Geometric Phase Elements For Beam Shaping

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EPIC Online Technology Meeting on Laser Beam and Pulse Shaping

Mat 25th 2020

WOP
Workshop of Photonics

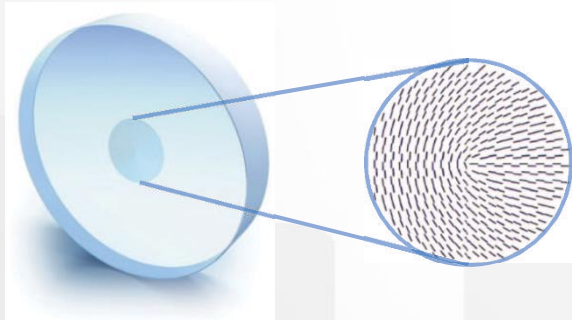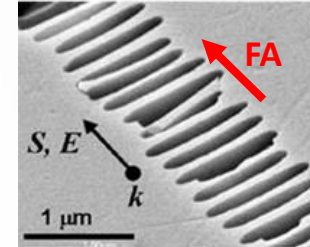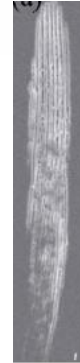# Space-Variant Retarder As Beam Shaper

Standart waveplates/retarders
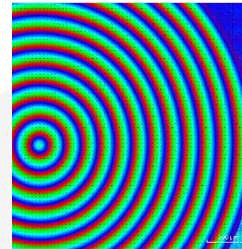
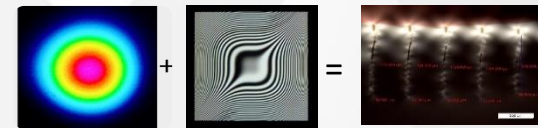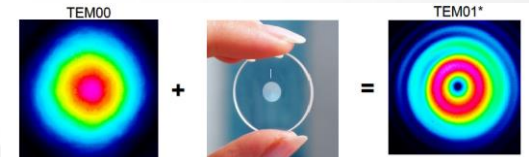1. Fast axis - constant
2. Retardance - constant

Space-variant retarder

1. Θ(x,y) - function
2. R(x,y) - function

FA

S, E
k

1 μm

Inscription in fused silica

Controlled Fast Axis Position

TEM00 + = TEM01*

+ =

And voilà – here you shape it!

Space-Variant Retarder As Beam Shaper

Standart waveplates/retarders
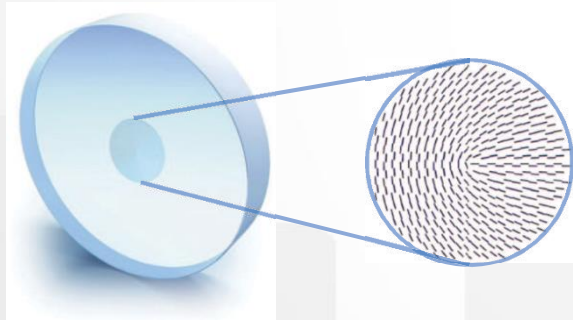
1. Fast axis - constant
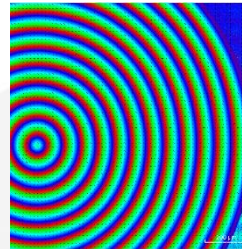2. Retardance - constant

Space-variant retarder

1. Θ(x,y) - function
2. R(x,y) - function

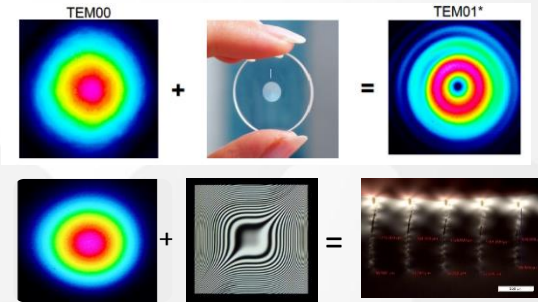● **LIDT | High damage threshold:**
63 J/cm² @ 1064 mn, 10 ns;
2 J/cm² @ 1030 nm, 212 fs
● **Transmission (no AR coating):**
85% @ 343 nm, 92% @ 515 nm,
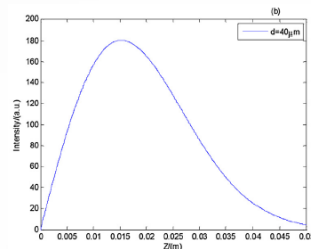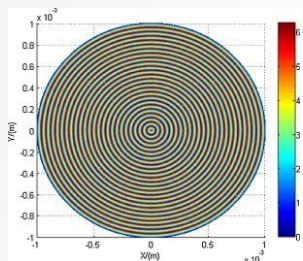**94% @ 1030 nm**

Inscription in fused silica

Controlled Fast Axis Position

TEM00   +   =   TEM01*

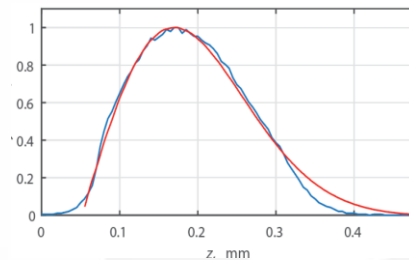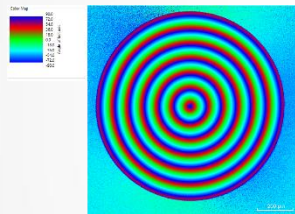# Axially Shaped Non-Diffracting Beams

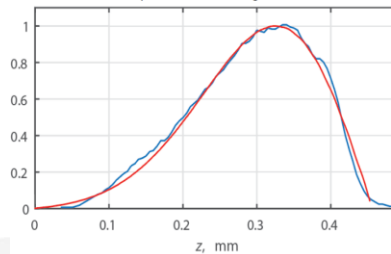Simple
Phase mask
by SLM

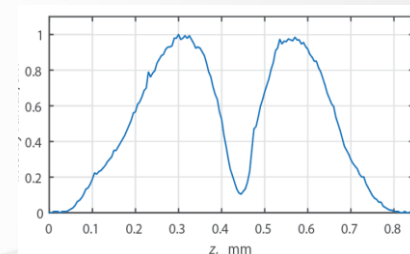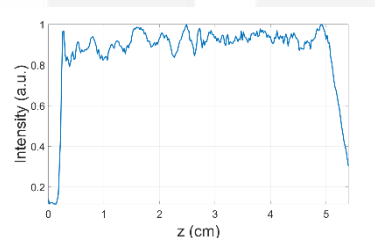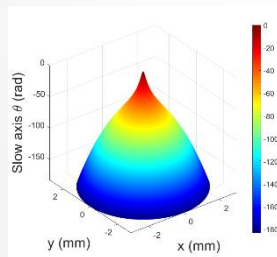Using Pancharatnam-Berry (P-B)
Phase Masks

P-B Phase
mask

LHC Polarization

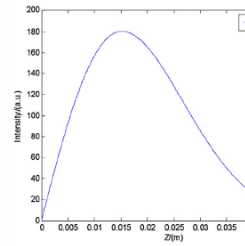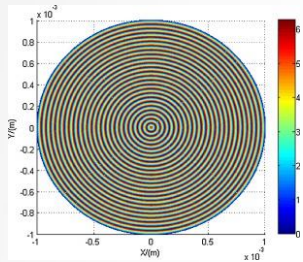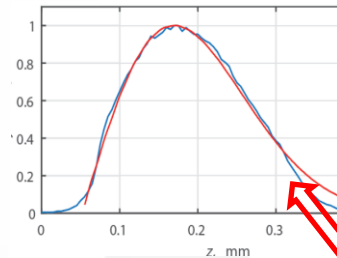RHC Polarization

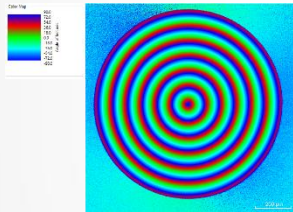Linear Polarization

P-B Phase
mask #2

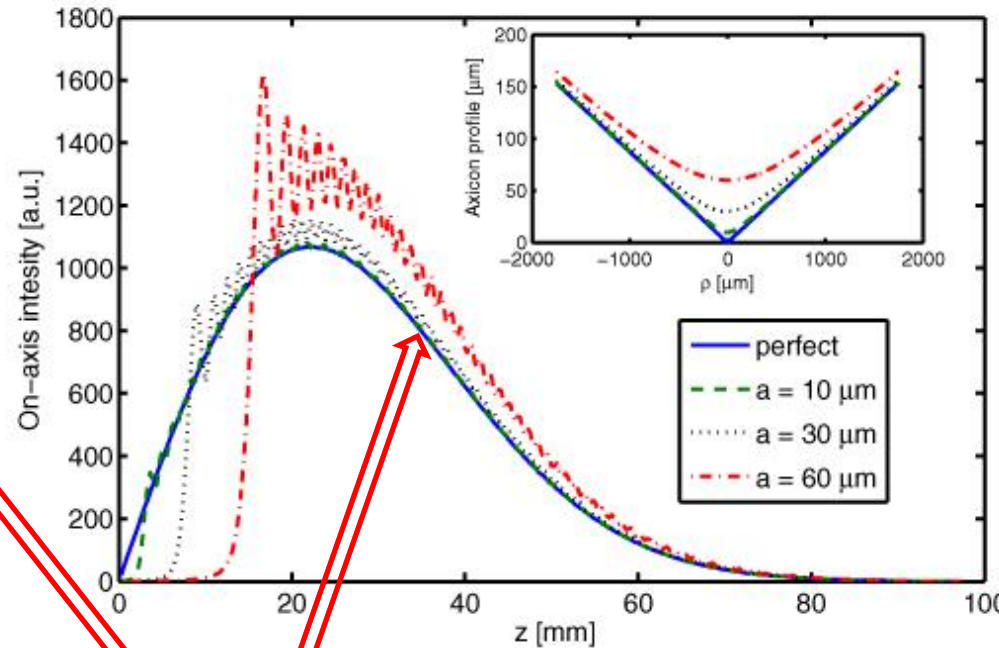# Axially Shaped Non-Diffracting Beams
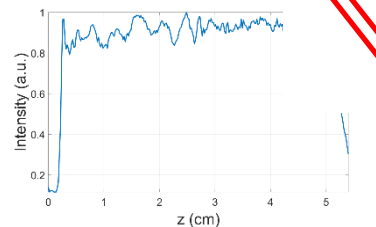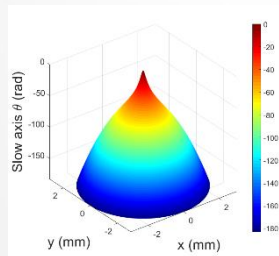
Simple
Phase mask
by SLM

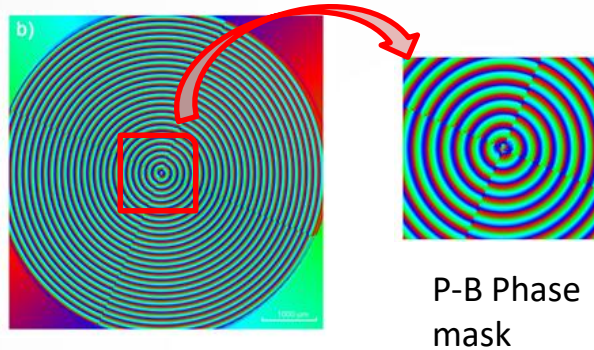P-B Phase
mask

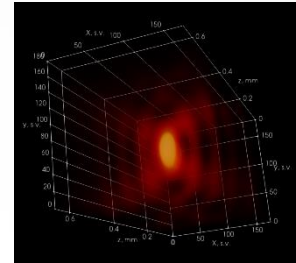LHC Polarization

P-B Phase
mask #2

Almost perfect Axicon!
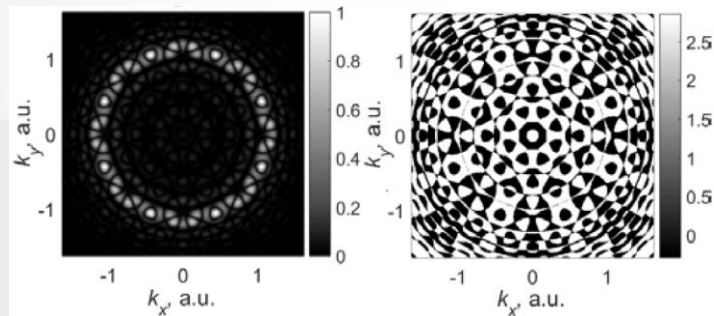
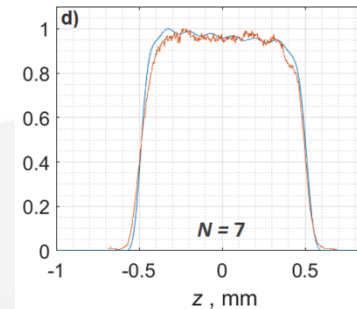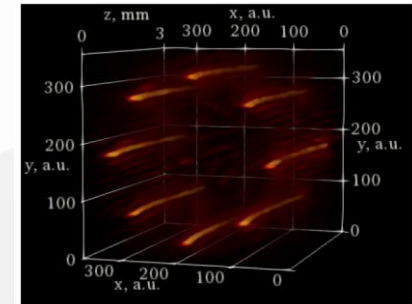# X-Y Shaped Non-Diffracting Beams

Simple case

P-B Phase mask

Y

X

Tricky case

Amplitude mask

Phase mask

Axial intensity

Measured 3D

Thank you!

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