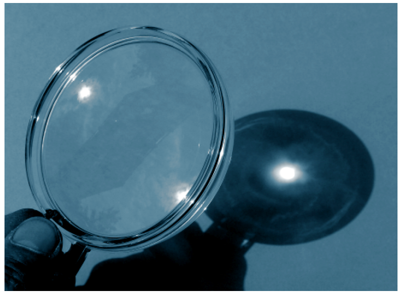
the
Swiss-Danish Instrument Initiative
presents

Estia
Εστία

a
focusing reflectometer for small samples
based on the
Selene guide concept



J. Stahn

ESS

the
Swiss-Danish Instrument Initiative
for reflectometry are

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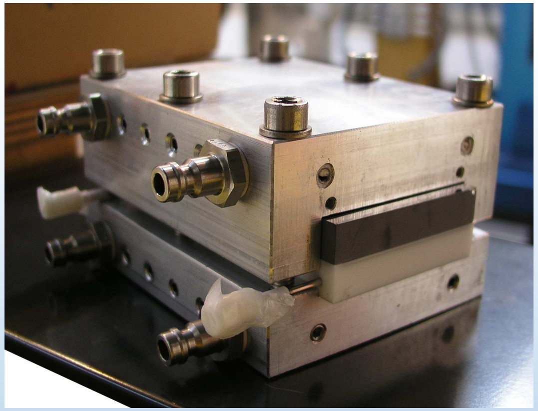
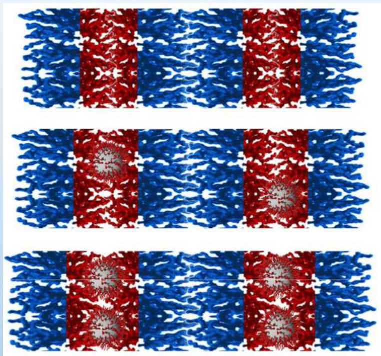
science case

depth-profiling of structural and magnetic densities

lateral structures close to surfaces

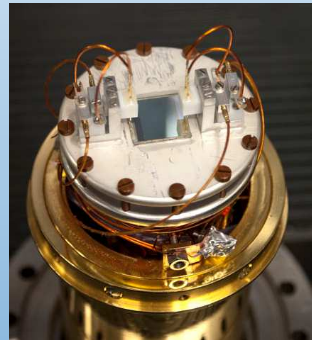


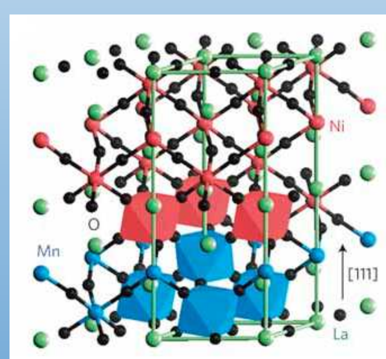
organic films at a solid liquid interface



laterally structured (organic) films

functional devices

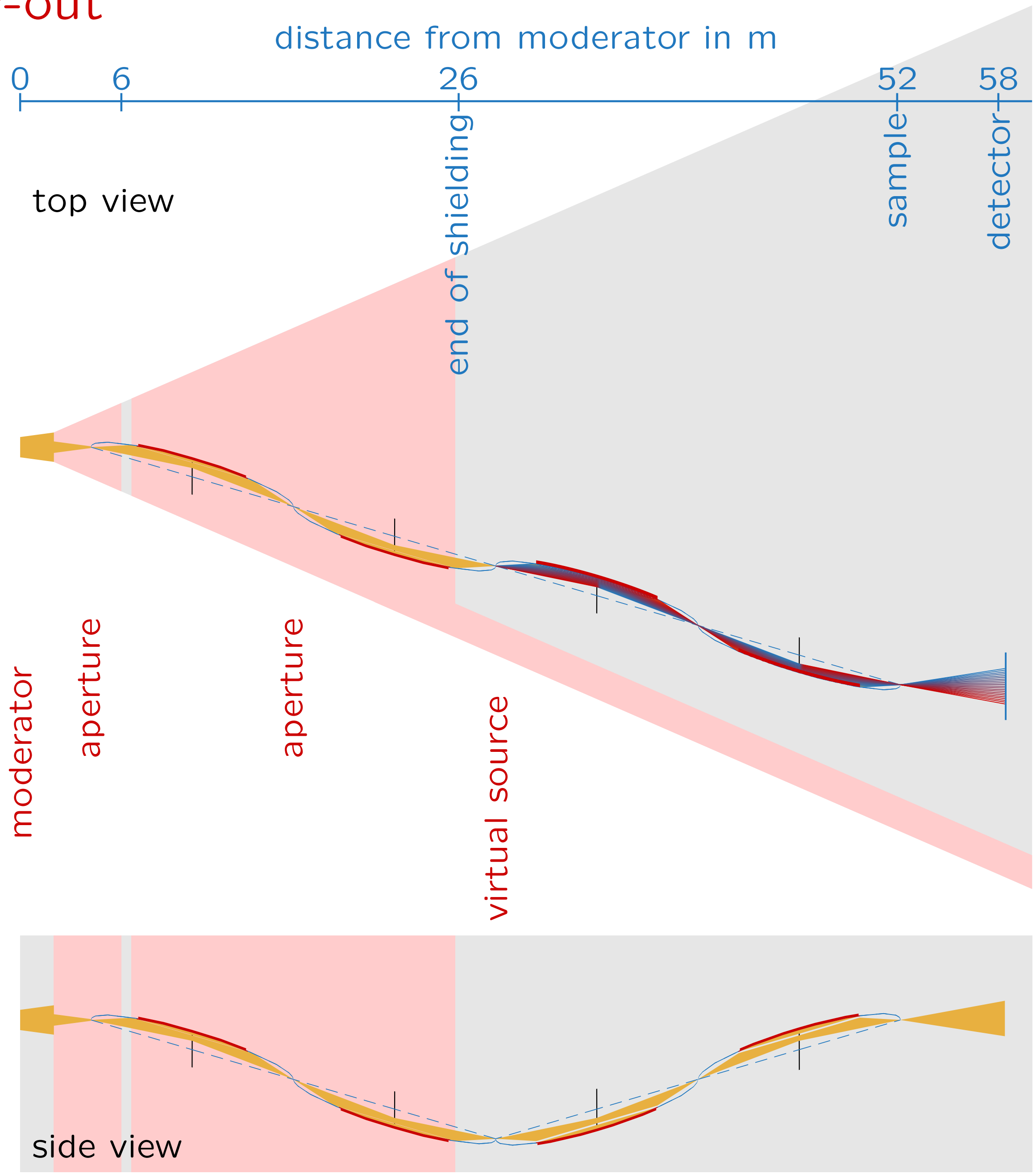




magnetic heterostructures

instrument

lay-out



key parameters

sample size $1 \times 1\,\mathrm{mm}^2$ to $10 \times 50\,\mathrm{mm}^2$

horizontal scattering plane

intrinsic resolution 2 to 4%

polarisation option

low background

truly focusing

instrument

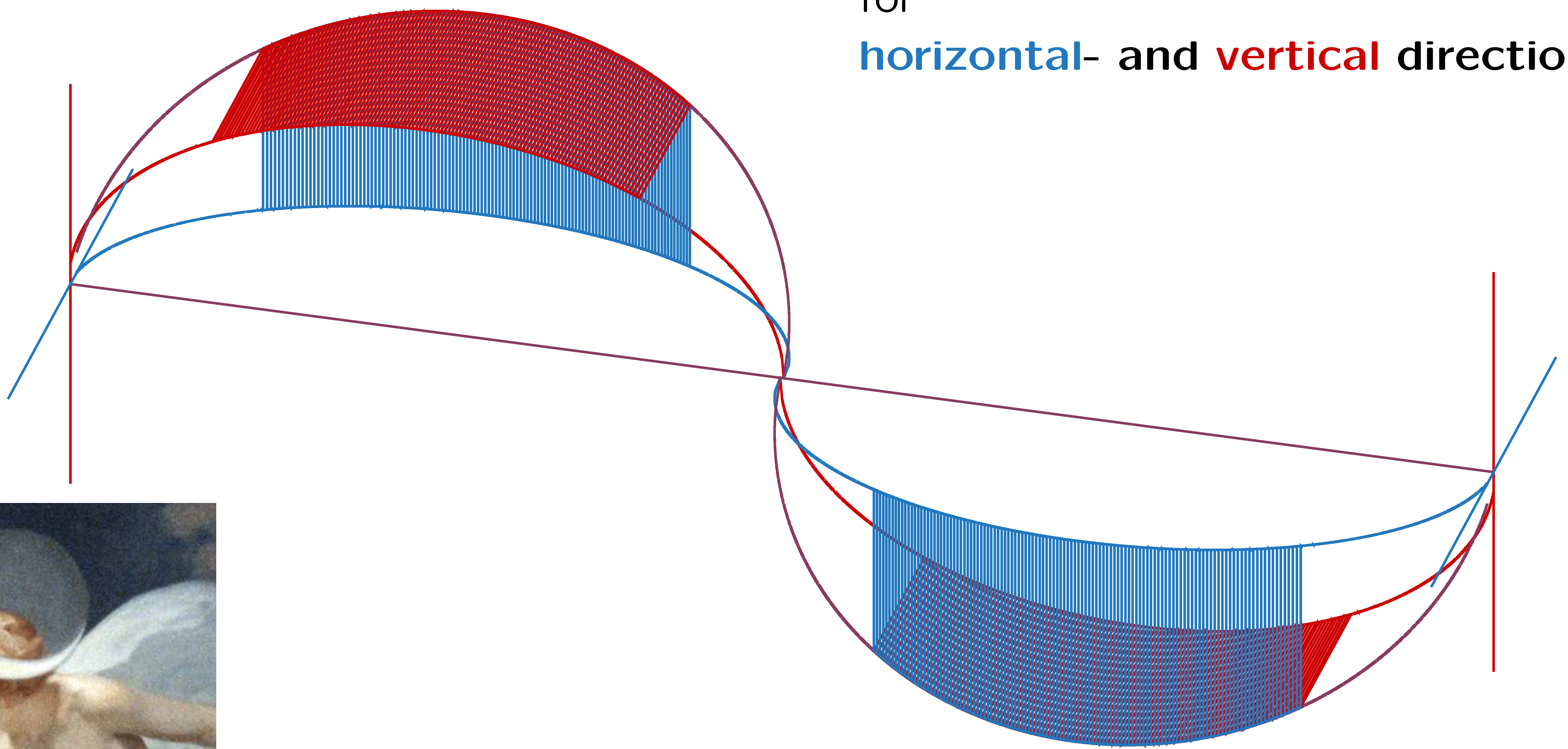
point-to-point focusing

with

2 subsequent elliptical reflectors

for

horizontal- and vertical direction

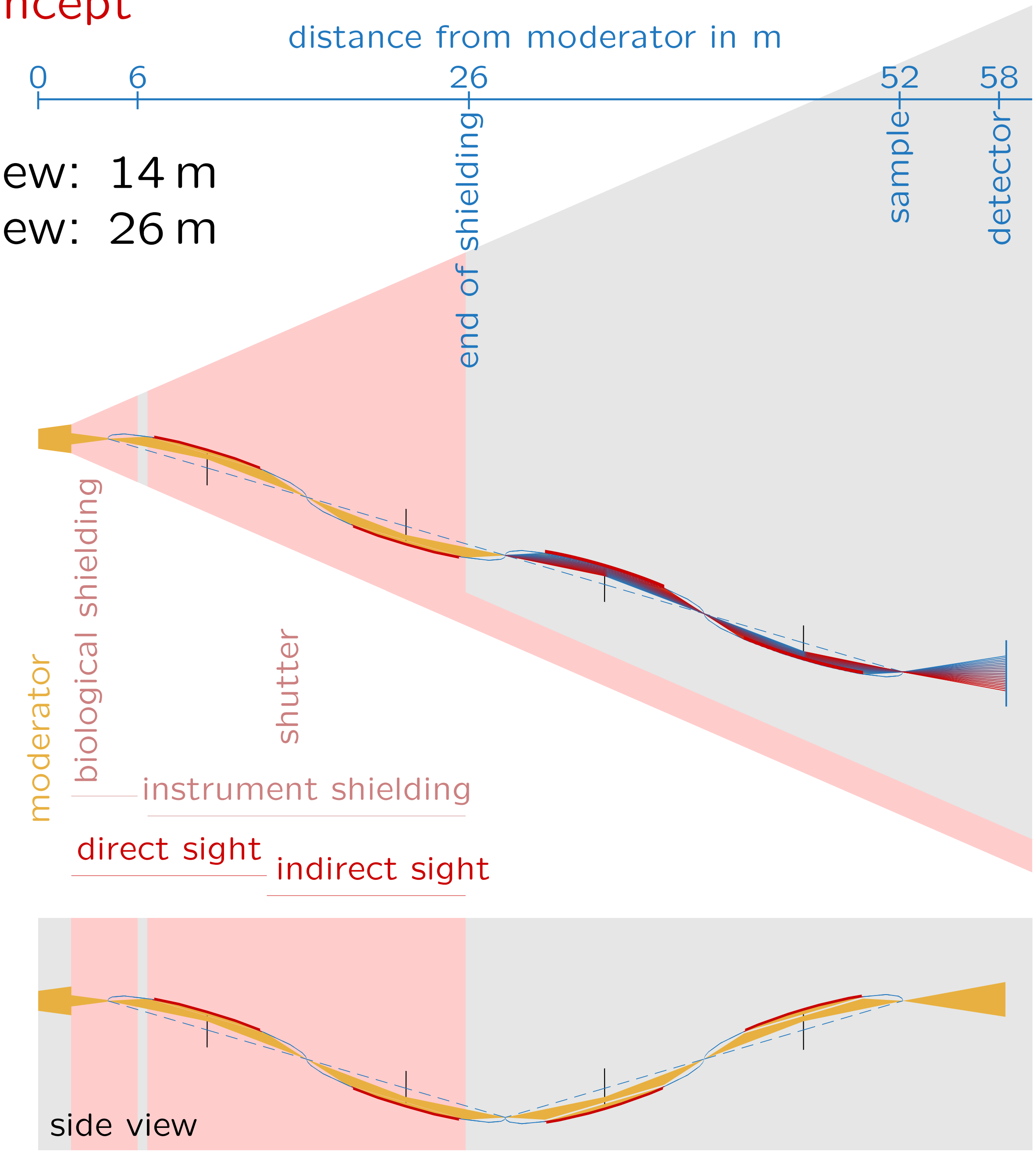


Selene guide concept

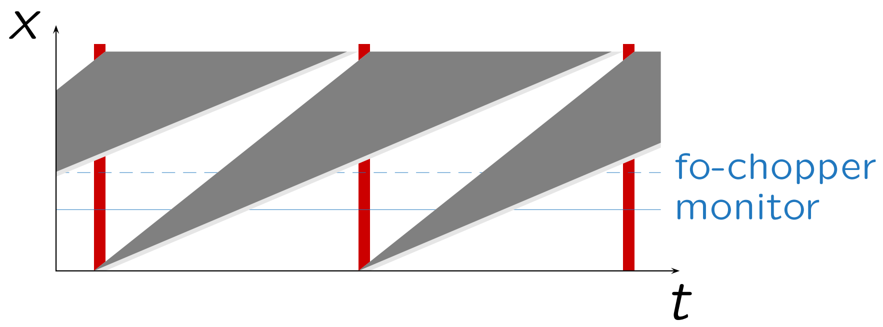
instrument

shielding concept

direct view: 14 m
indirect view: 26 m



time regime

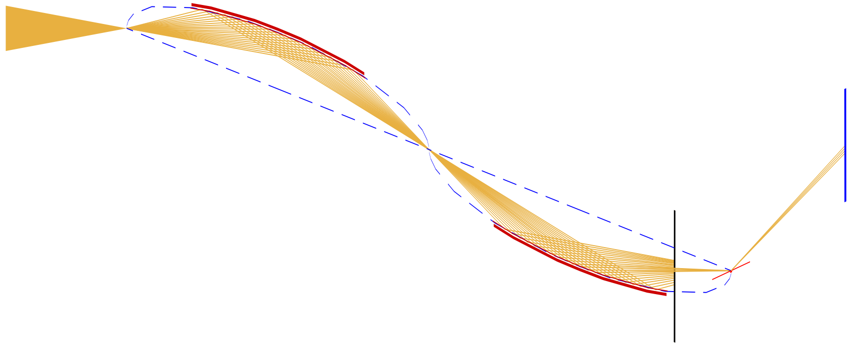


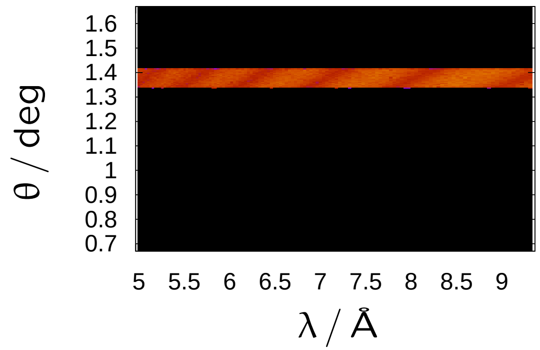
$\lambda \in [5,\ 9.4]$ Å

$\Delta\theta_{xy} = 1.5^\circ$
$\Delta\theta_{xz} = 1.5^\circ$

operation modes

almost conventional



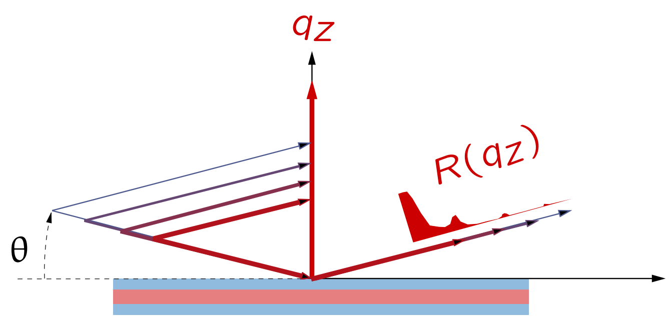


convergent beam

defined footprint

defined divergence

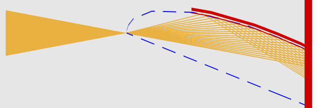
medium resolution (≈ 5%)



specular & off-specular reflectometry

operation modes

almost conventional



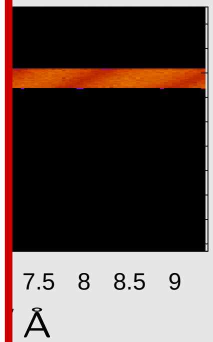
convergent beam

defined footprint

defined divergence

medium resolution ($\approx 5\%$)

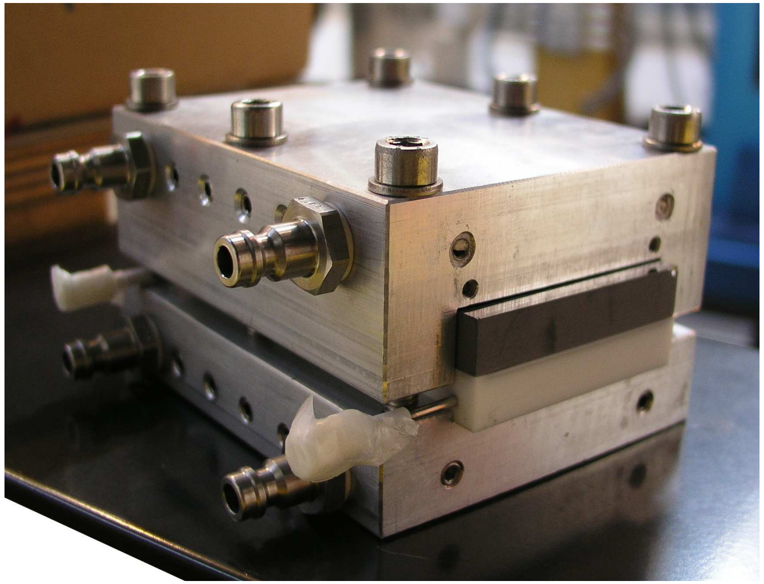
specular & off-specular reflectometry



liquid interfaces

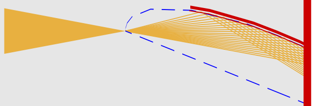
e.g. solid-liquid cell

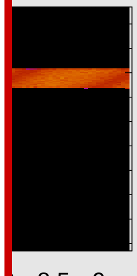
avoid gasket & trough walls
restrict to a homogeneous area



operation modes

almost conventional





convergent beam

defined footprint

defined divergence

medium resolution ($\approx 5\%$)

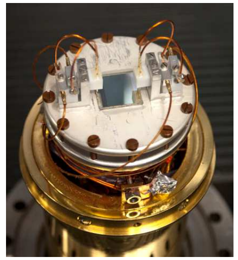
specular & off-specular reflectom

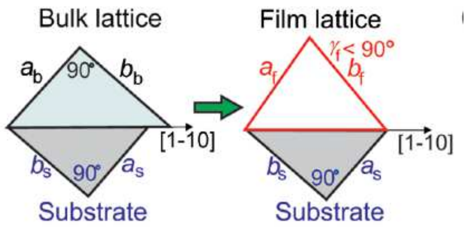
multiferroics

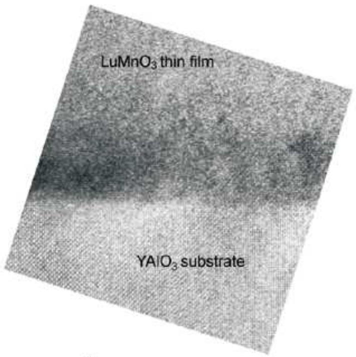
strain induced FM in multiferroic AFM $LuMnO_3$

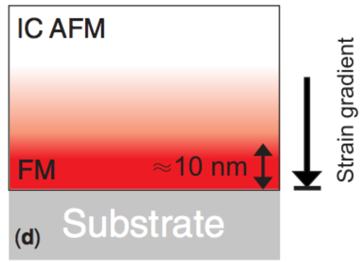
J. White et al.

PRL **111**, 037201 (2013)



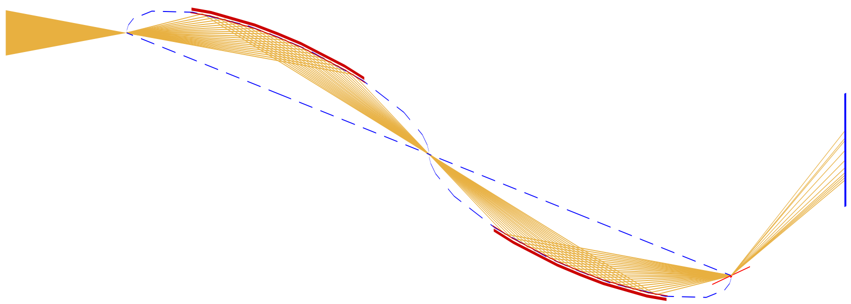


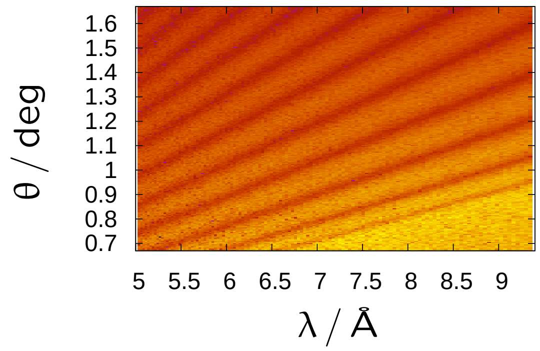




operation modes

high-intensity specular reflectivity





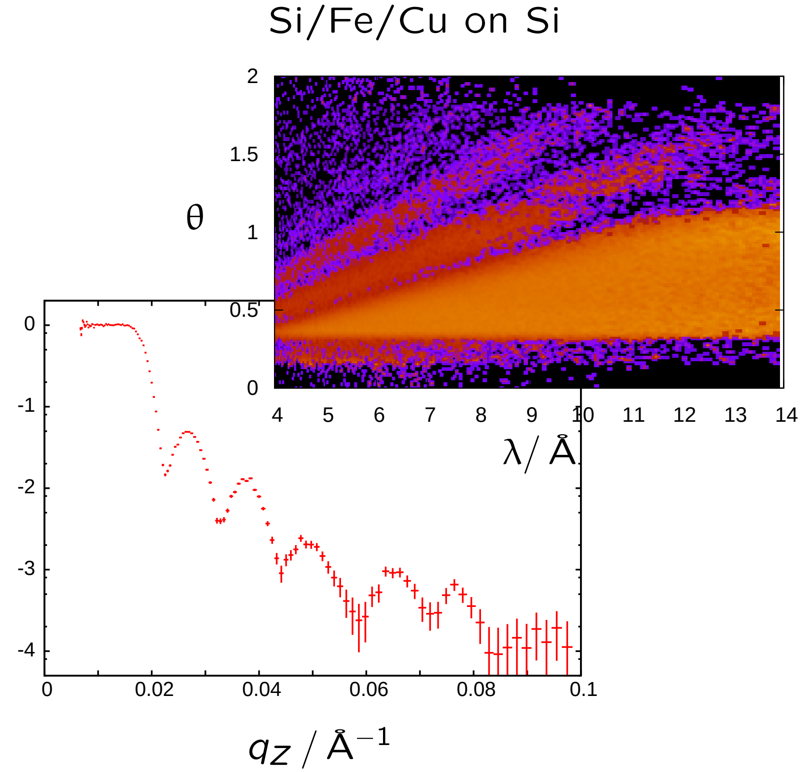
trading off-specular resolution for intensity

⇒ complex resolution function

quick & dirty way to scan a phase diagram

time-resolved studies

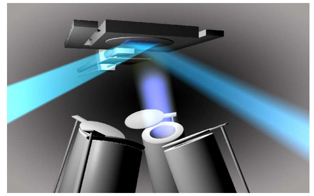
tiny samples



operation modes

high-intensity specular

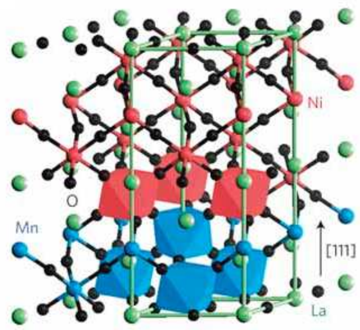
novel electronic phases at interfaces



exchange bias in $LaNiO_3$ (PM) / $LaMnO_3$ (FM) superlattices

M. Gibert et al.

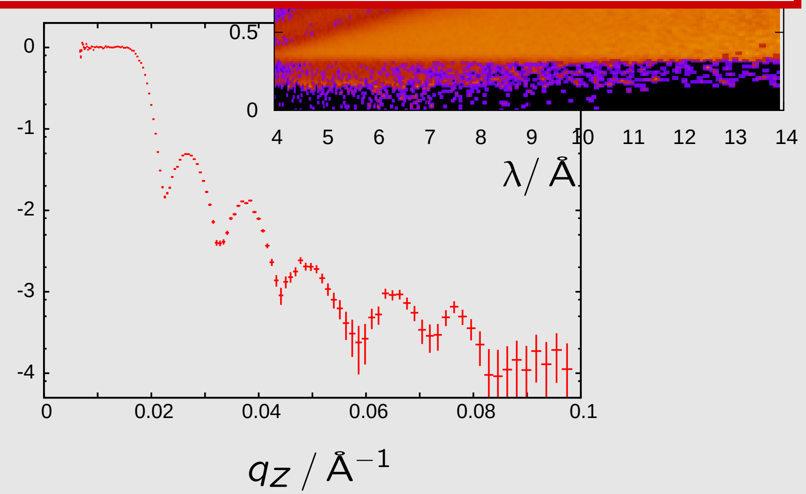
nature materials **11**, 195198 (2012)



trading off-specular re

⇒ complex resolution

quick & dirty way to scan a phase diagram



time-resolved studies

tiny samples

operation modes

high-intensity specular refle

trading off-specular resoluti

⇒ complex resolution functi

quick & dirty way to scan a

time-resolved studies

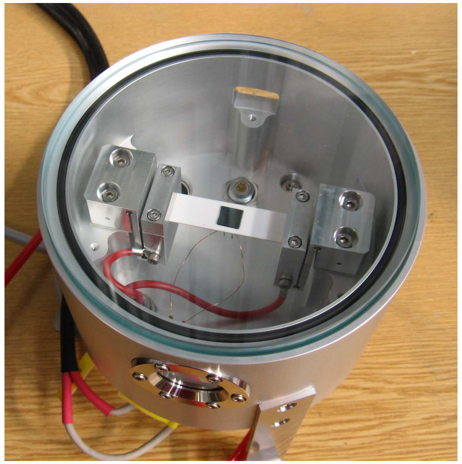
tiny samples

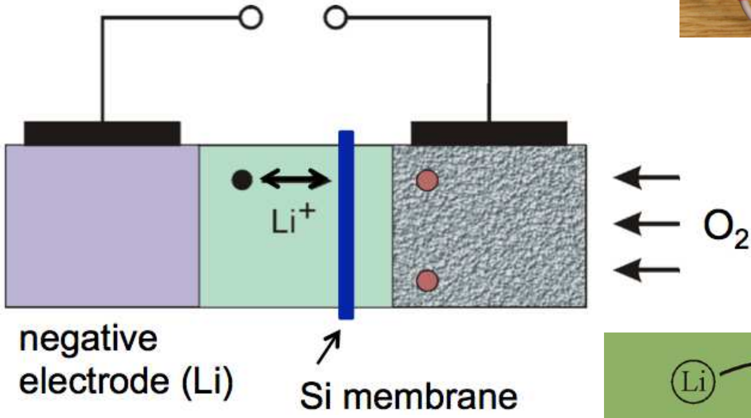
interdiffusion

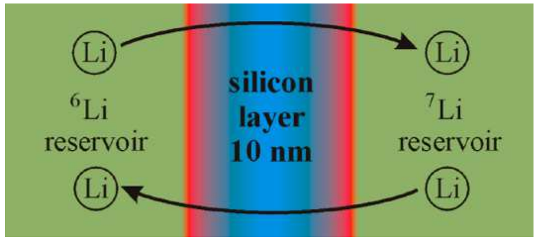
Li diffusion through a thin Si layer

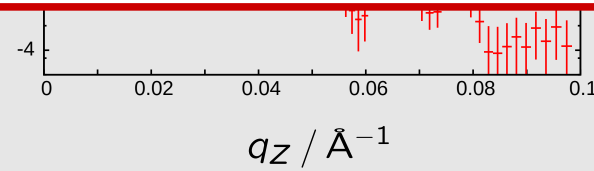
E. Huger at al.

Nano Lett. **13**, 1237 (2013)



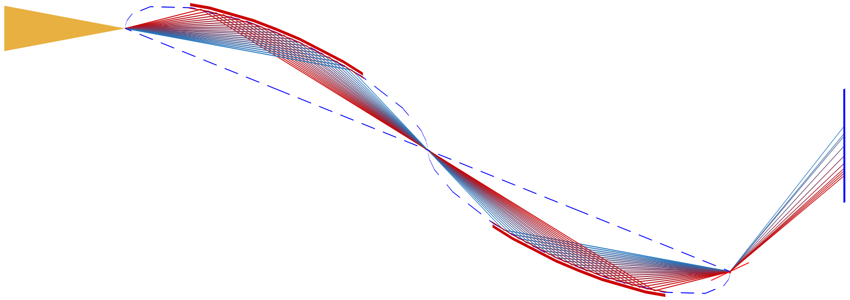


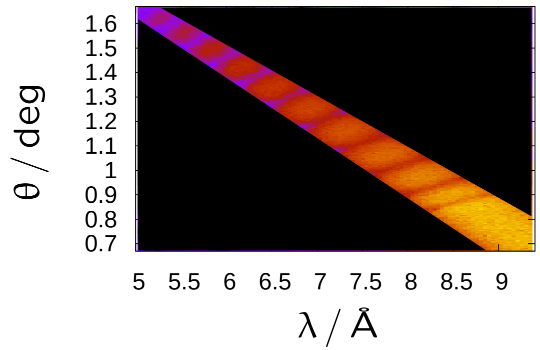


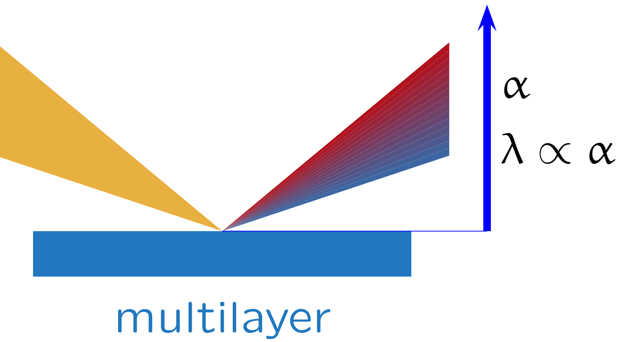


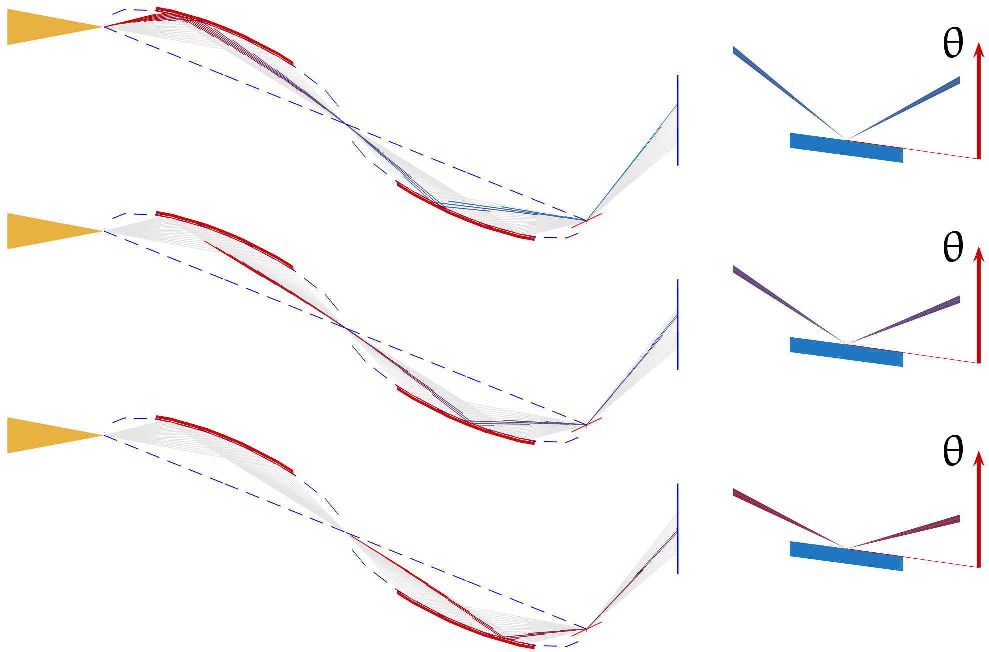
operation modes

λ-θ encoding









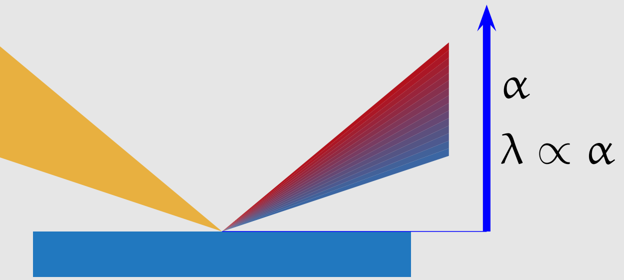
spectral analysis of the white beam

constant $\Delta q/q$

wide q_z-range

operation modes

λ-θ encoding



spectral analysis of the w

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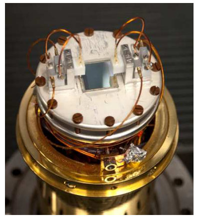
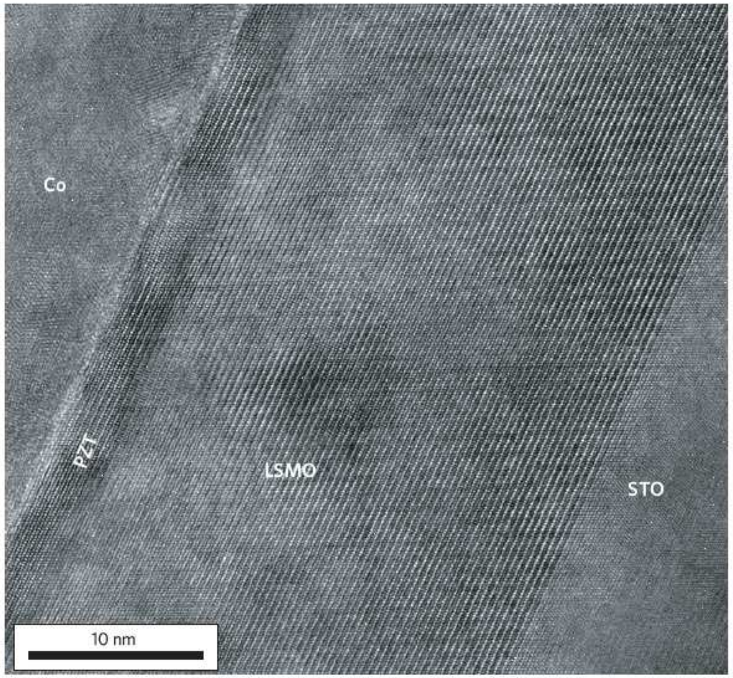
functional devices

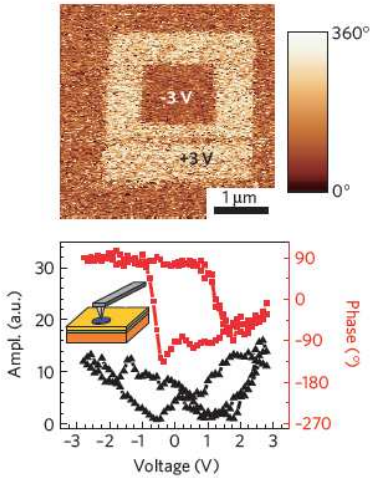


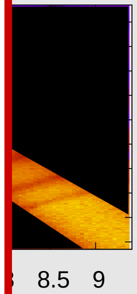
electrical switching of spin polarisation

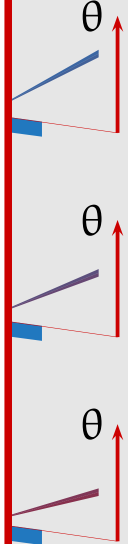
D. Pantel et al. nature materials **11**, 289 (2012)

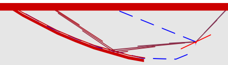
active area $< 50 \times 50\,\mu\mathrm{m}^2$











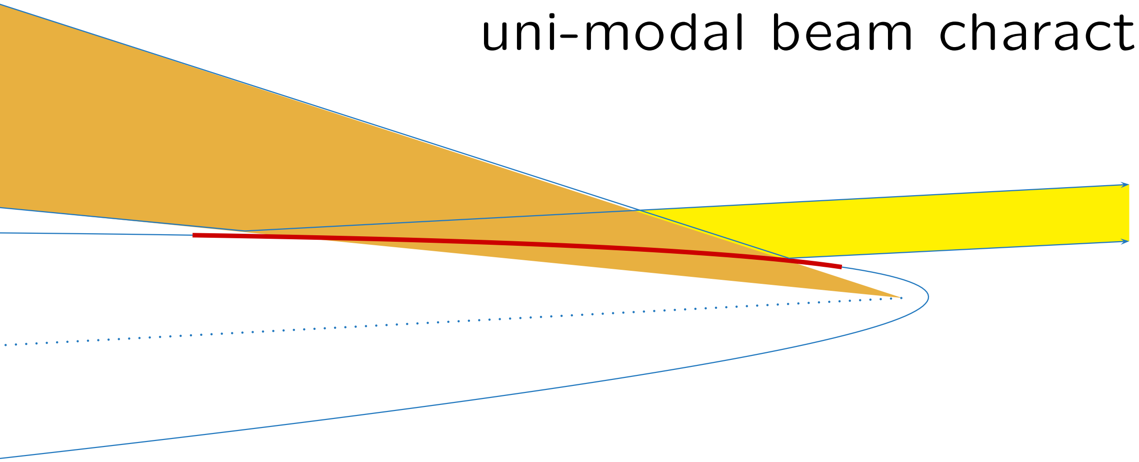
operation modes

parallel beam

by reflection on a parabolic mirror

tunable divergence and beam size

uni-modal beam characteristics

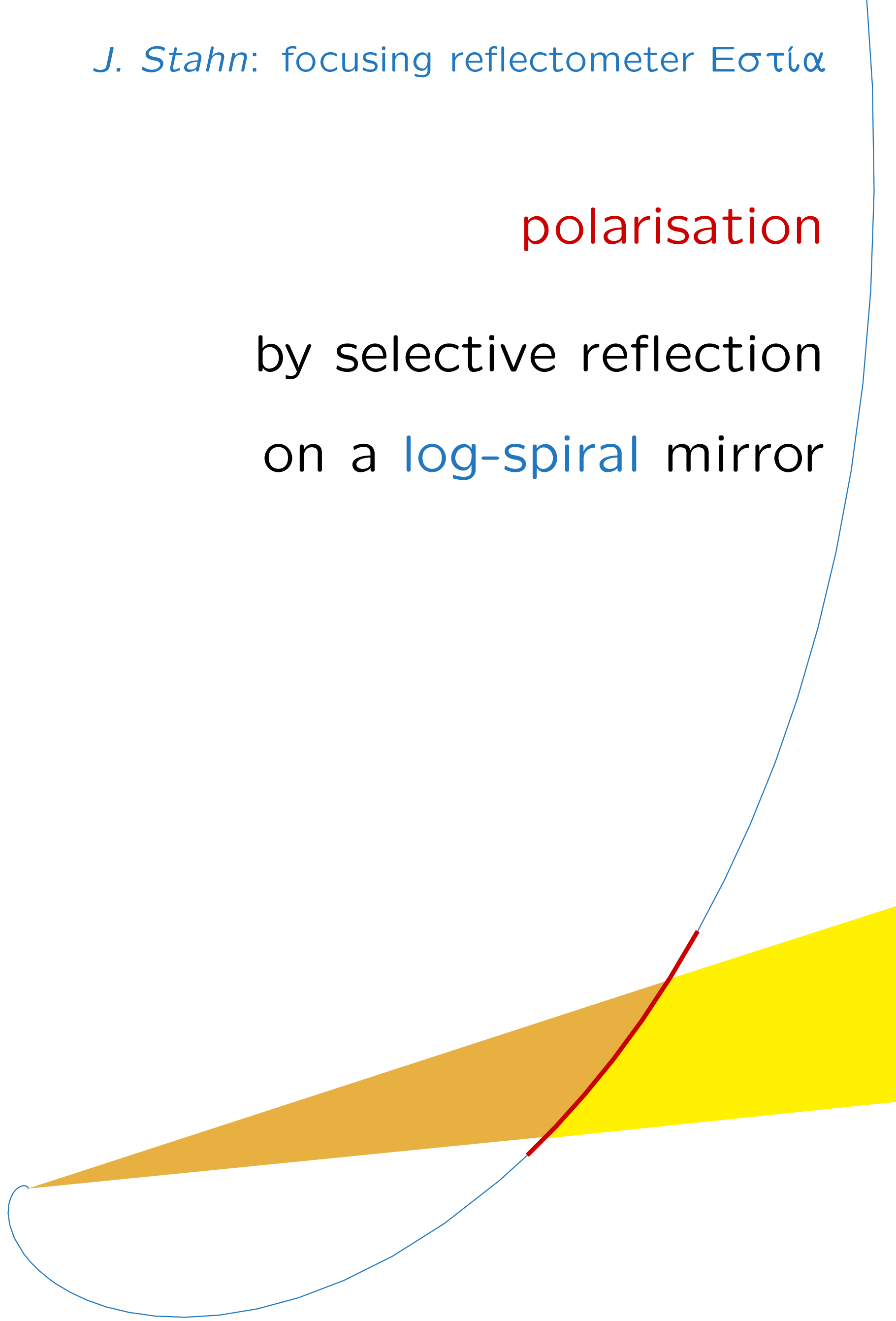


for
laterally structured samples
(GISANS)

polarisation

by selective reflection

on a log-spiral mirror



constant angle of incidence

low-m coating $\Rightarrow$ high P

operation modes

parallel beam

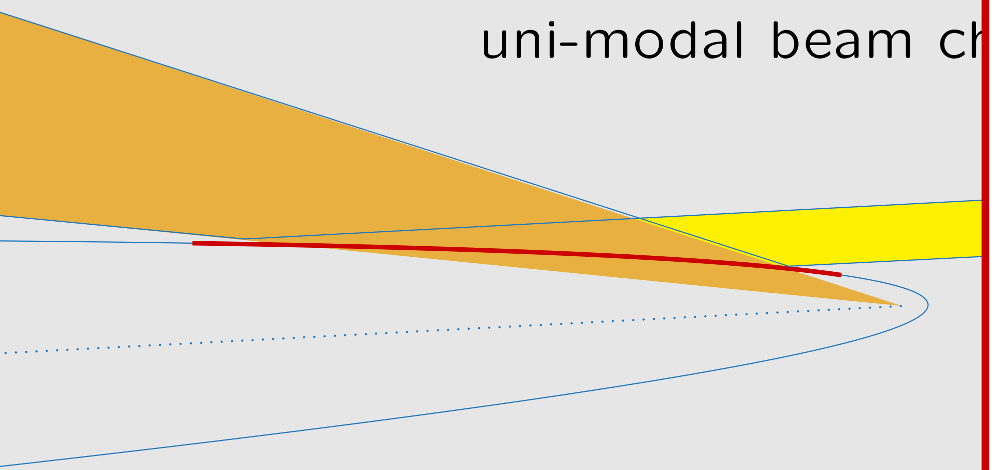
polarisation

by reflection on a parabolic mirror

by selective reflection

tunable divergence and

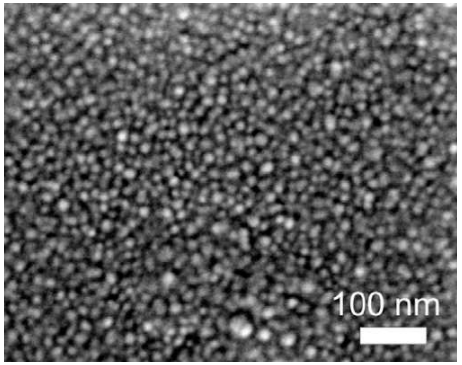
uni-modal beam ch



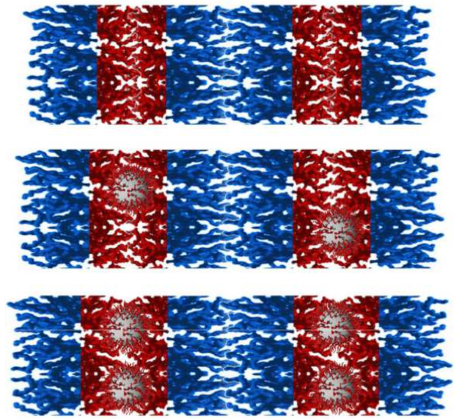
structured surfaces

nanostructured diblock copolymer films with embedded magnetic nanoparticles

Xin Xia et al. J. Phys. **23**, 254203 (2011)



SEM image



for
laterally structured samples
(GISANS)

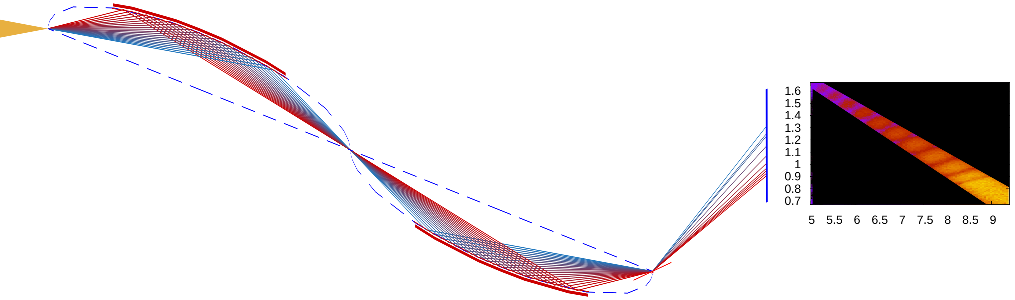
low-m coating $\Rightarrow$ high P

performance

obtained by McStas simulations

1000 Å Ni on glass ($5 \times 5\,\mathrm{mm}^2$)

λ-θ encoding



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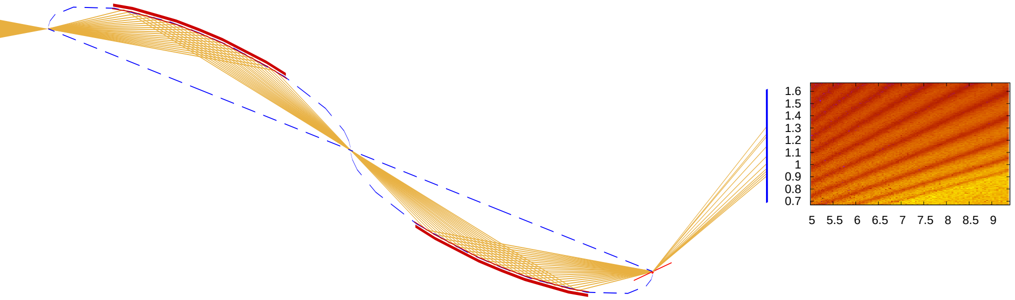
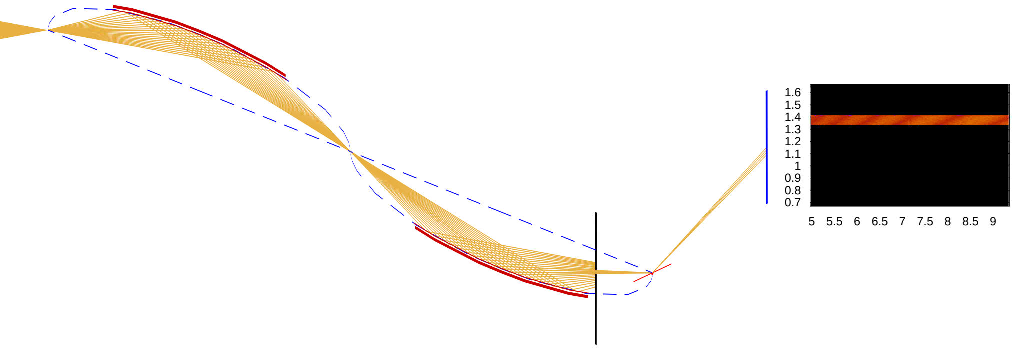
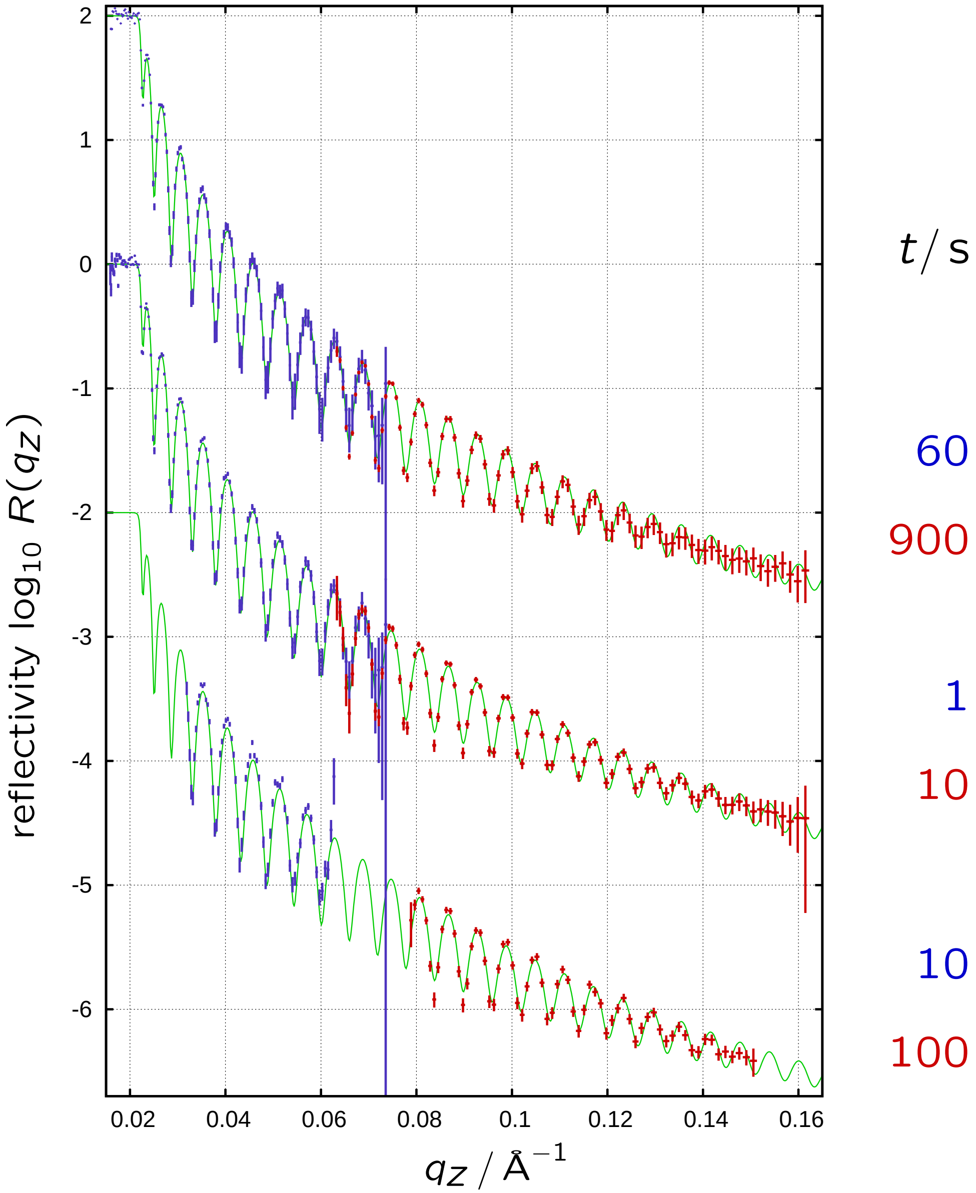
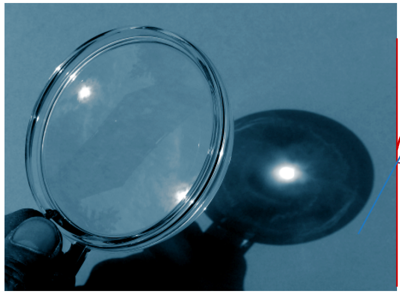


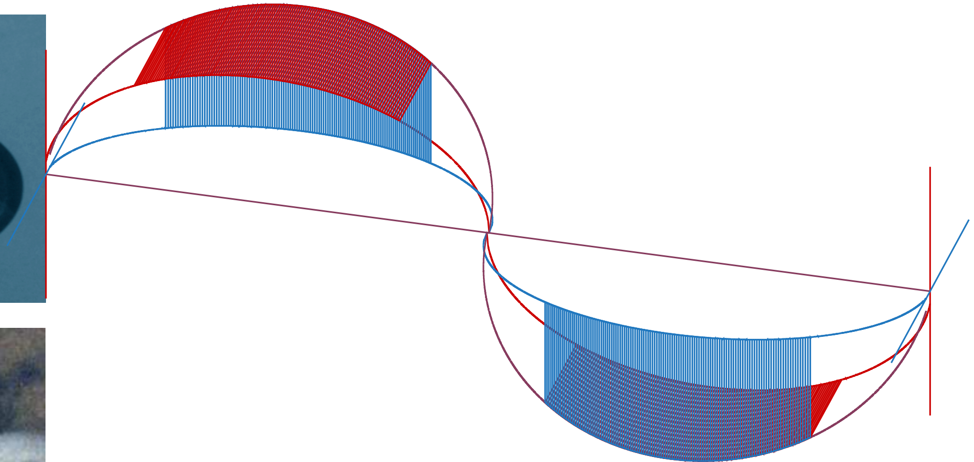
almost conventional

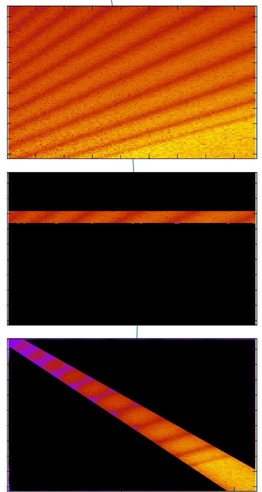


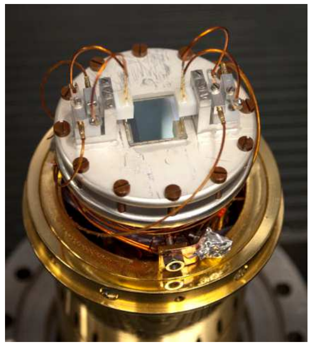


Estia
Εστία









J. Stahn