Contents


```
close all;
clear all;

no_elements = 128;
pitch = 0.29e-3;
kerf = 0.025e-3;
width = pitch - kerf;
height=13e-3;
no_sub_x = 5;
no_sub_y = 30;
focus = [0 0 60]/1000;
Rfocus = 60e-3;
c =1540;

field_init(0);

Th_tnx = xdc_focused_array(no_elements, width, height, kerf, Rfocus, no_sub_x, no_sub_y, f
ocus);
Th_rcv = xdc_focused_array(no_elements, width, height, kerf, Rfocus, no_sub_x, no_sub_y, f
ocus);
figure;
show_xdc_geir(Th_tnx, 1);
axis equal;
view(3);

%
fs = 100e6; %sampling freq (100Mhz)
f0 = 2.5e6; % transducer center freq (2.5Mhz)
t0 = 1/f0;
dt = 1/fs;  %sampling period
set_sampling(fs);
```

```
      *-------------------------------------------------------------*
      *                                                             *
      *                      F I E L D   I I                        *
      *                                                             *
      *              Simulator for ultrasound systems               *
      *                                                             *
      *             Copyright by Joergen Arendt Jensen              *
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      *                  Web-site: field-ii.dk                      *
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      *               field-ii.dk/?copyright.html                   *
      *  It is illegal to use this program, if the rules in the     *
      *  copyright statement is not followed.                       *
      *-------------------------------------------------------------*
Read rectangular data for plotting....
```
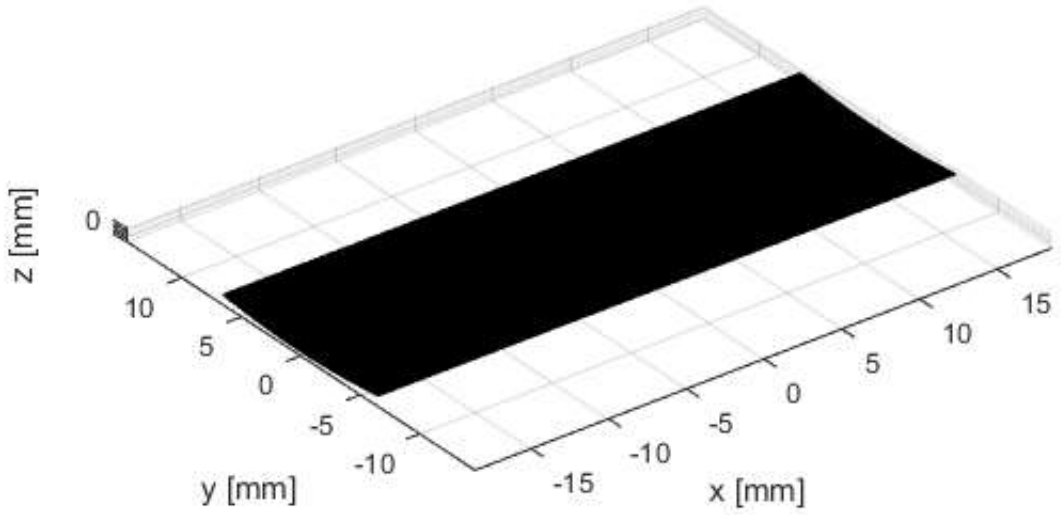
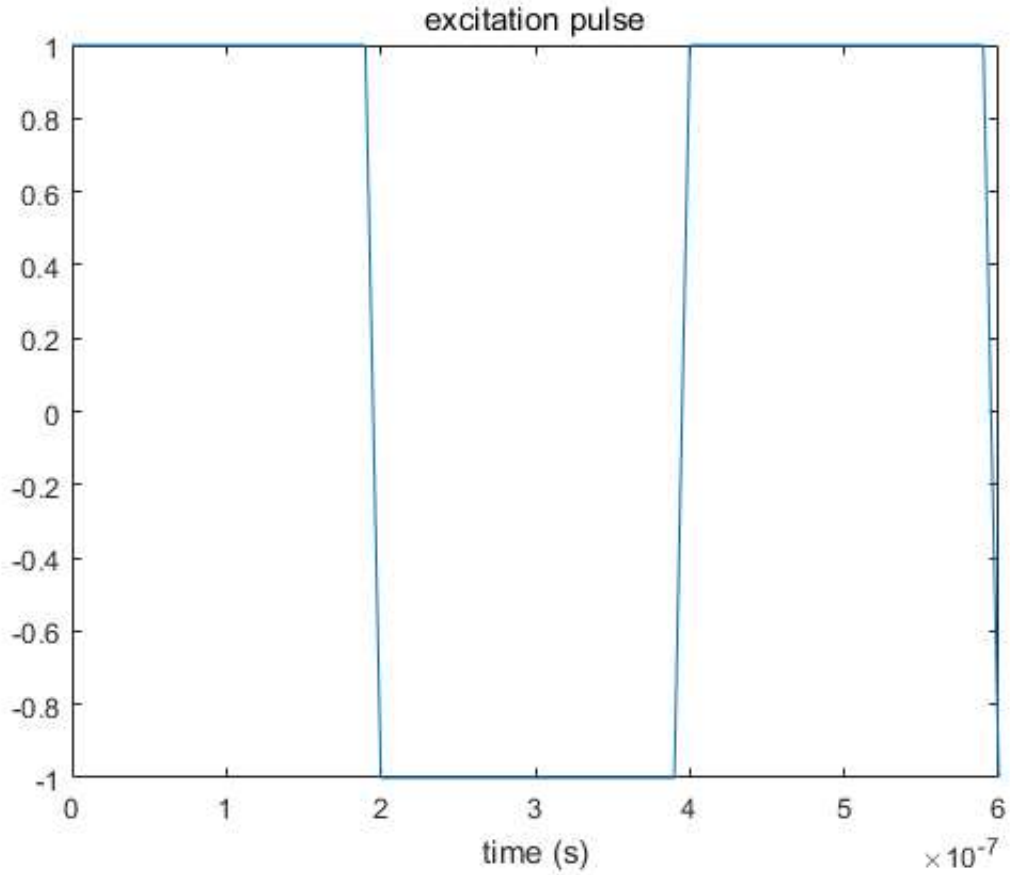
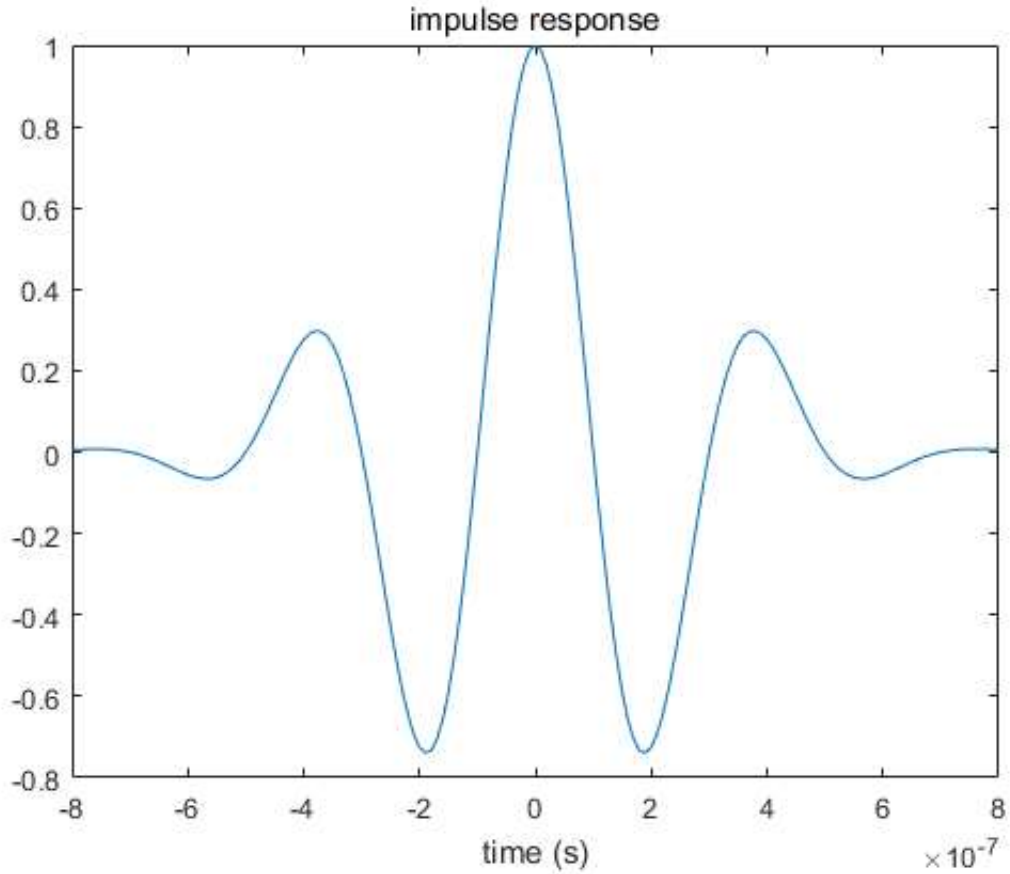

```
Plots aperture with physical element number...
Warning:  Remember to set all pulses in apertures for the new sampling frequency
```

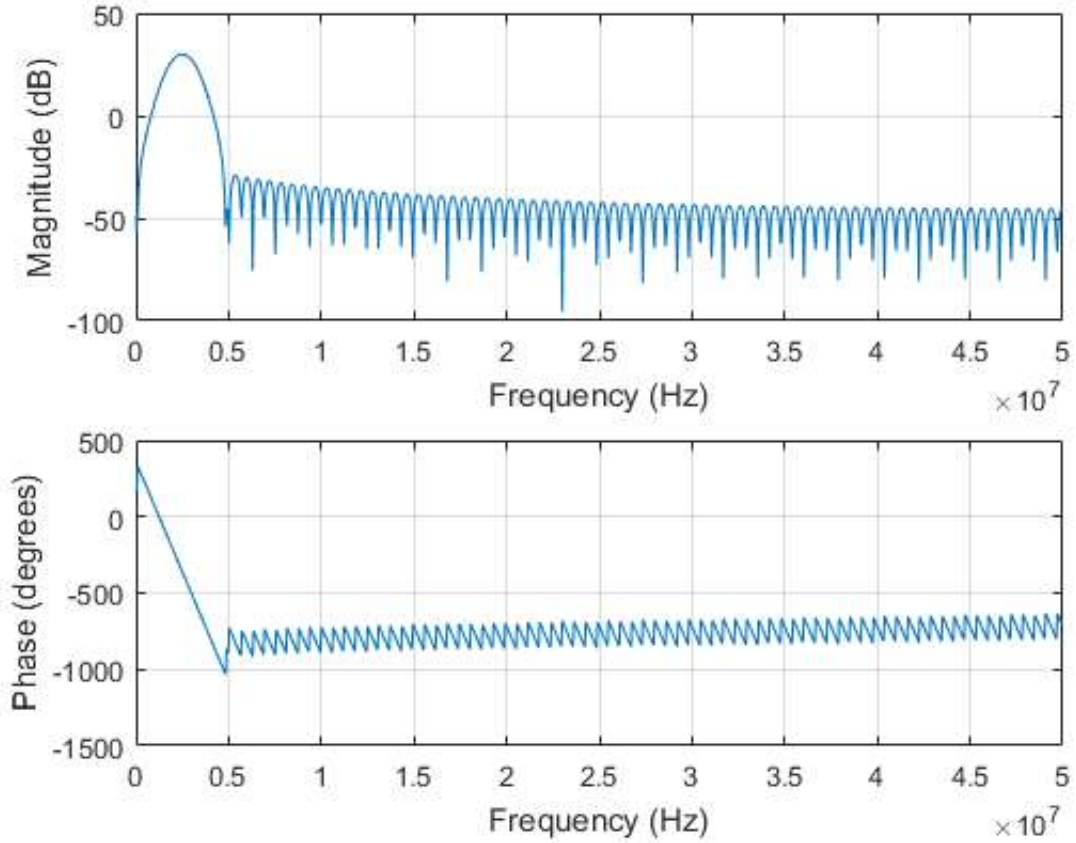


Impulse setup

```
t_ir = -2/f0:1/fs:2/f0;
Bw = 0.6;
impulse_response = gauspuls(t_ir, f0, Bw);
xdc_impulse (Th_tnx, impulse_response);
xdc_impulse (Th_rcv, impulse_response);

figure;
excitation = square(2*pi*f0*(0:dt:1.5*t0));
plot(0:dt:1.5*t0, excitation);
xlabel("time (s)");
title("excitation pulse");
xdc_excitation(Th_tnx, excitation);
figure;
plot(t_ir, impulse_response);
xlabel("time (s)");
title("impulse response");
figure;
freqz(impulse_response,1,1024,fs);
```

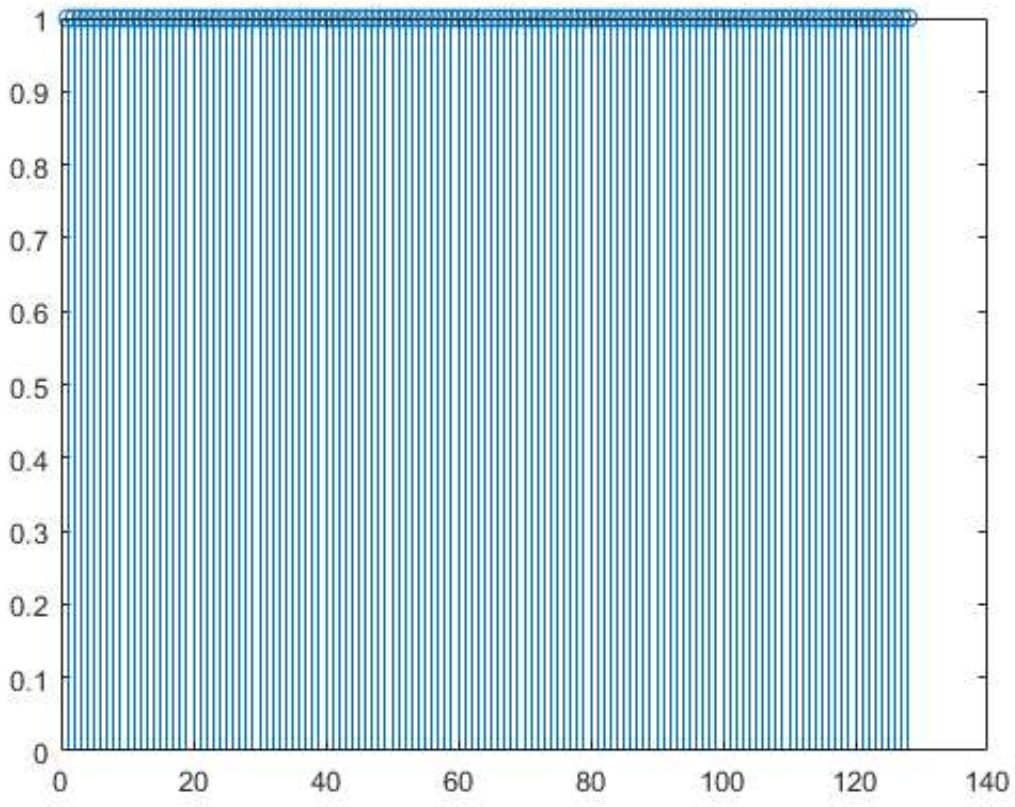

excitation pulse
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
time (s)
×10^-7


impulse response
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-8
-6
-4
-2
0
2
4
6
8
time (s)
×10^-7



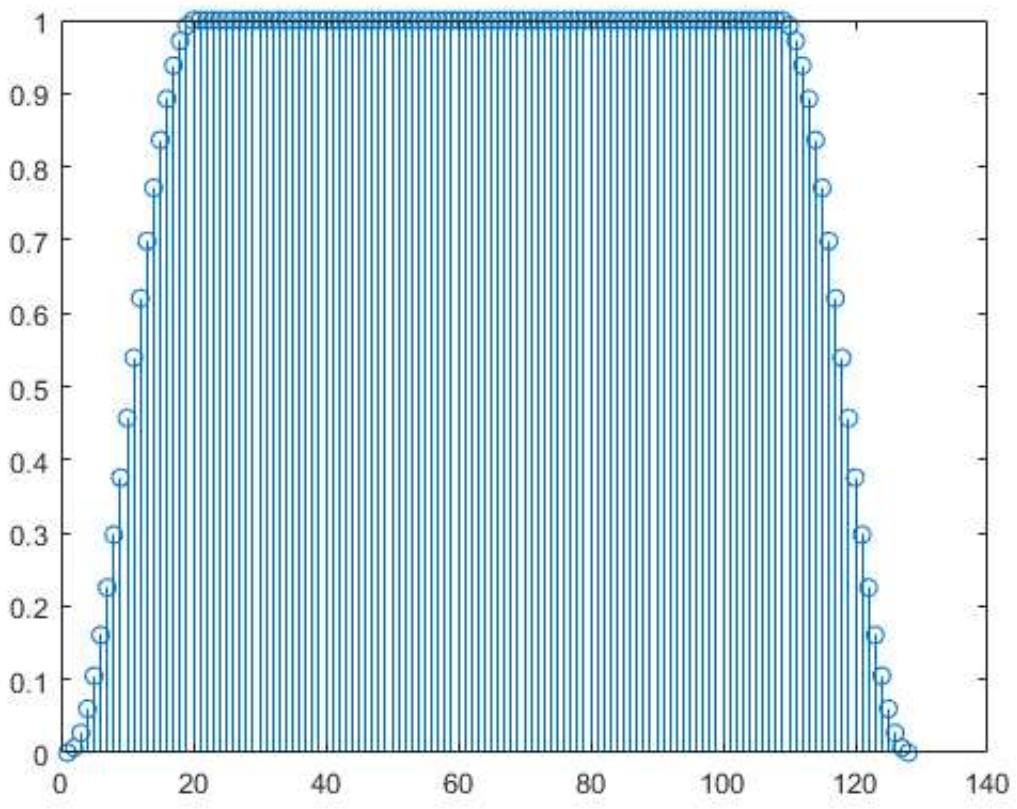
setup tx Apod

```
txApodWeights = ones(1, no_elements);
%txApodWeights = hanning(no_elements)';
%txApodWeights = tukeywin(no_elements, 0.3)';
figure;
stem(txApodWeights);
xdc_apodization(Th_tnx, 0, txApodWeights);
```



setup rx Apod

```
%rxApodWeights = ones(1, no_elements);
%rxApodWeights = hanning(no_elements)';
rxApodWeights = tukeywin(no_elements, 0.3)';
figure;
stem(rxApodWeights);
xdc_apodization(Th_rcv, 0, rxApodWeights);

xdc_dynamic_focus(Th_rcv, 0, 0, 0);
```

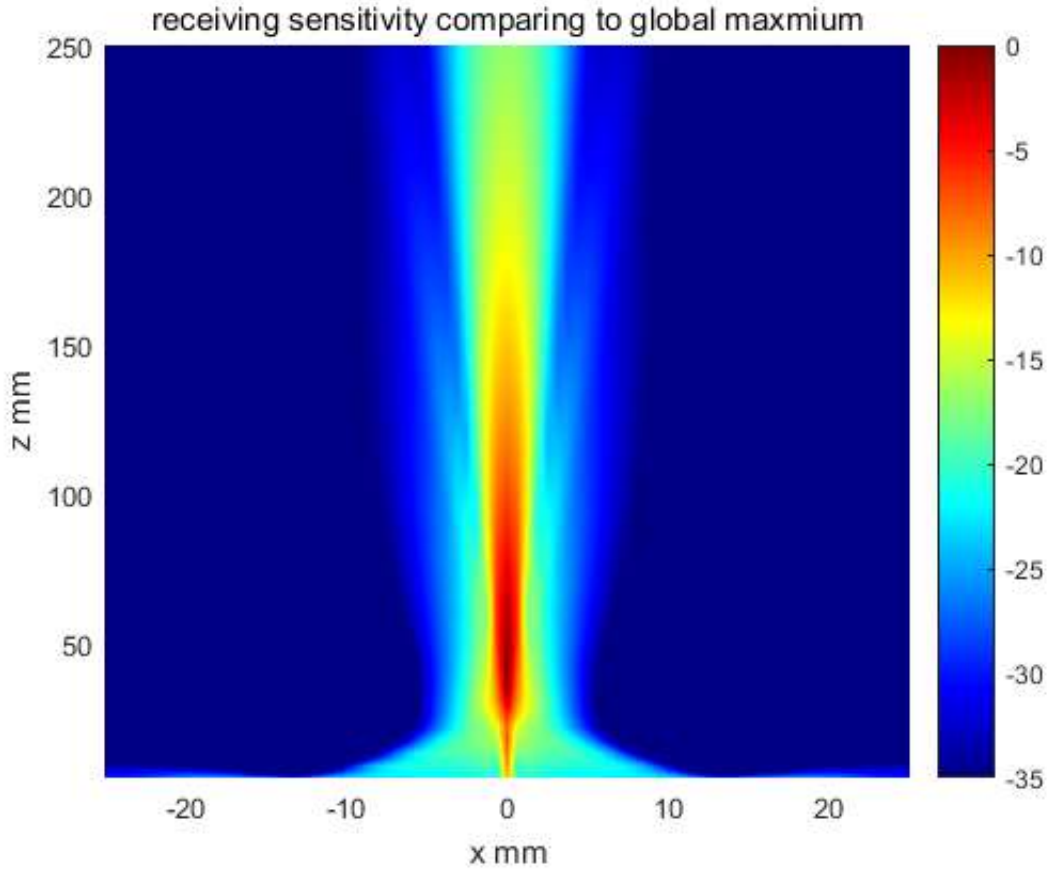


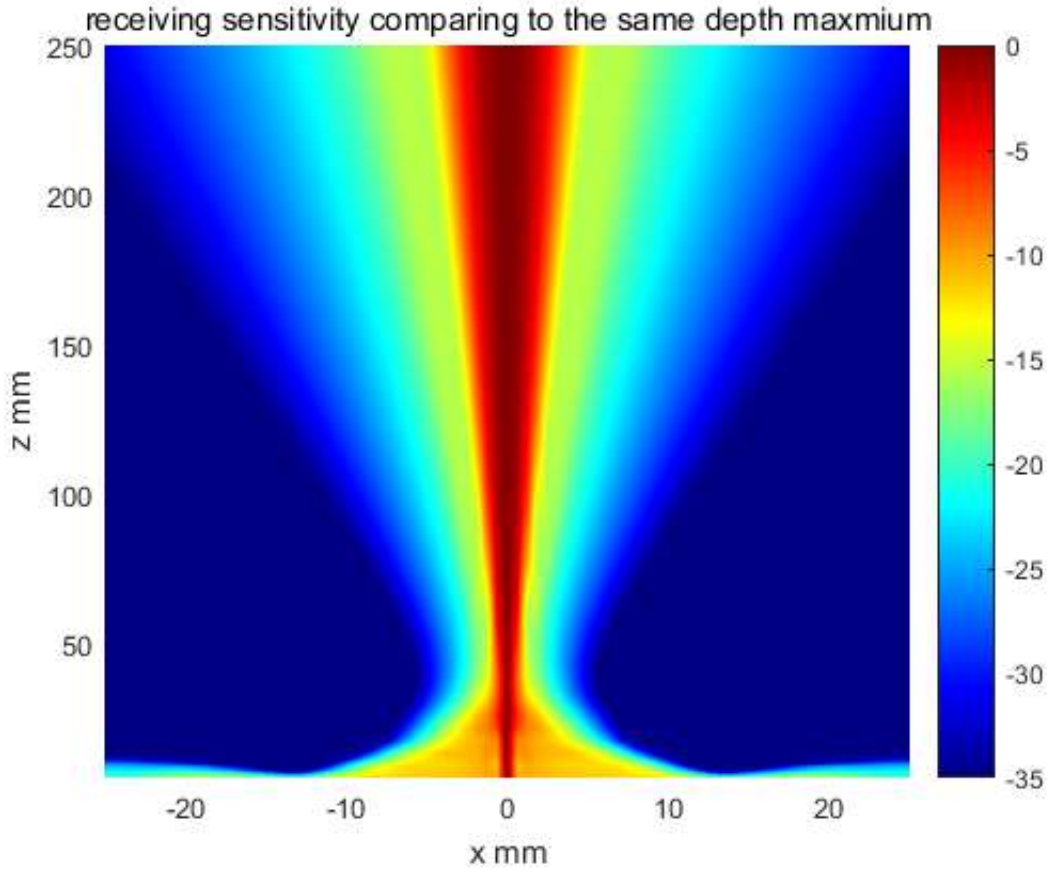
pressure response from x=-15mm to x=15mm, depth 5~150mm

```
Nx = 81; Nz = 59;
x0=linspace(-25e-3,25e-3,Nx);
z0=linspace( 5e-3,250e-3,Nz);
[X,Z]=meshgrid(x0,z0);
measure_point = [X(:), zeros(length(X(:)),1),Z(:)];
[hp_x0, t_start]=calc_hp(Th_rcv, measure_point);
figure;
tAx_hp = t_start+(0:length(hp_x0)-1)/fs;
rms_hp_x0 = rms(hp_x0);
rms_hp_x0 = rms_hp_x0/max(rms_hp_x0);
BPmatrix = reshape(rms_hp_x0,Nz,Nx);
pcolor(x0*1000,z0*1000,20*log10(BPmatrix));
shading interp

caxis([-35 0]); % Set dynamic range
colormap(jet(256));
colorbar

xlabel("x mm");
ylabel("z mm");
title("receiving sensitivity comparing to global maxmium");


BPmatrix = rms(hp_x0);
BPmatrix = reshape(BPmatrix,Nz,Nx);
% BPmatrix_s = max(BPmatrix');
% BPmatrix_n = min(BPmatrix');
BPmatrix= BPmatrix./repmat(max(BPmatrix')', 1,Nx);
% SNR = BPmatrix_s./BPmatrix_n;
% figure;
% plot(z0*1000,SNR);
```

```
% xlabel("depth (mm)");
% title("SNR based on same depth SNR");

figure;
pcolor(x0*1000,z0*1000,20*log10(BPmatrix));
shading interp
caxis([-35 0]); % Set dynamic range
colormap(jet(256));
colorbar
xlabel("x mm");
ylabel("z mm");
title("receiving sensitivity comparing to the same depth maxmium");
```

```
  89.1 % performed (roughly  1 seconds remaining)                                  6 seconds u
sed for the calculation
```





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