
Selene guide concept recent developments

- focusing reflectometer

MCNPX calculations

- extraction & guide shielding



Selene

guide workshop & simulation meeting
27.–28. 11. 2012, Lund, Sweden

Selene guide: principle

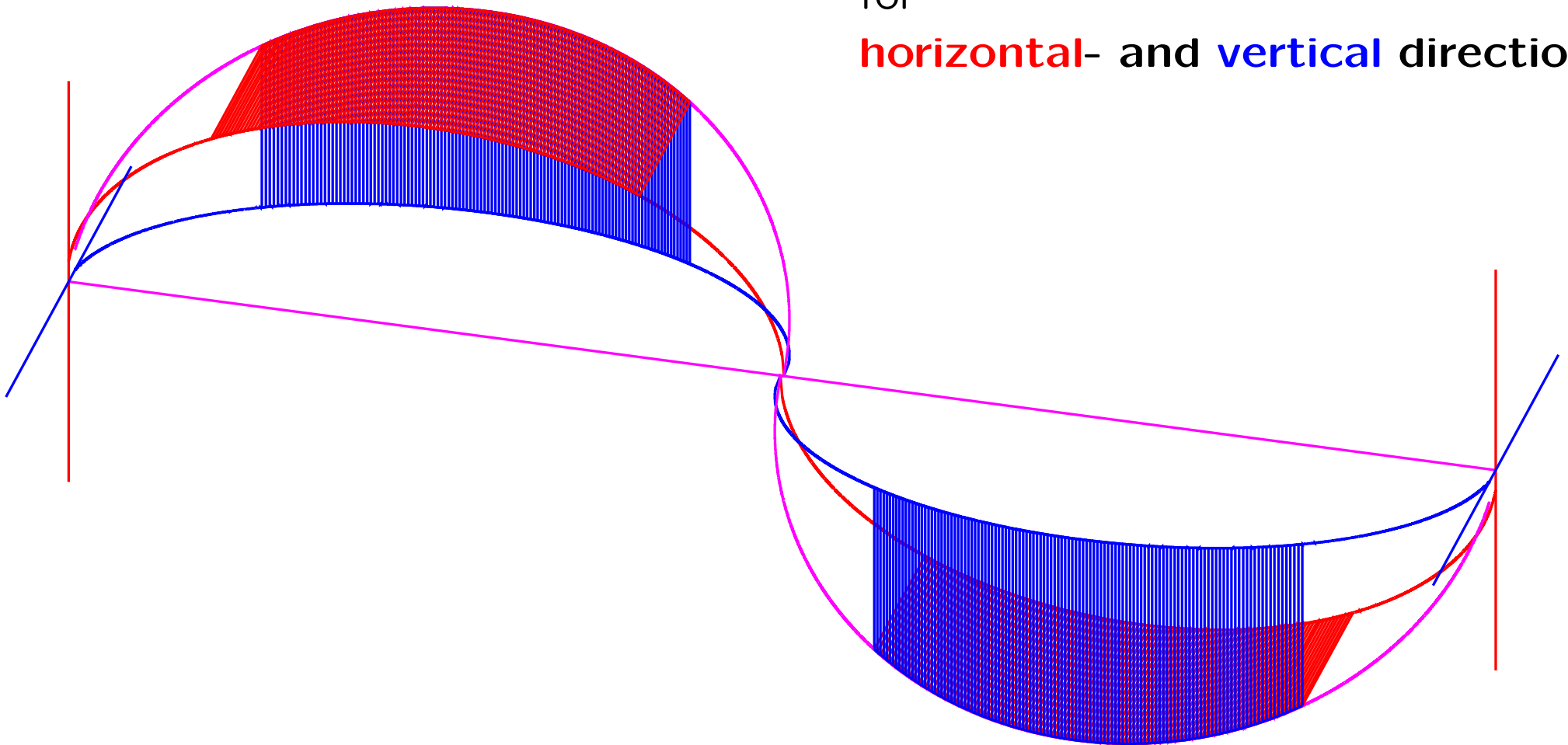
point-to-point focusing

with

2 subsequent elliptical reflectors

for

horizontal- and **vertical** direction



focusing reflectometer

ESS *Selene*  small samples

one Selene guide section

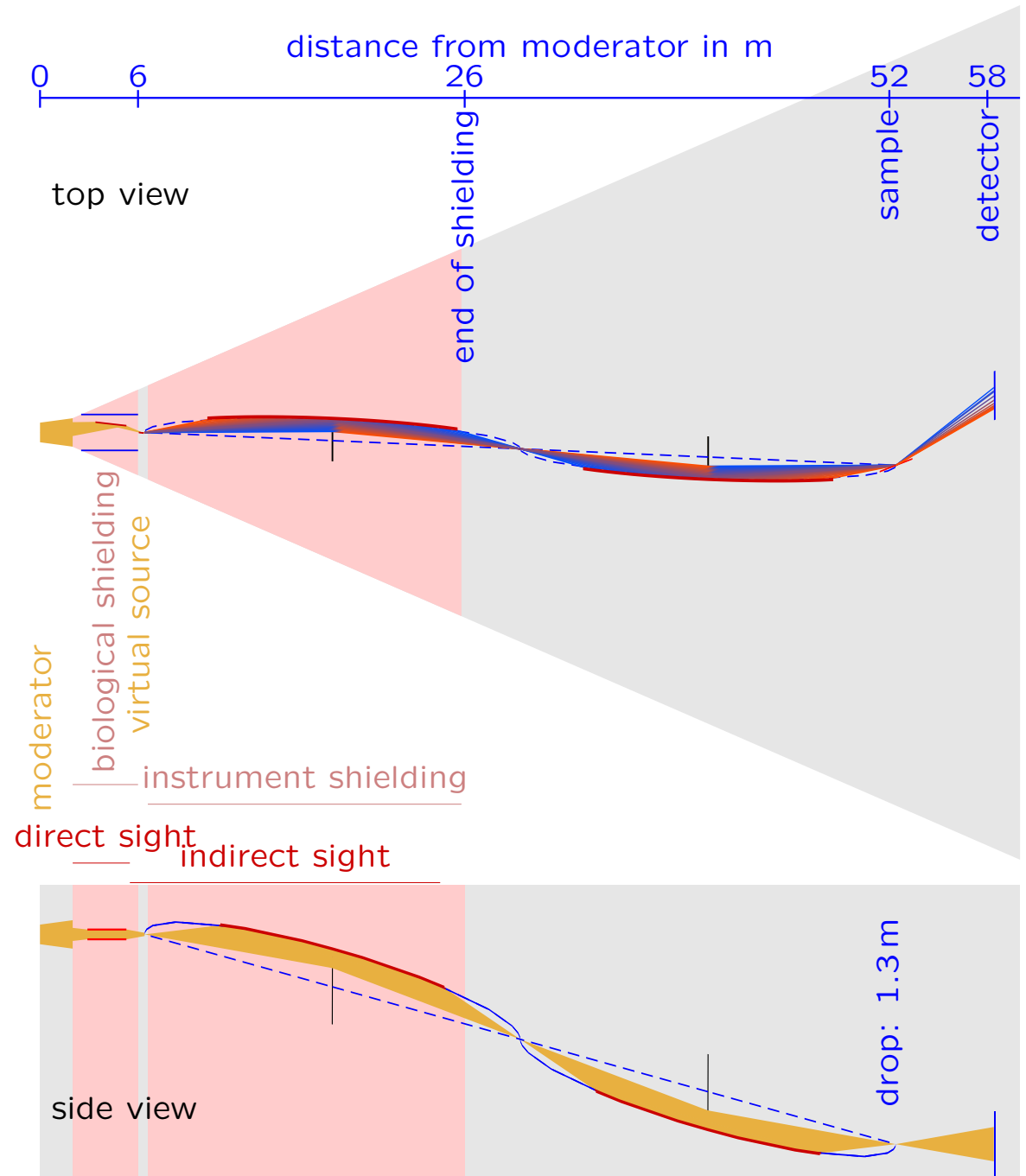
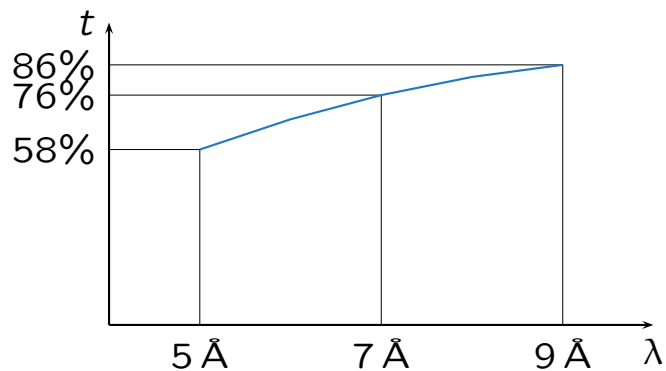
λ/θ encoding

ML-monochromator at 6.5 m

$$\Delta\theta_{xy} = 1^\circ$$

$$\Delta\theta_{xz} = 2^\circ$$

transmission:



focusing reflectometer

ESS *Selene*  small samples

effective maximum of $I(\lambda)$:

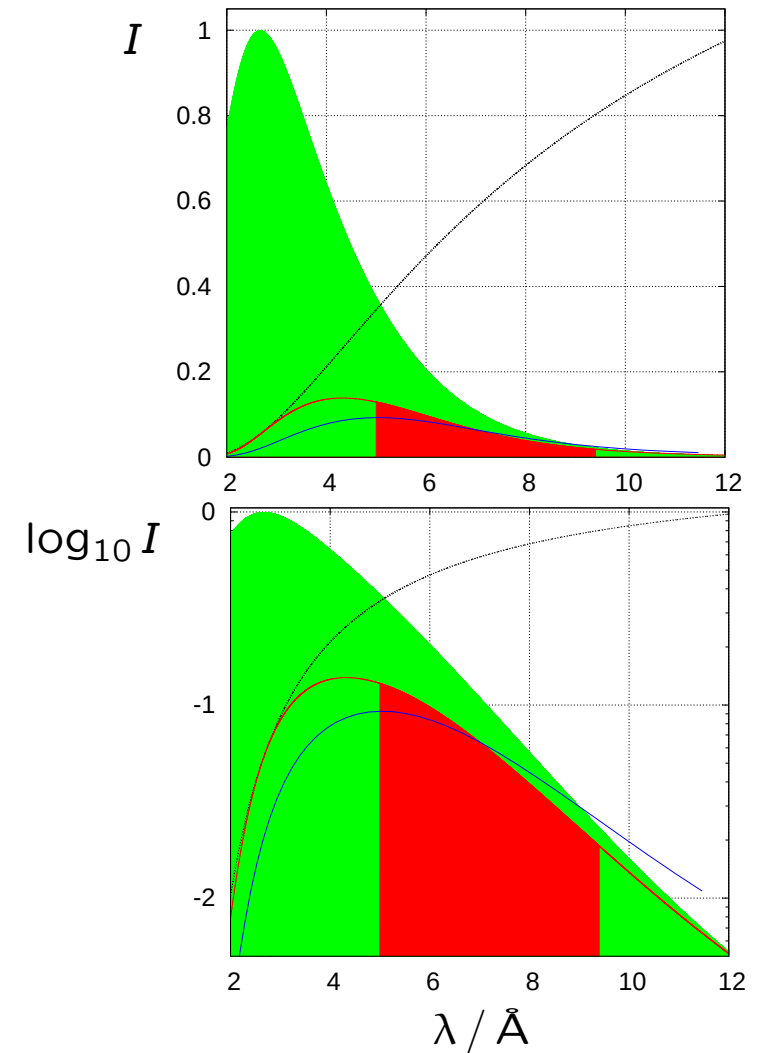
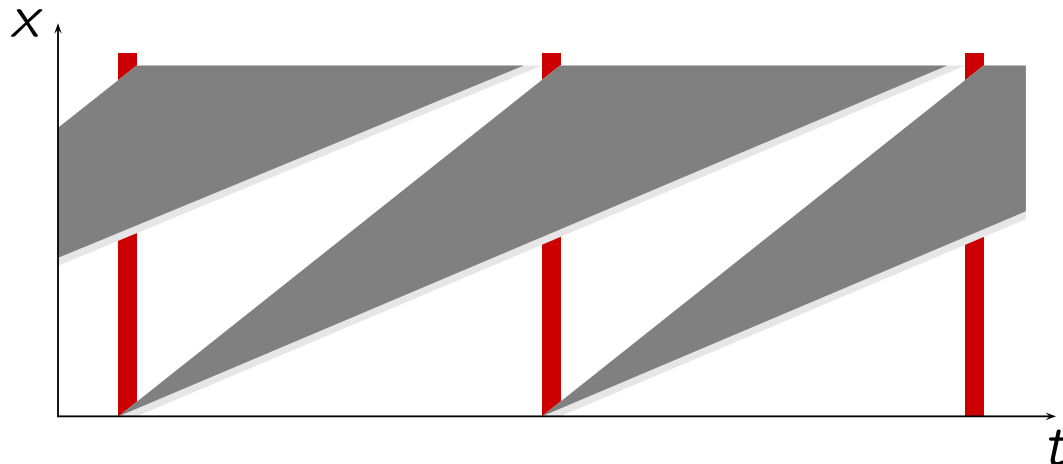
$$I(\lambda) \propto \underbrace{I_0(\lambda) \cdot \prod_i R_i(\lambda)}_{I_{\text{sample}}(\lambda)} \cdot \lambda, \quad \Delta\lambda/\lambda = \text{const}$$

$$\Rightarrow \lambda_{\min} = 5 \text{ \AA}$$

exclusion of γ and neutron burst:

$\Rightarrow$ instrument length: 58 m

$$\Rightarrow \lambda_{\max} = 9.4 \text{ \AA}$$



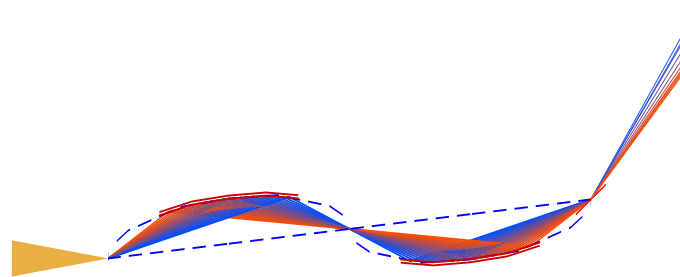
focusing reflectometer

ESS *Selene* 
small samples

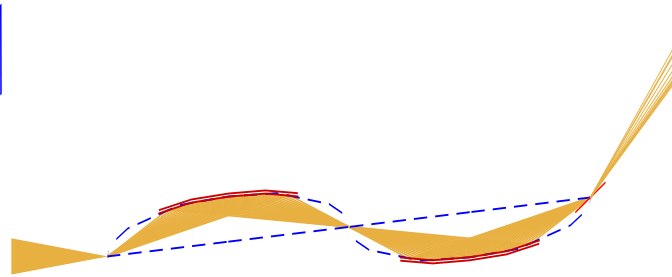
McStas simulations (T. Panzner)

sample: 1000 Å Ni on glass

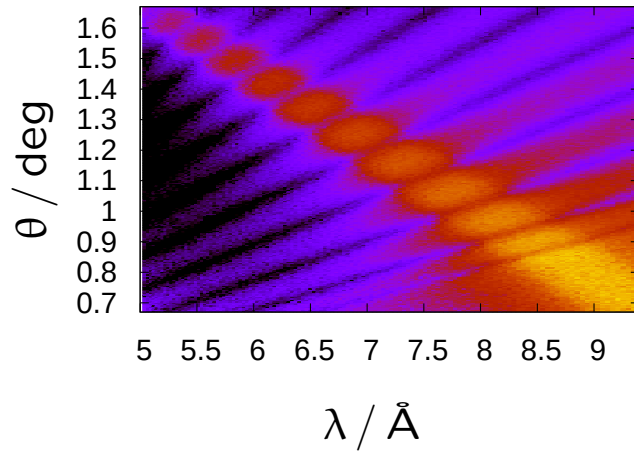
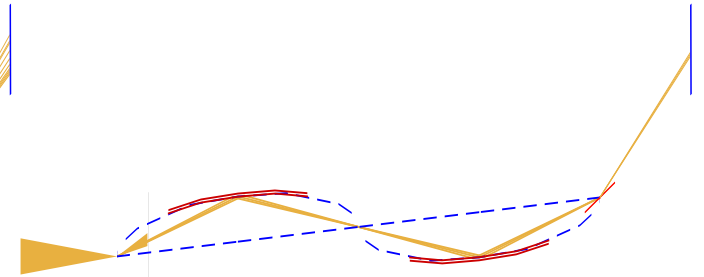
λ - θ encoding



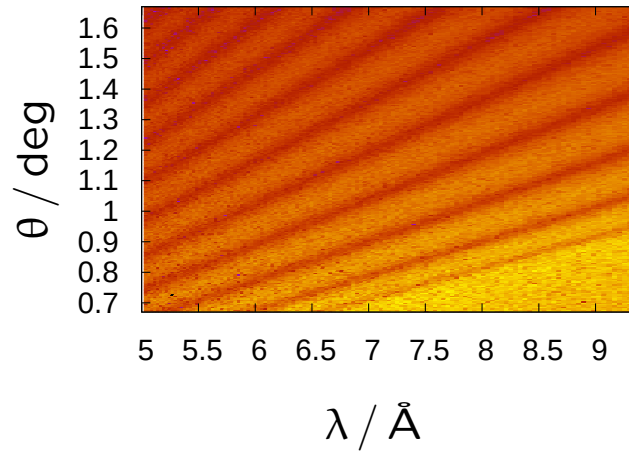
high-intensity
specular reflectivity



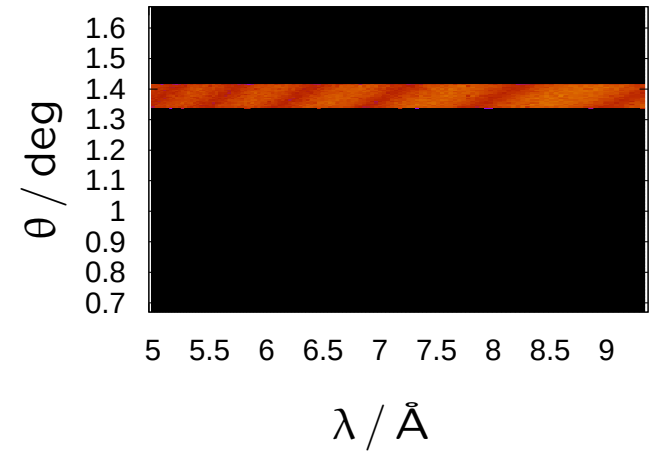
almost conventional
reflectivity



flux: $2.2 \cdot 10^5 \text{ cm}^{-2} \text{ s}^{-1}$



$1.3 \cdot 10^7 \text{ cm}^{-2} \text{ s}^{-1}$



$1.1 \cdot 10^6 \text{ cm}^{-2} \text{ s}^{-1}$

focusing reflectometer

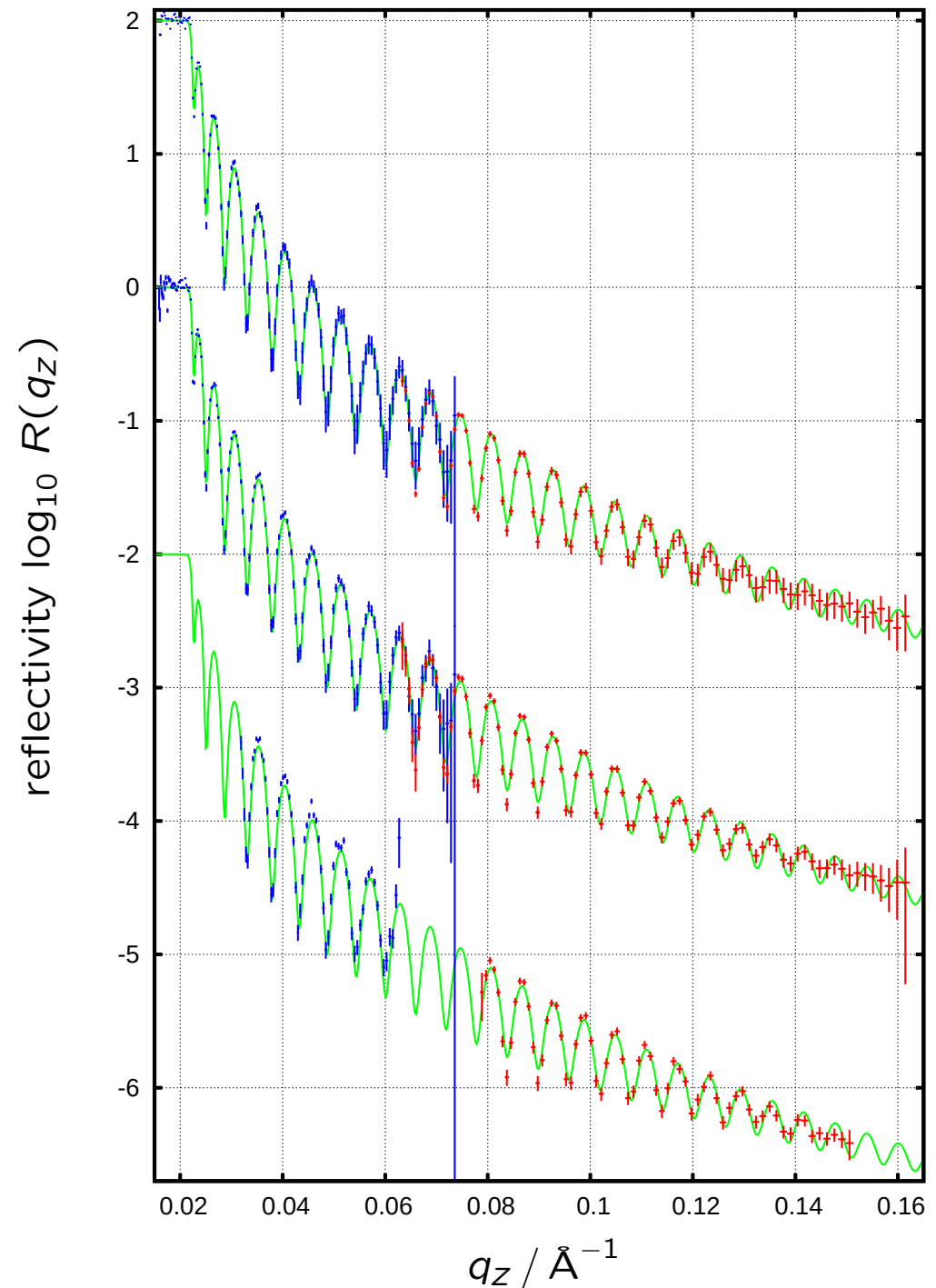
ESS *Selene* 
small samples

sample: 1000 Å Ni on glass

McStas simulations

(T. Panzner)

mode	ω	t/s
encoding	2°	60
	4°	900
high intensity	2°	1
	4°	10
conventional	2°	10
	4°	100



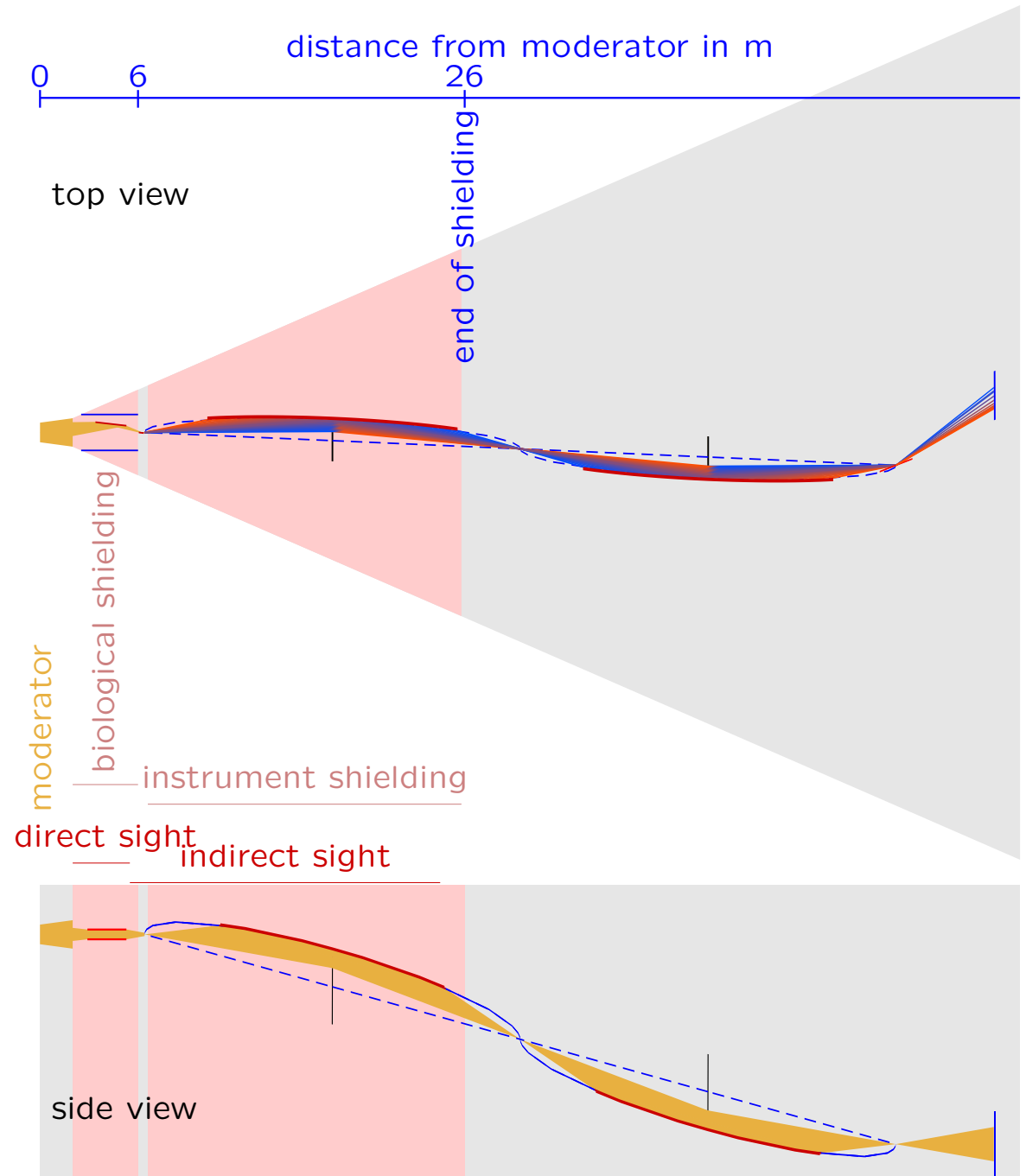
focusing reflectometer

ESS *Selene* 
small samples

one Selene guide section

problem:

shielding might be too weak!



focusing reflectometer

ESS *Selene* 
small samples

two Selene guide sections

λ/θ encoding

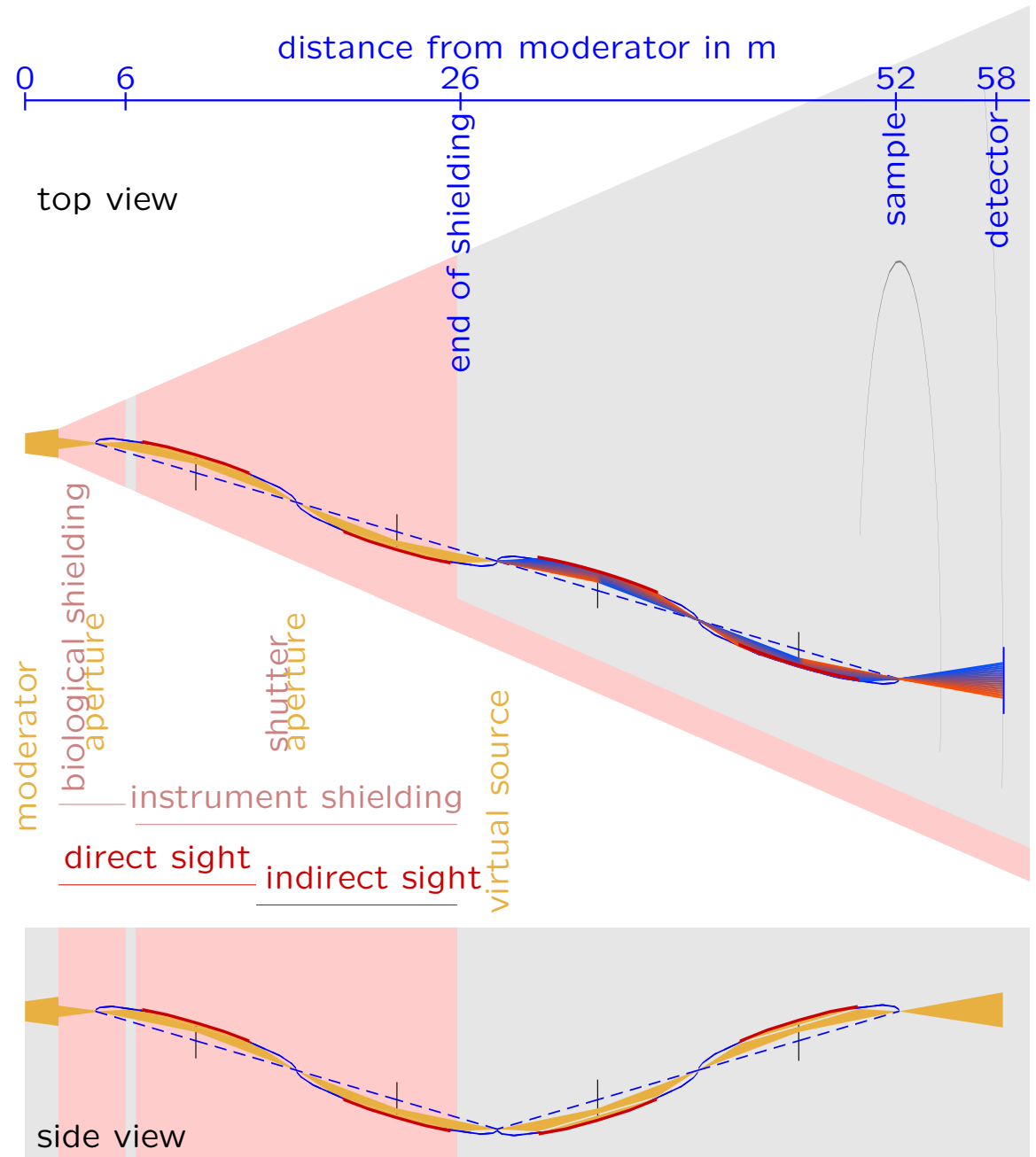
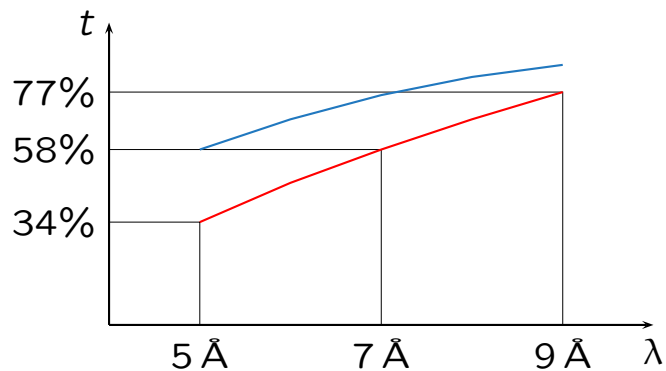
ML-monochromator at $x = 28$ m

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

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

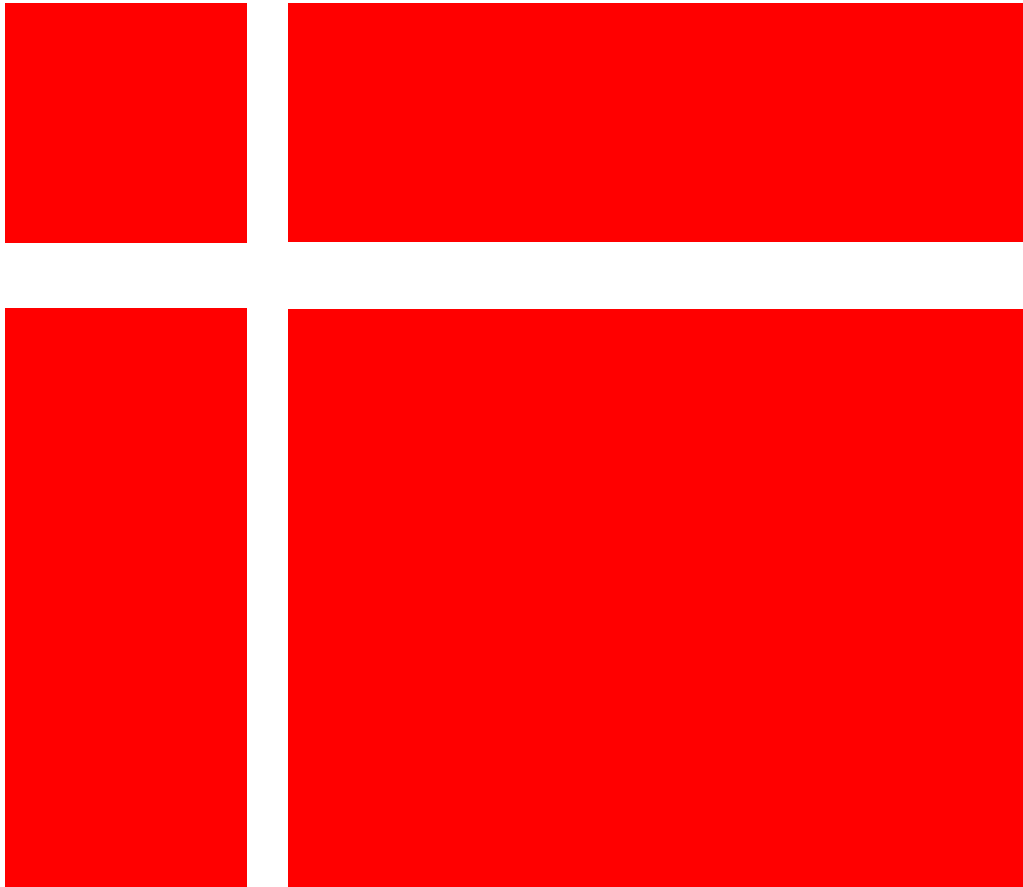
problem:

lower transmission



shielding

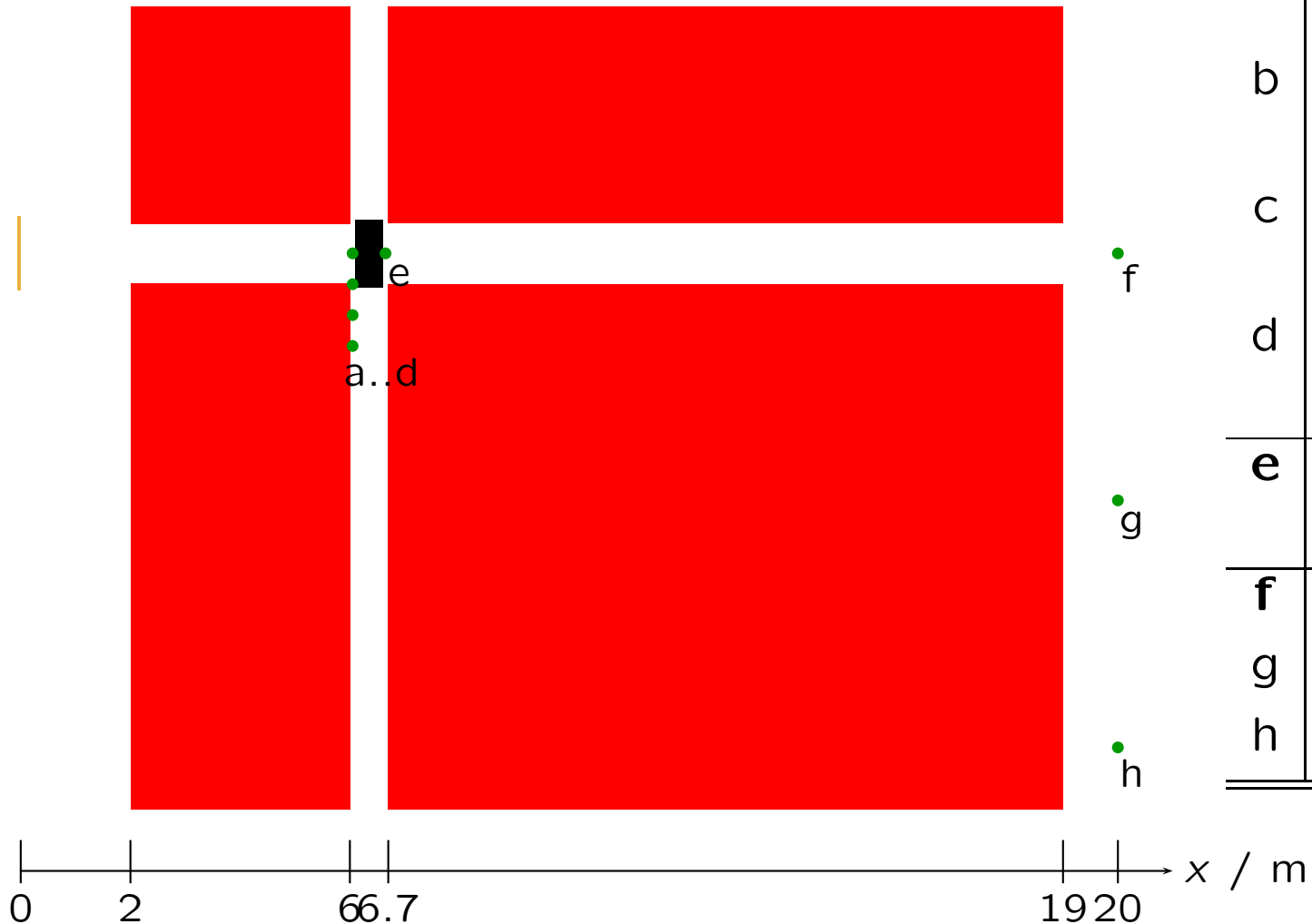
MCNPX calculations by Uwe Filges
using a simple model:



shielding

material: steel

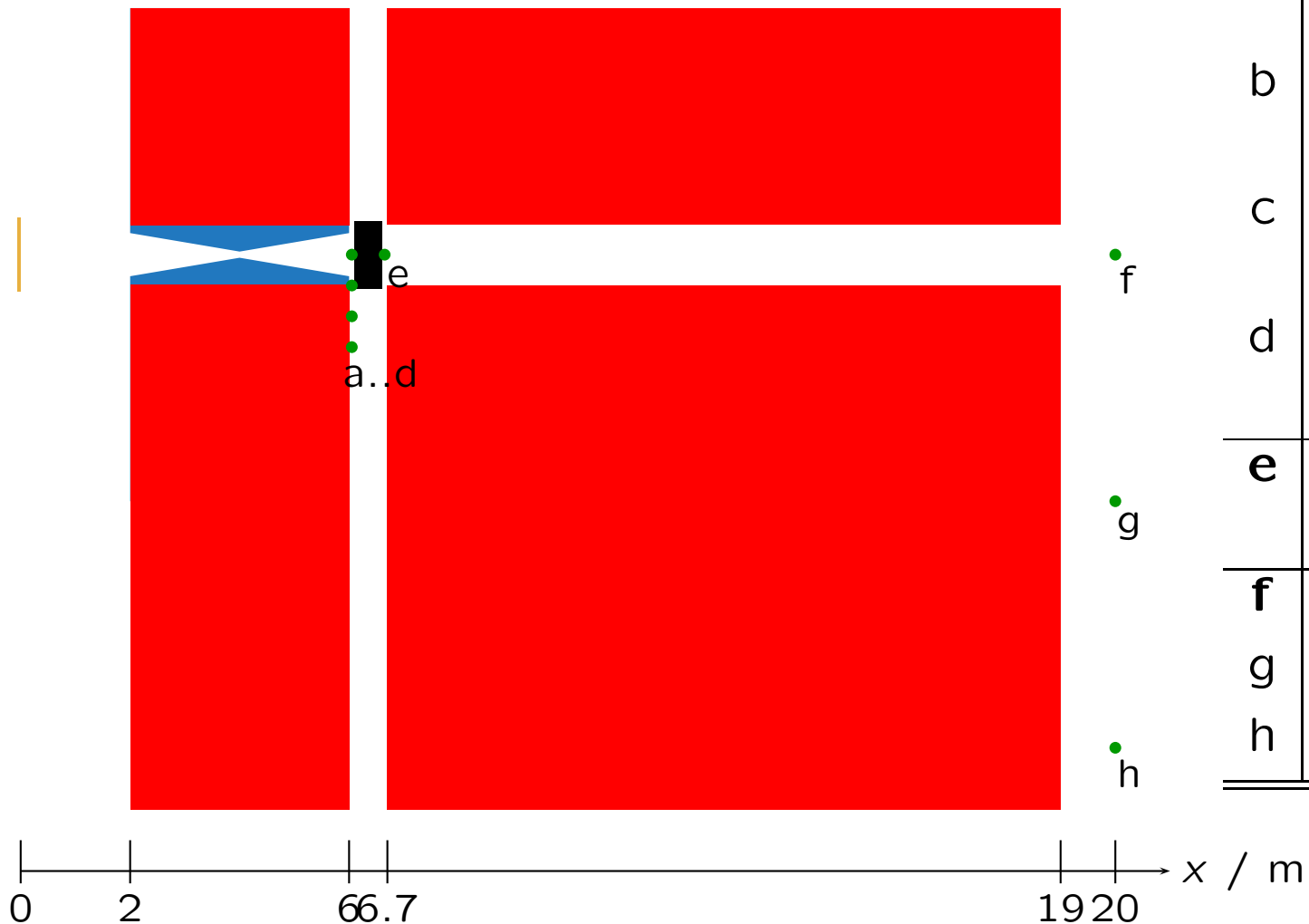
guide: $95 \times 95 \text{ mm}^2$ & $100 \times 100 \text{ mm}^2$



	γ Sv/h	n Sv/h	n-flux $1/\text{cm}^2 \text{ s}$
a	5e+1	8e+3	2e+10
b	3e+1	4e+3	1e+10
c	1e+1	3e+2	6e+8
d	6e+0	2e+2	3e+8
e	8e-2	3e+1	3e+7
f	2e-7	1e-1	5e+5
g	1e-7	3e-4	1e+4
h	2e-7	4e-4	2e+4

shielding

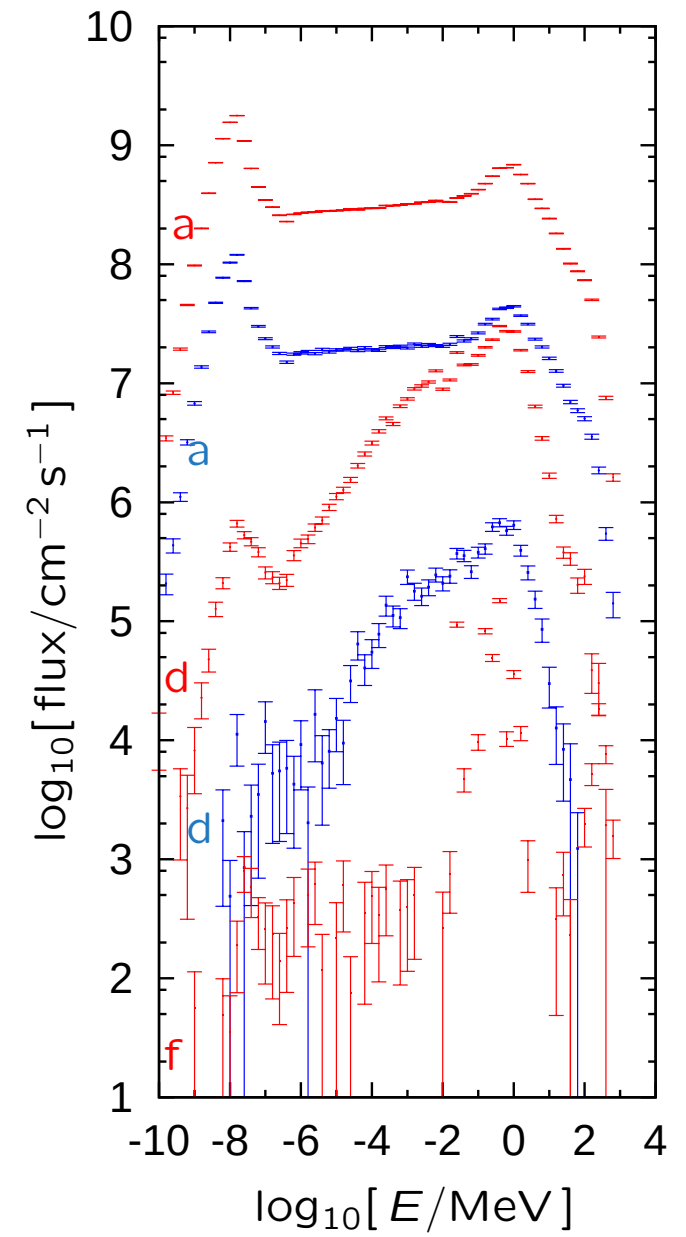
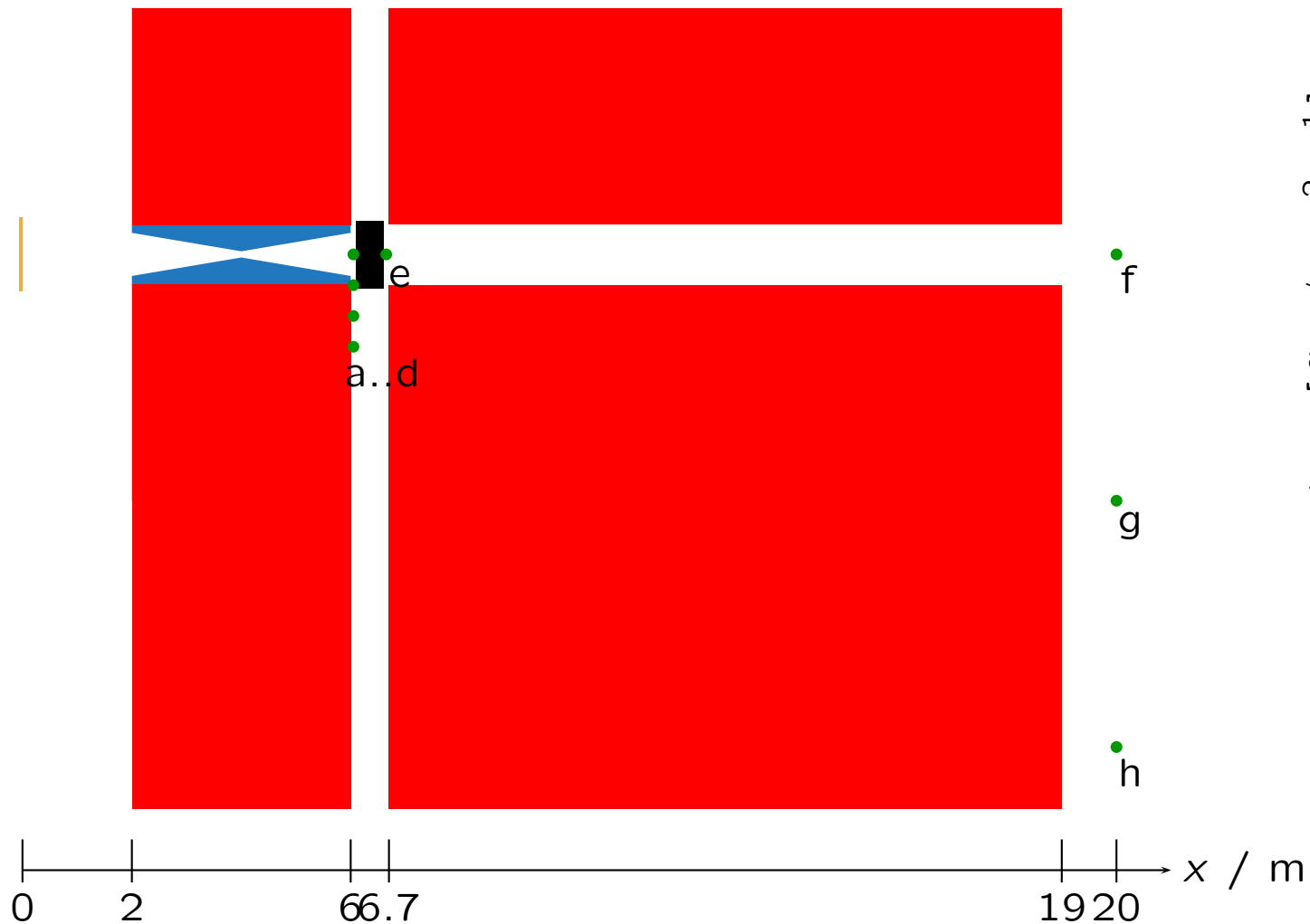
pin-hole of $1 \times 1 \text{ cm}^2$ at 4 m



	γ Sv/h	n Sv/h	n-flux $1/\text{cm}^2 \text{ s}$
a	5e+1 2e+0	8e+3 5e+2	2e+10 1e+9
b	3e+1 6e-1	4e+3 4e+1	1e+10 9e+7
c	1e+1 2e-1	3e+2 7e+0	6e+8 1e+7
d	6e+0 1e-1	2e+2 5e+0	3e+8 7e+6
e	8e-2 1e-3	3e+1 2e+0	3e+7 2e+6
f	2e-7	1e-1	5e+5
g	1e-7	3e-4	1e+4
h	2e-7	4e-4	2e+4

shielding

flux spectra at selected points



shielding

proposed guide shielding for *Selene* guide

