

Geometric Phase Elements For Beam Shaping

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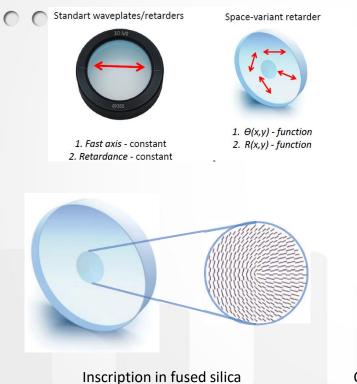
Space-Variant Retarder As Beam Shaper

Standart waveplates/retarders Space-variant retarder 1. $\Theta(x,y)$ - function 1 um 1. Fast axis - constant 2. R(x,y) - function 2. Retardance - constant TEM01* TEM00 = Controlled Fast Axis Position And voilà – here you shape it! Inscription in fused silica

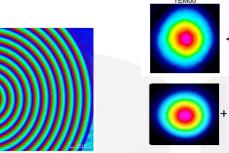


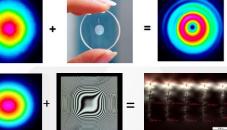
TEM01*

Space-Variant Retarder As Beam Shaper



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





Controlled Fast Axis Position

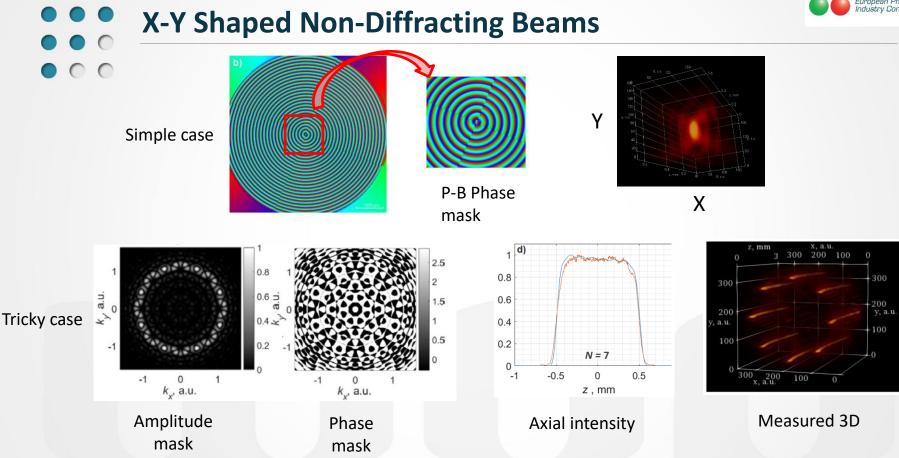


••• **Axially Shaped Non-Diffracting Beams** x 10 d=40µm 00 0.8 160 0.6 140 Simple Using Pancharatnam-Berry (P-B) 100 -80 -Phase mask Phase Masks 60 by SLM -0.6 -0.8 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05 0.5 Z/(m) 0.8 0.8 0.8 P-B Phase 0.6 0.6 0.6 0.4 mask 0.4 0.4 0.2 0.2 0.1 0.2 0.3 0.4 0 0.2 0.5 0.8 0.1 0.2 0.3 0.4 0 0.1 0.3 0.4 0.6 0.7 0 *z*, mm z, mm z, mm LHC Polarization Linear Polarization **RHC** Polarization P-B Phase Intensity (a.u.) Slow axis *θ* (rad) mask #2 0.2 2 y (mm) z (cm) x (mm)



••• **Axially Shaped Non-Diffracting Beams** 00 0.8 1800 200 140 Simple G 120 Axicon profile [µm] 1600 100 -80 -150 Phase mask by SLM 1400 100 -0.6 -0.8 On-axis intesity [a.u.] 50 0.005 0.01 0.015 0.02 0.025 0.03 0.035 1200 0.5 -2000 -10001000 2000 0 1000 ρ [μm] 0.8 P-B Phase 800 0.6 perfect mask 0.4 a = 10 µm 600 0.2 $a = 30 \, \mu m$ 400 0.1 0.2 0 0.3 a = 60 um z. mm LHC Polarization 200 P-B Phase Intensity (a.u.) 20 40 60 80 100 axis θ (rad) mask #2 z [mm] Almost perfect Axicon! 0.2 y (mm) z (cm) x (mm)







Thank you!

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