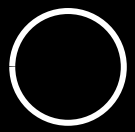
polarization



gratings

Frans Snik

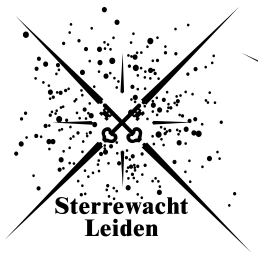
+ LEOPARD group

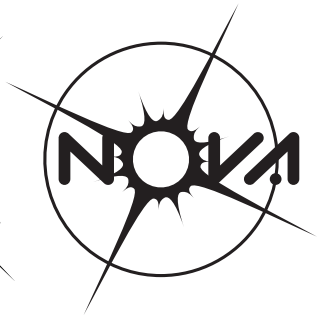
Universiteit Leiden

Mike Escuti

+ GPL group

NCSU / ImagineOptix



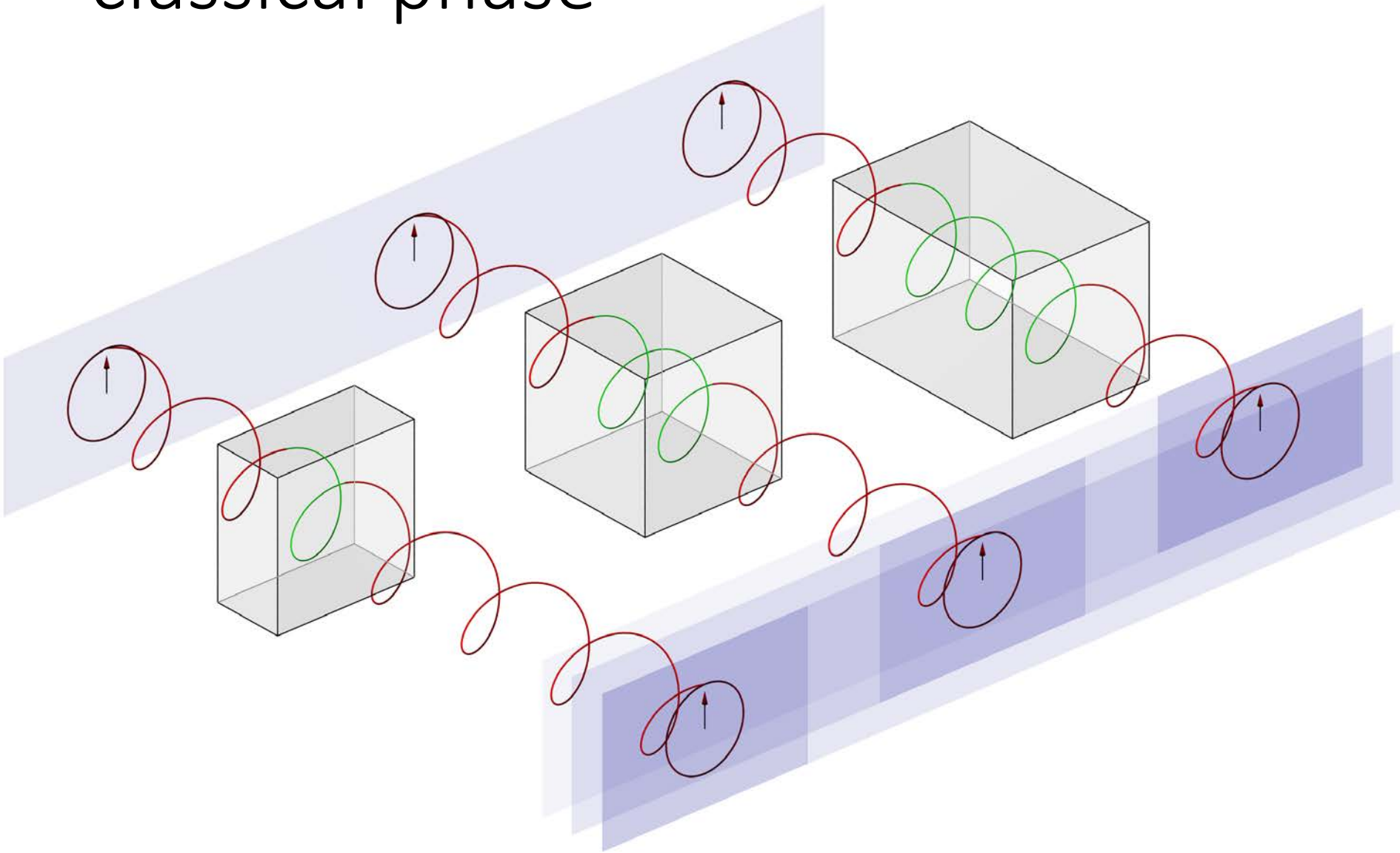


NC STATE UNIVERSITY

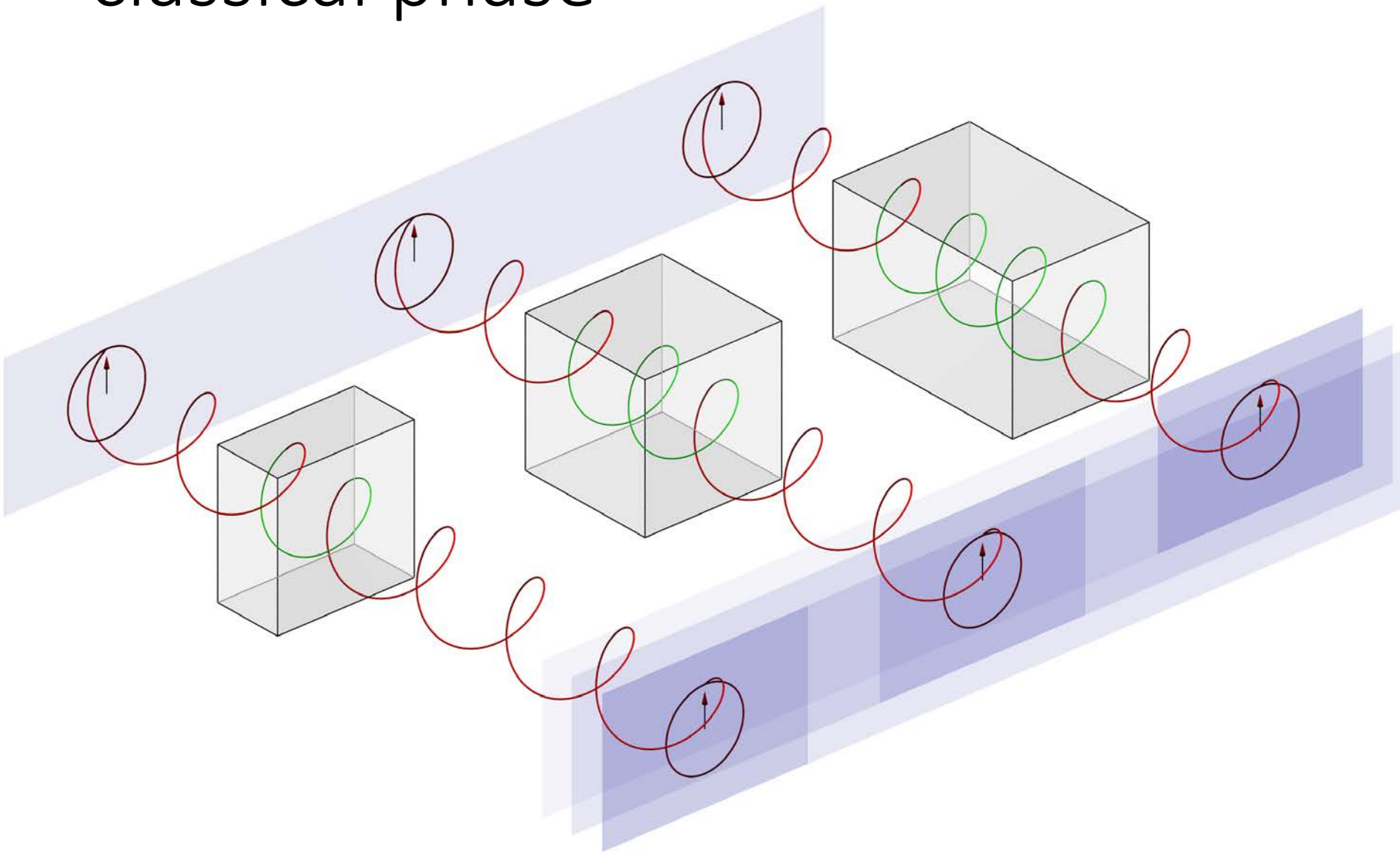
gpl

imagineOptix

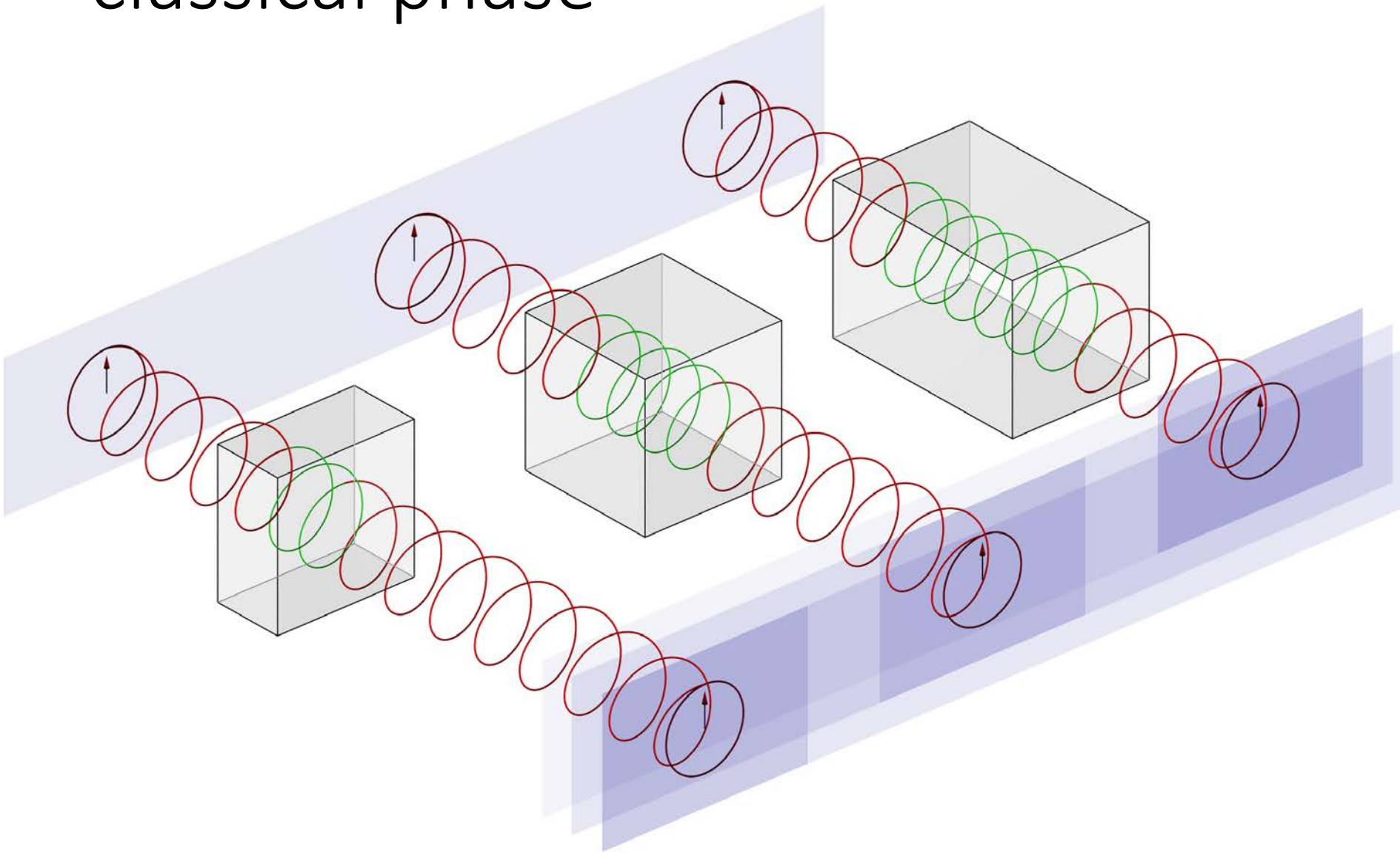
classical phase



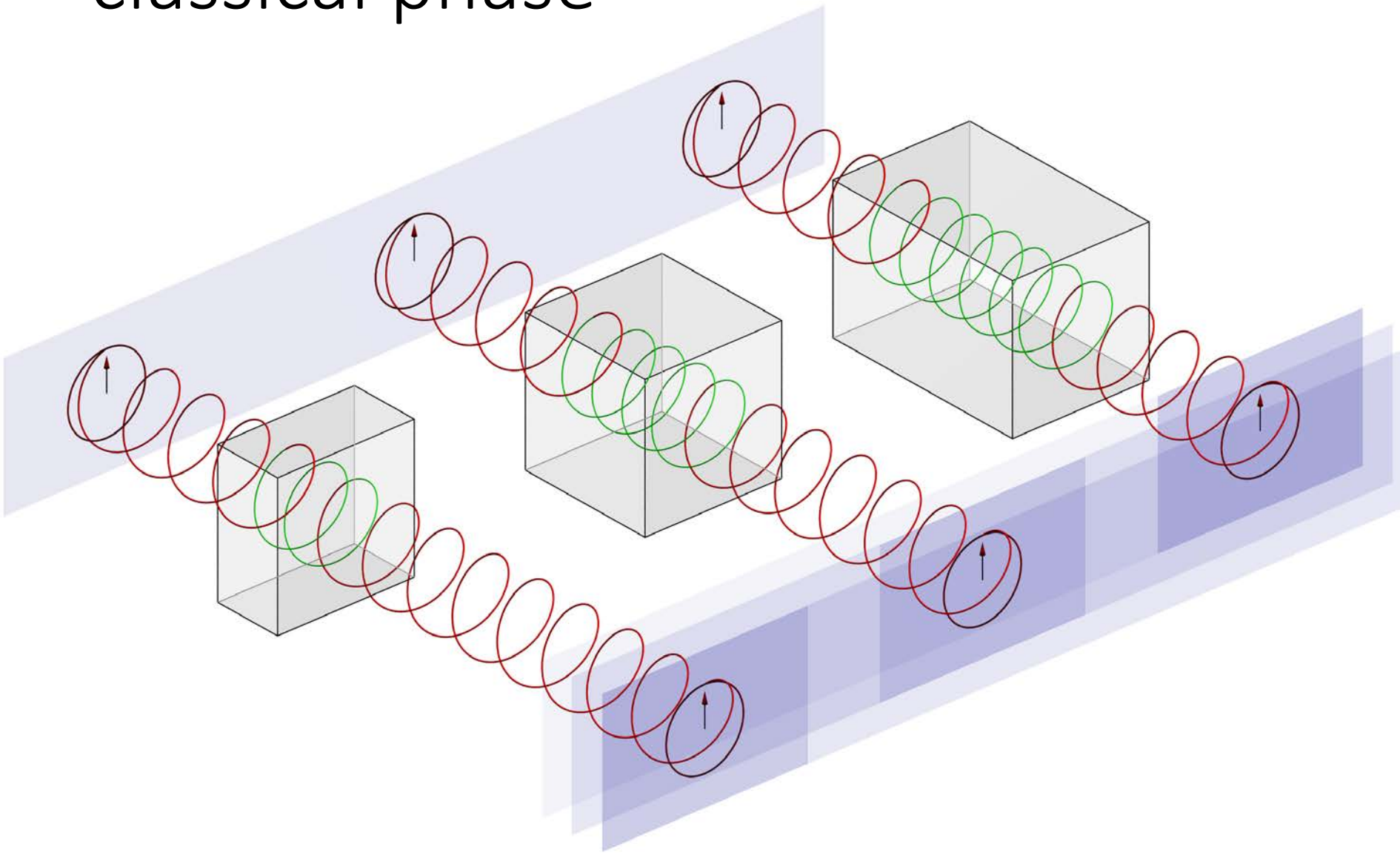
classical phase



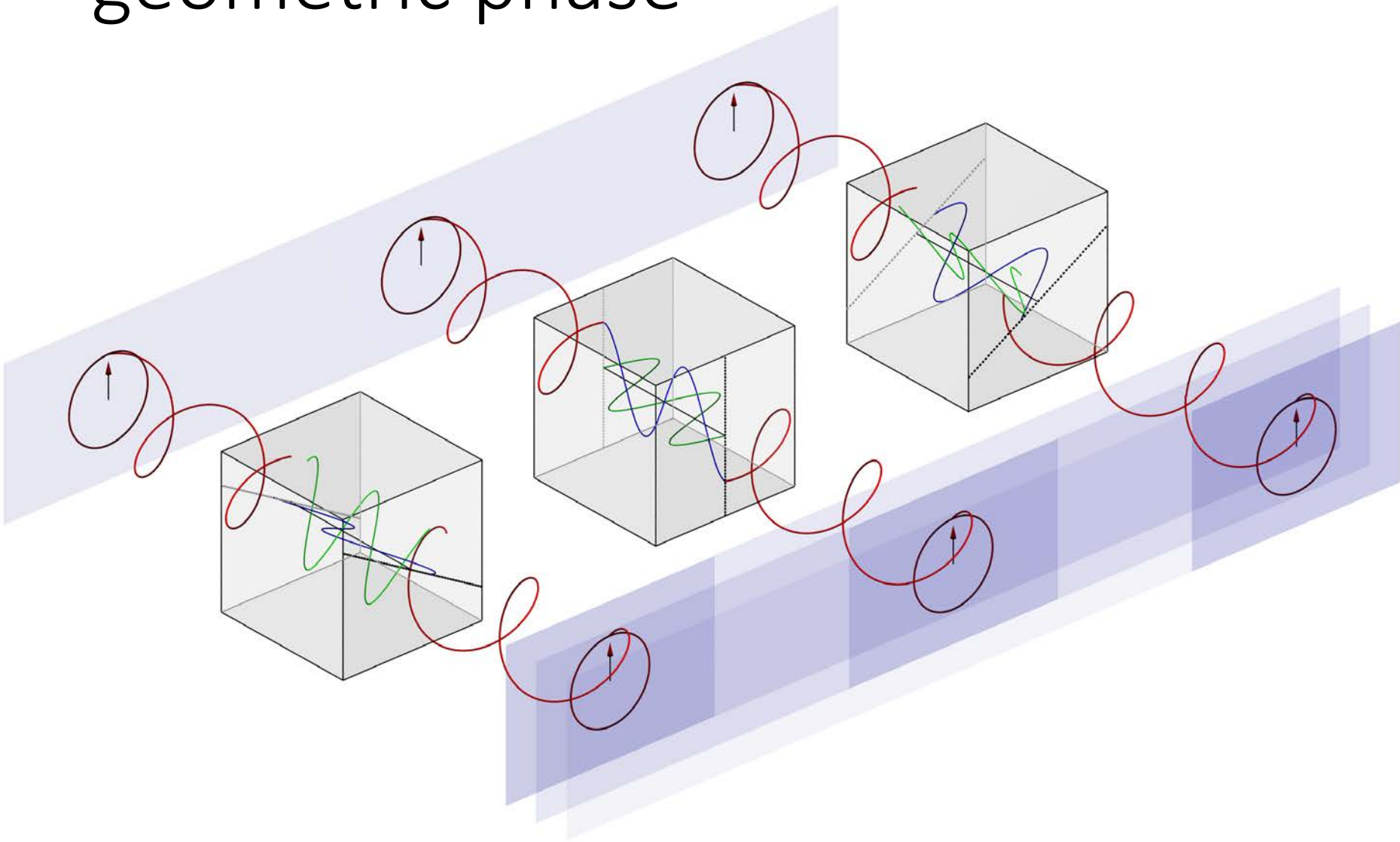
classical phase



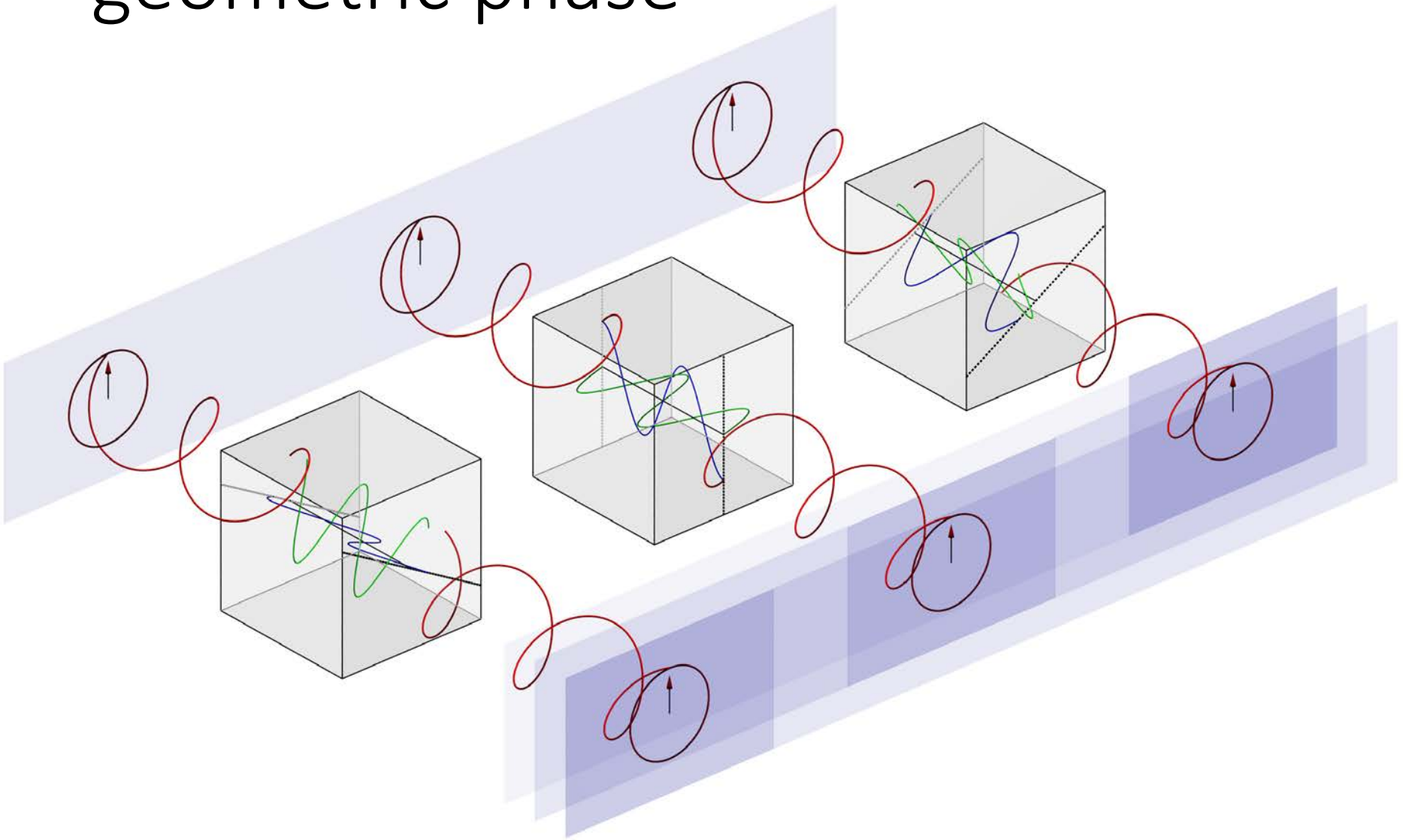
classical phase



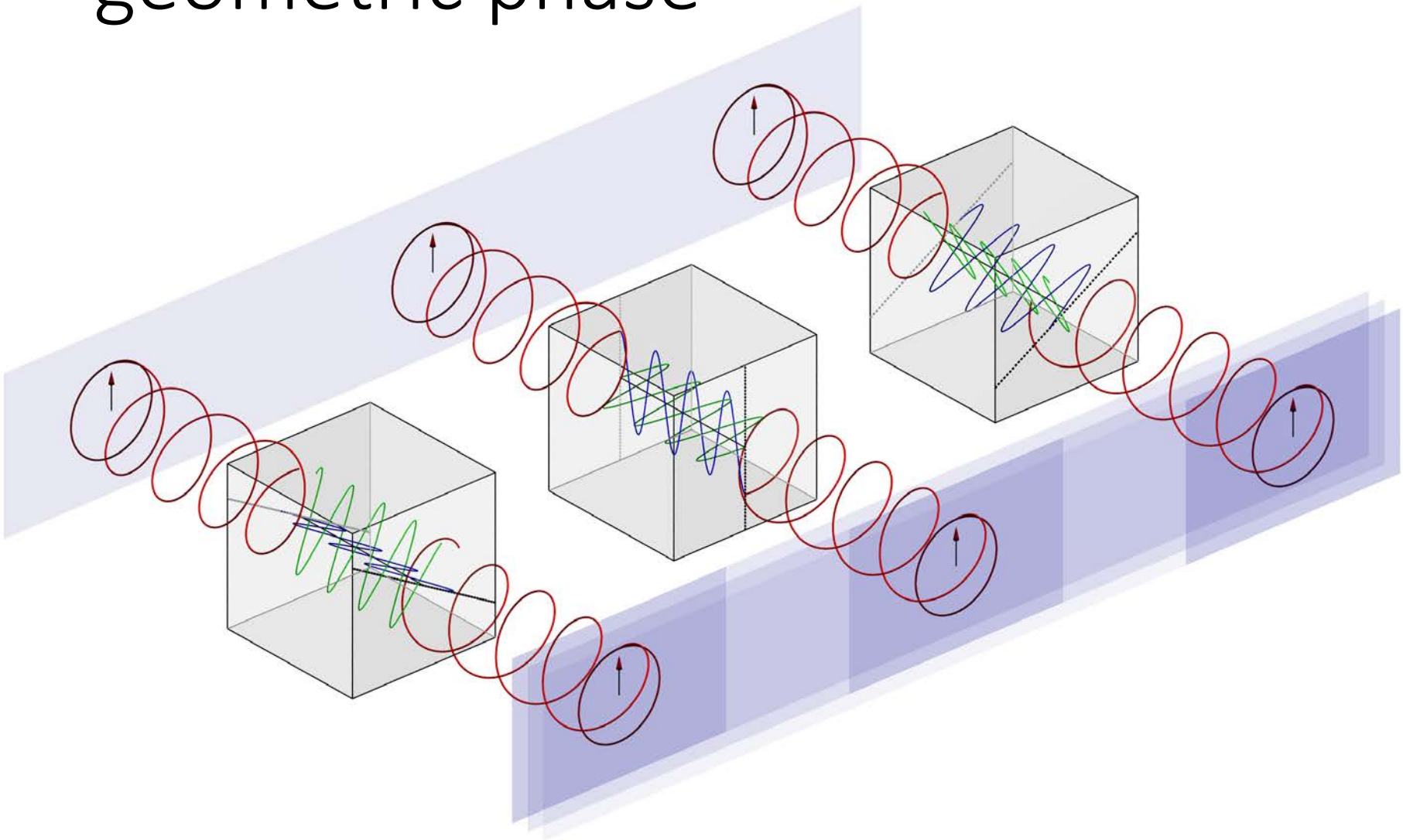
geometric phase



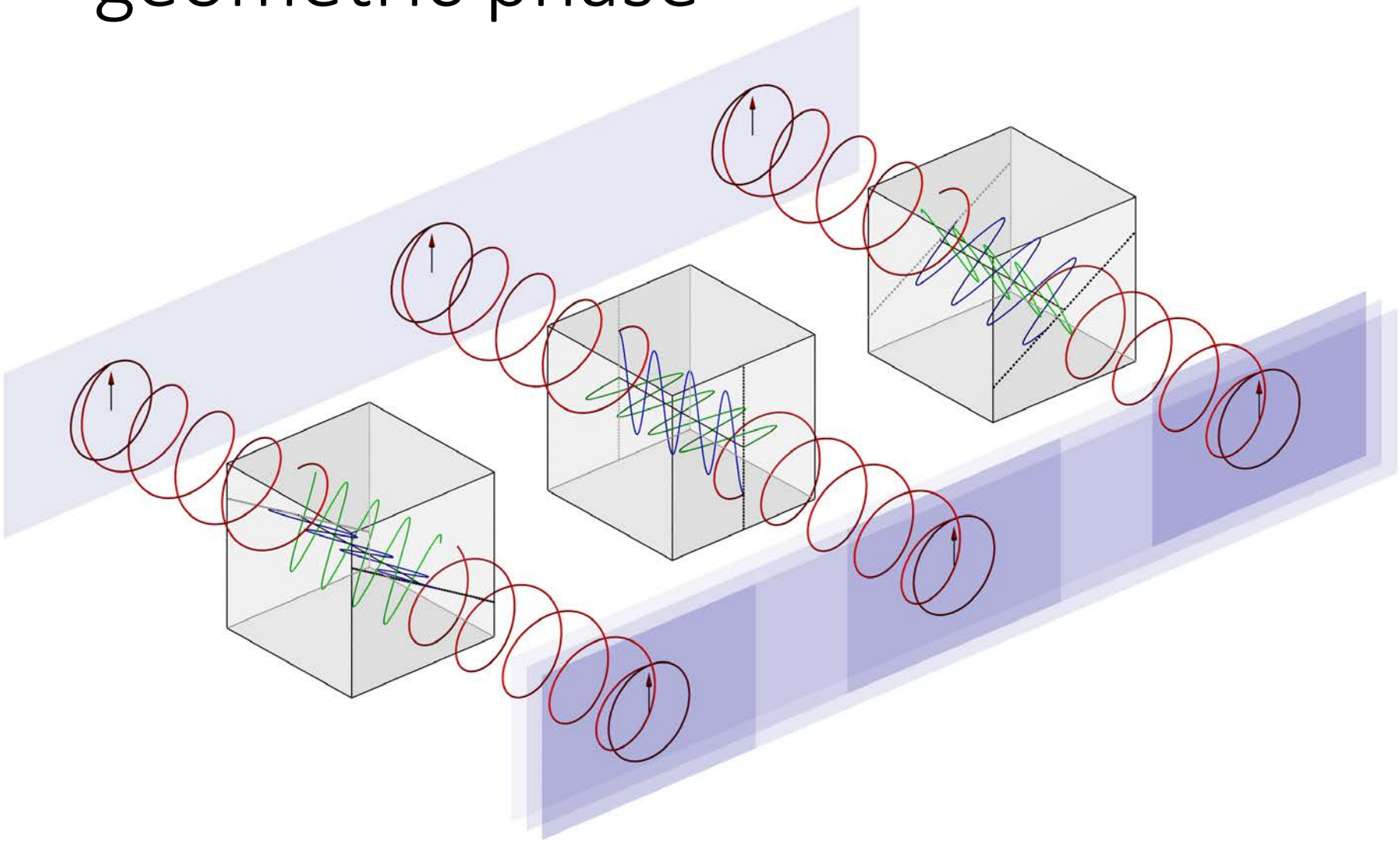
geometric phase



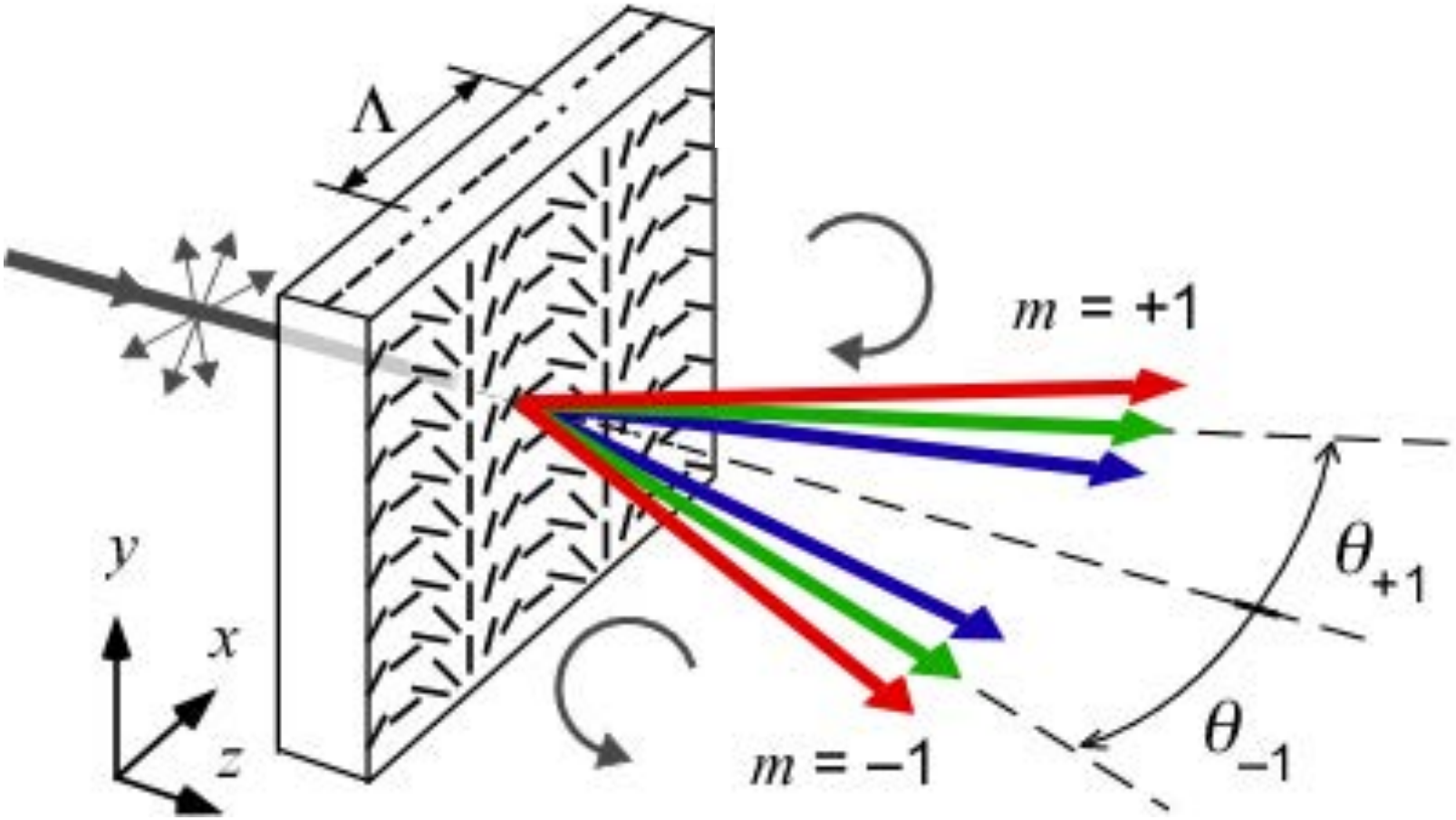
geometric phase



geometric phase



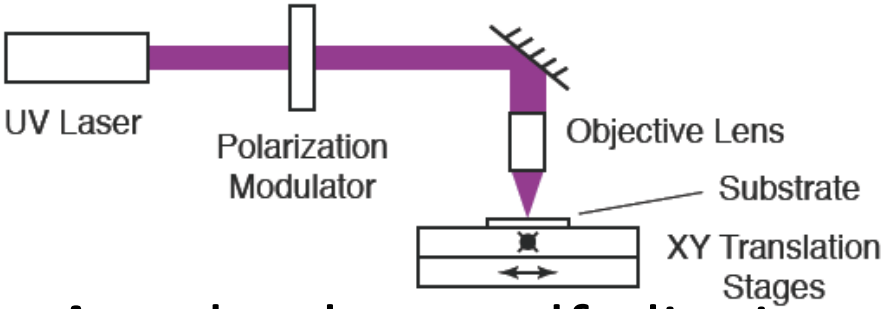
the polarization grating



courtesy:
Michael Escuti (NCSU)

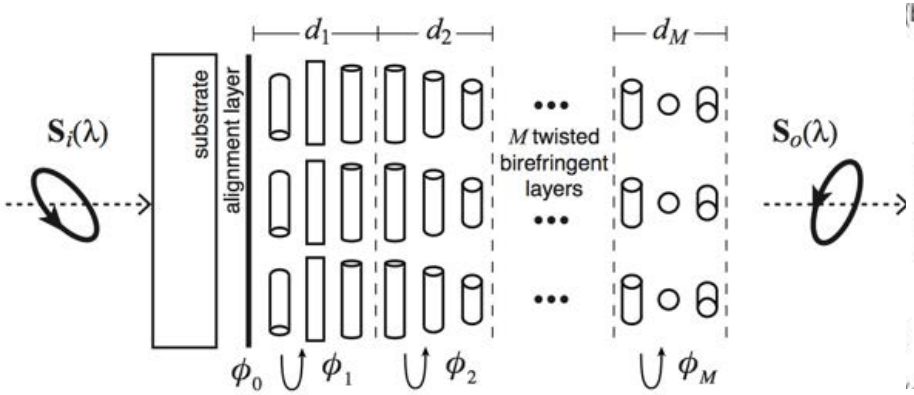
liquid-crystal optics

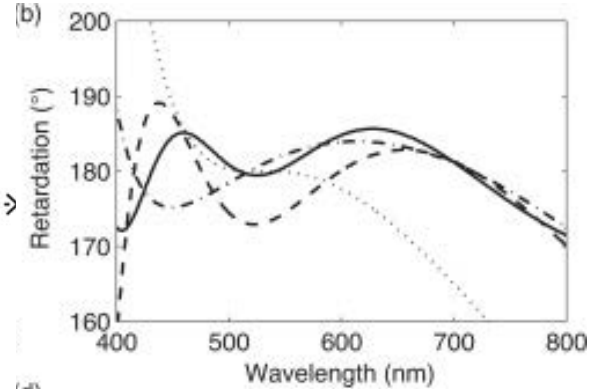
1. **any phase pattern** thanks to direct-write technique



Miskiewicz & Escuti (2014)

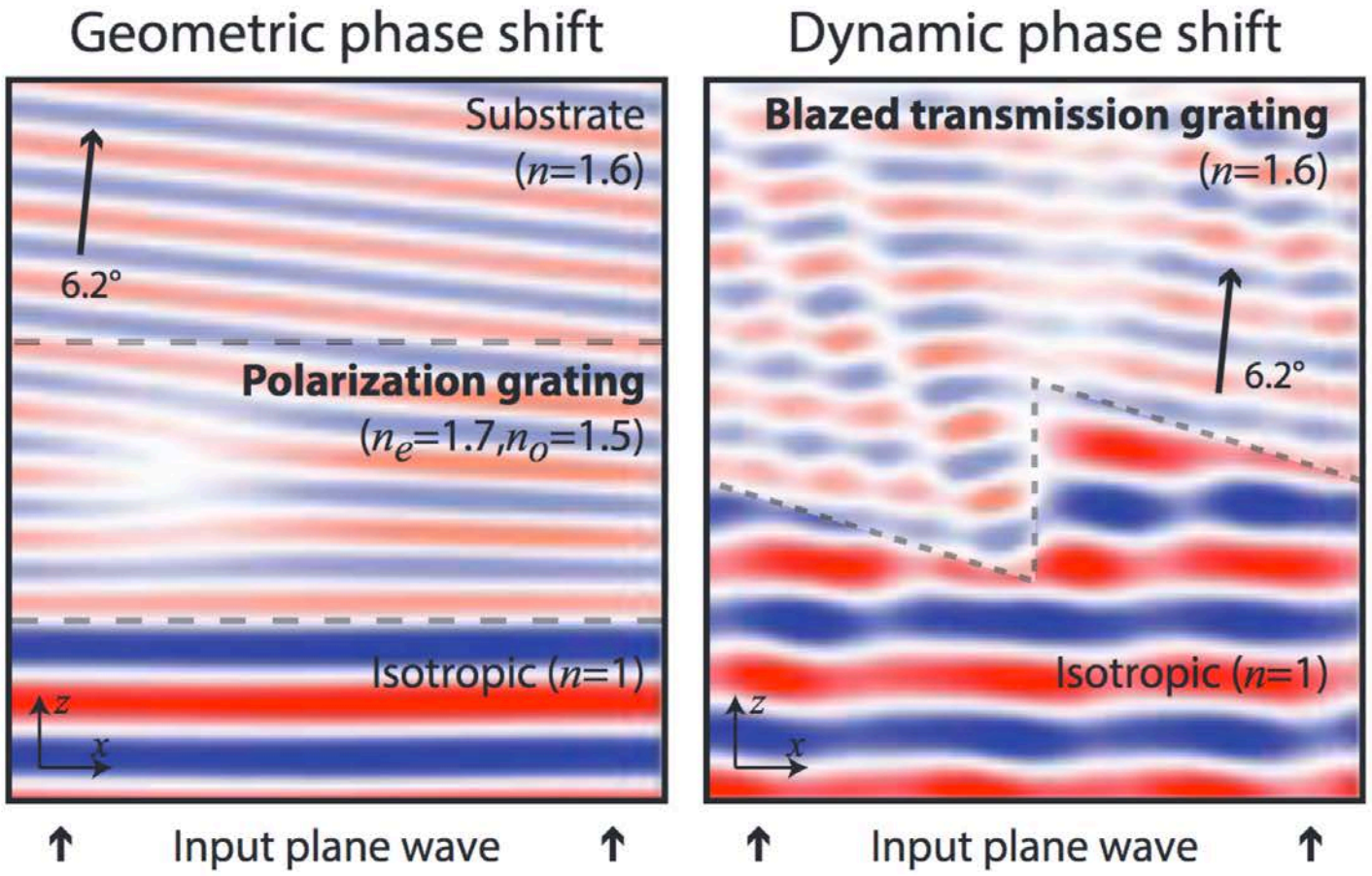
2. **achromatization** thanks to self-aligning multi-twist liquid crystal retarder





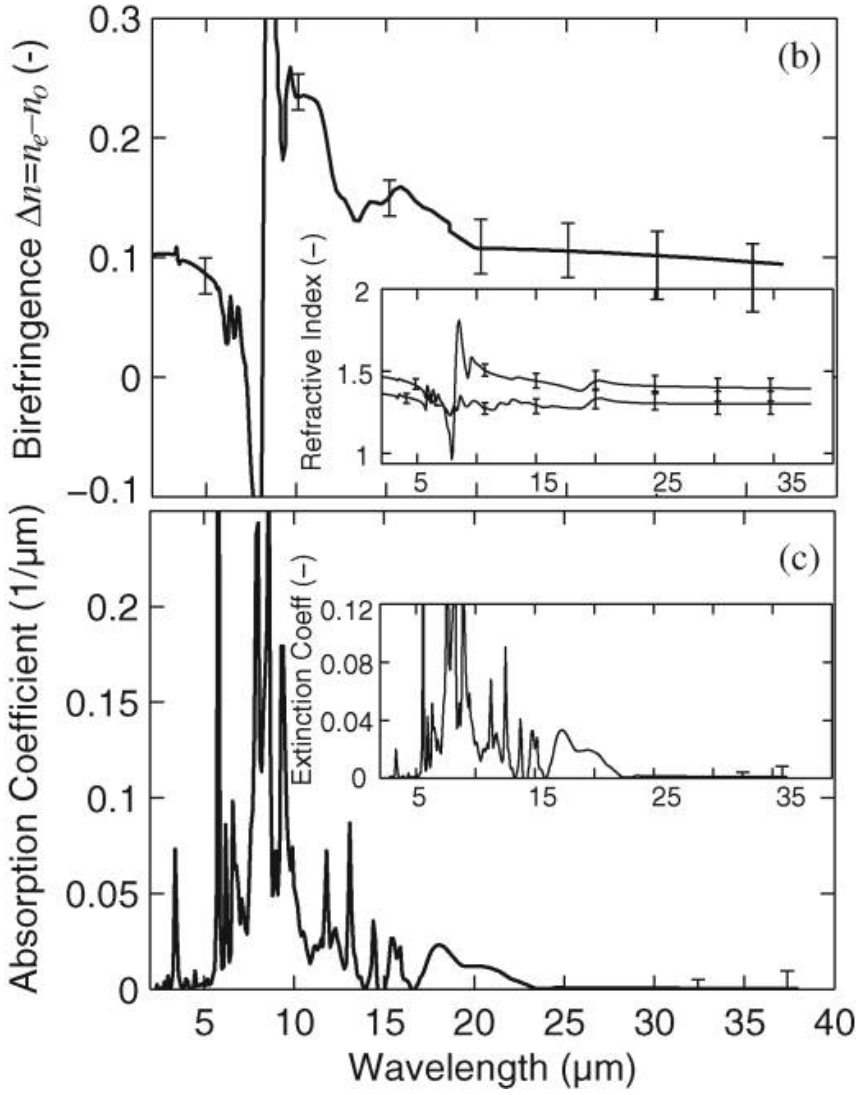
Komanduri et al. (2013)

diffraction efficiency



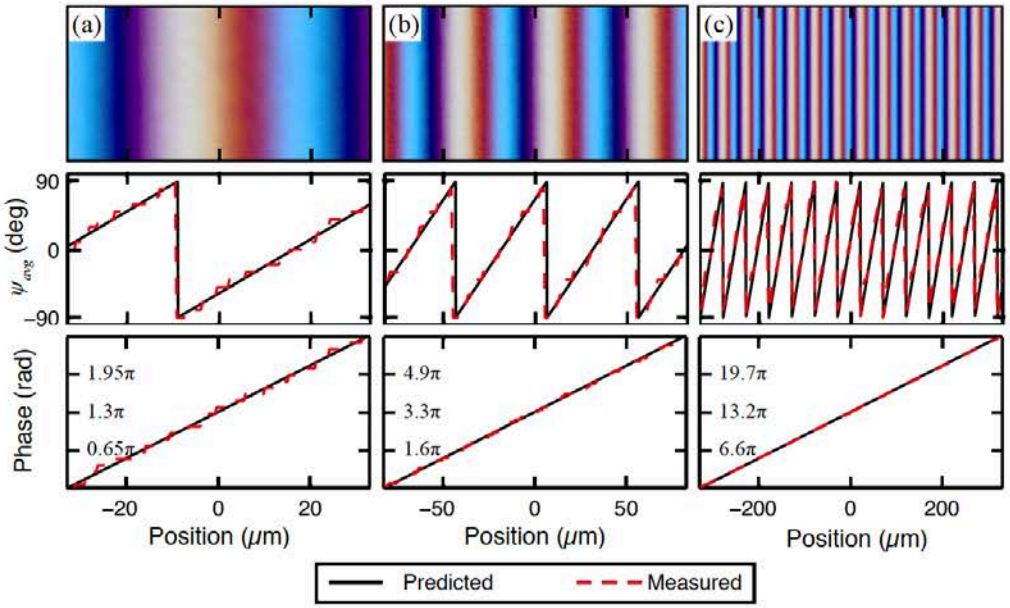
Escuti et al. (2016)

transmission

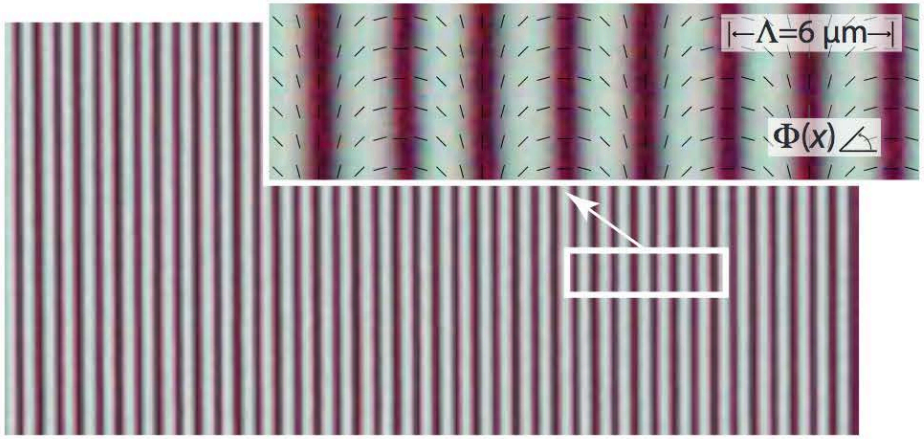


Packham et al. (2010)

direct-write resolution + accuracy



Miskiewicz & Escuti (2014)

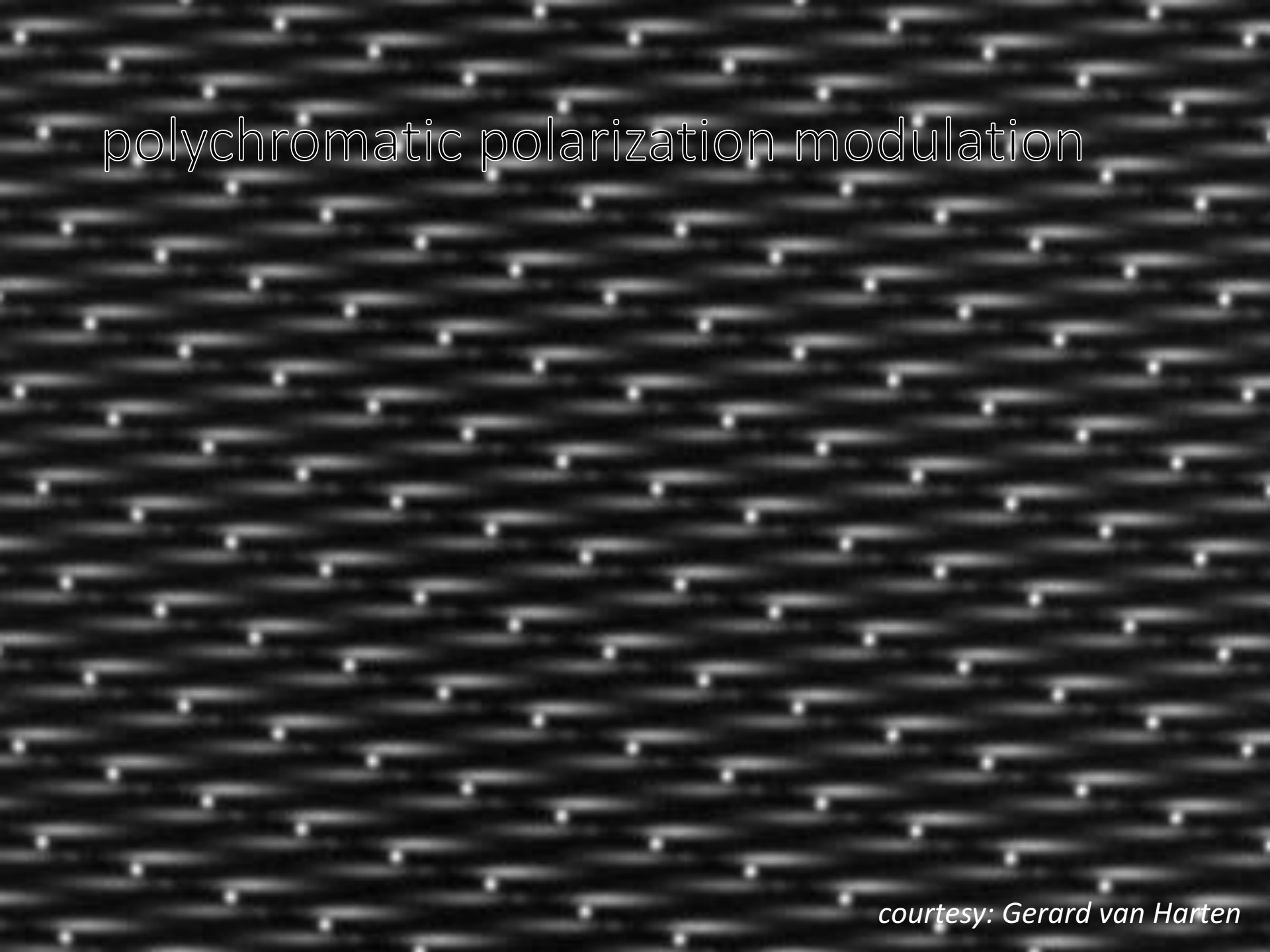


Escuti et al. (2016)

ExPo pIFU

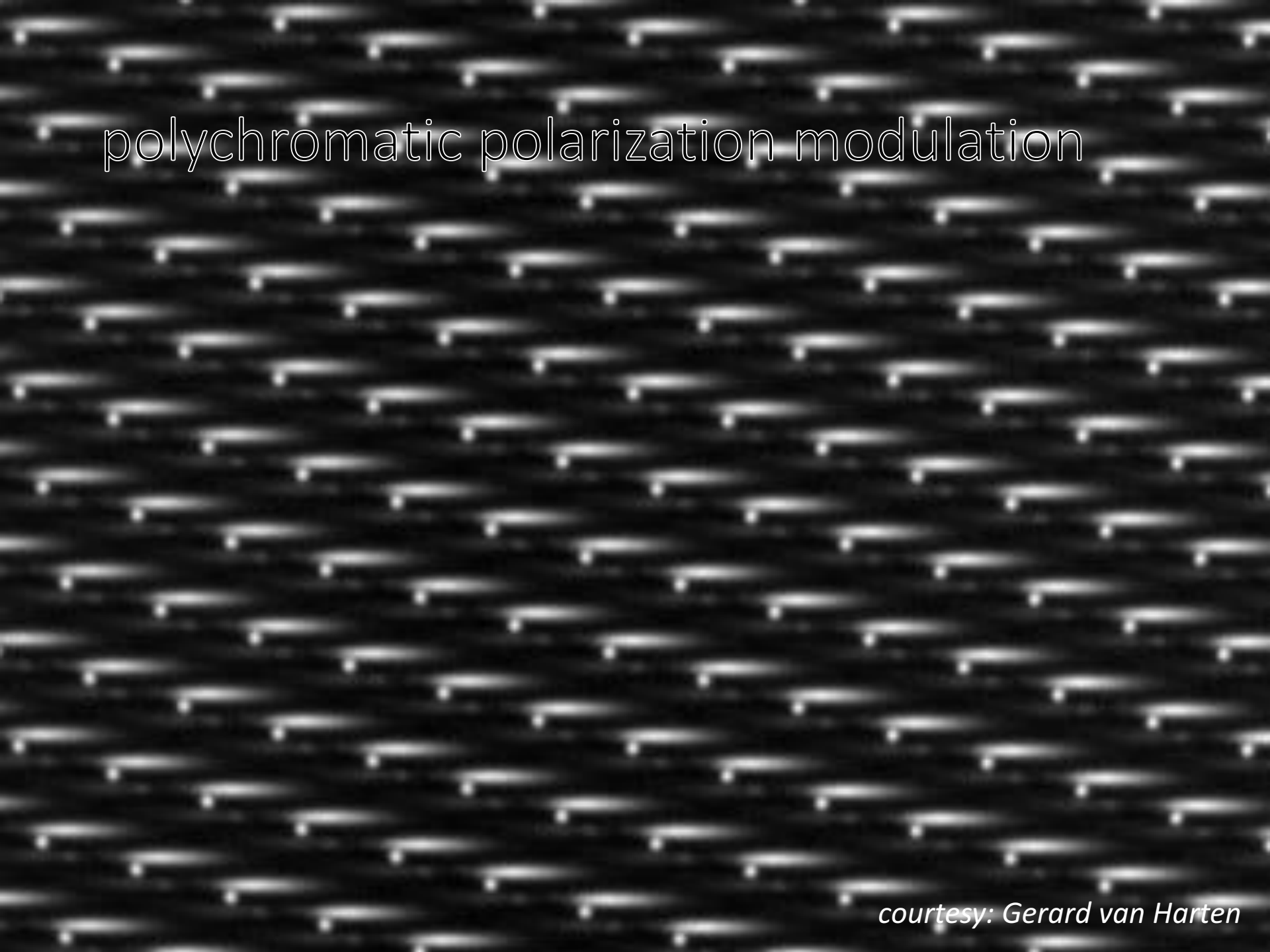
courtesy: Michiel Rodenhuis

polychromatic polarization modulation



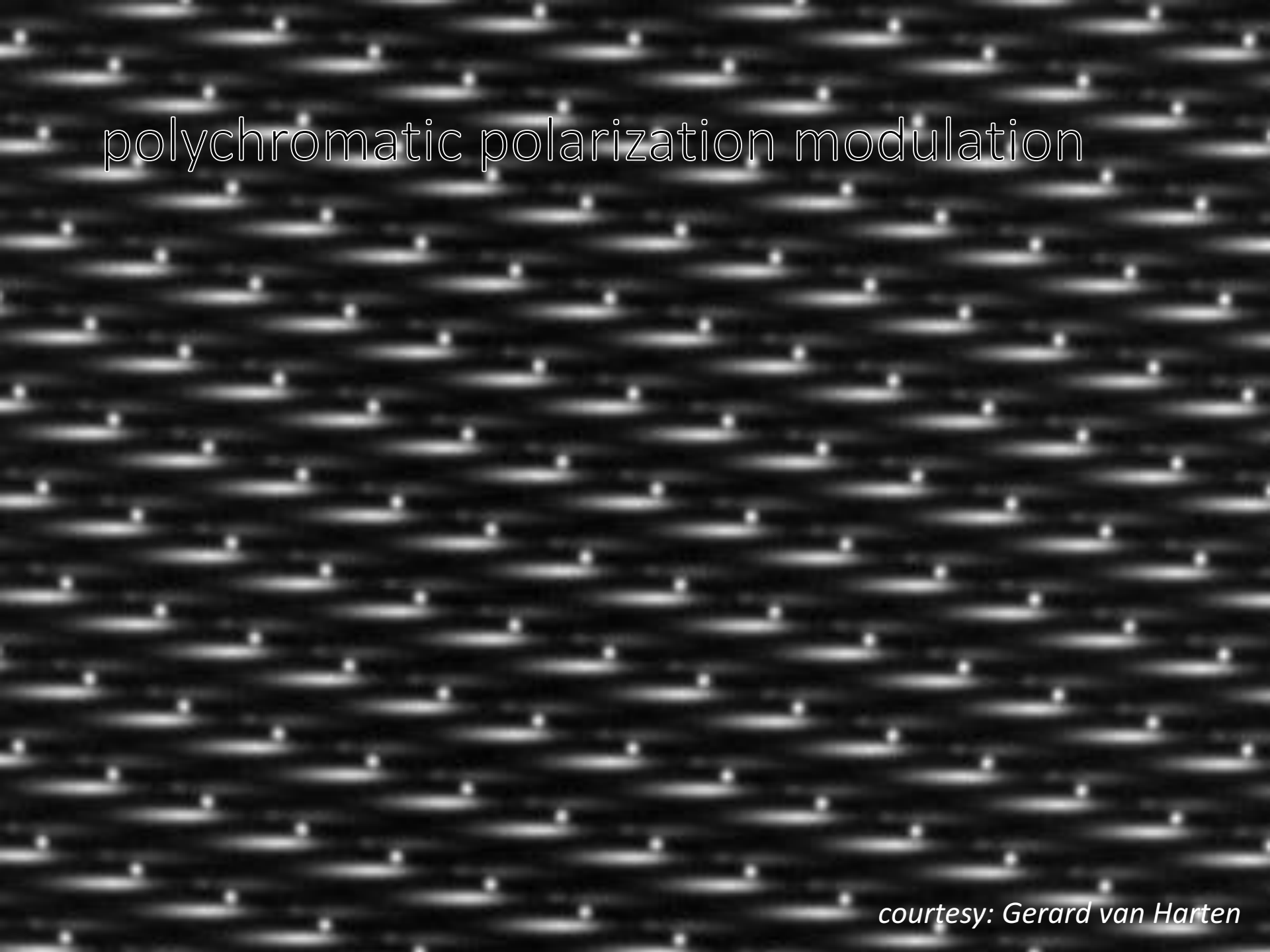
courtesy: Gerard van Harten

polychromatic polarization modulation



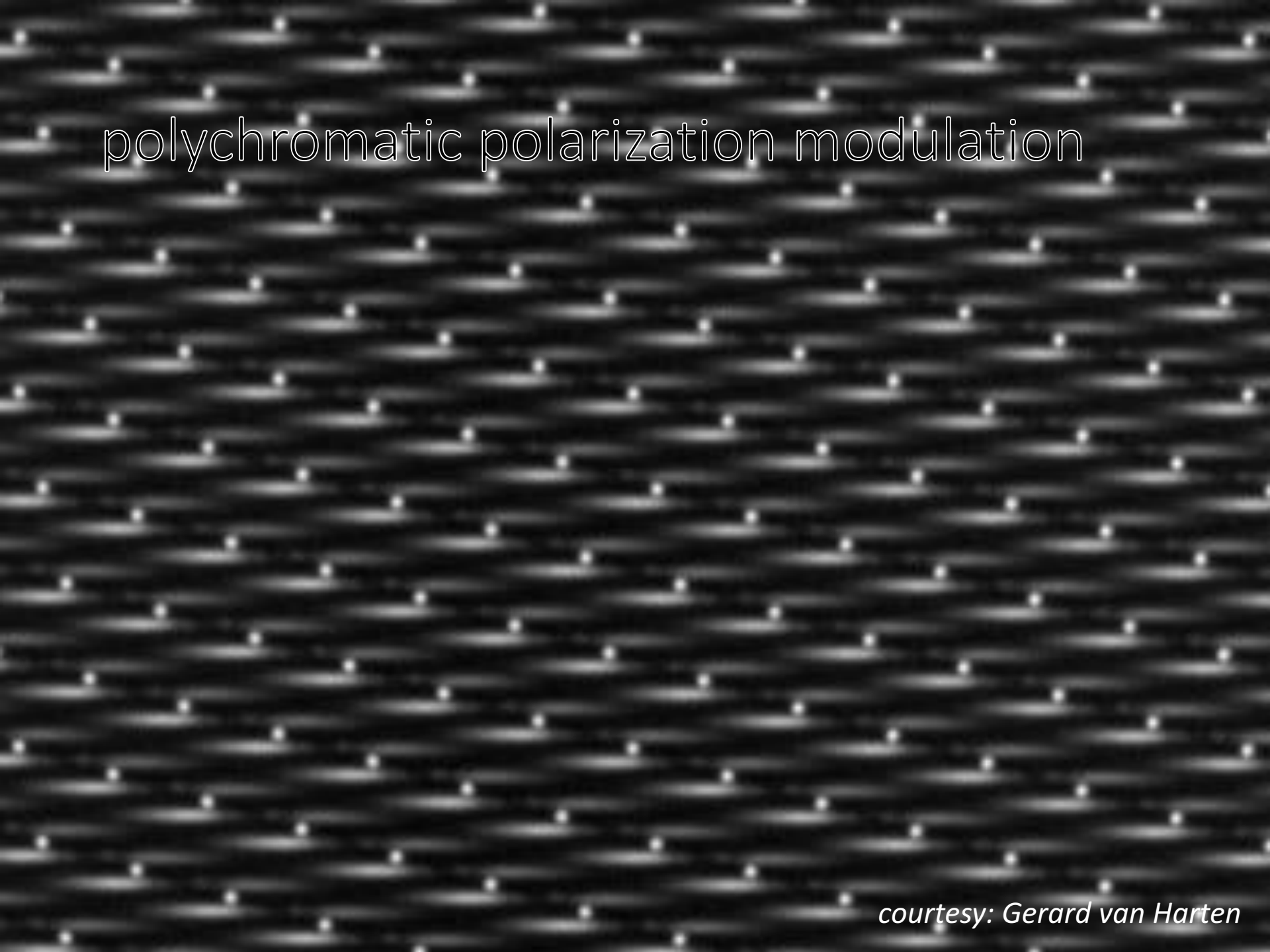
courtesy: Gerard van Harten

polychromatic polarization modulation



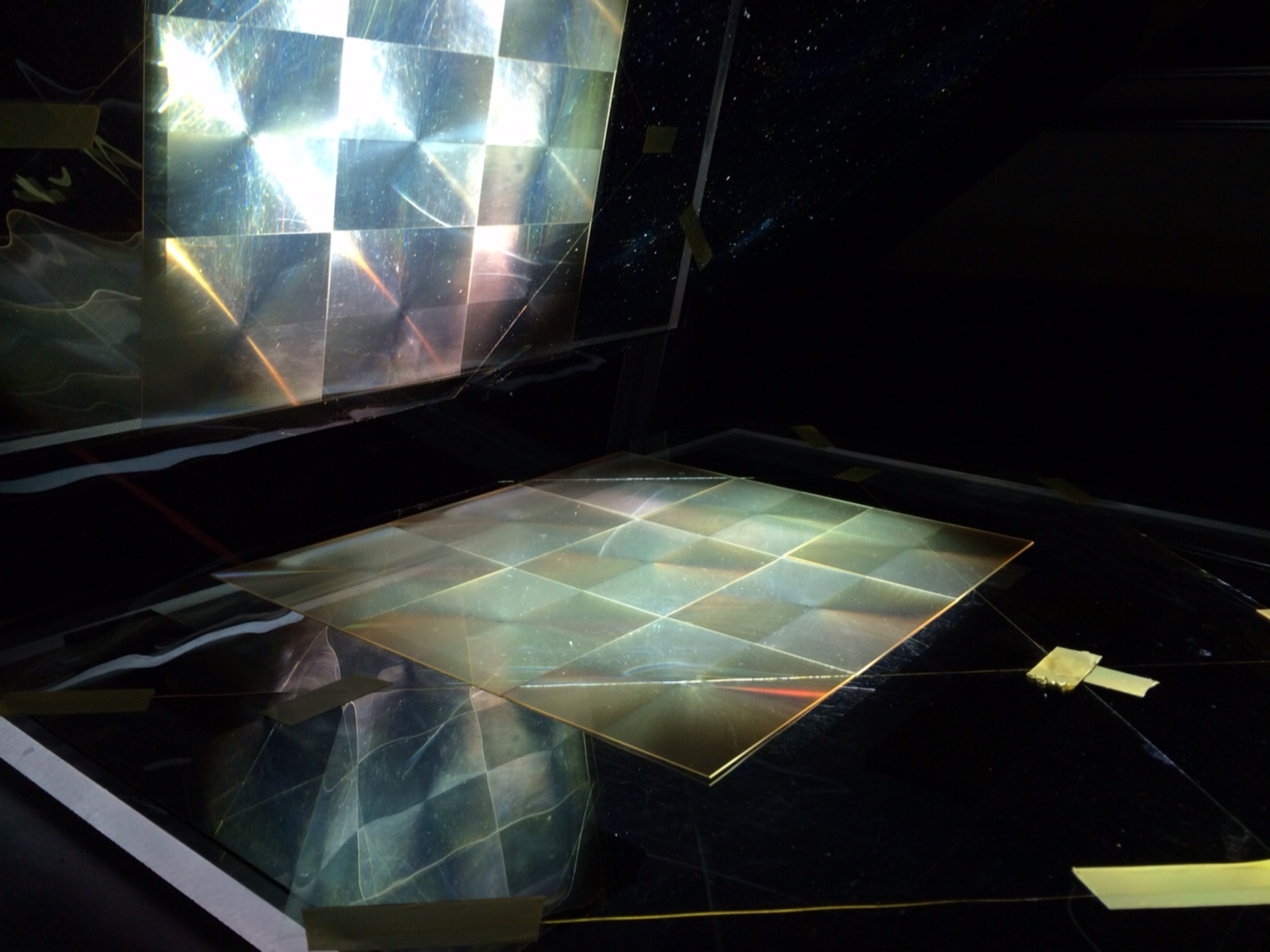
courtesy: Gerard van Harten

polychromatic polarization modulation



courtesy: Gerard van Harten

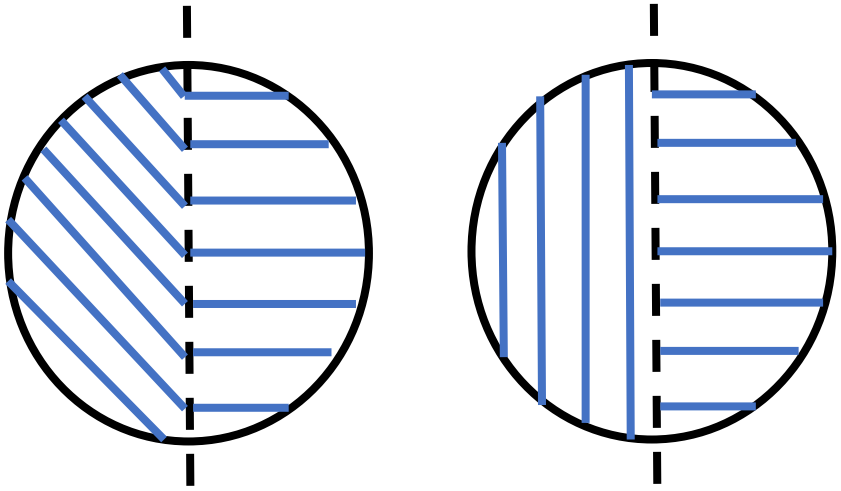

courtesy: ImagineOptix



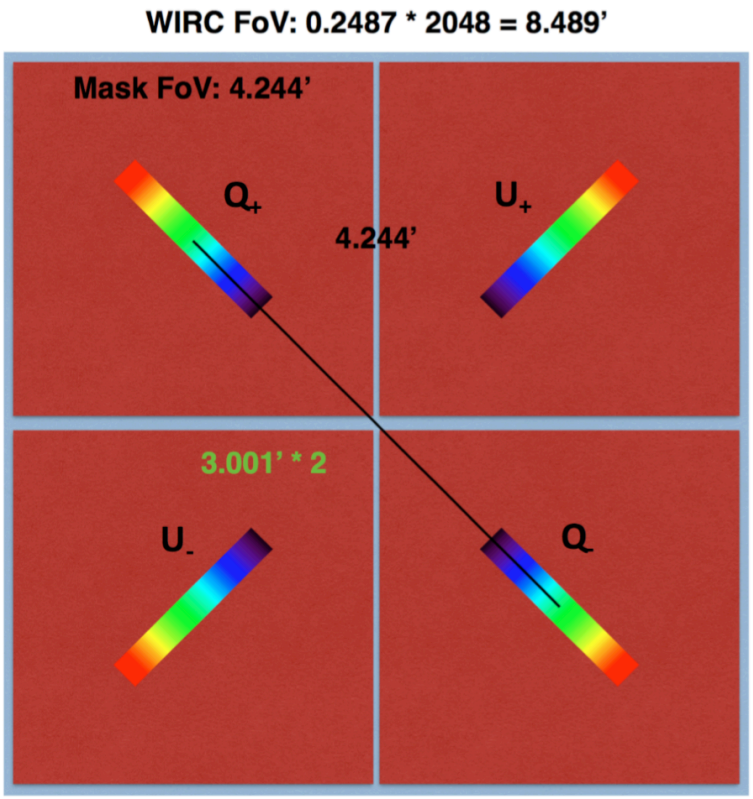
credit: Studio Roosegaarde, Frans Snik, Michiel Rodenhuis

WIRC-pol design

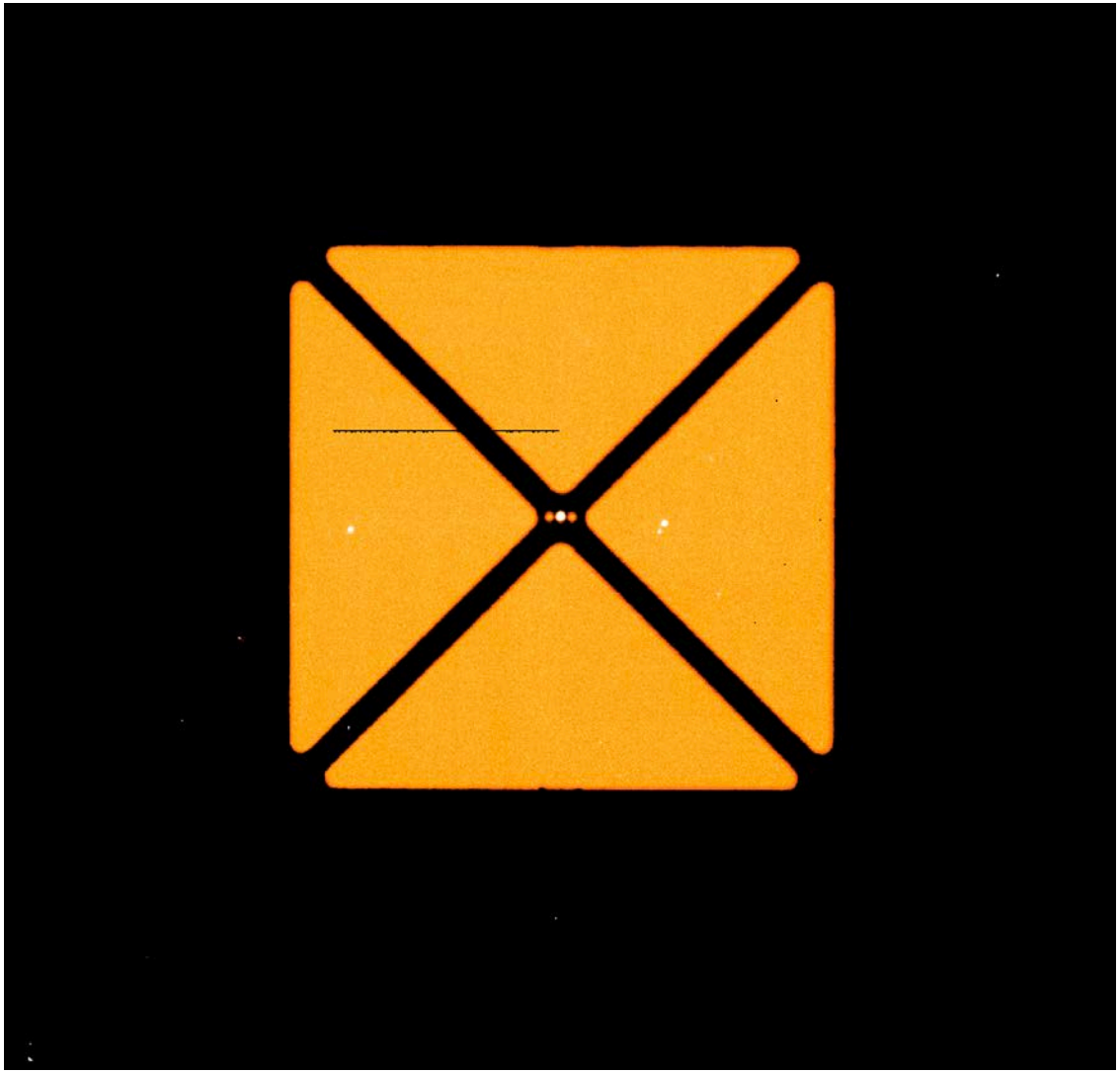
45°



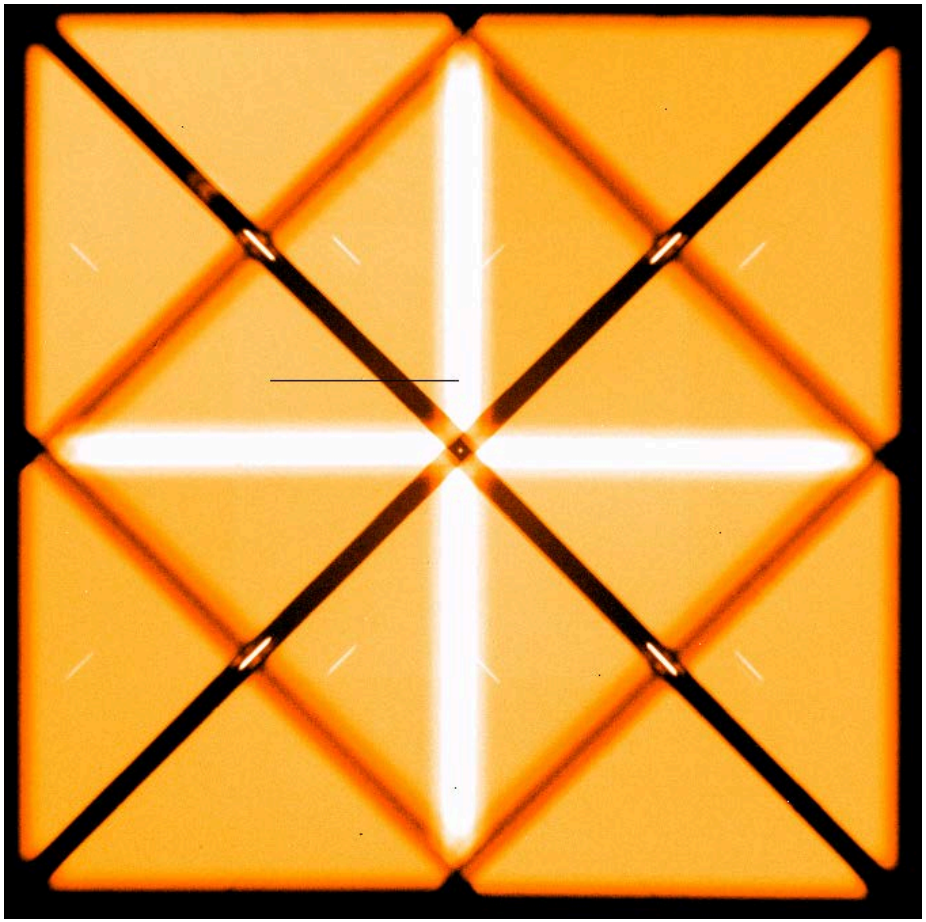
QWP PG



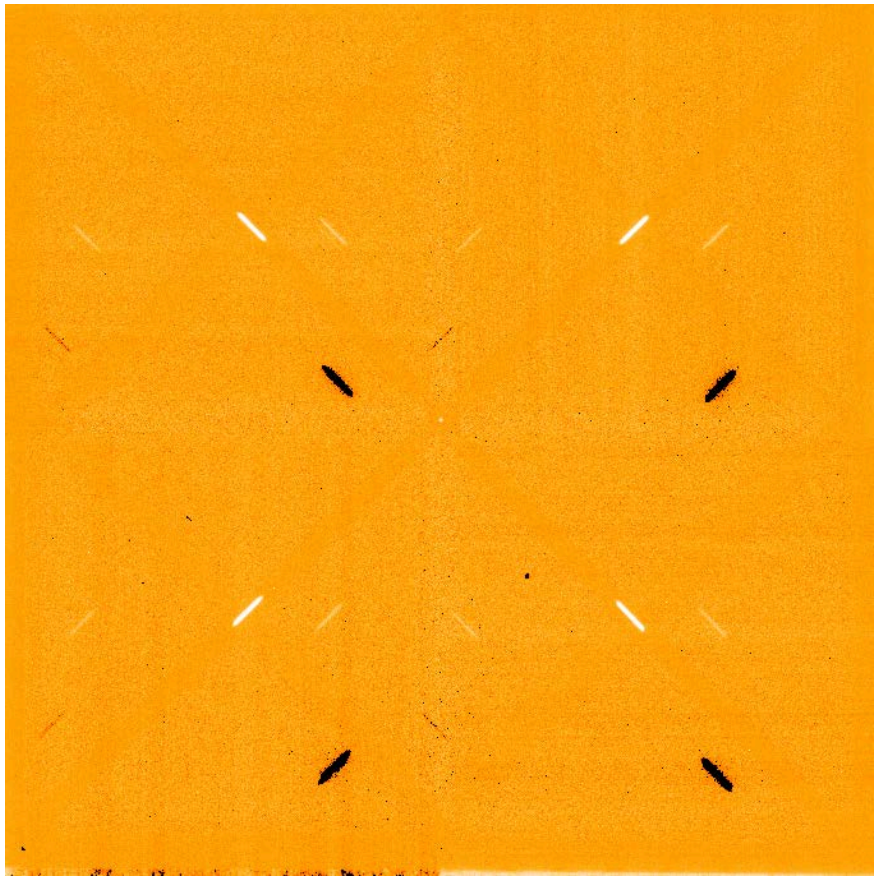
courtesy:
Max Millar-Blanchaer (CalTech)



courtesy:
Max Millar-Blanchaer (CalTech)

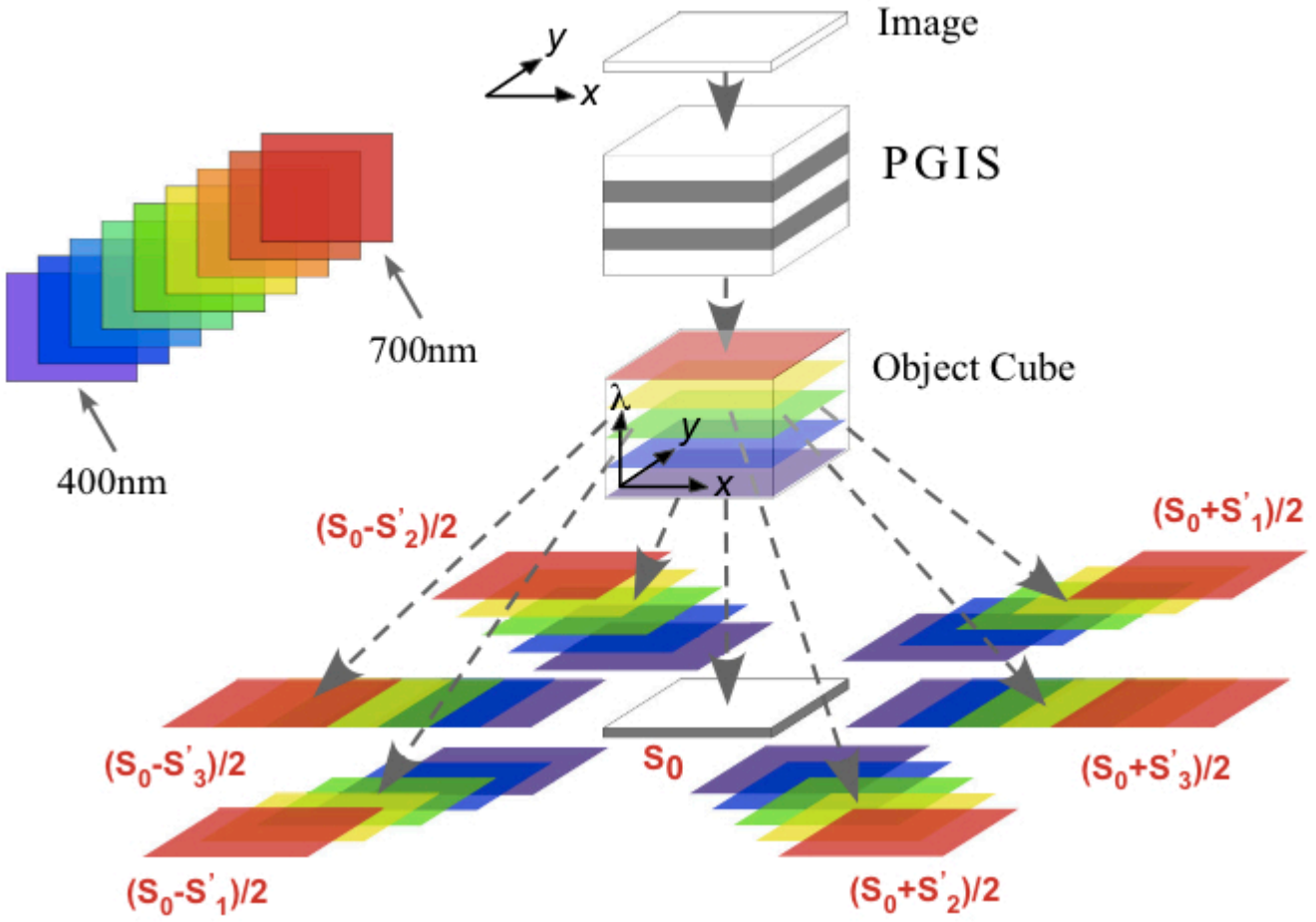


courtesy:
Max Millar-Blanchaer (CalTech)



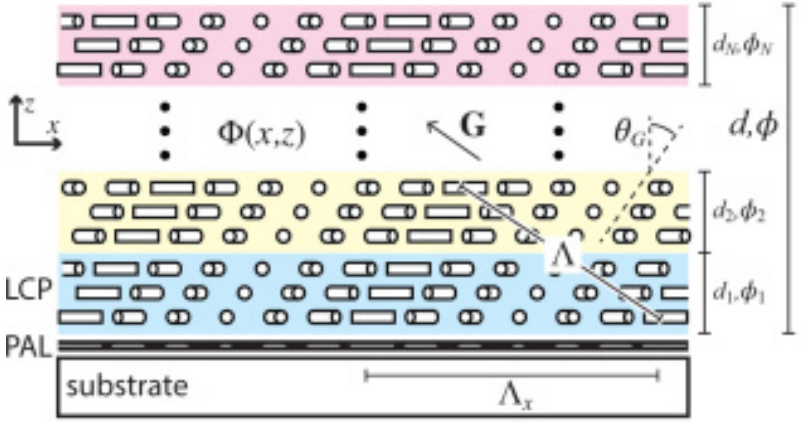
courtesy:
Max Millar-Blanchaer (CalTech)

hyperspectralpolarimetric imaging

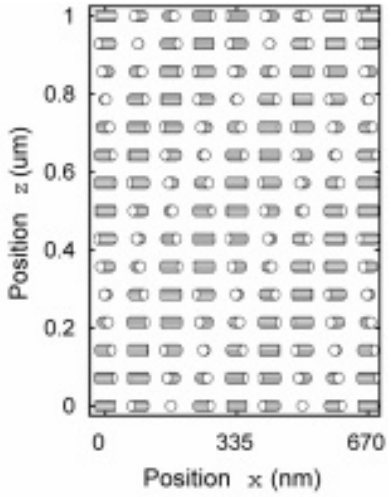


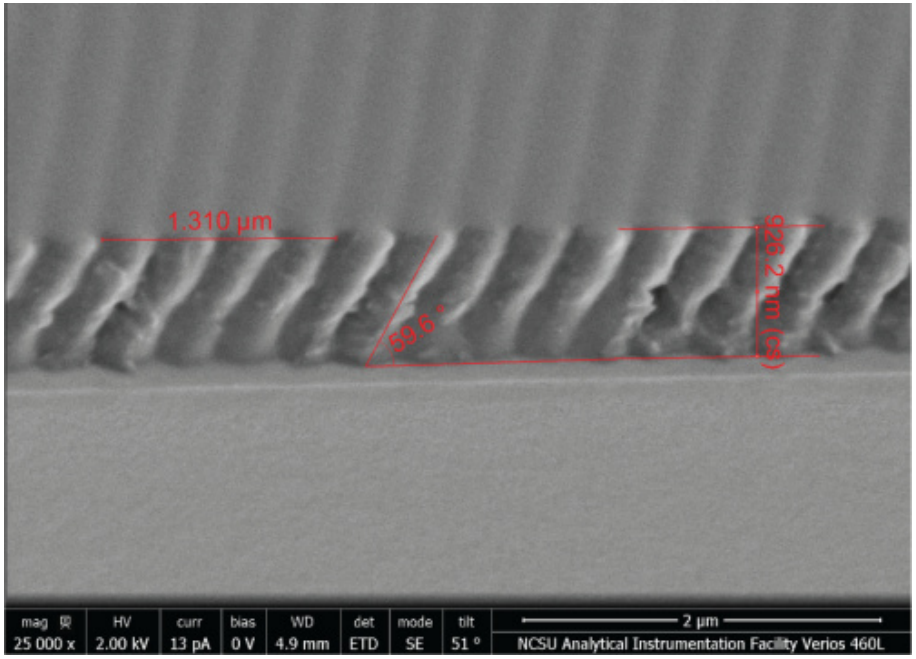
courtesy:
Jihwan Kim (NCSU)

LC Bragg gratings



(a)





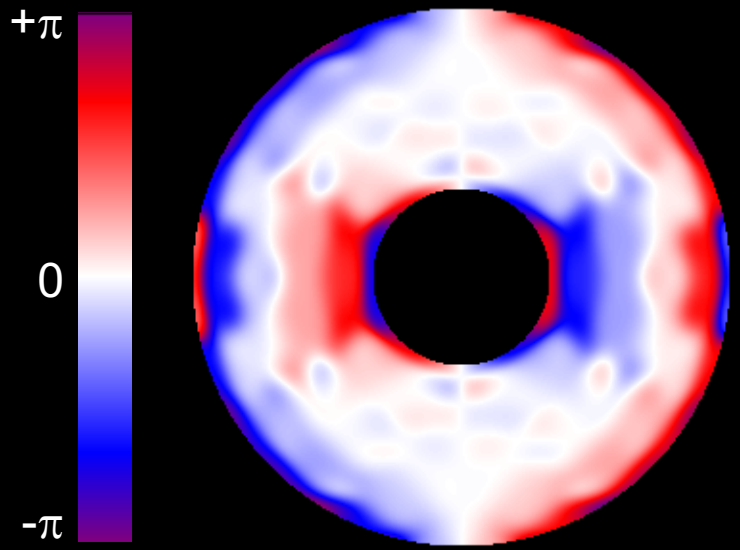
Xiang et al. (2017)

What if you're not interested in polarization or m=-1?

Split off half the light effectively with a polarizing beam-splitter + a QWP, and use that light for

- WFS
- imaging
- whatever…

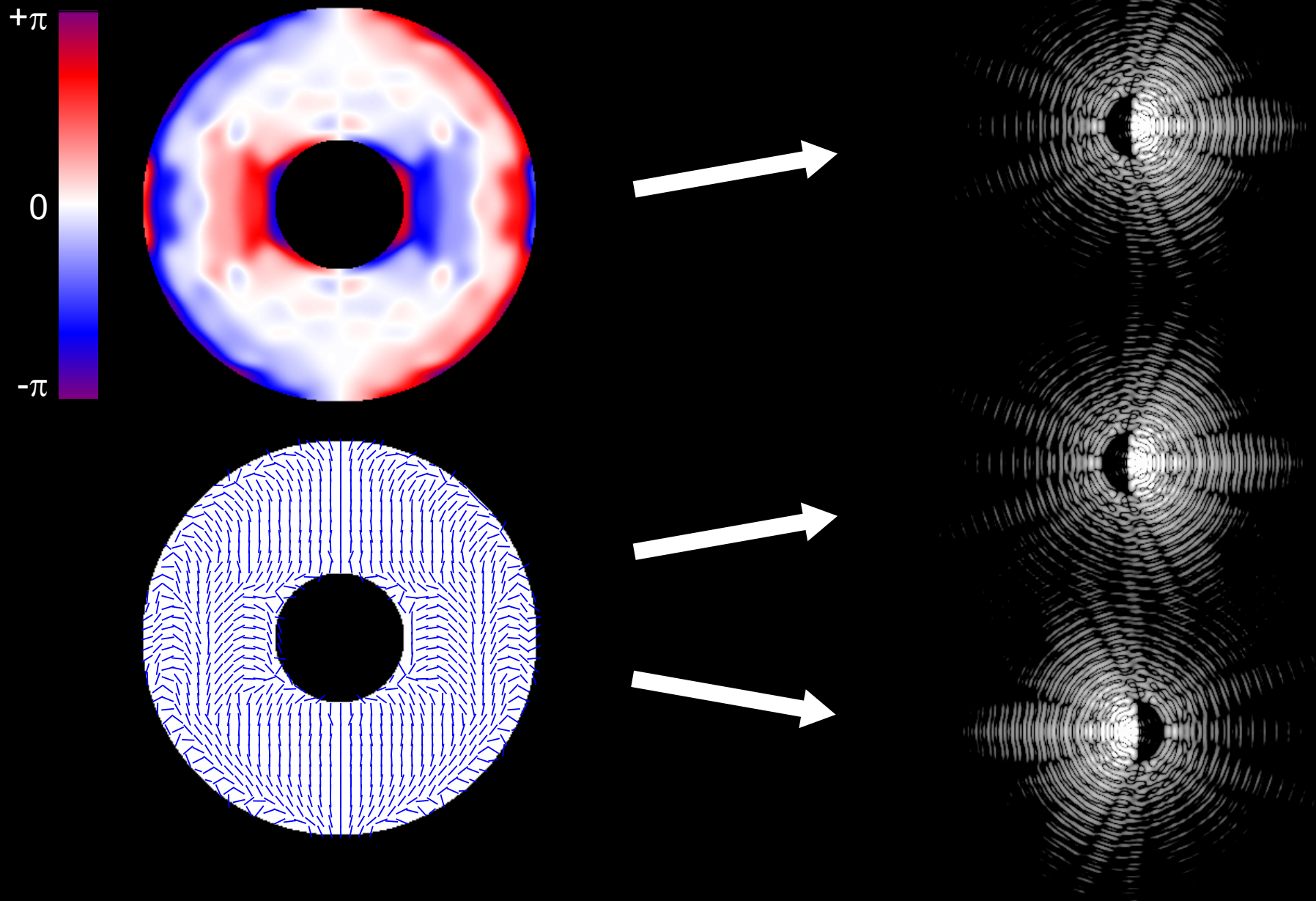
Apodizing Phase Plate coronagraph



classical phase

- chromatic
- impossible to manufacture extreme patterns
- only 180° instantaneous search space

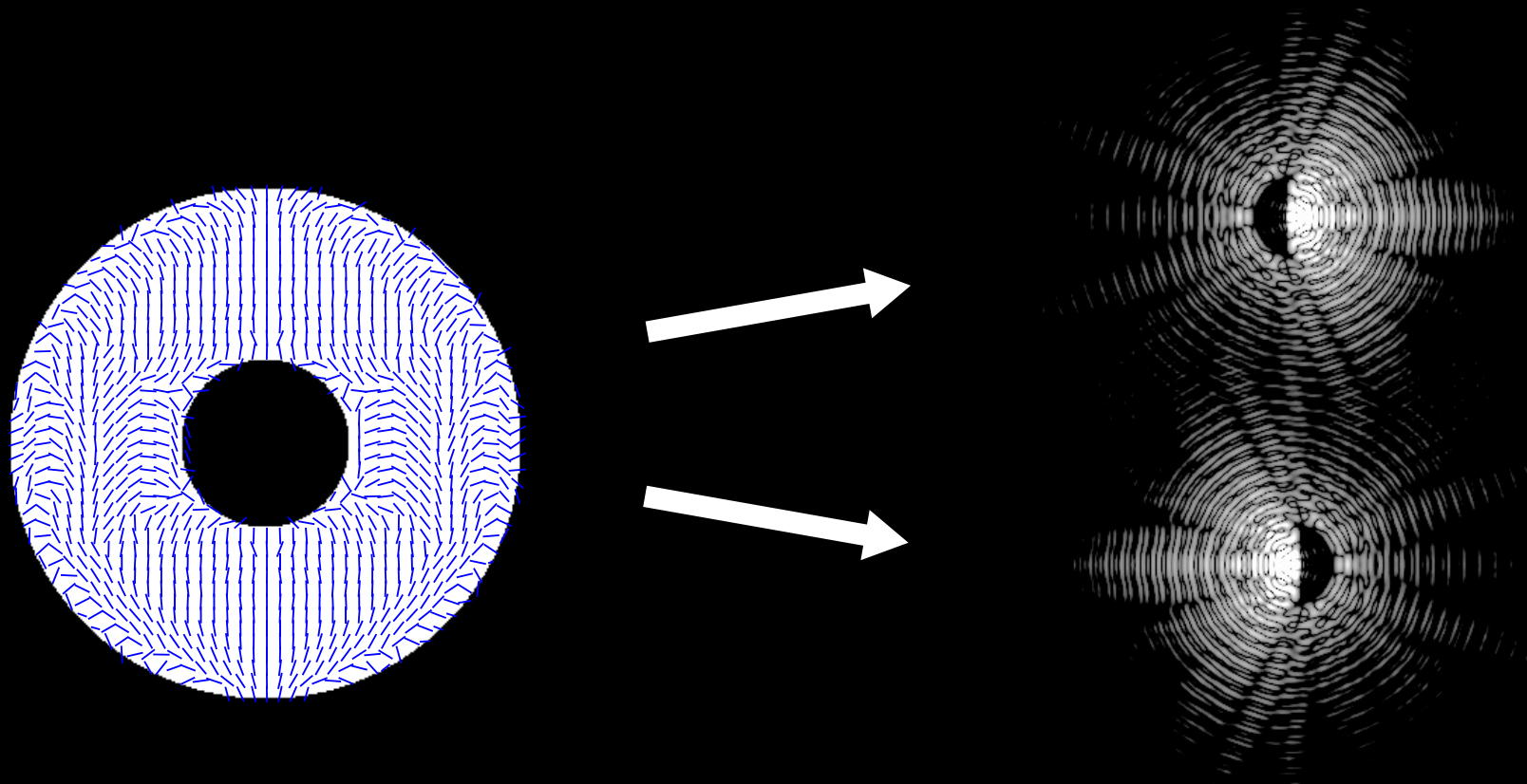
vector-APP coronagraph



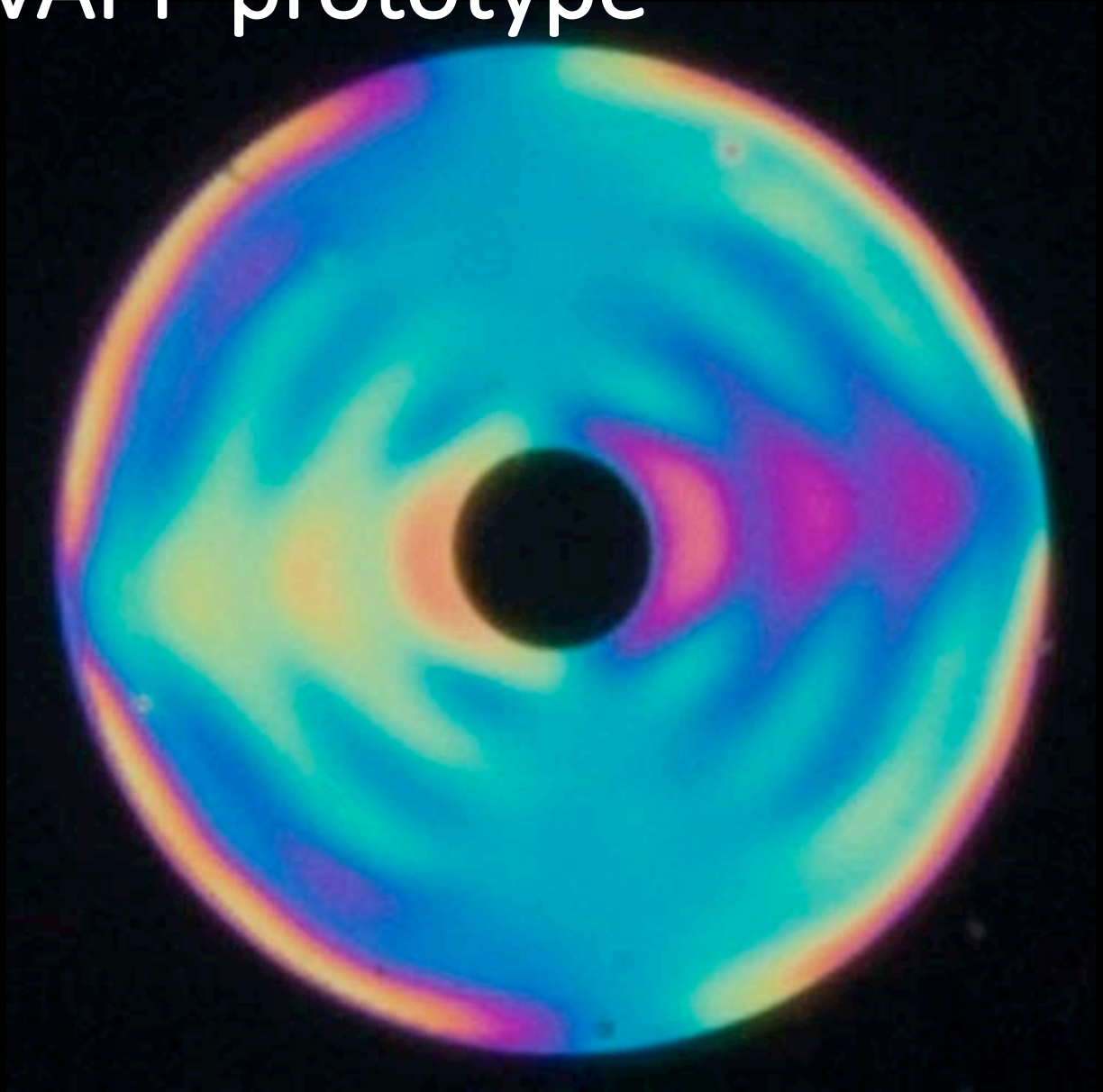
vector-APP coronagraph

geometric phase

- inherently achromatic
- use liquid crystals for extreme patterns
- two complementary PSFs



the vAPP prototype



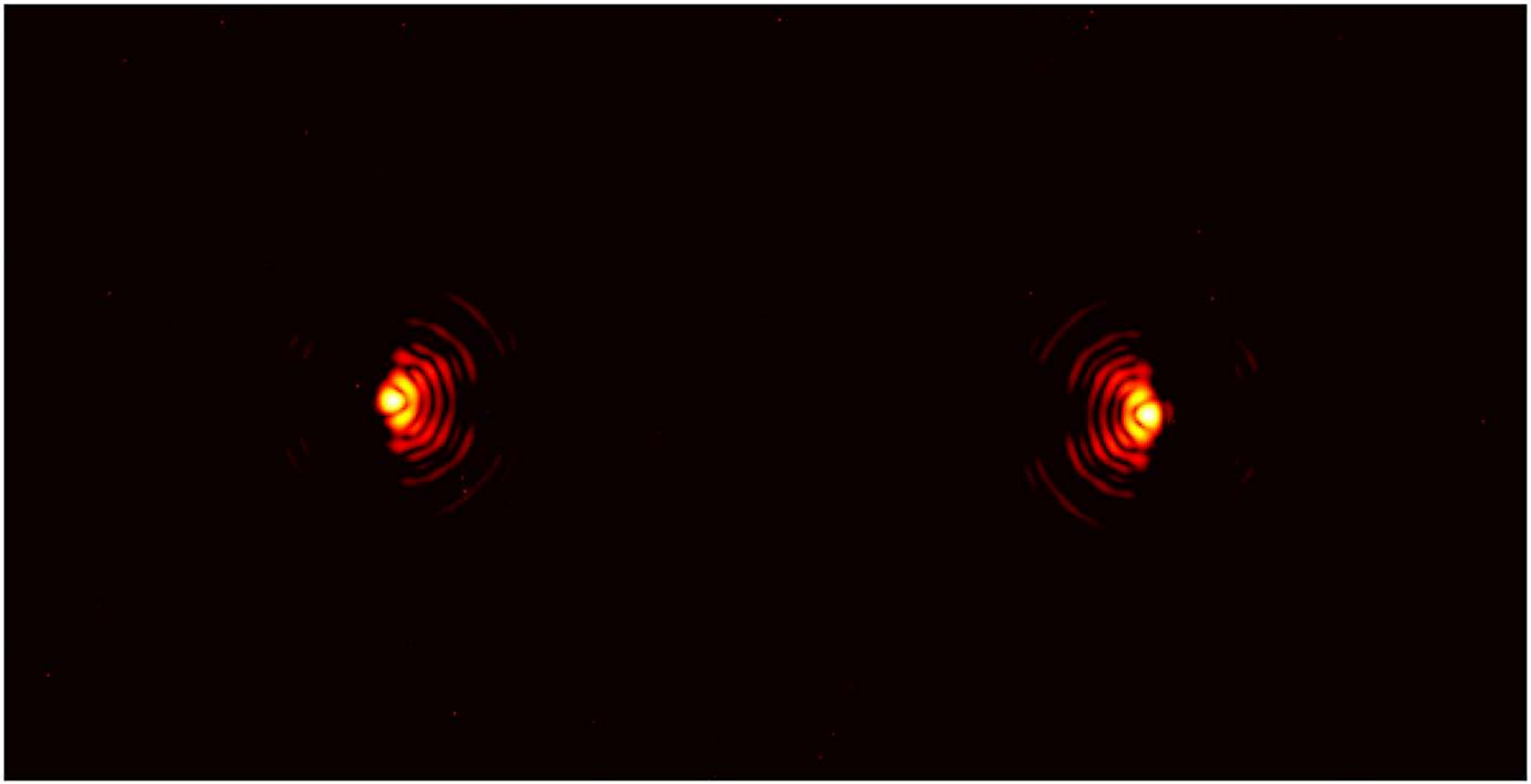
the vAPP prototype

Otten, Snik et al. Opt. Express (2014)

the vAPP prototype

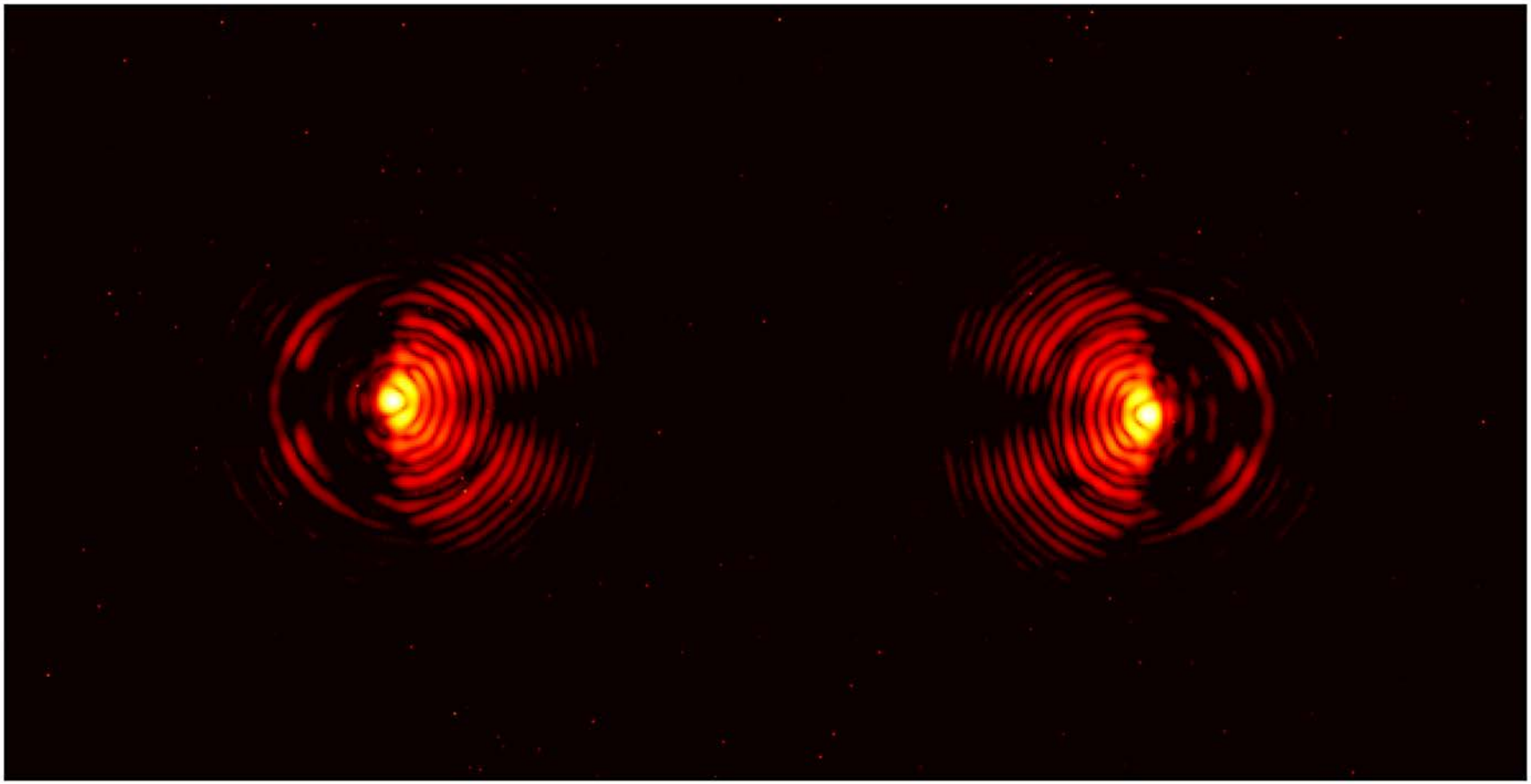
Otten, Snik et al. Opt. Express (2014)

the vAPP prototype



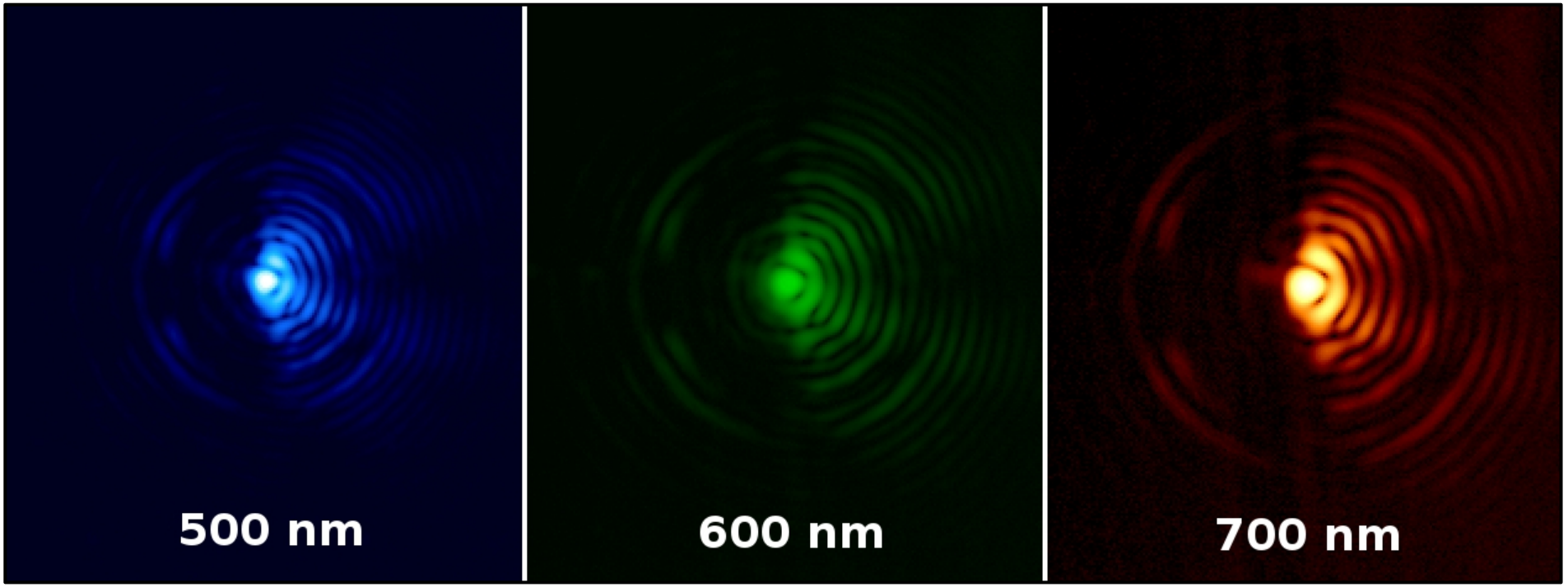
Otten, Snik et al. Opt. Express (2014)

the vAPP prototype



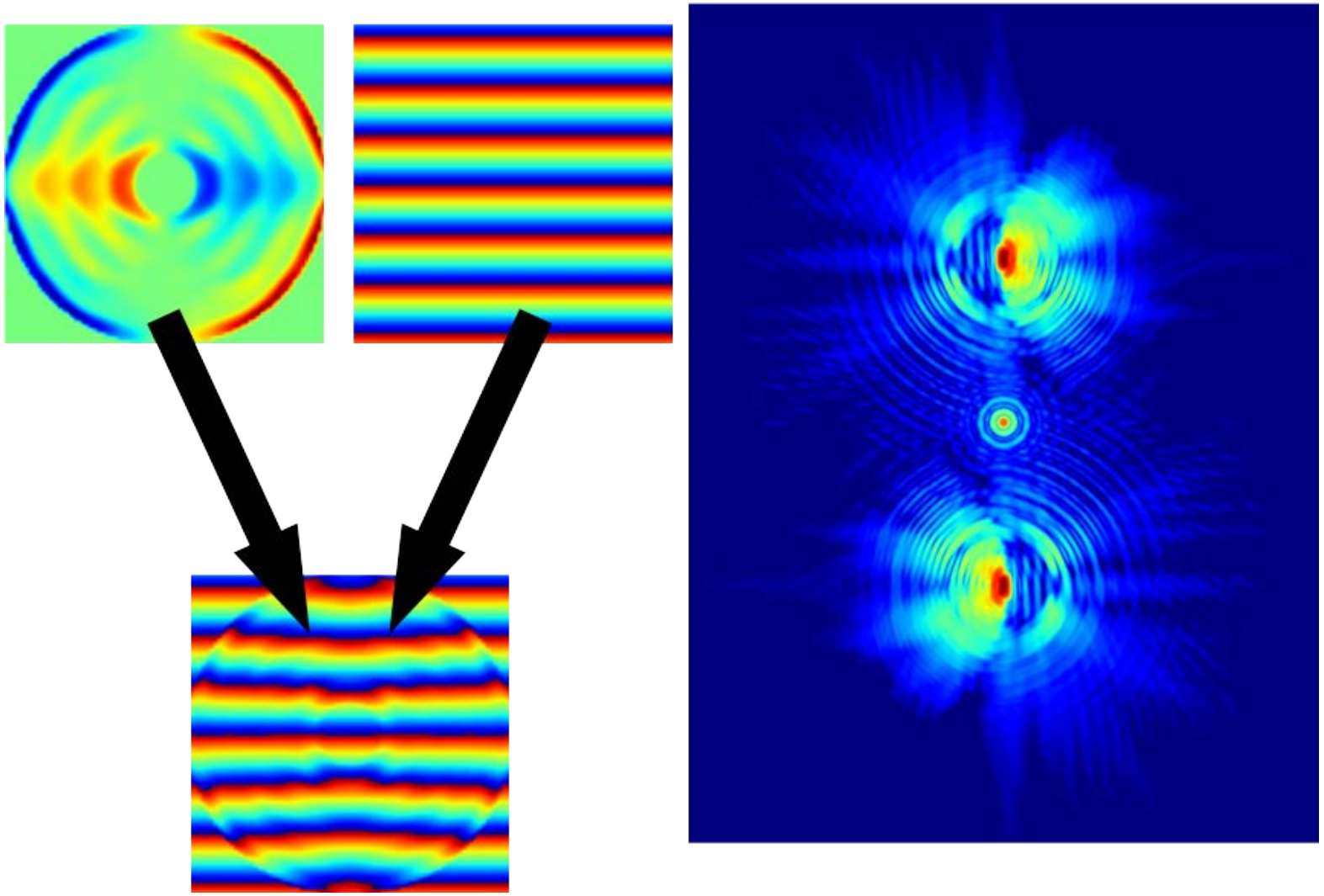
Otten, Snik et al. Opt. Express (2014)

the vAPP prototype



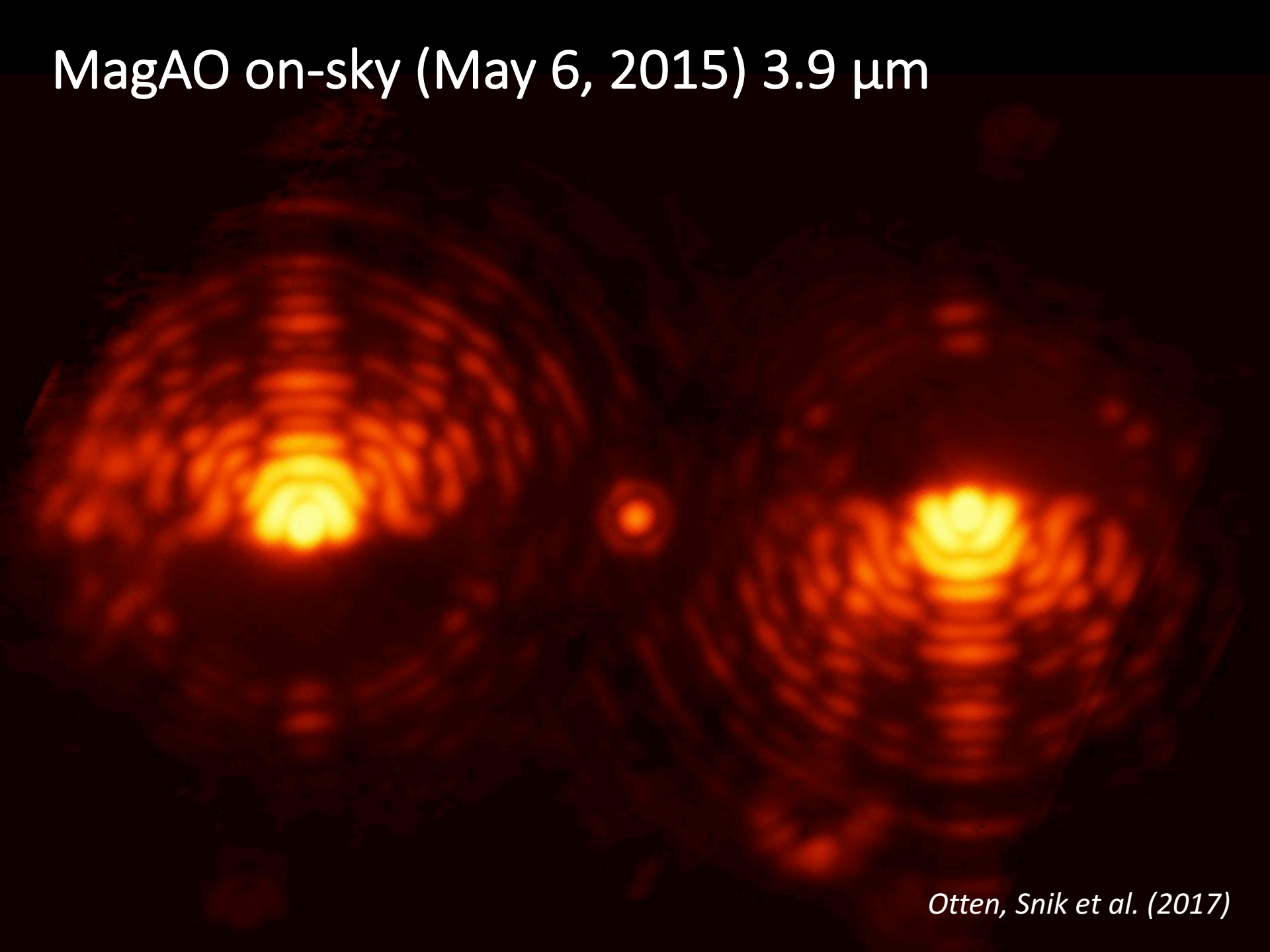
Otten, Snik et al. Opt. Express (2014)

grating-vAPP (gvAPP)



Otten, Snik et al. SPIE (2014)

MagAO on-sky (May 6, 2015) 3.9 µm

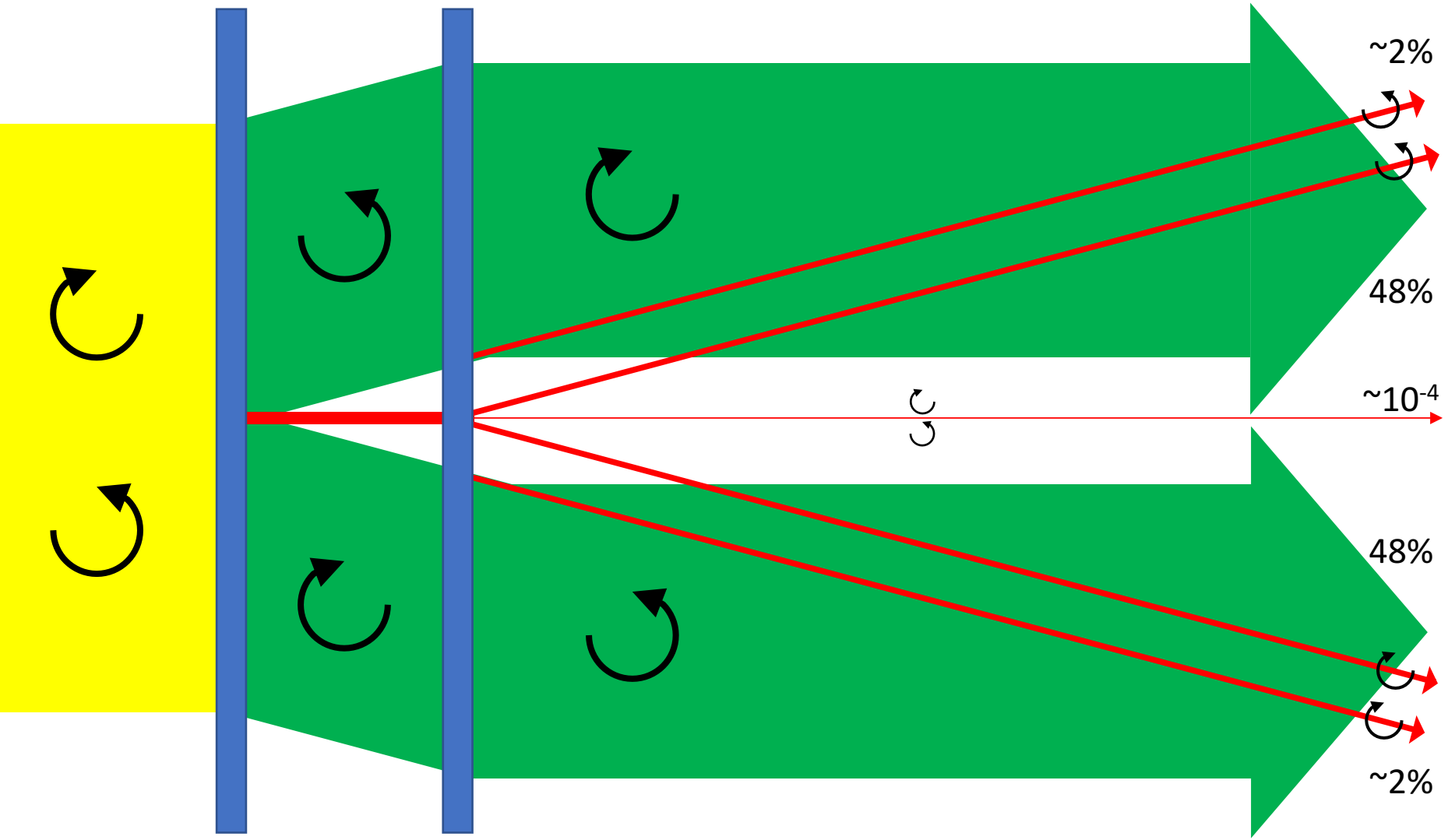


Otten, Snik et al. (2017)

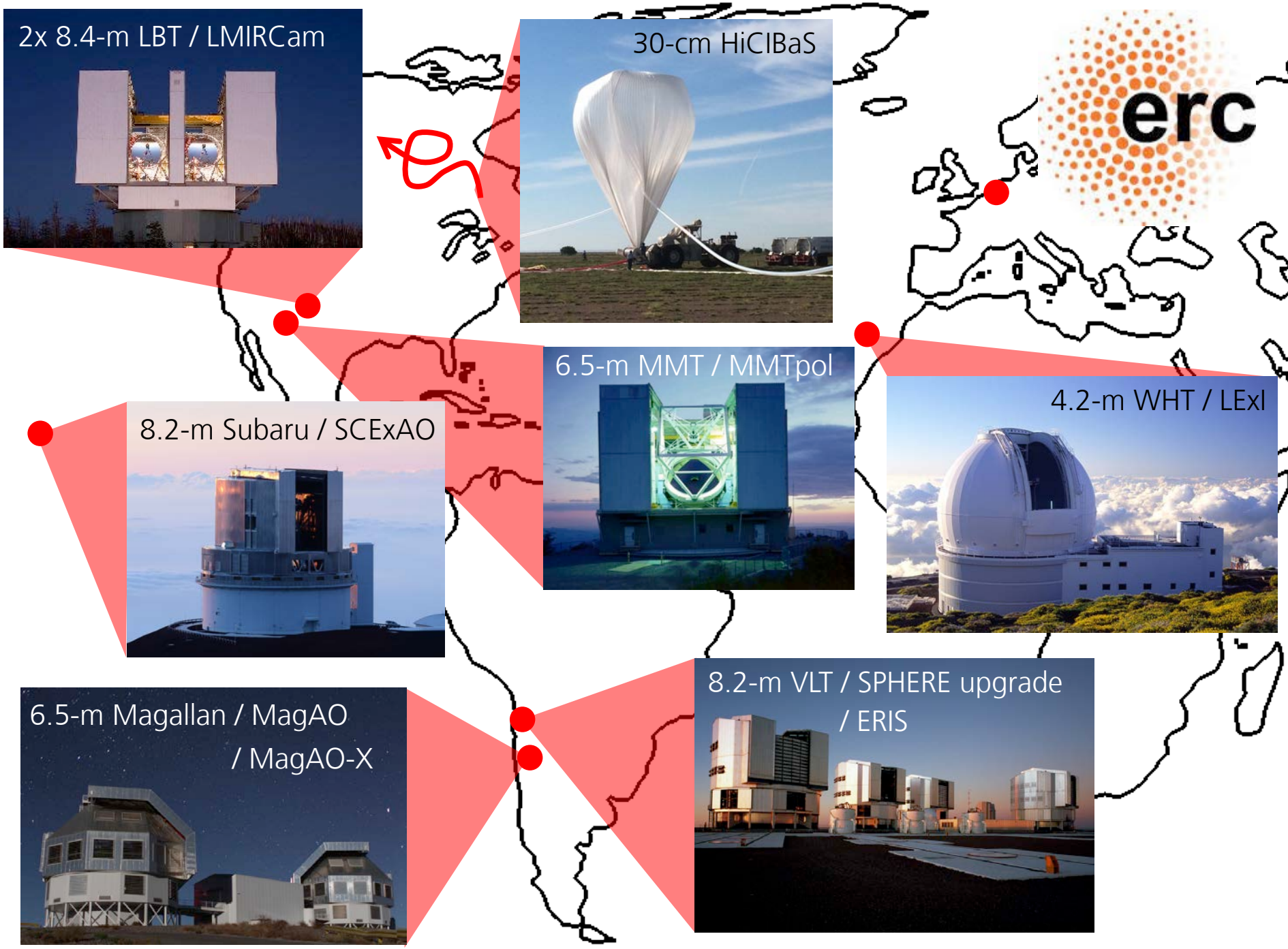
vAPP for LBT

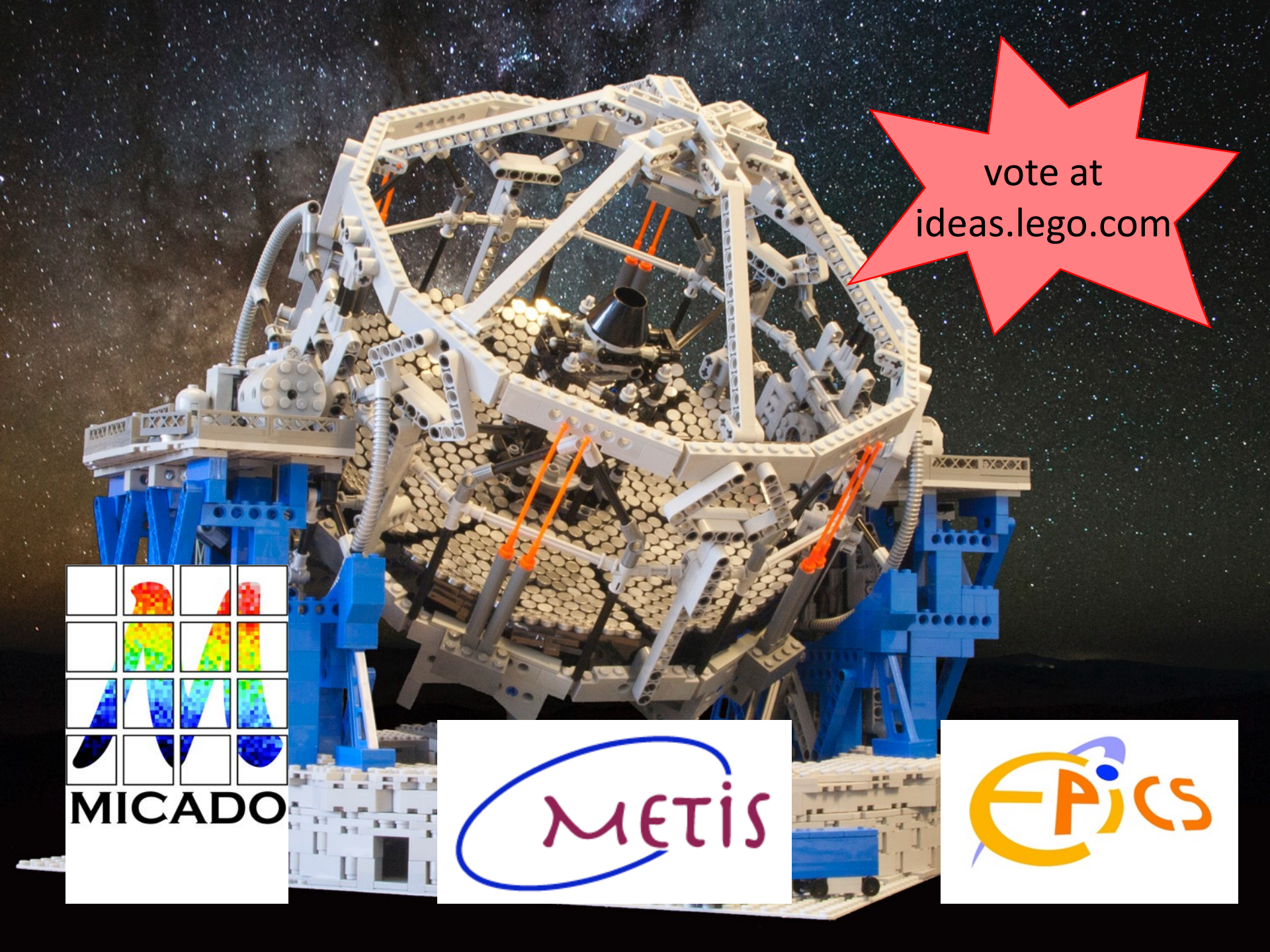
courstesy: David Doelman

double-grating-vAPP



Doelman, Snik, et al. (in prep.)


2x 8.4-m LBT / LMIRCam
30-cm HiCIBaS
erc
6.5-m MMT / MMTpol
8.2-m Subaru / SCExAO
4.2-m WHT / LExI
8.2-m VLT / SPHERE upgrade
/ ERIS
6.5-m Magallan / MagAO
/ MagAO-X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