clear all; clc; close all;

so=0;

delta = 2\*pi/3;

lamda = 0.043\*delta^3 + (-0.64)\*delta^2 + 3.2\*delta + 0.45;

ko = 0;

max\_pos\_SLM = 39; period\_grating = 3; pixel\_pitch = 13; vol = max\_pos\_SLM/period\_grating;

final\_phase\_pattern = 0;

for jj = 1:100

iter2 = 0; iter3=0; iter4 = 0;

for counter2 = -vol:vol

iter2 = iter2 + 1;

phase1(iter2) = (2\*delta/2)\*(erf((2\*(-counter2))/lamda)+1);

end

phase\_keep1 = phase1(14:27);

phasee = phase\_keep1;

for counter3 = -vol:vol

iter3 = iter3 +1;

phase2(iter3) = (delta/2)\*(erf((2\*counter3)/lamda)+1);

end

phase\_keep2 = phase2(10:27);

phasee(15:15+17) = phase\_keep2;

for counter4 = -vol:vol

iter4 = iter4 +1;

phase3(iter4) = 2\*pi/3 + (delta/2)\*(erf((2\*counter4)/lamda)+1);

end

phase\_keep3 = phase3(10:27);

phasee(32:32+17) = phase\_keep3;

phasee(49:49+4) = phase1(10:14);

final\_phase\_pattern(length(final\_phase\_pattern):length(final\_phase\_pattern)+length(phasee)-1) = phasee(:);

clearvars -except delta lamda vol final\_phase\_pattern

end

for i=1:length(final\_phase\_pattern)

final\_phase\_pattern(i,:)=final\_phase\_pattern(1,:);

end

imagesc(final\_phase\_pattern)

set(gca,'YTickLabel',[]);

set(gca,'XTickLabel',[]);

hcb=colorbar;

hcb.TickLabelInterpreter = "latex";

hcb.Title.String = "Phase Depth $(/pi)$";

hcb.Title.Interpreter = "latex"

hcb.Title.Rotation = 90;

Far-Field Propagation (Fresnel)

D1=13.45e-6; %grating side length

L1=450\*13e-6; %array side length

lambda = 1500e-9; % Light wavlength [m]

k = 2\*pi/SIM\_PARAMETERS.lambda; % Wave number (m-1)

z = 0.5; % Distance between planes [m]

M=5201; %# samples

dx1=L1/M;

x1=-L1/2:dx1:L1/2-dx1; %source coords

[X1,Y1]=meshgrid(x1,x1);

x0 = 0; % Center of beam coordinates (m)

y0 = 0;

sigmaX = 0.5e-3; % Standard Deviation (m)

sigmaY = 0.5e-3;

map = gaussianBeam2D(X1,Y1,x0,y0,sigmaX,sigmaY,'On');

limit\_down = length(map)/2-length(final\_phase\_pattern)/2+1;

limit\_up = length(map)/2+length(final\_phase\_pattern)/2;

input\_plane\_E = map;

input\_plane\_E(limit\_down:limit\_up,limit\_down:limit\_up) = map(limit\_down:limit\_up,limit\_down:limit\_up) .\*...

final\_phase\_pattern .\* final\_phase\_pattern;

input\_plane\_I = abs(E).^2;

quadrature = exp(1i\*k/(2\*z).\*(X1.^2 + Y1.^2));

phaseFactor = exp(1i\*k\*z)\*exp(1i\*k\*(X1.^2 + Y1.^2)/(2\*z));

amplitudeFactor = 1/(1i \* lambda \* z);

output\_plane\_E = fftshift(fft2(input\_plane\_E.\*quadrature));

output\_plane\_E = output\_plane\_E .\*phaseFactor .\* amplitudeFactor;

output\_plane\_I = abs(output\_plane\_E).^2;

output\_fin = (output\_plane\_I/max(max(output\_plane\_I)));

figure;

surf(output\_fin(2500:2700,2300:2900))

set(gca,'YTickLabel',[]);

set(gca,'XTickLabel',[]);

zlabel ('Normalized Intensity','Interpreter','latex');

set(gca,'Linewidth',2);set(gca,'TickLabelInterpreter','latex');set(gca,'TickLength',[0, 0]);set(gca,'LooseInset',max(get(gca,'TightInset'), 0.02))

ax=gca;ax.FontSize=14;pos=get(gca,'pos');set(gca,'pos',[pos(1) pos(2) pos(3) pos(4)\*.95]);