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% No steer - full wavelength.
vel=1540;                                % Speed of sound - all units MKS
num_elems=128;                            % Number of elements
fc=10e6;                                  % Center frequency
pitch= vel/(fc);                          % Array element pitch
z_foc=50e-3;                              % Range direction focal distance
theta_steer=0*pi/180;                    % Steer angle

[z_pts_full0, x_pts_full0, field_db_full0] = UltrasoundHomework_Task6(theta_steer,

figure(1); hold on;
mesh(z_pts*1e3,x_pts*1e3,field_db');
colormap('autumn')

% 45 degree steer - full wavelength.
theta_steer = 45*pi/180;
[z_pts_full_45, x_pts_full_45, field_db_full_45] = UltrasoundHomework_Task6(theta_
mesh(z_pts*1e3,x_pts*1e3,field_db');
colormap('winter')

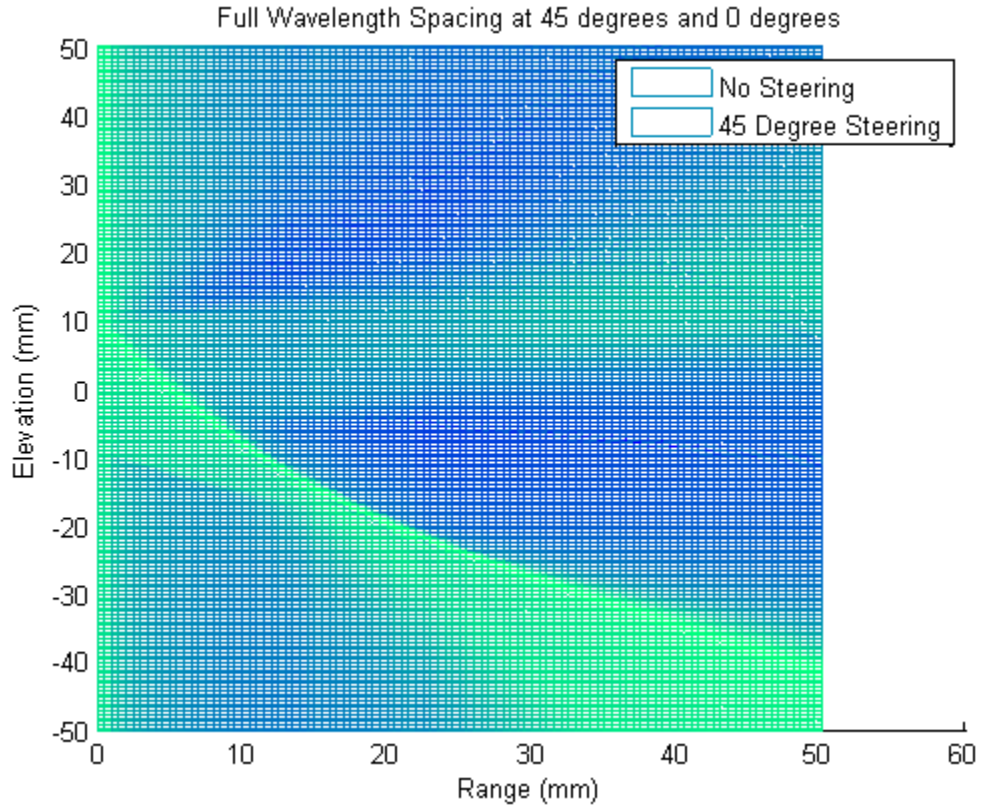
xlabel('Range (mm)')
ylabel('Elevation (mm)')
title('Full Wavelength Spacing at 45 degrees and 0 degrees');
legend('No Steering','45 Degree Steering');

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26

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% No steer - half wavelength.
vel=1540;
num_elems=128;
fc=10e6;
pitch= vel/(2*fc);
z_foc=50e-3;
theta_steer=0*pi/180;

% Speed of sound - all units MKS
% Number of elements
% Center frequency
% Array element pitch
% Range direction focal distance
% Steer angle

[z_pts_half0, x_pts_half0, field_db_half0] = UltrasoundHomework_Task6(theta_steer,

figure(2); hold on;
mesh(z_pts*1e3,x_pts*1e3,field_db');
colormap('autumn')

% 45 degree steer - half wavelength.
theta_steer = 45*pi/180;
[z_pts_half_45, x_pts_half_45, field_db_half_45] = UltrasoundHomework_Task6(theta_
mesh(z_pts*1e3,x_pts*1e3,field_db');
colormap('winter')

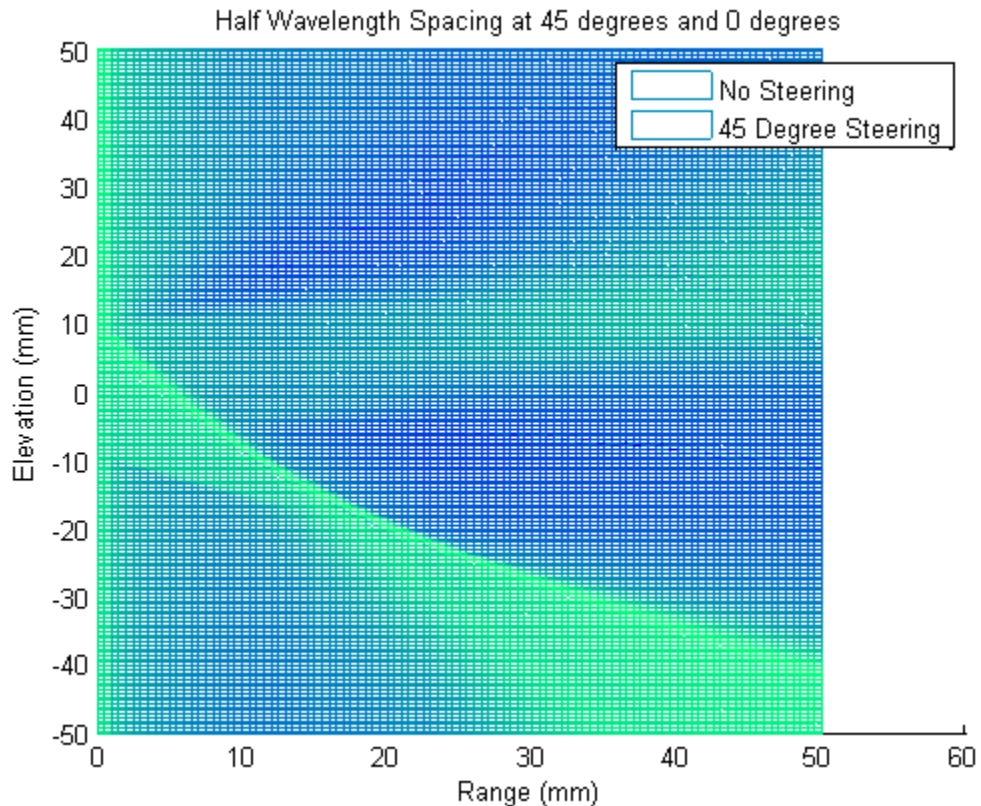
xlabel('Range (mm)')
ylabel('Elevation (mm)')
title('Half Wavelength Spacing at 45 degrees and 0 degrees');
legend('No Steering','45 Degree Steering');

```

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26

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# Answers

When you steer the beam, you have less effective elements due to the angle and this in effect reduces the aperture. Reduced aperture leads to smaller focal length, this is reflected in the mesh plots.

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