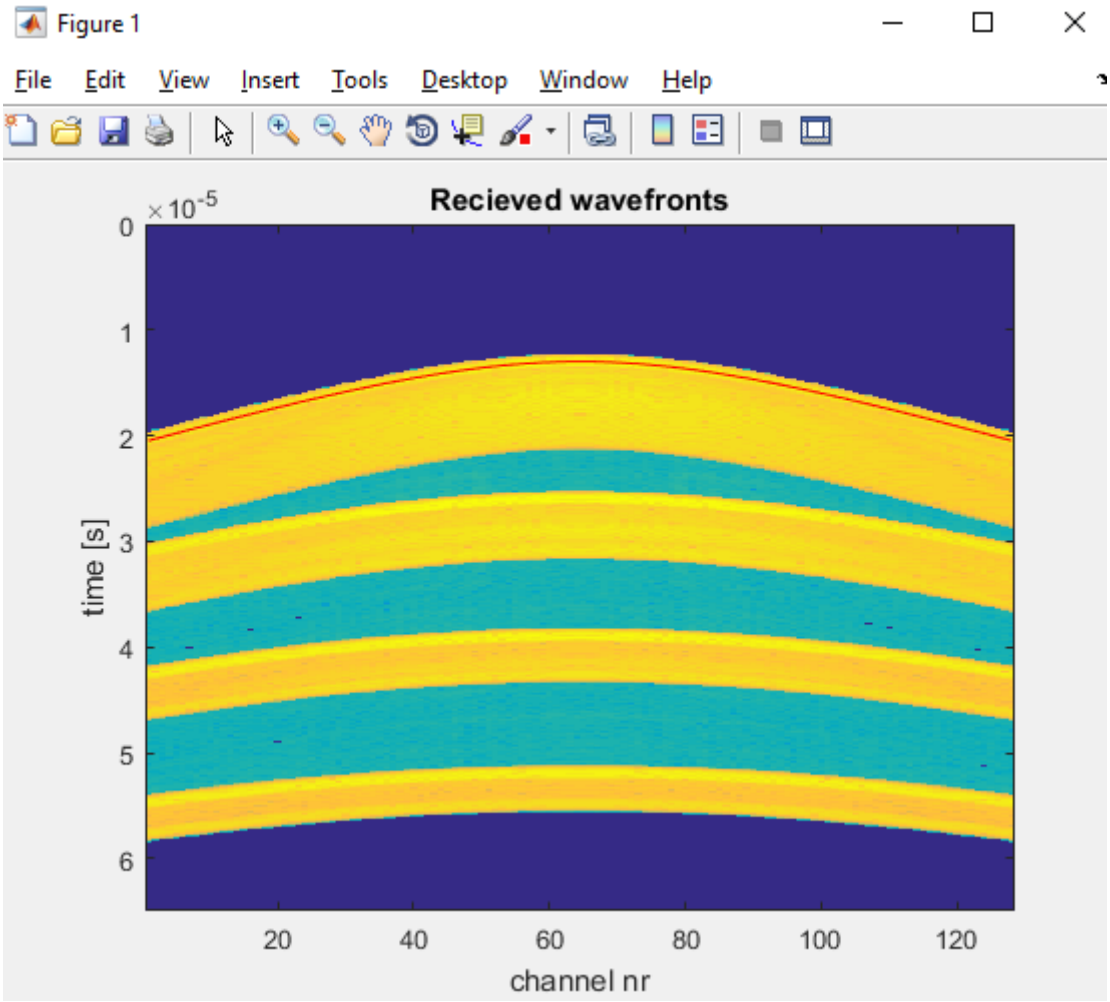
Exercise 6: Beamforming
19.02.2020

Task 1)



As we can see from the figure above, the TOF aligns with the received wave fronts. This figure is describing the received wave front of a single scatter.

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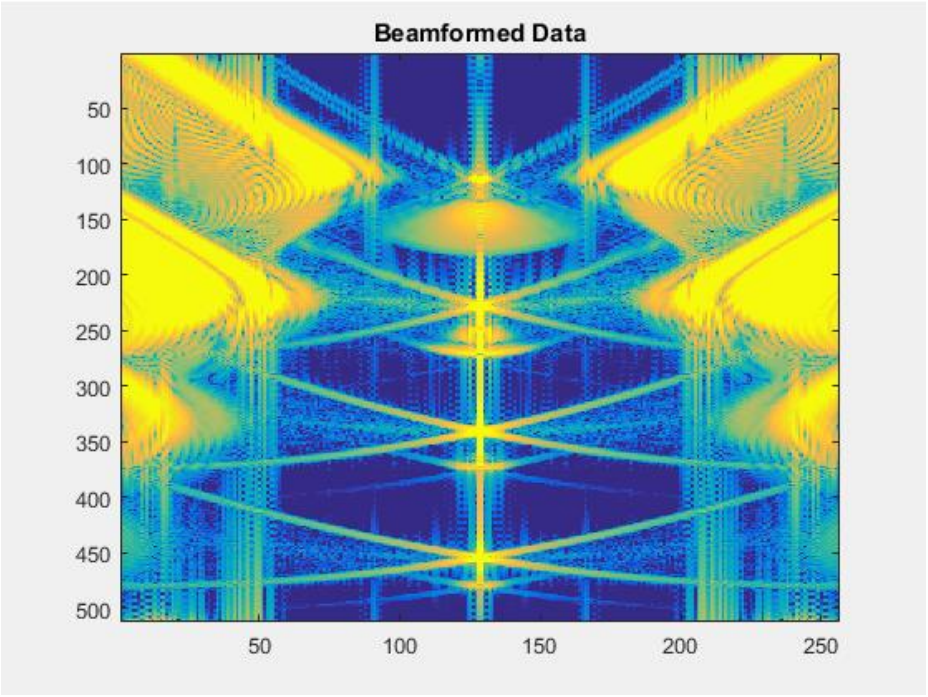
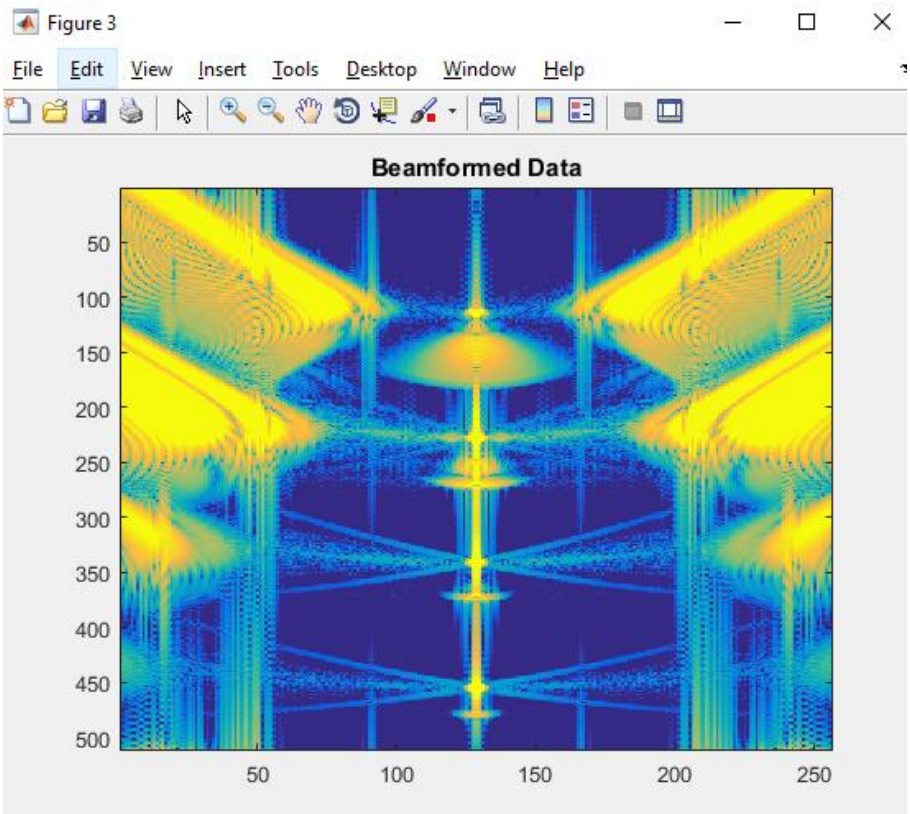
Task 2)

Without any window function:



Using hamming window on all the elements:



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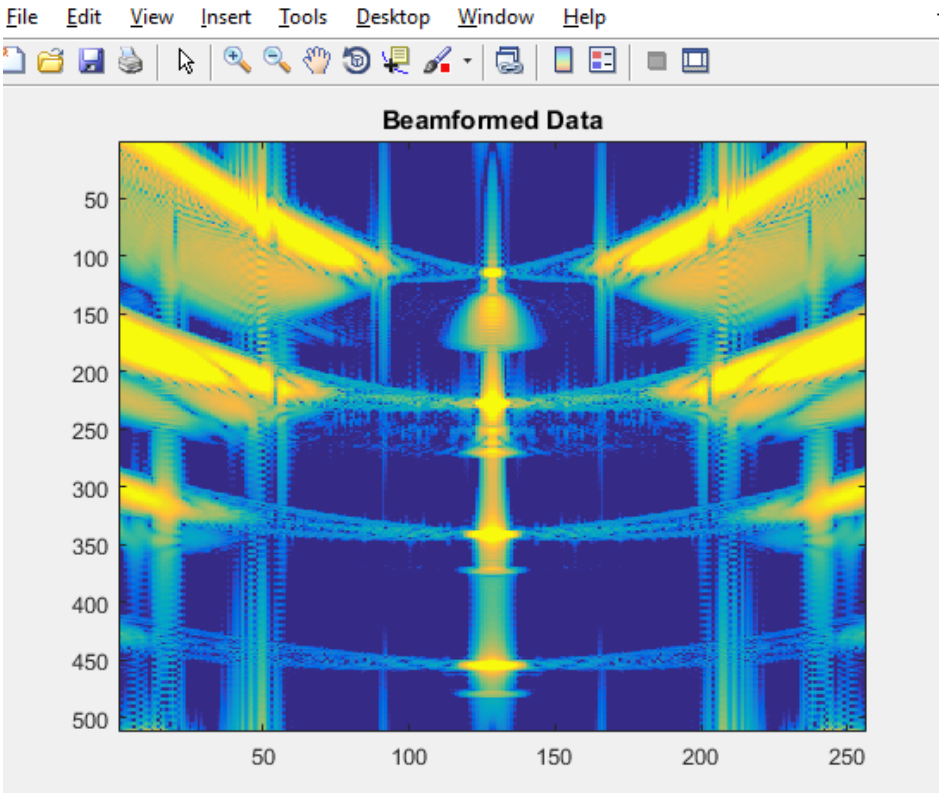
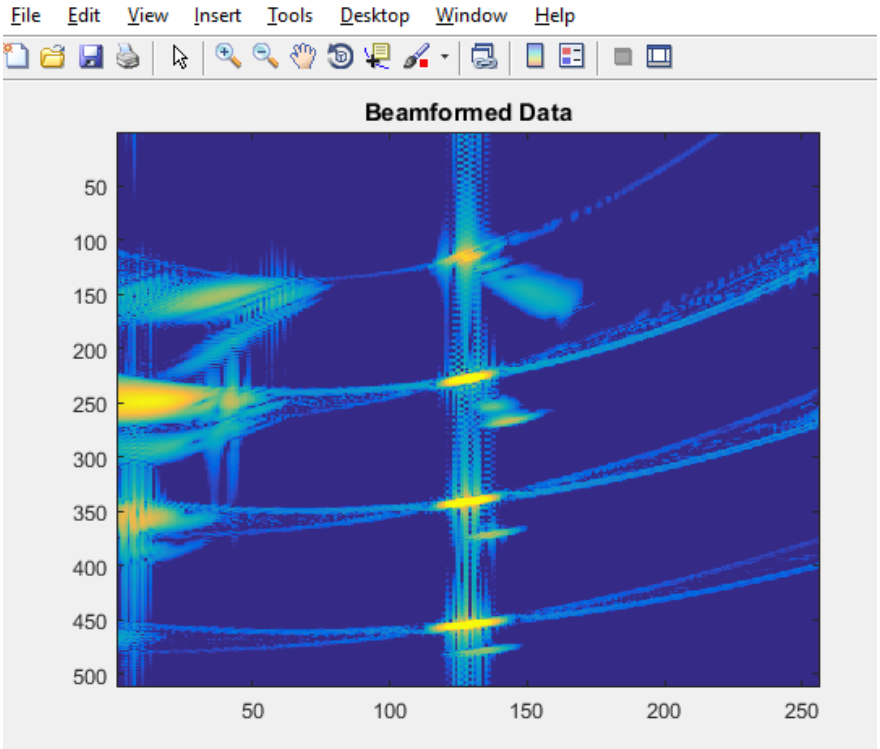
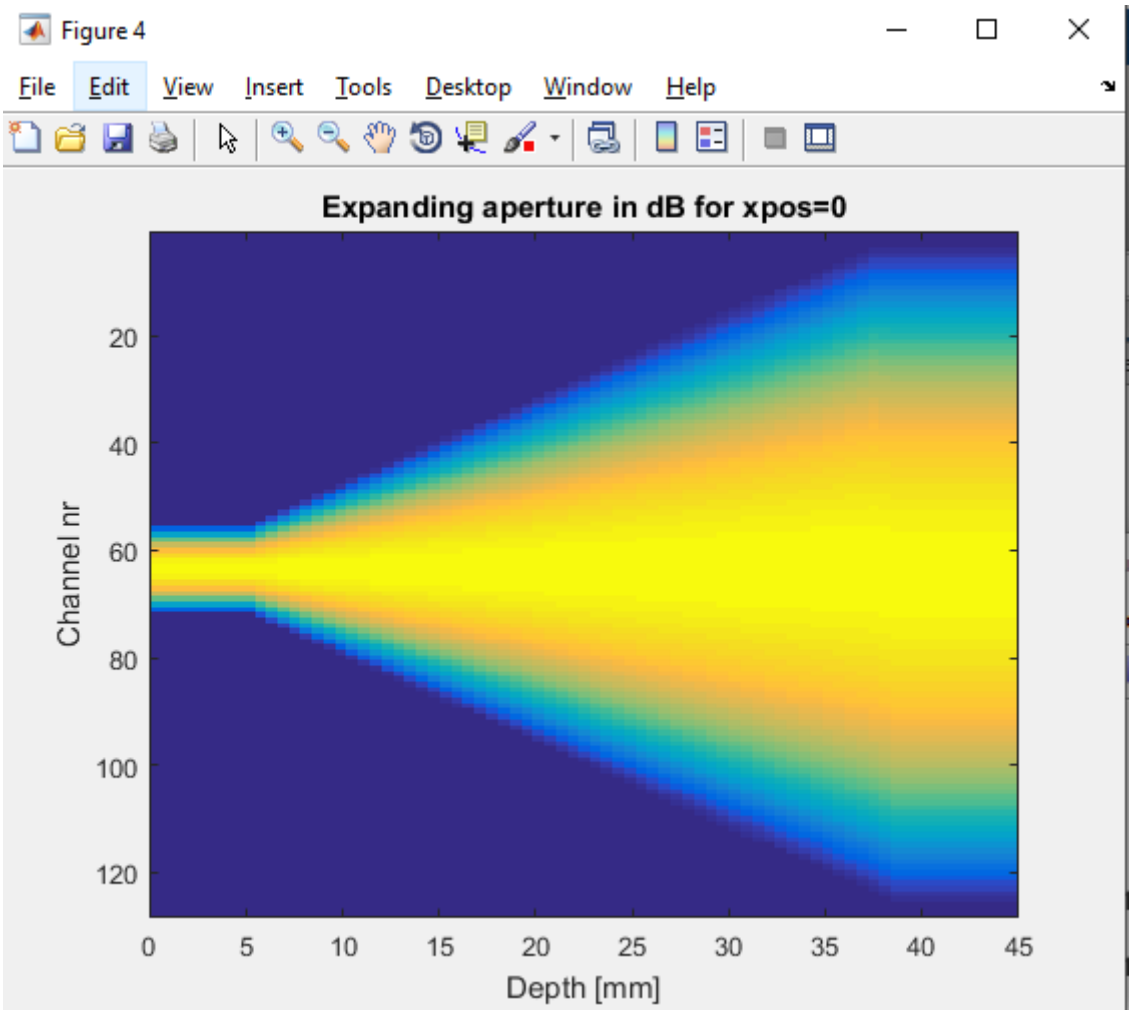
Hamming window on the middle 32 elements:



Using hamming window on the first 32 elements:



Task 3)



As we can see from the figure above, we have a constant aperture from 0-6mm and from 38mm-45mm.

The for generating the figure above:

```
%% task 3
figure(4)
fnumber=1;
xpos=0;
apod=generateApod(simdata.elPosX, xpos, z, fnumber);
channelNum=1:128;
imagesc(z*1e3,channelNum,20*log10(abs(apod)));%1e3-->mm, 20*log10-->dB
title('Expanding aperture in dB for x=0');xlabel('Depth [mm]');ylabel('Channel nr');
```

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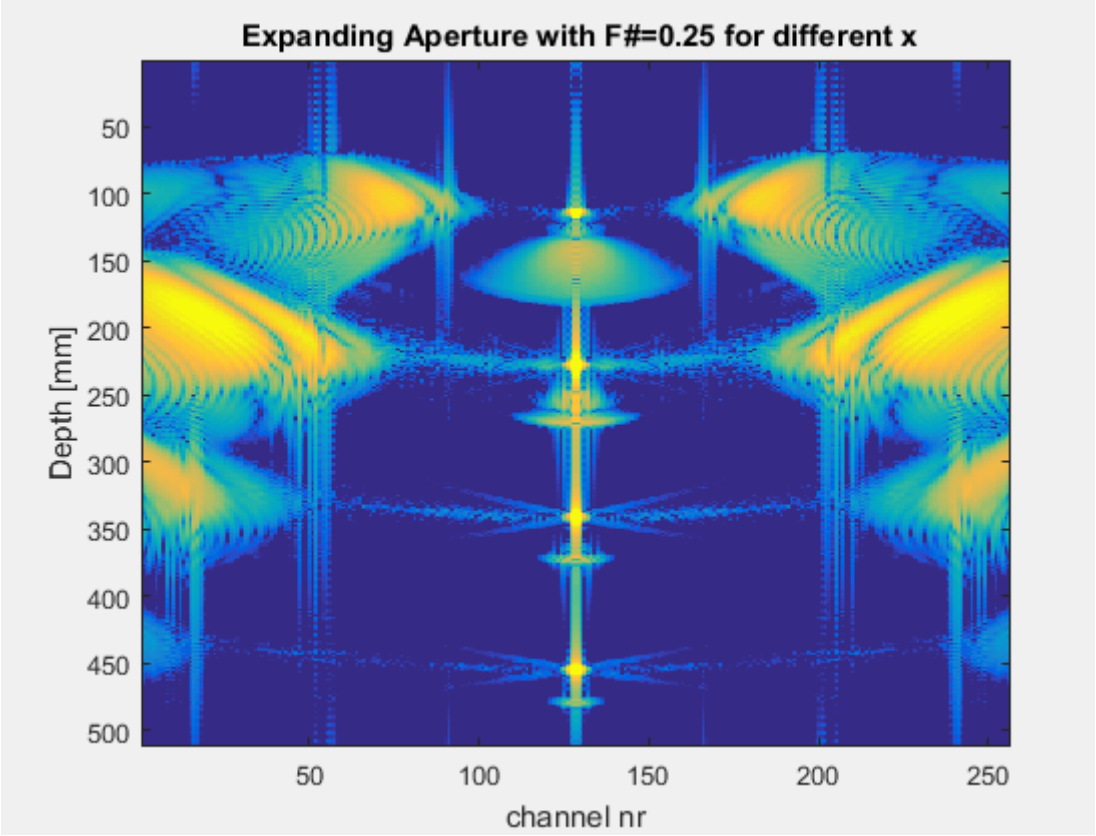
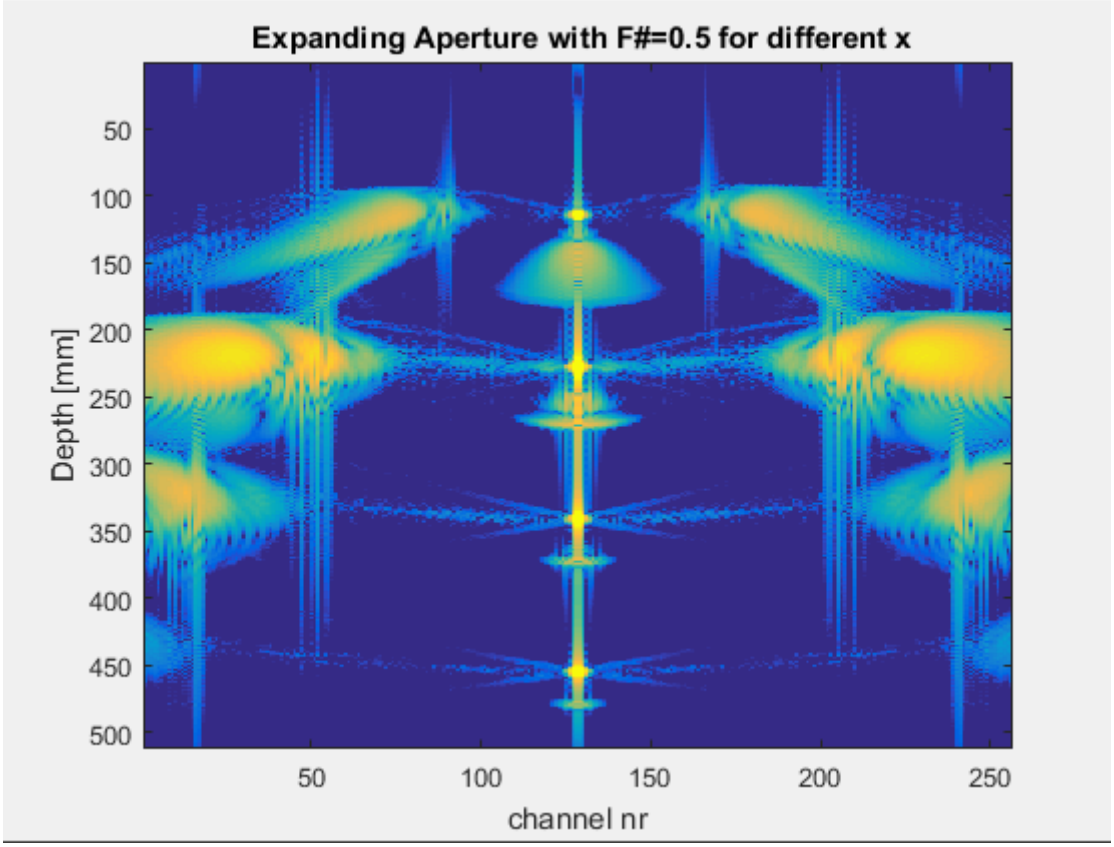
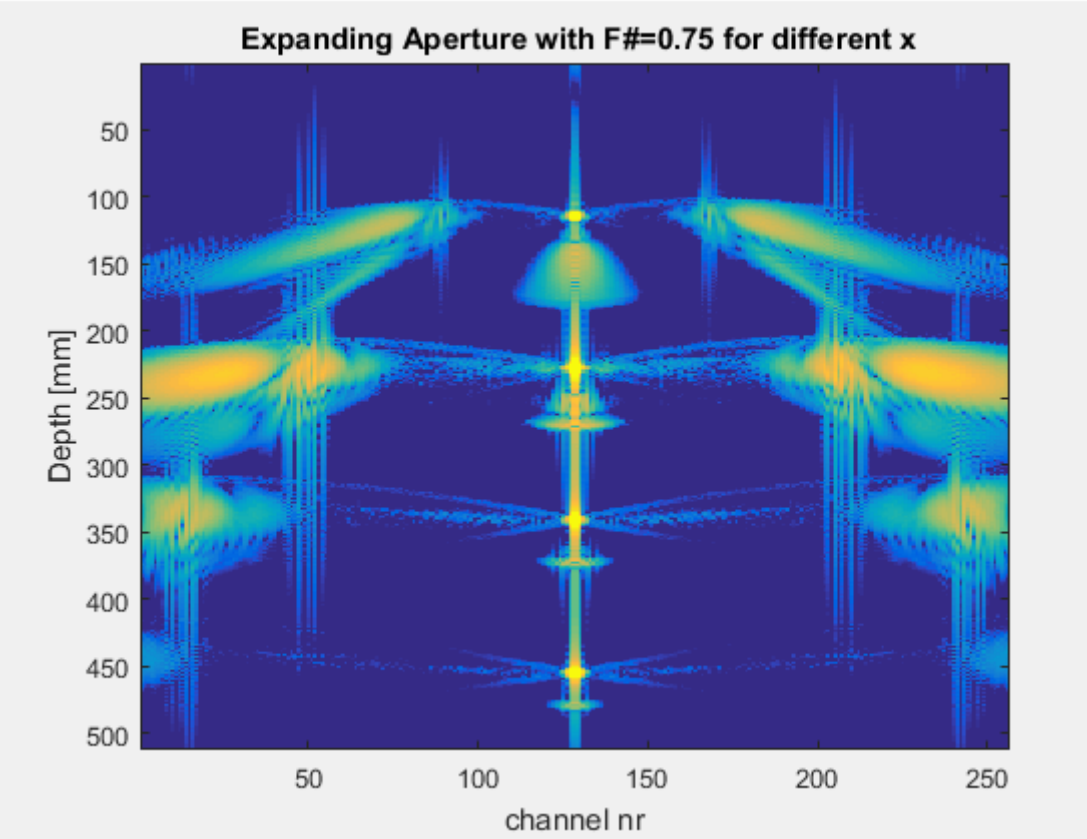
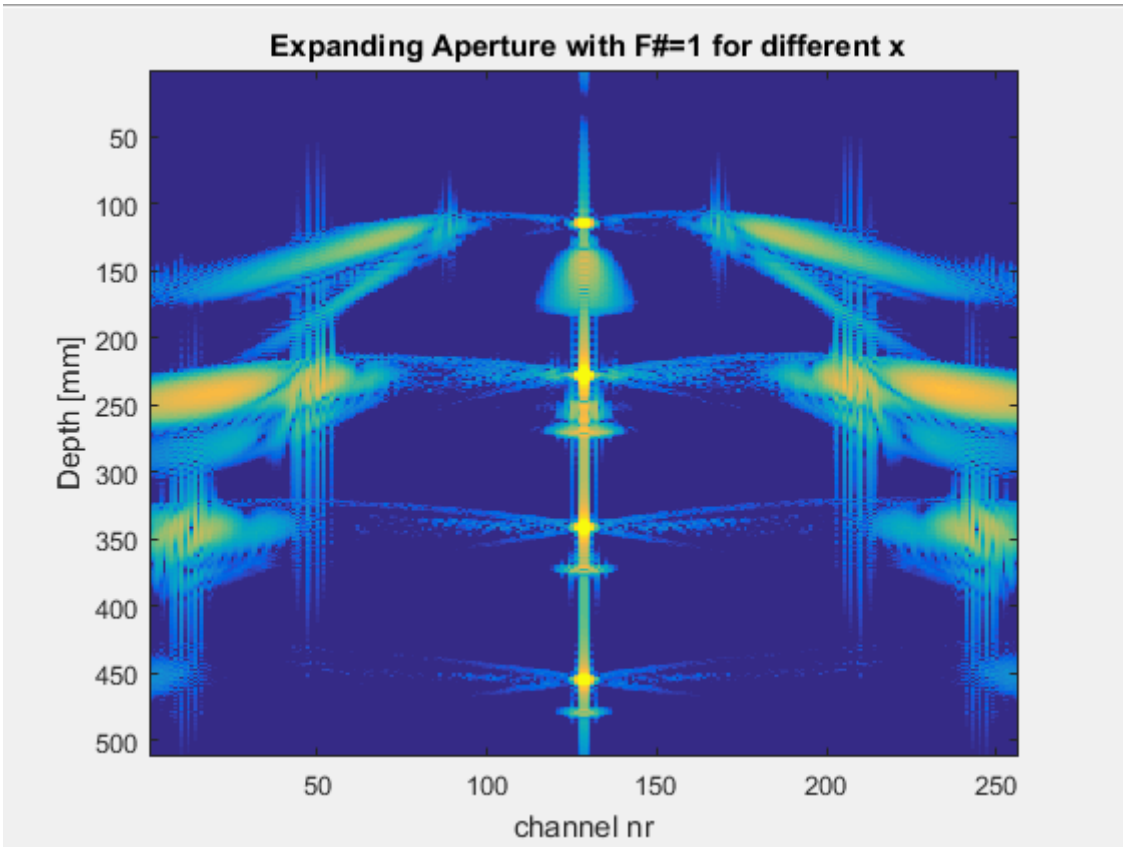
For different expanding aperture we get something like this:






Expanding Aperture with F#=0.75 for different x
Depth [mm]
50
100
150
200
250
300
350
400
450
500
50
100
150
200
250
channel nr


Expanding Aperture with F#=1 for different x
Depth [mm]
50
100
150
200
250
300
350
400
450
500
50
100
150
200
250
channel nr

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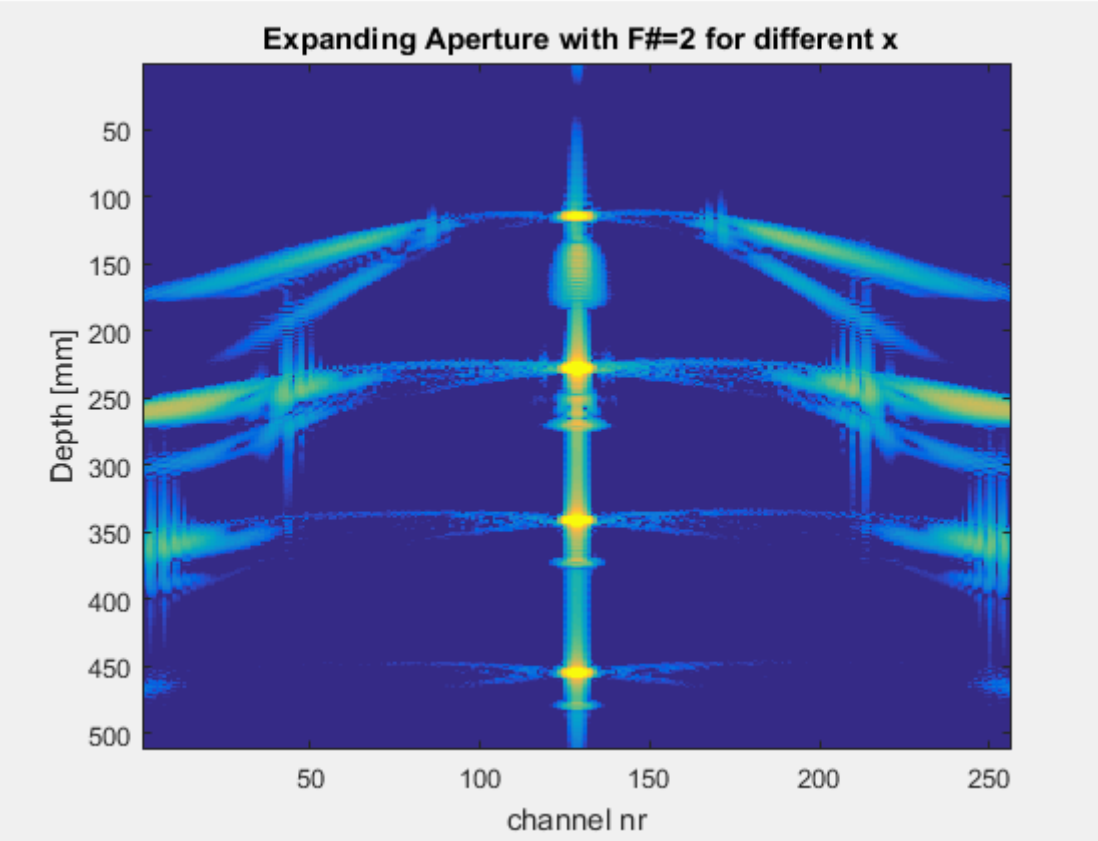

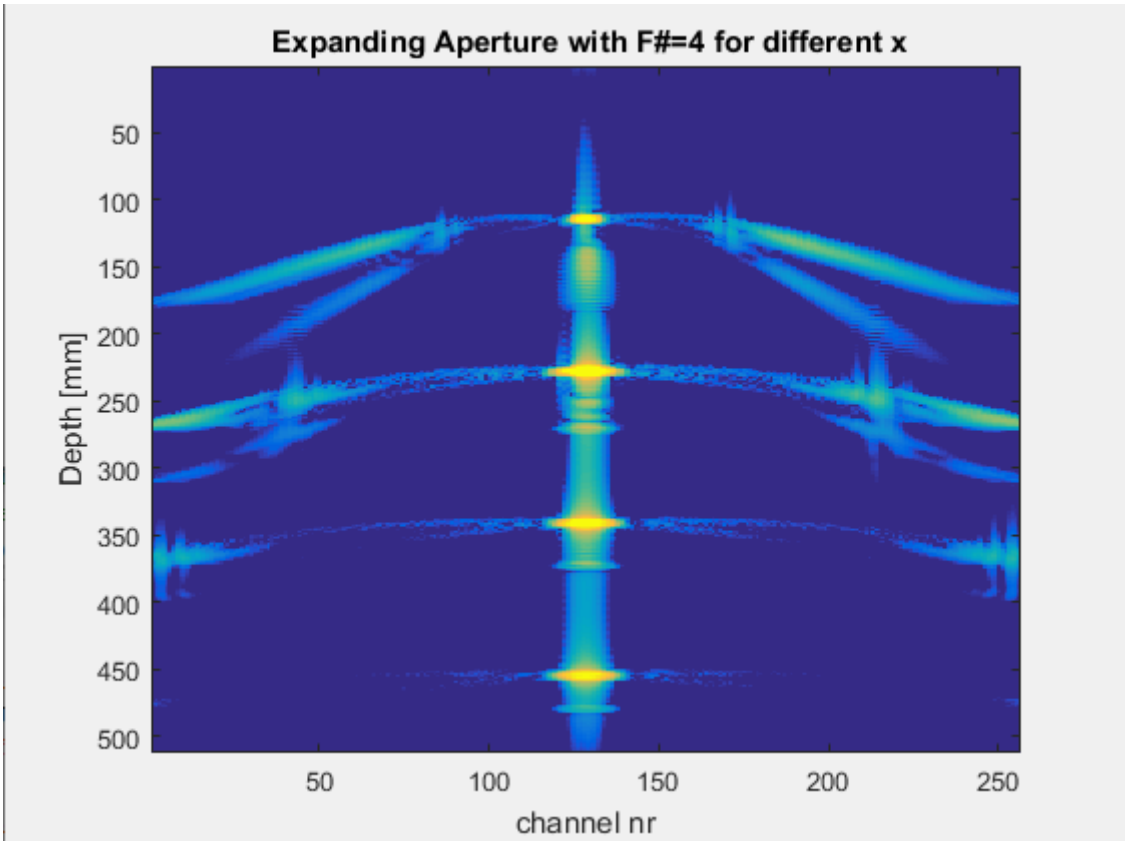

As we can see, the radial resolution get orse when increasing the F#-number.

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Task4

The image generated from Invivo Data with given gain and dynamic range:

```
imagesc(20*log10(apod_envelope_vivo));
caxis([-45 0] +115);
```