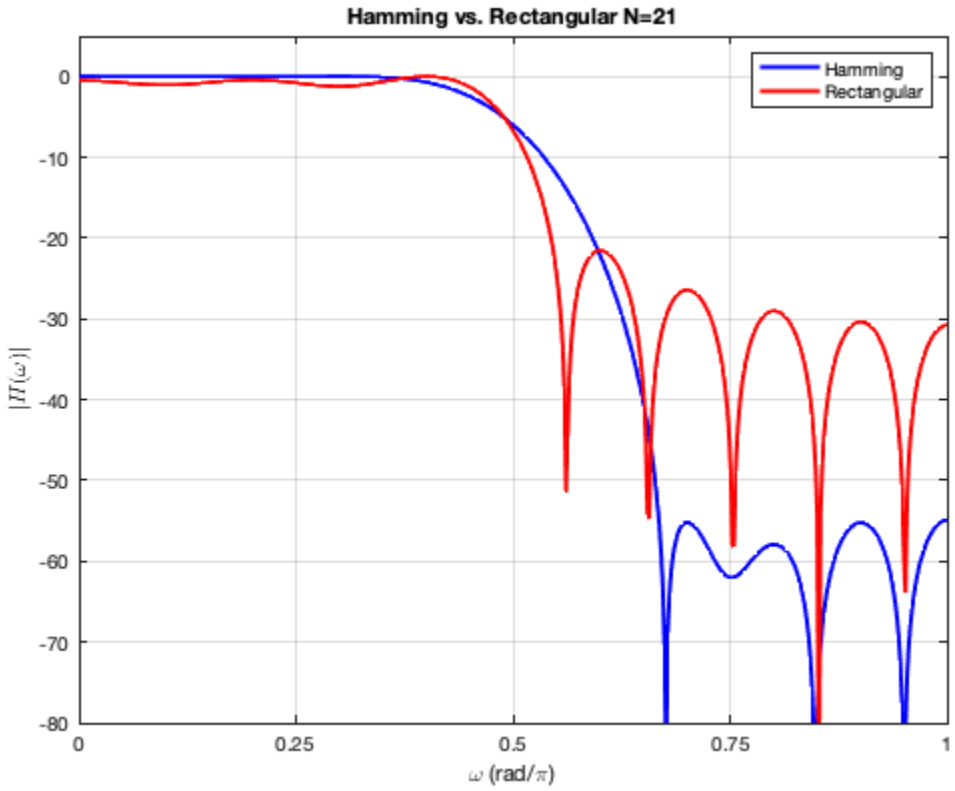

Rectangular
wc = 0.2π
wc = 0.4π
wc = 0.6π
0
-10
-20
-30
-40
-50
-60
-70
-80
|H(ω)|
0
0.25
0.5
0.75
1
ω (rad/π)

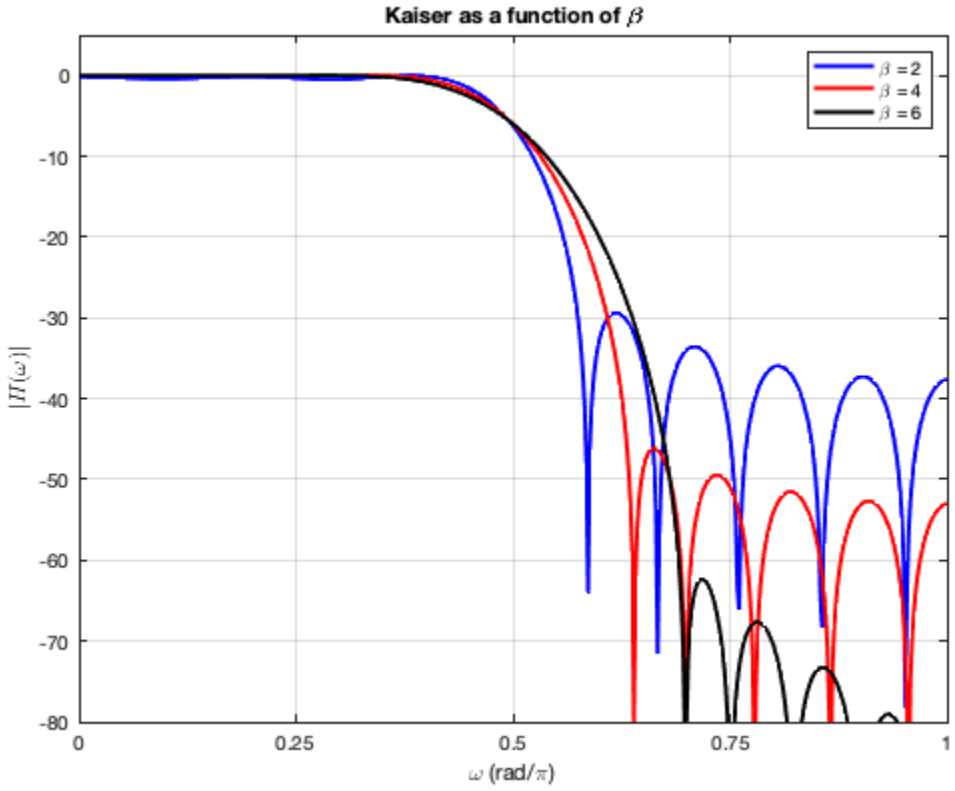

Hamming
N = 21
N = 31
N = 41
0
-10
-20
-30
-40
-50
-60
-70
-80
|H(ω)|
0
0.25
0.5
0.75
1
ω (rad/π)

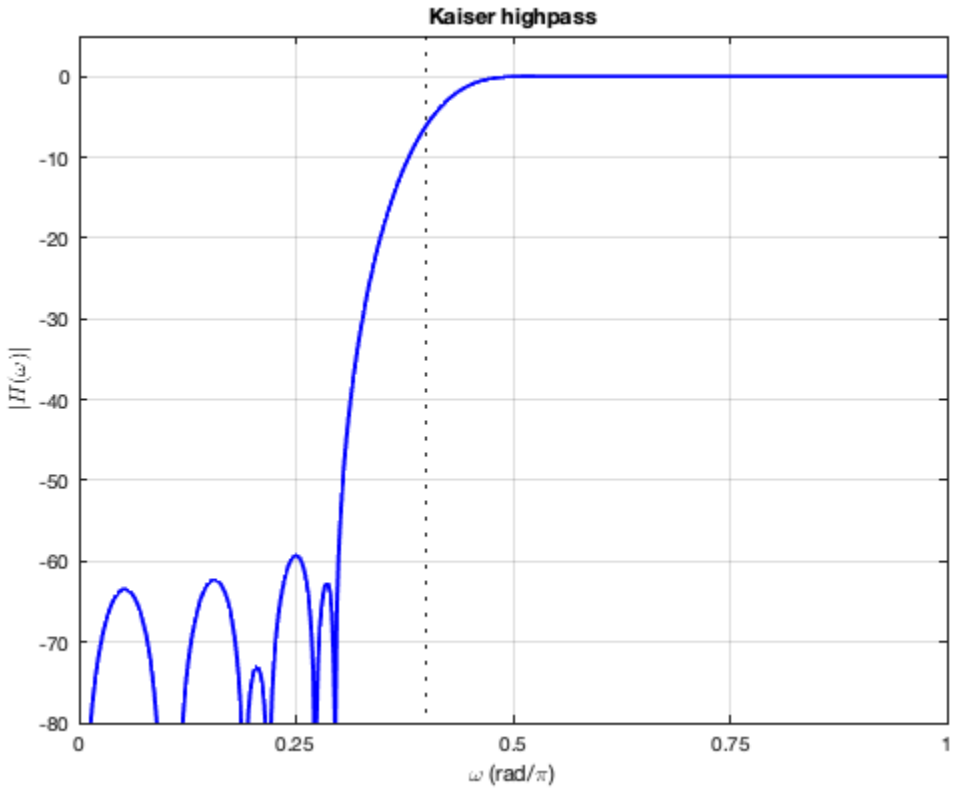

Hamming
wc = 0.2π
wc = 0.4π
wc = 0.6π
0
-10
-20
-30
-40
-50
-60
-70
-80
|H(ω)|
0
0.25
0.5
0.75
1
ω (rad/π)


Kaiser
N = 21
N = 31
N = 41
0
-10
-20
-30
-40
-50
-60
-70
-80
|H(ω)|
0
0.25
0.5
0.75
1
ω (rad/π)


Kaiser
wc = 0.2π
wc = 0.4π
wc = 0.6π
0
-10
-20
-30
-40
-50
-60
-70
-80
|H(ω)|
0
0.25
0.5
0.75
1
ω (rad/π)


Hamming vs. Rectangular N=21
Hamming
Rectangular
0
-10
-20
-30
-40
-50
-60
-70
-80
|H(ω)|
0
0.25
0.5
0.75
1
ω (rad/π)


Kaiser as a function of β
$\beta = 2$
$\beta = 4$
$\beta = 6$
0
-10
-20
-30
-40
-50
-60
-70
-80
$|H(\omega)|$
0
0.25
0.5
0.75
1
ω (rad/π)


Kaiser highpass
0
-10
-20
-30
-40
-50
-60
-70
-80
$|H(\omega)|$
0
0.25
0.5
0.75
1
ω (rad/π)

Part III: Phone tones

```
test_lab4c
```

```
Signal to noise ratio of row tones: 11.0844
Signal to noise ratio of column tones: -0.18327
```

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