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```
% 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.
```

```
w =
```

```
Columns 1 through 7
```

```
0.0800    0.1025    0.1679    0.2696    0.3979    0.5400    0.6821
```

```
Columns 8 through 14
```

```
0.8104    0.9121    0.9775    1.0000    0.9775    0.9121    0.8104
```

```
Columns 15 through 21
```

```
0.6821    0.5400    0.3979    0.2696    0.1679    0.1025    0.0800
```

```
Testing 'hammingfilt' with N=21 and wc=0.25: O.K.
```

```
w =
```

```
Columns 1 through 7
```

```
0.0800    0.0901    0.1198    0.1679    0.2322    0.3100    0.3979
```

```
Columns 8 through 14
```

0.4919	0.5881	0.6821	0.7700	0.8478	0.9121	0.9602
Columns 15 through 21						
0.9899	1.0000	0.9899	0.9602	0.9121	0.8478	0.7700
Columns 22 through 28						
0.6821	0.5881	0.4919	0.3979	0.3100	0.2322	0.1679
Columns 29 through 31						
0.1198	0.0901	0.0800				
Testing 'hammingfilt' with N=31 and wc=0.25: O.K.						
w =						
Columns 1 through 7						
0.0800	0.0857	0.1025	0.1301	0.1679	0.2147	0.2696
Columns 8 through 14						
0.3312	0.3979	0.4680	0.5400	0.6120	0.6821	0.7488
Columns 15 through 21						
0.8104	0.8653	0.9121	0.9499	0.9775	0.9943	1.0000
Columns 22 through 28						
0.9943	0.9775	0.9499	0.9121	0.8653	0.8104	0.7488
Columns 29 through 35						
0.6821	0.6120	0.5400	0.4680	0.3979	0.3312	0.2696
Columns 36 through 41						
0.2147	0.1679	0.1301	0.1025	0.0857	0.0800	
Testing 'hammingfilt' with N=41 and wc=0.25: O.K.						
w =						
Columns 1 through 7						
0.0800	0.1025	0.1679	0.2696	0.3979	0.5400	0.6821
Columns 8 through 14						
0.8104	0.9121	0.9775	1.0000	0.9775	0.9121	0.8104

Columns 15 through 21

0.6821	0.5400	0.3979	0.2696	0.1679	0.1025	0.0800
--------	--------	--------	--------	--------	--------	--------

Testing 'hammingfilt' with N=21 and wc=0.50: O.K.

w =

Columns 1 through 7

0.0800	0.0901	0.1198	0.1679	0.2322	0.3100	0.3979
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.4919	0.5881	0.6821	0.7700	0.8478	0.9121	0.9602
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.9899	1.0000	0.9899	0.9602	0.9121	0.8478	0.7700
--------	--------	--------	--------	--------	--------	--------

Columns 22 through 28

0.6821	0.5881	0.4919	0.3979	0.3100	0.2322	0.1679
--------	--------	--------	--------	--------	--------	--------

Columns 29 through 31

0.1198	0.0901	0.0800
--------	--------	--------

Testing 'hammingfilt' with N=31 and wc=0.50: O.K.

w =

Columns 1 through 7

0.0800	0.0857	0.1025	0.1301	0.1679	0.2147	0.2696
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.3312	0.3979	0.4680	0.5400	0.6120	0.6821	0.7488
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.8104	0.8653	0.9121	0.9499	0.9775	0.9943	1.0000
--------	--------	--------	--------	--------	--------	--------

Columns 22 through 28

0.9943	0.9775	0.9499	0.9121	0.8653	0.8104	0.7488
--------	--------	--------	--------	--------	--------	--------

Columns 29 through 35

0.6821	0.6120	0.5400	0.4680	0.3979	0.3312	0.2696
--------	--------	--------	--------	--------	--------	--------

Columns 36 through 41

0.2147	0.1679	0.1301	0.1025	0.0857	0.0800
--------	--------	--------	--------	--------	--------

Testing 'hammingfilt' with N=41 and wc=0.50: O.K.

w =

Columns 1 through 7

0.0800	0.1025	0.1679	0.2696	0.3979	0.5400	0.6821
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.8104	0.9121	0.9775	1.0000	0.9775	0.9121	0.8104
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.6821	0.5400	0.3979	0.2696	0.1679	0.1025	0.0800
--------	--------	--------	--------	--------	--------	--------

Testing 'hammingfilt' with N=21 and wc=0.75: O.K.

w =

Columns 1 through 7

0.0800	0.0901	0.1198	0.1679	0.2322	0.3100	0.3979
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.4919	0.5881	0.6821	0.7700	0.8478	0.9121	0.9602
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.9899	1.0000	0.9899	0.9602	0.9121	0.8478	0.7700
--------	--------	--------	--------	--------	--------	--------

Columns 22 through 28

0.6821	0.5881	0.4919	0.3979	0.3100	0.2322	0.1679
--------	--------	--------	--------	--------	--------	--------

Columns 29 through 31

0.1198	0.0901	0.0800
--------	--------	--------

Testing 'hammingfilt' with N=31 and wc=0.75: O.K.

w =

Columns 1 through 7

0.0800	0.0857	0.1025	0.1301	0.1679	0.2147	0.2696
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.3312	0.3979	0.4680	0.5400	0.6120	0.6821	0.7488
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.8104	0.8653	0.9121	0.9499	0.9775	0.9943	1.0000
--------	--------	--------	--------	--------	--------	--------

Columns 22 through 28

0.9943	0.9775	0.9499	0.9121	0.8653	0.8104	0.7488
--------	--------	--------	--------	--------	--------	--------

Columns 29 through 35

0.6821	0.6120	0.5400	0.4680	0.3979	0.3312	0.2696
--------	--------	--------	--------	--------	--------	--------

Columns 36 through 41

0.2147	0.1679	0.1301	0.1025	0.0857	0.0800
--------	--------	--------	--------	--------	--------

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

$w =$

Columns 1 through 7

0.0800	0.1025	0.1679	0.2696	0.3979	0.5400	0.6821
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.8104	0.9121	0.9775	1.0000	0.9775	0.9121	0.8104
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.6821	0.5400	0.3979	0.2696	0.1679	0.1025	0.0800
--------	--------	--------	--------	--------	--------	--------

$w =$

Columns 1 through 7

0.0800	0.0901	0.1198	0.1679	0.2322	0.3100	0.3979
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.4919	0.5881	0.6821	0.7700	0.8478	0.9121	0.9602
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.9899	1.0000	0.9899	0.9602	0.9121	0.8478	0.7700
--------	--------	--------	--------	--------	--------	--------

Columns 22 through 28

0.6821	0.5881	0.4919	0.3979	0.3100	0.2322	0.1679
--------	--------	--------	--------	--------	--------	--------

Columns 29 through 31

0.1198	0.0901	0.0800
--------	--------	--------

$w =$

Columns 1 through 7

0.0800	0.0857	0.1025	0.1301	0.1679	0.2147	0.2696
--------	--------	--------	--------	--------	--------	--------

Columns 8 through 14

0.3312	0.3979	0.4680	0.5400	0.6120	0.6821	0.7488
--------	--------	--------	--------	--------	--------	--------

Columns 15 through 21

0.8104	0.8653	0.9121	0.9499	0.9775	0.9943	1.0000
--------	--------	--------	--------	--------	--------	--------

Columns 22 through 28

0.9943	0.9775	0.9499	0.9121	0.8653	0.8104	0.7488
Columns 29 through 35						
0.6821	0.6120	0.5400	0.4680	0.3979	0.3312	0.2696
Columns 36 through 41						
0.2147	0.1679	0.1301	0.1025	0.0857	0.0800	
$w =$						
Columns 1 through 7						
0.0800	0.0901	0.1198	0.1679	0.2322	0.3100	0.3979
Columns 8 through 14						
0.4919	0.5881	0.6821	0.7700	0.8478	0.9121	0.9602
Columns 15 through 21						
0.9899	1.0000	0.9899	0.9602	0.9121	0.8478	0.7700
Columns 22 through 28						
0.6821	0.5881	0.4919	0.3979	0.3100	0.2322	0.1679
Columns 29 through 31						
0.1198	0.0901	0.0800				
$w =$						
Columns 1 through 7						
0.0800	0.0901	0.1198	0.1679	0.2322	0.3100	0.3979
Columns 8 through 14						
0.4919	0.5881	0.6821	0.7700	0.8478	0.9121	0.9602
Columns 15 through 21						
0.9899	1.0000	0.9899	0.9602	0.9121	0.8478	0.7700
Columns 22 through 28						
0.6821	0.5881	0.4919	0.3979	0.3100	0.2322	0.1679
Columns 29 through 31						

0.1198 0.0901 0.0800

$w =$

Columns 1 through 7

0.0800 0.0901 0.1198 0.1679 0.2322 0.3100 0.3979

Columns 8 through 14

0.4919 0.5881 0.6821 0.7700 0.8478 0.9121 0.9602

Columns 15 through 21

0.9899 1.0000 0.9899 0.9602 0.9121 0.8478 0.7700

Columns 22 through 28

0.6821 0.5881 0.4919 0.3979 0.3100 0.2322 0.1679

Columns 29 through 31

0.1198 0.0901 0.0800

$w =$

Columns 1 through 7

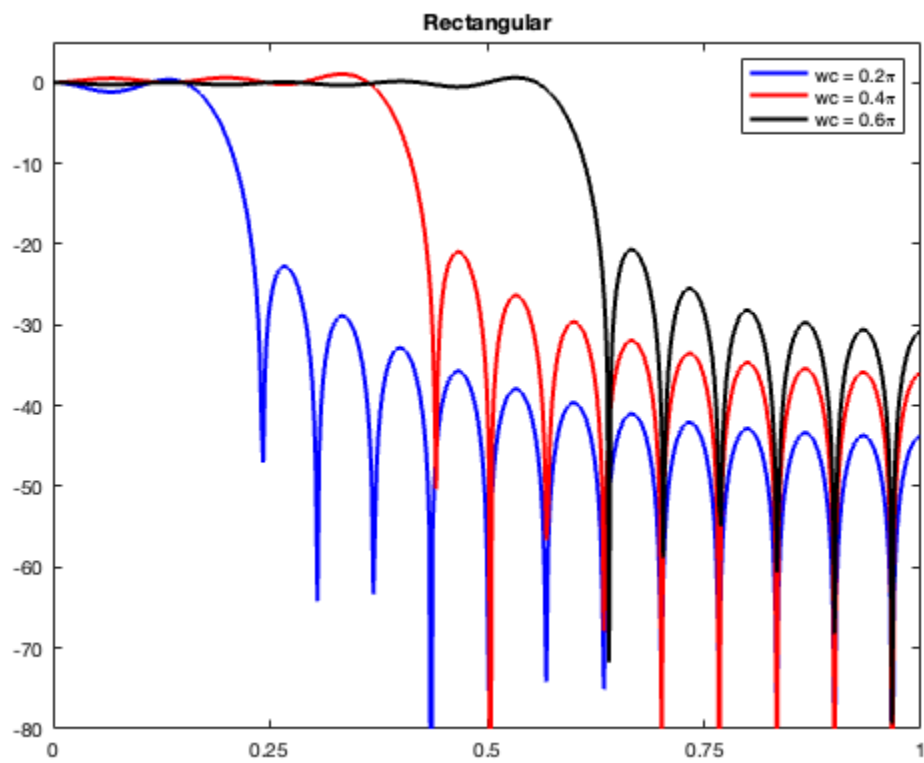
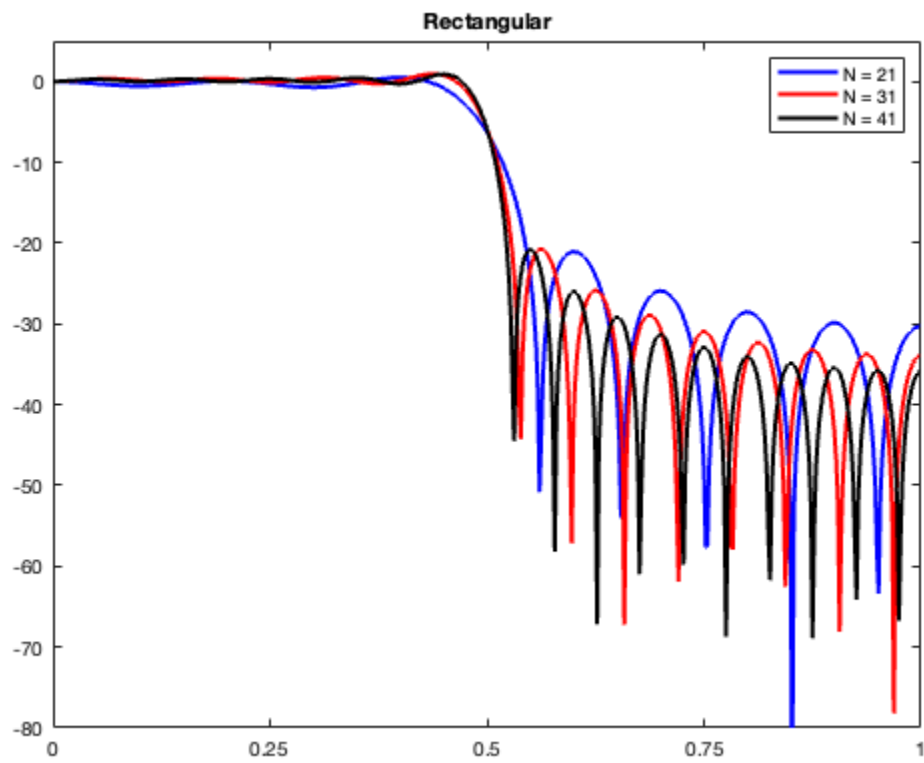
0.0800 0.1025 0.1679 0.2696 0.3979 0.5400 0.6821

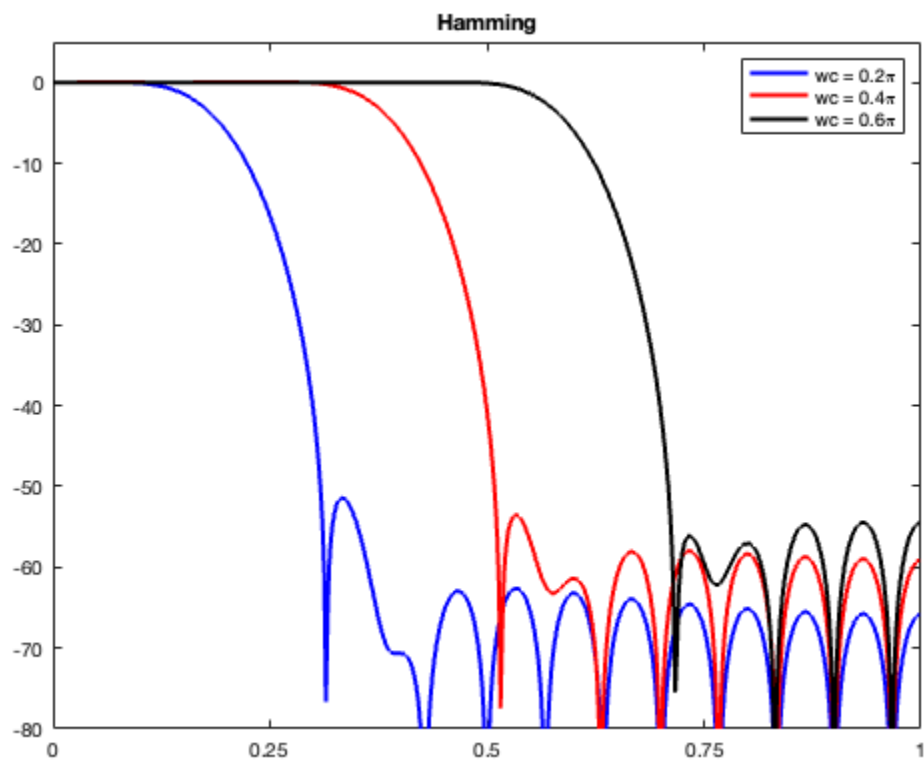
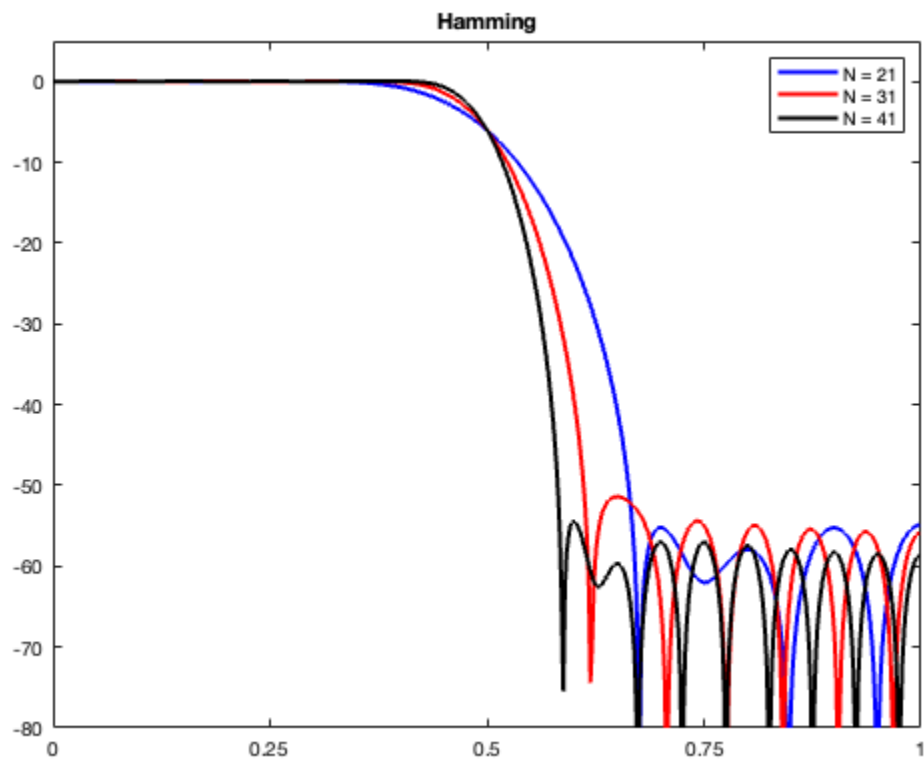
Columns 8 through 14

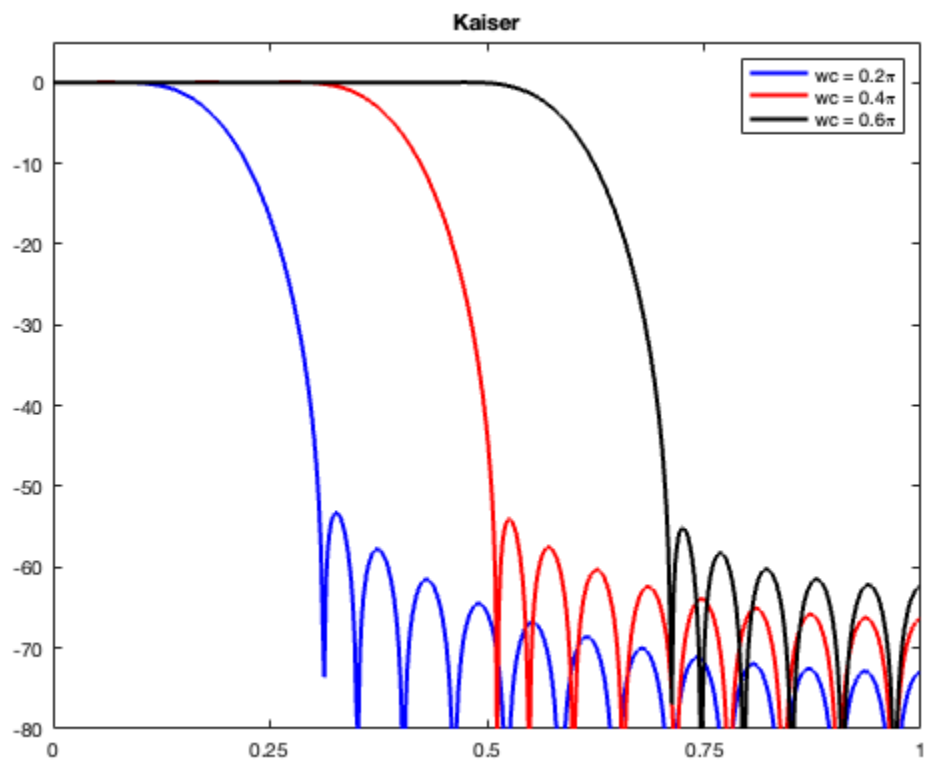
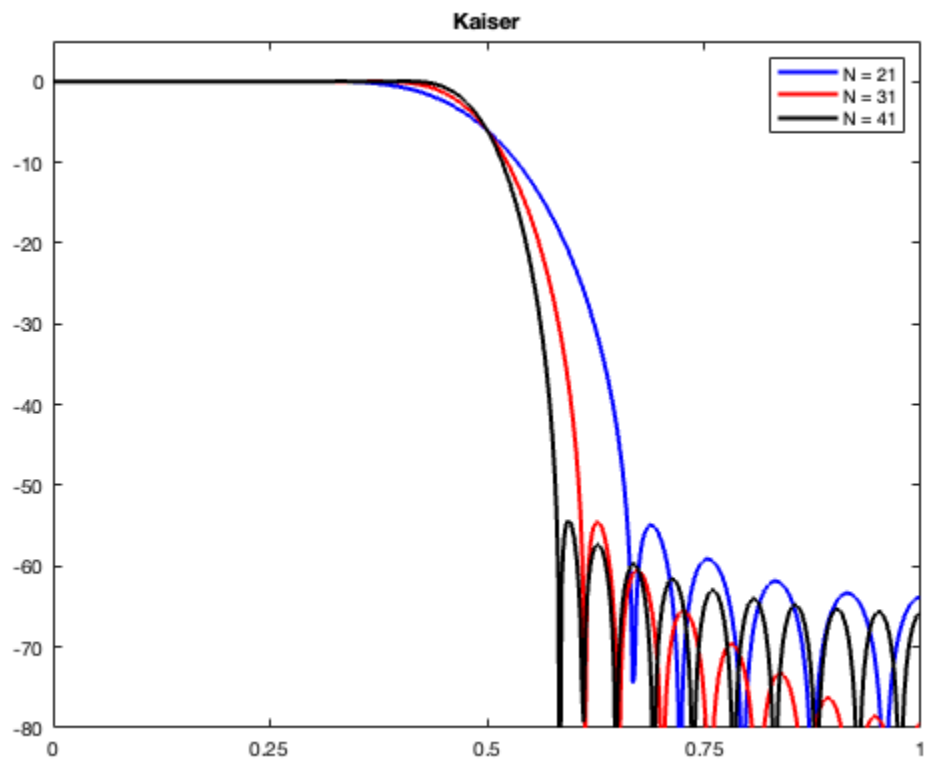
0.8104 0.9121 0.9775 1.0000 0.9775 0.9121 0.8104

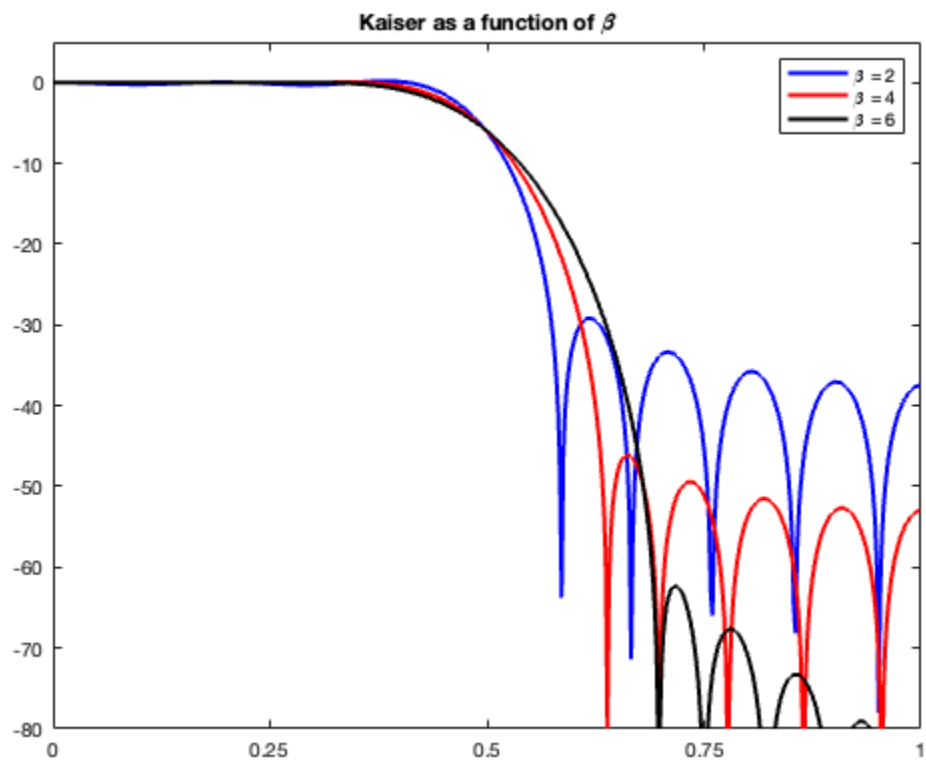
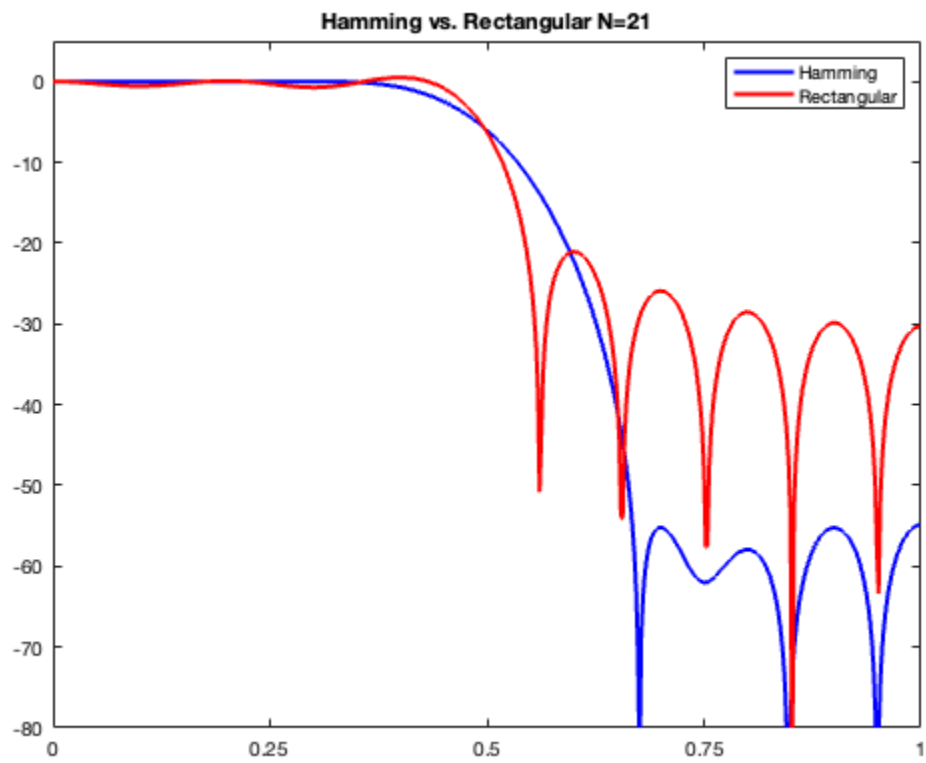
Columns 15 through 21

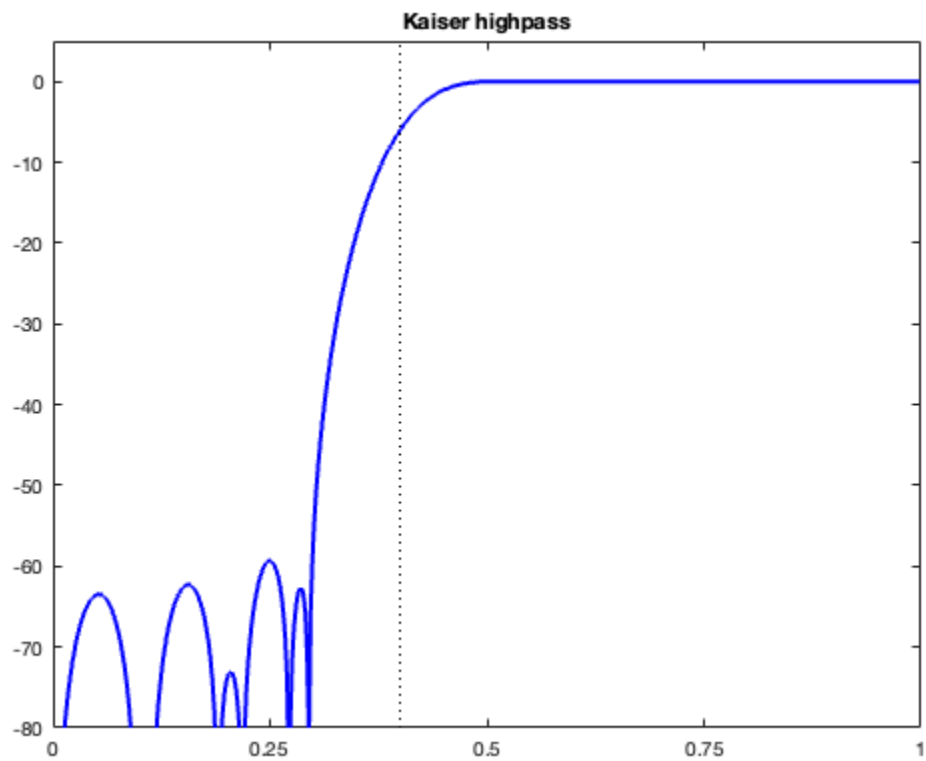
0.6821 0.5400 0.3979 0.2696 0.1679 0.1025 0.0800











Part III: Phone tones

test_lab4c

Signal to noise ratio of row tones: 52.8291

Signal to noise ratio of column tones: 21.8656

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