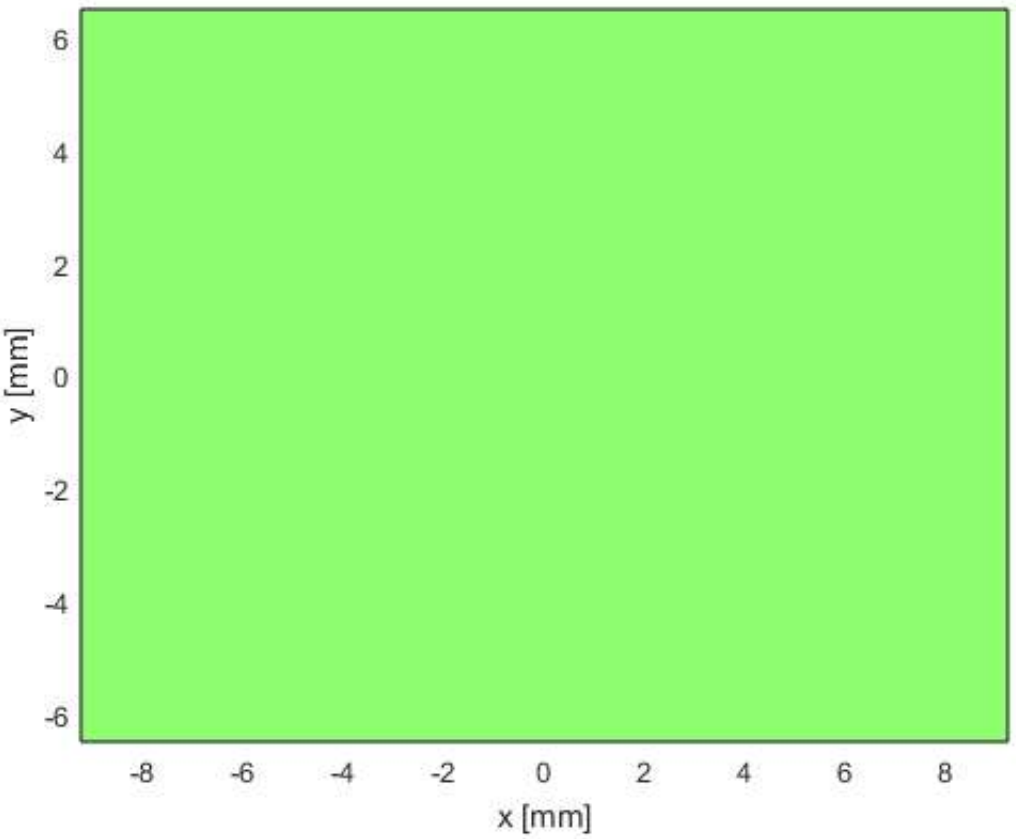
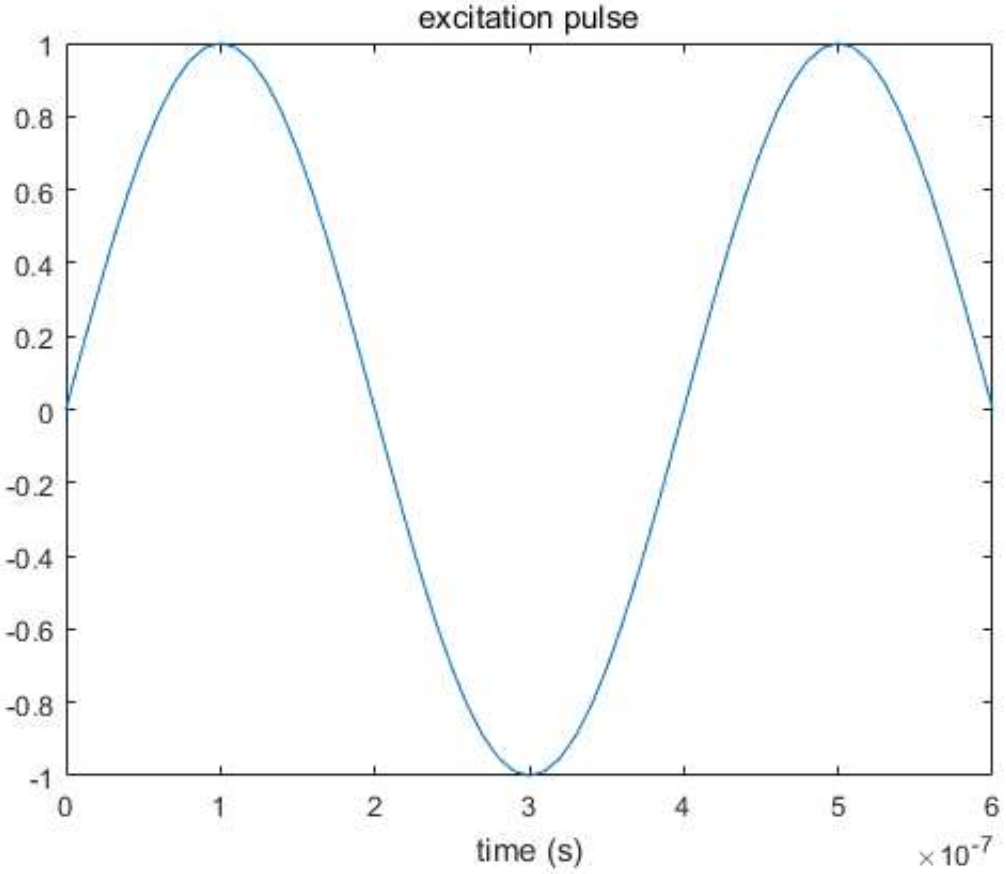
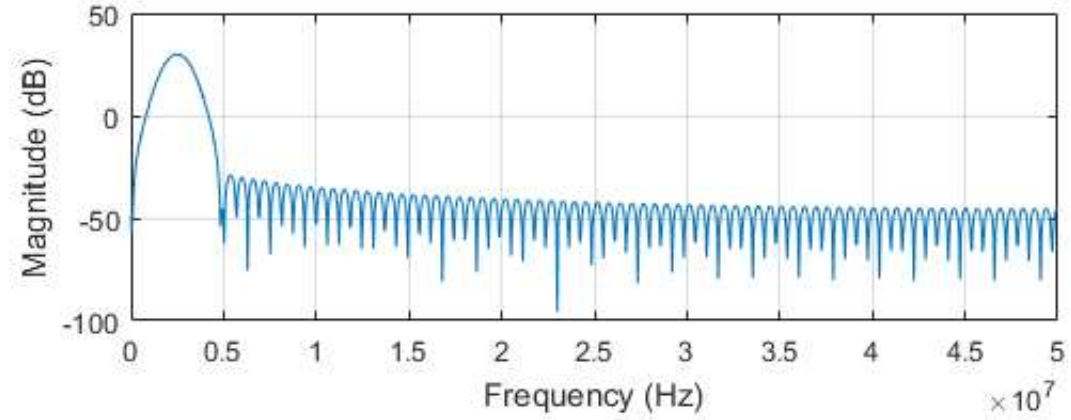
```
no_elements = 1;
width=18.5e-3;
height=13e-3;
kerf = 0;
no_sub_x = 1;
no_sub_y = 1;
focus = [0 0 60]/1000;

Th = xdc_linear_array(no_elements, width, height, kerf, no_sub_x, no_sub_y, focus);
figure;
show_xdc_geir(Th, 1);

fs = 100e6; %sampling freq (100Mhz)
f0 = 2.5e6; % transducer center freq (2.5Mhz)
t0 = 1/f0;
dt = 1/fs;  %sampling period
excitation = sin(2*pi*f0*(0:dt:1.5*t0));

figure;
plot(0:dt:1.5*t0, excitation);
xlabel("time (s)");
title("excitation pulse");

xdc_excitation(Th, excitation);

t_ir = -2/f0:1/fs:2/f0;
Bw = 0.6;
impulse_response = gauspuls(t_ir, f0, Bw);
figure;
plot(t_ir, impulse_response);
xlabel("time (s)");
title("impulse response");

freqz(impulse_response,1,1024,fs);

%sub problem2
%define a measurement point
x0=30e-3;
y0=10e-3;
z0=50e-3;
measure_point=[x0 y0 z0];
[h_x0, t_start]=calc_h(Th, measure_point);
figure;
plot(t_start+(0:length(h_x0)-1)*dt, h_x0);
xlabel("time (s)");
stitle = sprintf("spatial impulse response at (%2.2d %2.2d %2.2d)", measure_point);
title(stitle);

%sub problem3
no_elements = 1;
width=18.5e-3;
height=13e-3;
kerf = 0;
no_sub_x = 30;
no_sub_y = 30;
focus = [0 0 60]/1000;

Th = xdc_linear_array(no_elements, width, height, kerf, no_sub_x, no_sub_y, focus);
figure;
```

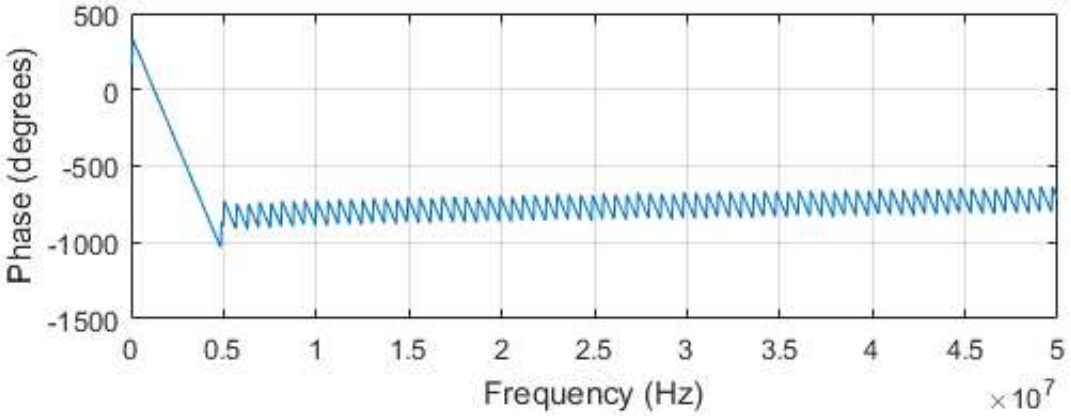
```
show_xdc_geir(Th, 1);

fs = 100e6; %sampling freq (100Mhz)
set_sampling(fs);
f0 = 2.5e6; % transducer center freq (2.5Mhz)
t0 = 1/f0;
dt = 1/fs;  %sampling period
excitation = sin(2*pi*f0*(0:dt:1.5*t0));

figure;
plot(0:dt:1.5*t0, excitation);
xlabel("time (s)");
title("excitation pulse");

xdc_excitation(Th, excitation);

t_ir = -2/f0:1/fs:2/f0;
Bw = 0.6;
impulse_response = gauspuls(t_ir, f0, Bw);
figure;
plot(t_ir, impulse_response);
xlabel("time (s)");
title("impulse response");

freqz(impulse_response,1,1024,fs);

%
%define a measurement point
x0=30e-3;
y0=10e-3;
z0=50e-3;
measure_point=[x0 y0 z0];
[h_x0, t_start]=calc_h(Th, measure_point);
figure;
plot(t_start+(0:length(h_x0)-1)*dt, h_x0);
xlabel("time (s)");
stitle = sprintf("spatial impulse response at (%2.2d %2.2d %2.2d)", measure_point);
title(stitle);
```

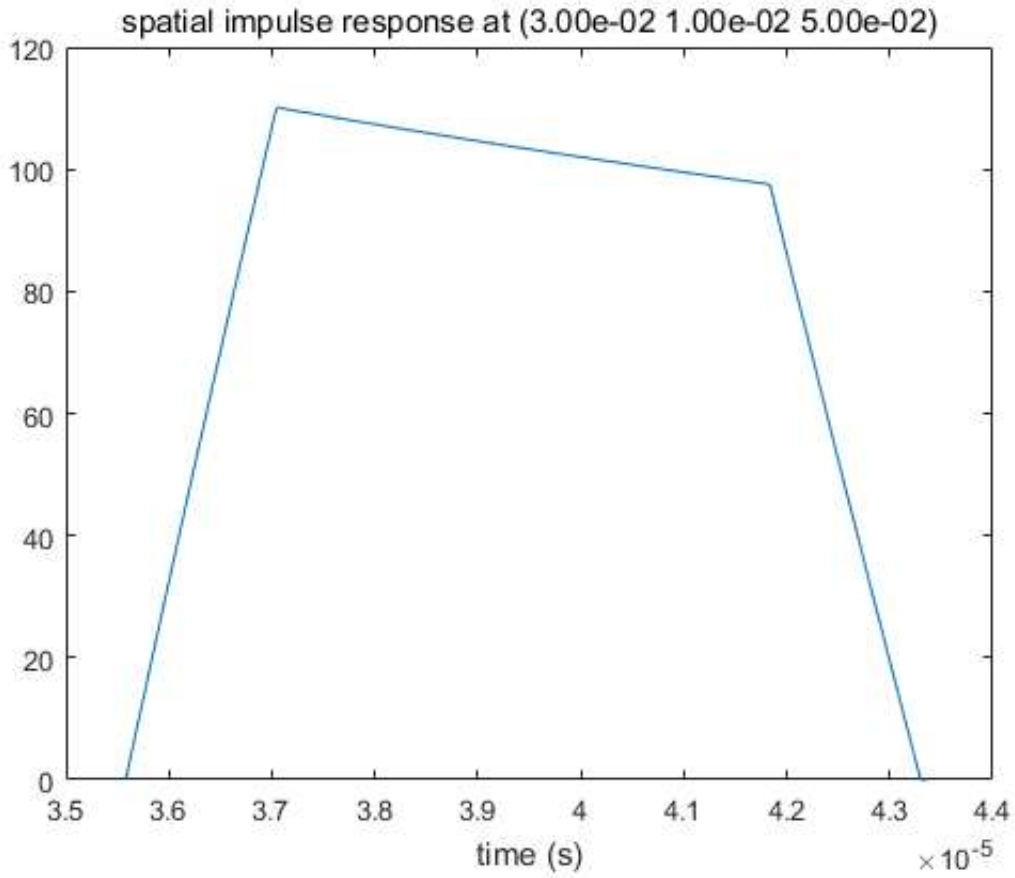
```
Read rectangular data for plotting....
Plots aperture with physical element number...
Read rectangular data for plotting....
Plots aperture with physical element number...
Warning:  Remember to set all pulses in apertures for the new sampling frequency
```

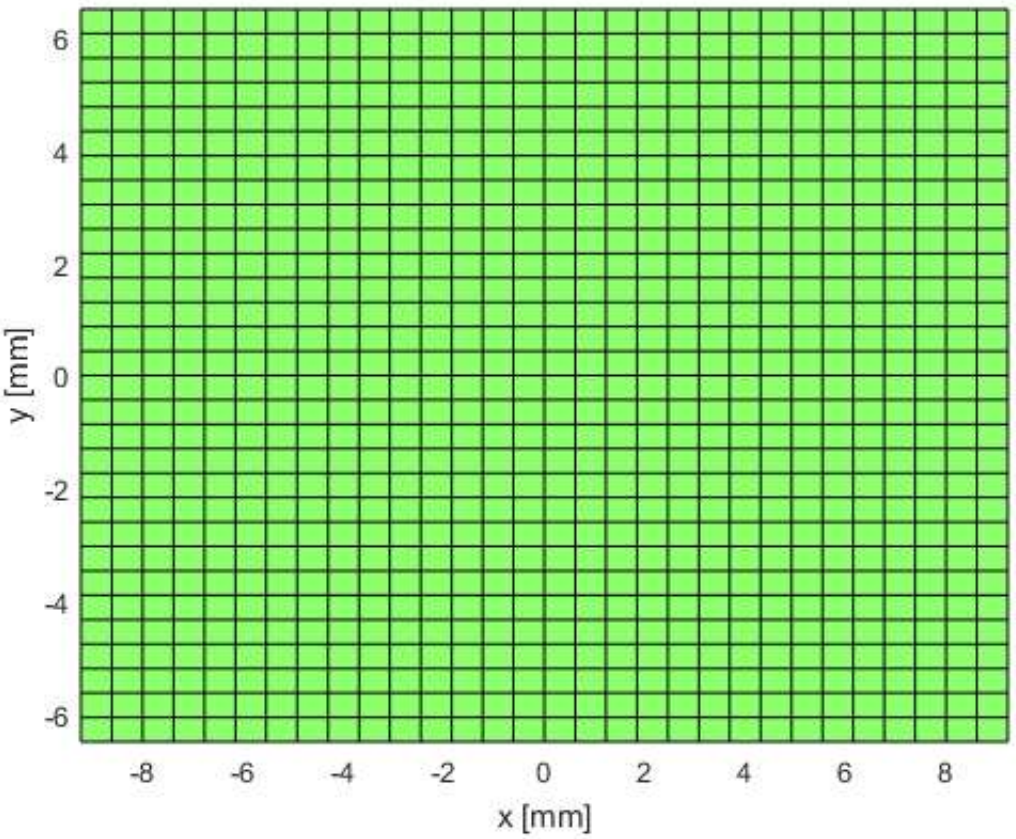

6
4
2
0
-2
-4
-6
y [mm]
-8
-6
-4
-2
0
2
4
6
8
x [mm]

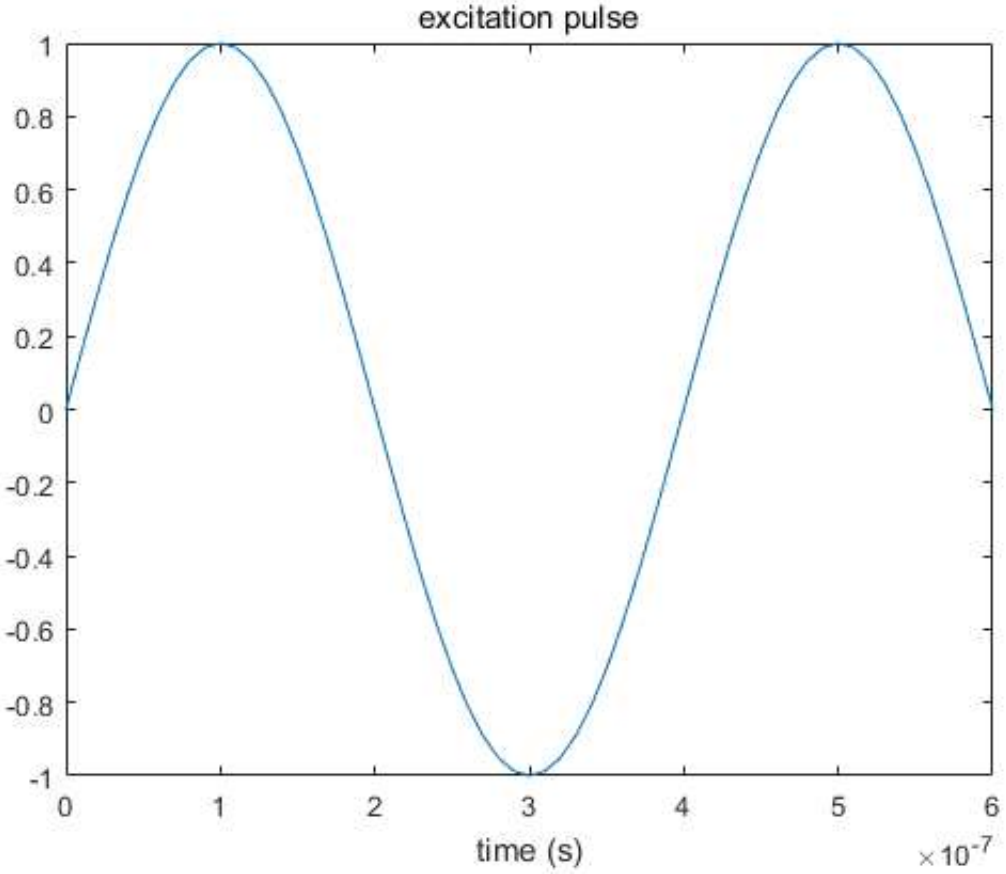

excitation pulse
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
time (s)
×10^-7

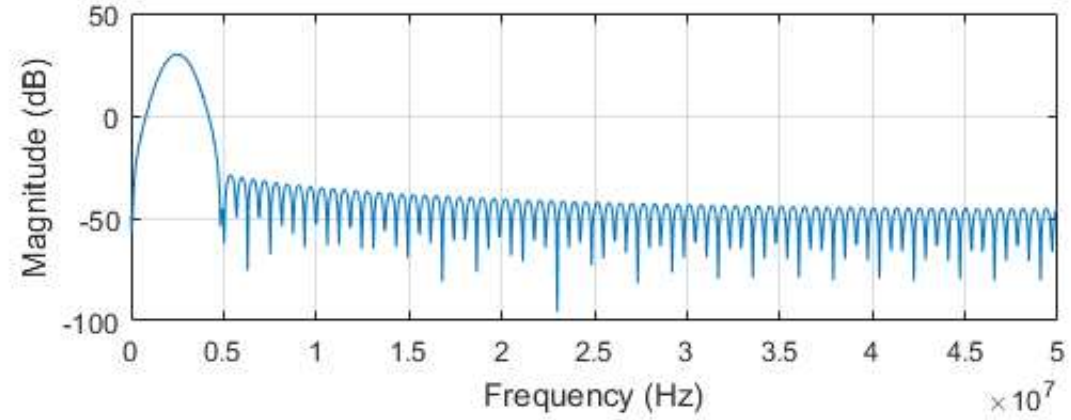

Magnitude (dB)
50
0
-50
-100
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Frequency (Hz)
×10^7

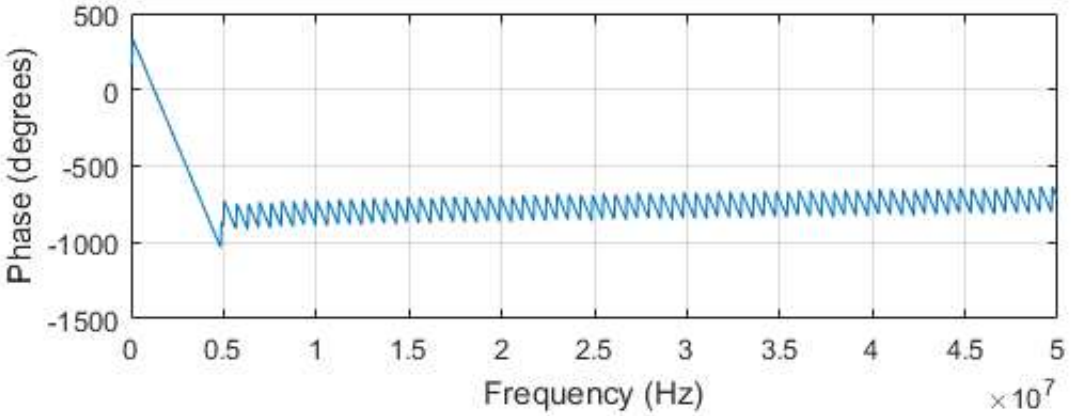

Phase (degrees)
500
0
-500
-1000
-1500
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Frequency (Hz)
×10^7

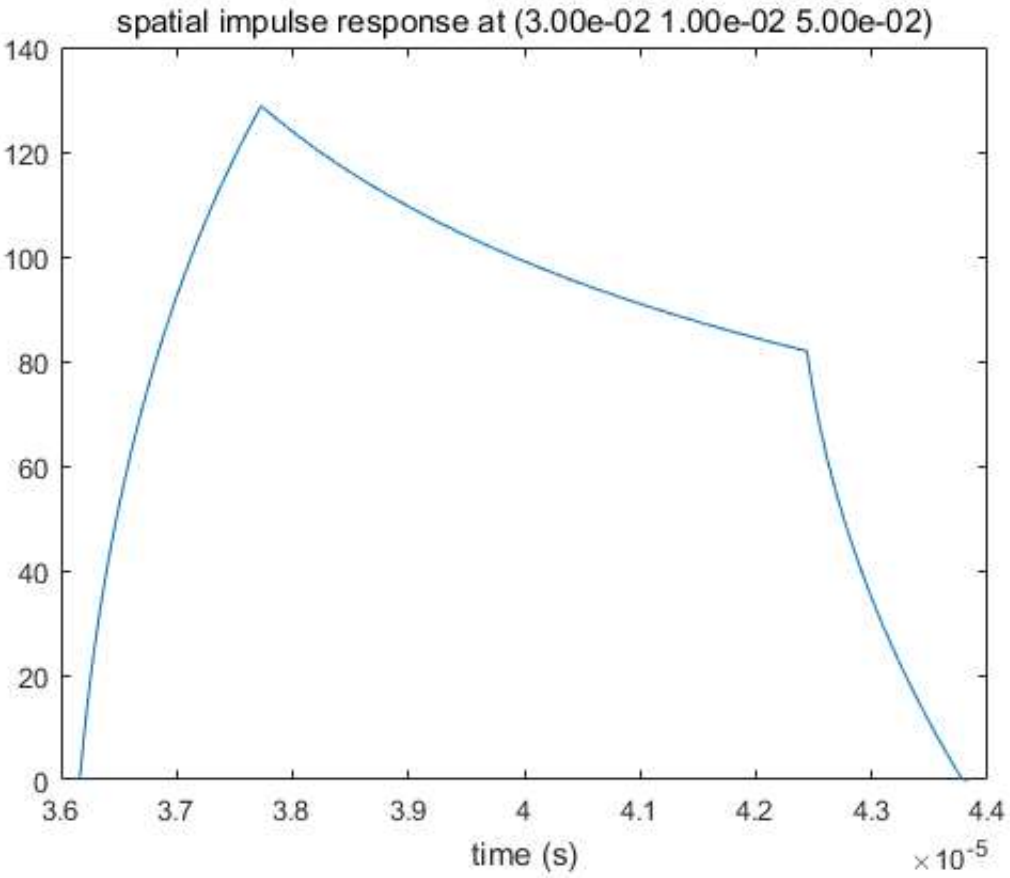

spatial impulse response at (3.00e-02 1.00e-02 5.00e-02)
120
100
80
60
40
20
0
3.5
3.6
3.7
3.8
3.9
4
4.1
4.2
4.3
4.4
time (s)
×10^-5


6
4
2
0
-2
-4
-6
y [mm]
-8
-6
-4
-2
0
2
4
6
8
x [mm]


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

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