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Tobias Panzner

Uwe Filges

ESS

Selene guide concept

recent developments

- ## focusing reflectometer

MCNPX calculations

- ## extraction & guide shielding

Selene

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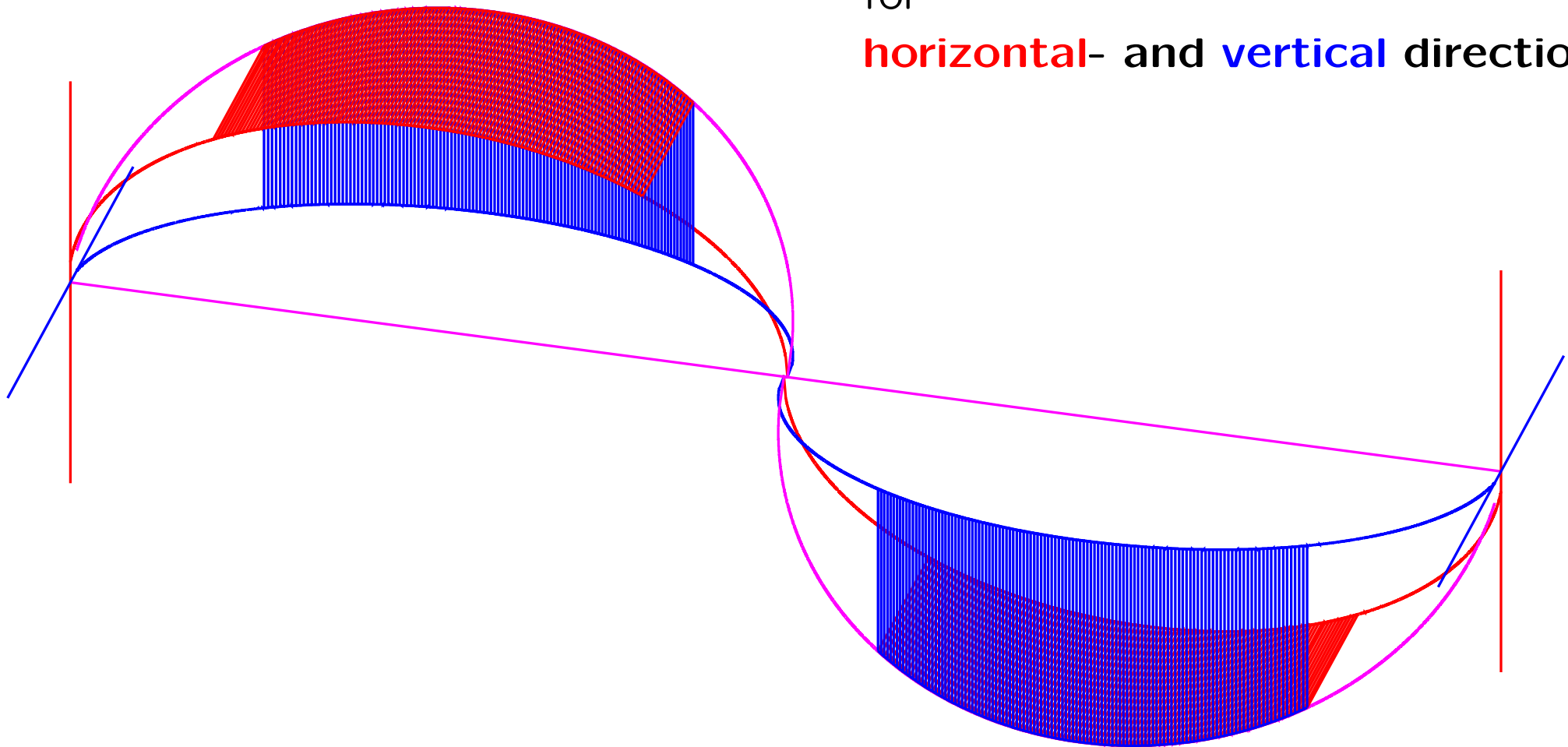
27.–28. 11. 2012, Lund, Sweden

Selene guide: principle

point-to-point focusing

with

2 subsequent elliptical reflectors

for

horizontal- and vertical direction

focusing reflectometer

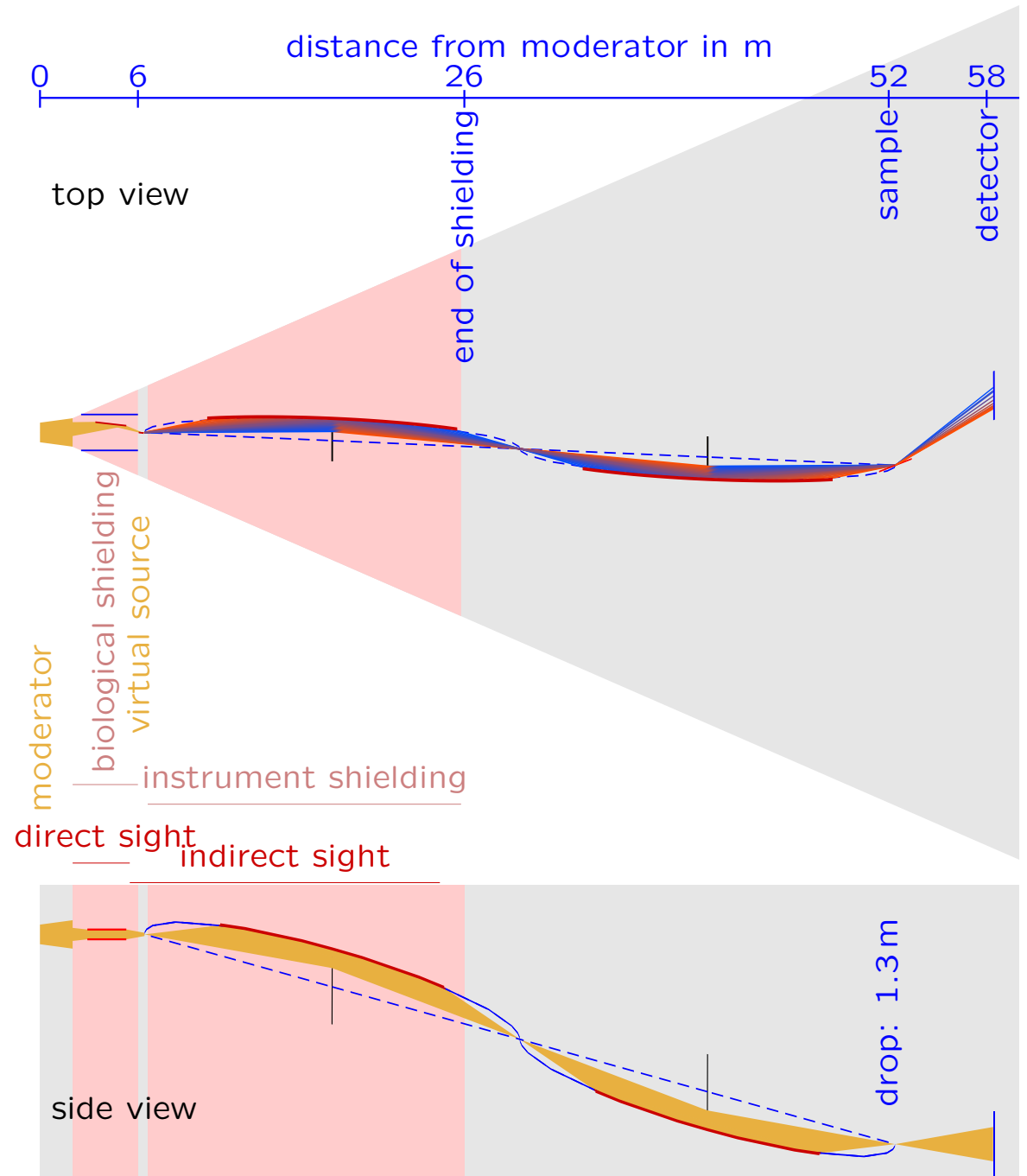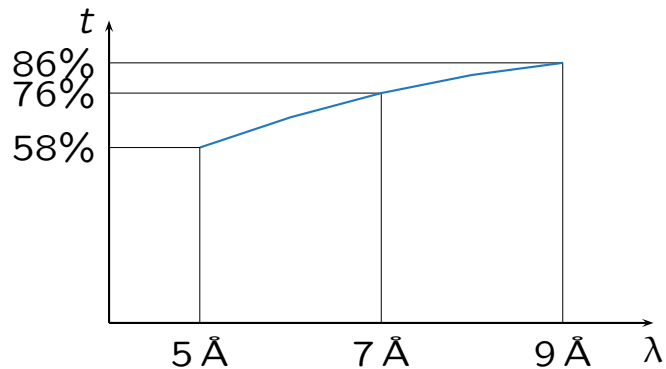**ESS***Selene* **small samples**

one Selene guide section

λ/θ encoding

ML-monochromator at 6.5 m

$\Delta\theta_{xy} = 1°$

$\Delta\theta_{xz} = 2°$

transmission:

distance from moderator in m

0   6   26   52   58

top view

sample

detector

end of shielding

moderator

biological shielding

virtual source

instrument shielding

direct sight

indirect sight

side view

drop: 1.3 m

t

86%
76%
58%

5 Å   7 Å   9 Å λ

focusing reflectometer

ESS *Selene* **small samples**

effective maximum of $I(\lambda)$:

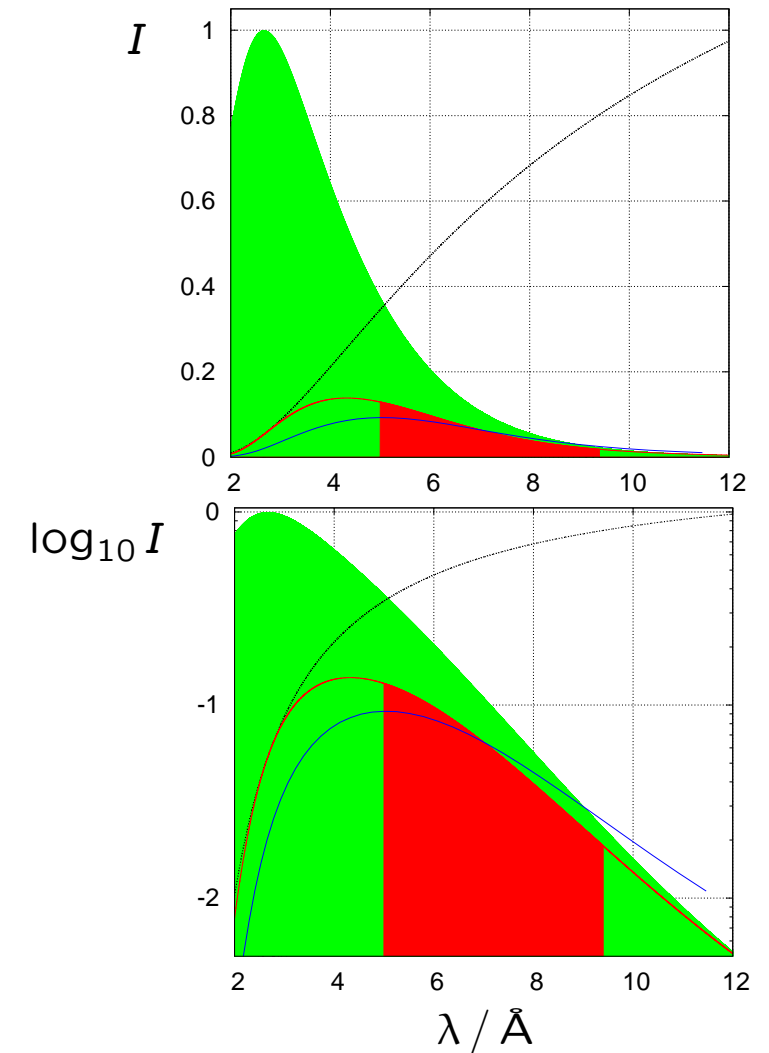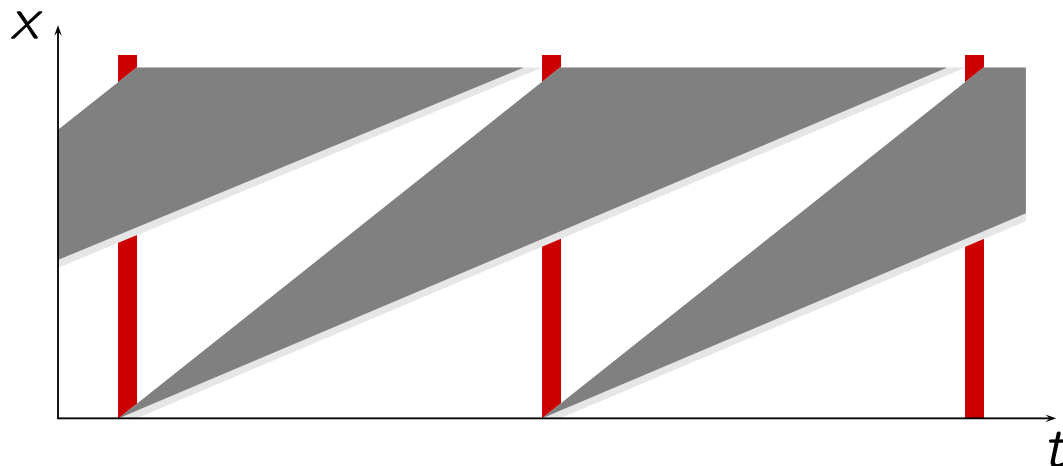$$\underbrace{I(\lambda) \propto I_0(\lambda) \cdot \prod_i R_i(\lambda)}_{I_{\text{sample}}(\lambda)} \cdot \lambda \quad , \Delta\lambda/\lambda = \text{const}$$

$$\Rightarrow \lambda_{\text{min}} = 5\,\text{Å}$$

exclusion of γ and neutron burst:

$\Rightarrow$ instrument length: 58 m
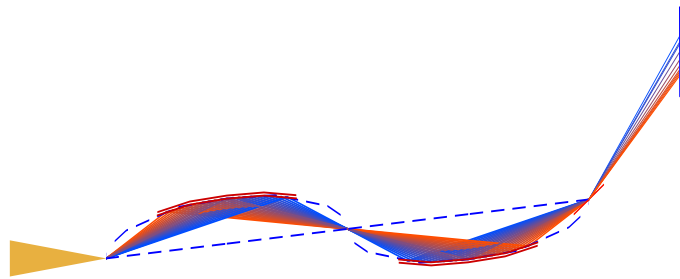
$\Rightarrow \lambda_{\text{max}} = 9.4\,\text{Å}$

focusing reflectometer
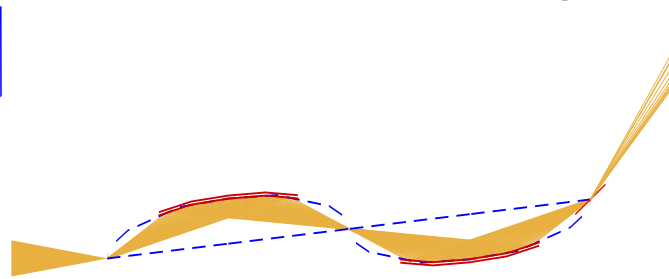
ESS *Selene* **small samples**

McStas simulations (T. Panzner)
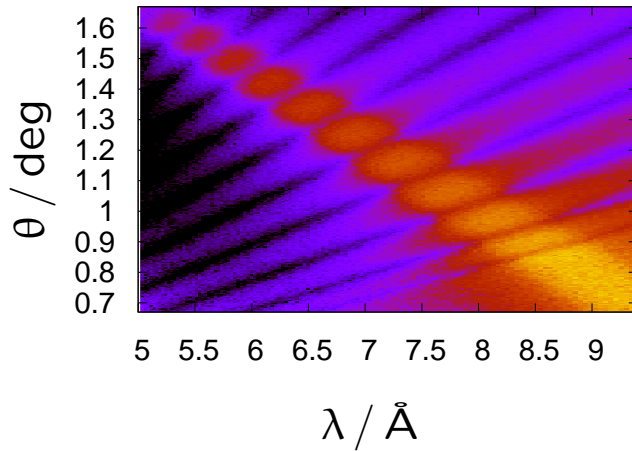
sample: 1000 Å Ni on glass
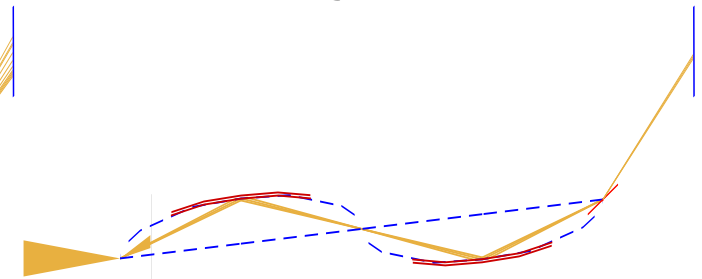

λ-θ encoding
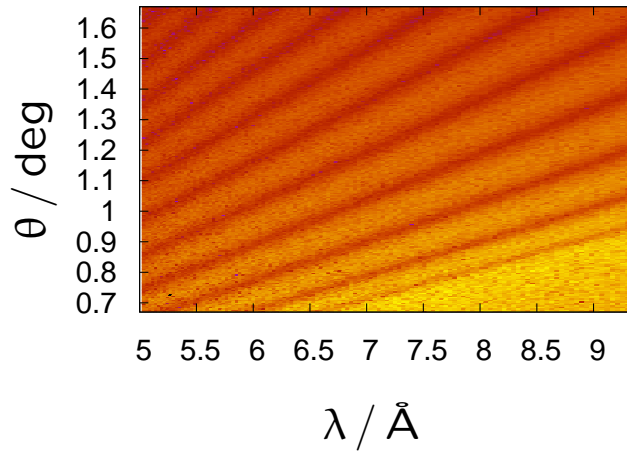
high-intensity
specular reflectivity

almost conventional
reflectivity

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

$1.3 \cdot 10^7$ cm^{-2}s^{-1}
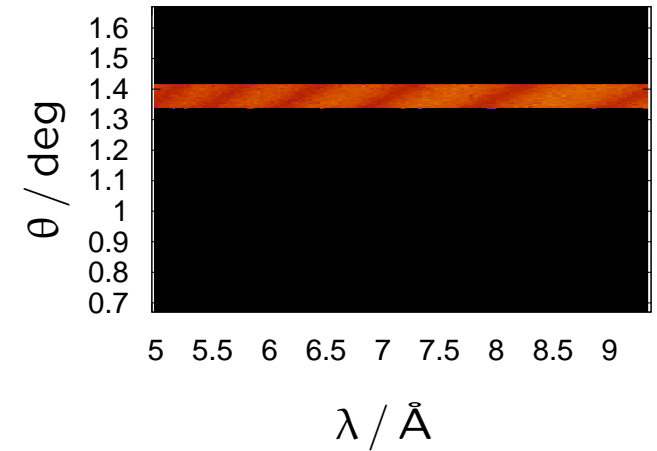
$1.1 \cdot 10^6$ cm^{-2}s^{-1}

focusing reflectometer

ESS *Selene* **small samples**

sample: 1000 Å Ni on glass

McStas simulations

(T. Panzner)

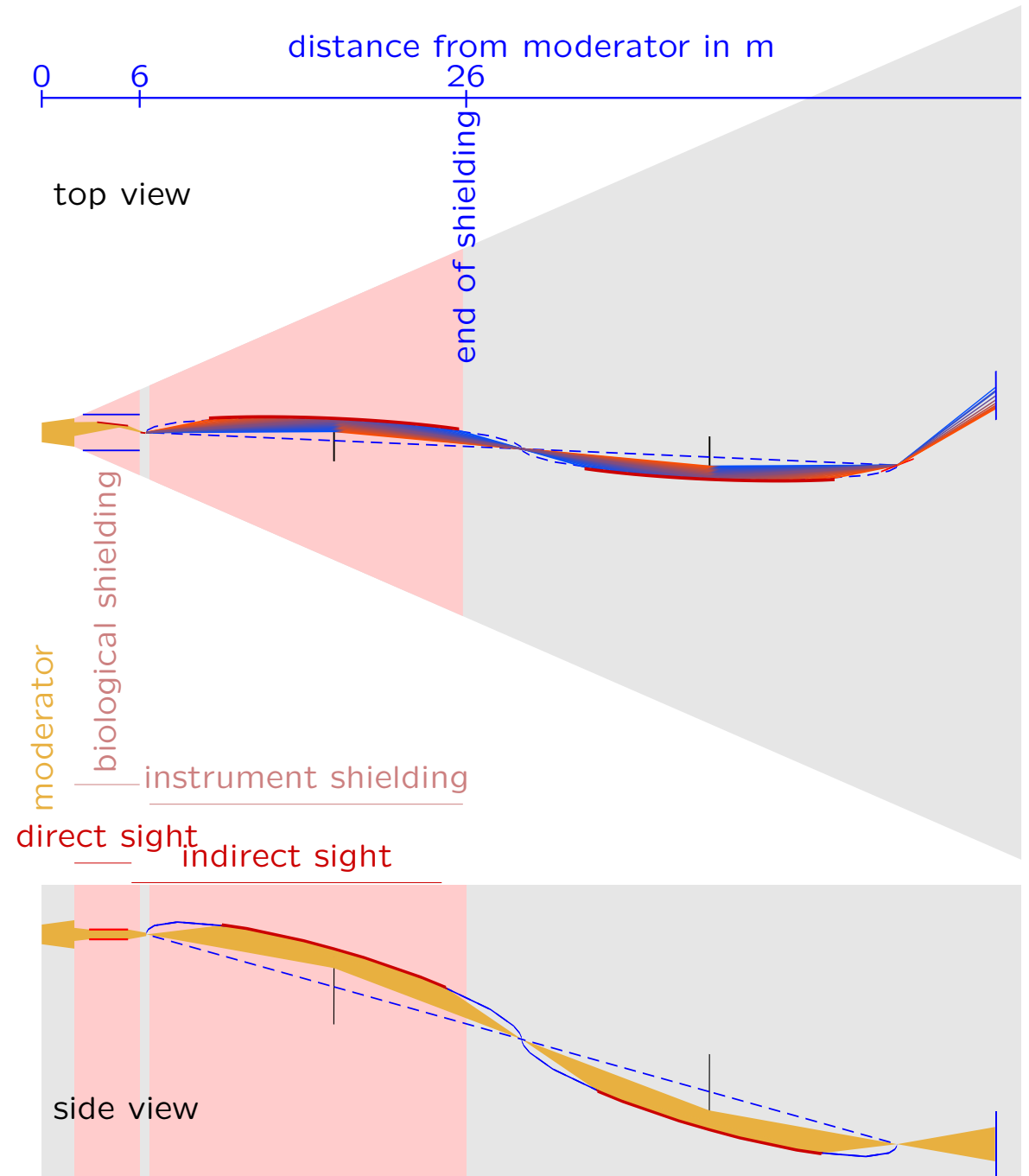| mode	ω	t/s
encoding	2°	60
	4°	900
high intensity	2°	**1**
	4°	10
conventional	2°	10
	4°	100
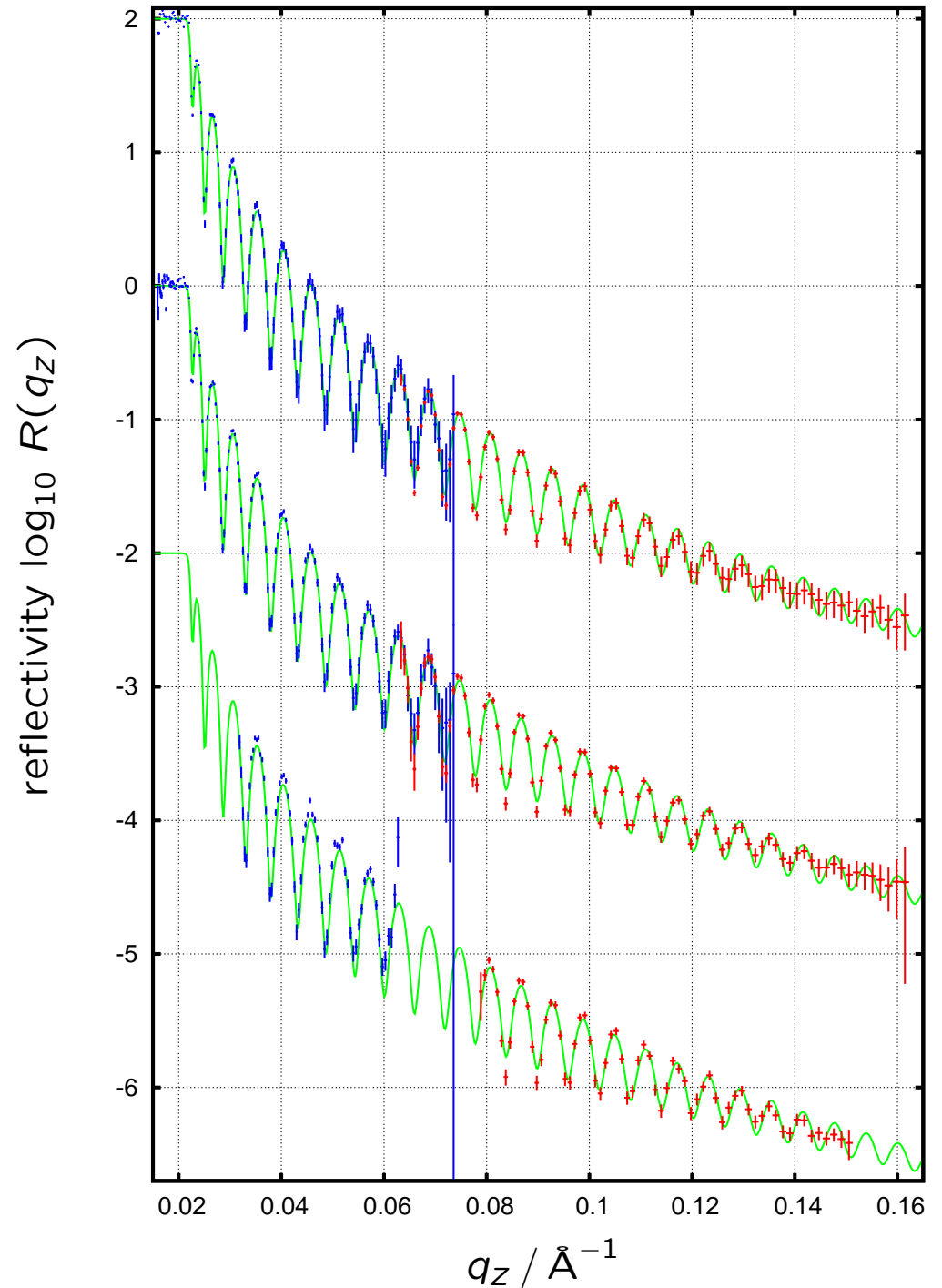
focusing reflectometer

ESS*Selene* **small samples**

one Selene guide section

problem:

shielding might be too weak!

distance from moderator in m

0   6   26

end of shielding

top view

moderator

biological shielding

instrument shielding

direct sight

indirect sight

side view

focusing reflectometer

ESS*Selene* small samples

two Selene guide sections

λ/θ encoding

ML-monochromator at $x = 28\,\text{m}$

$\Delta\theta_{xy} = 1.5°$
$\Delta\theta_{xz} = 1.5°$

problem:
lower transmission

distance from moderator in m

top view

end of shielding

sample

detector

moderator

biological shielding
aperture

shutter
aperture

virtual source

instrument shielding

direct sight   indirect sight

side view

t

77%

58%

34%

5 Å   7 Å   9 Å λ
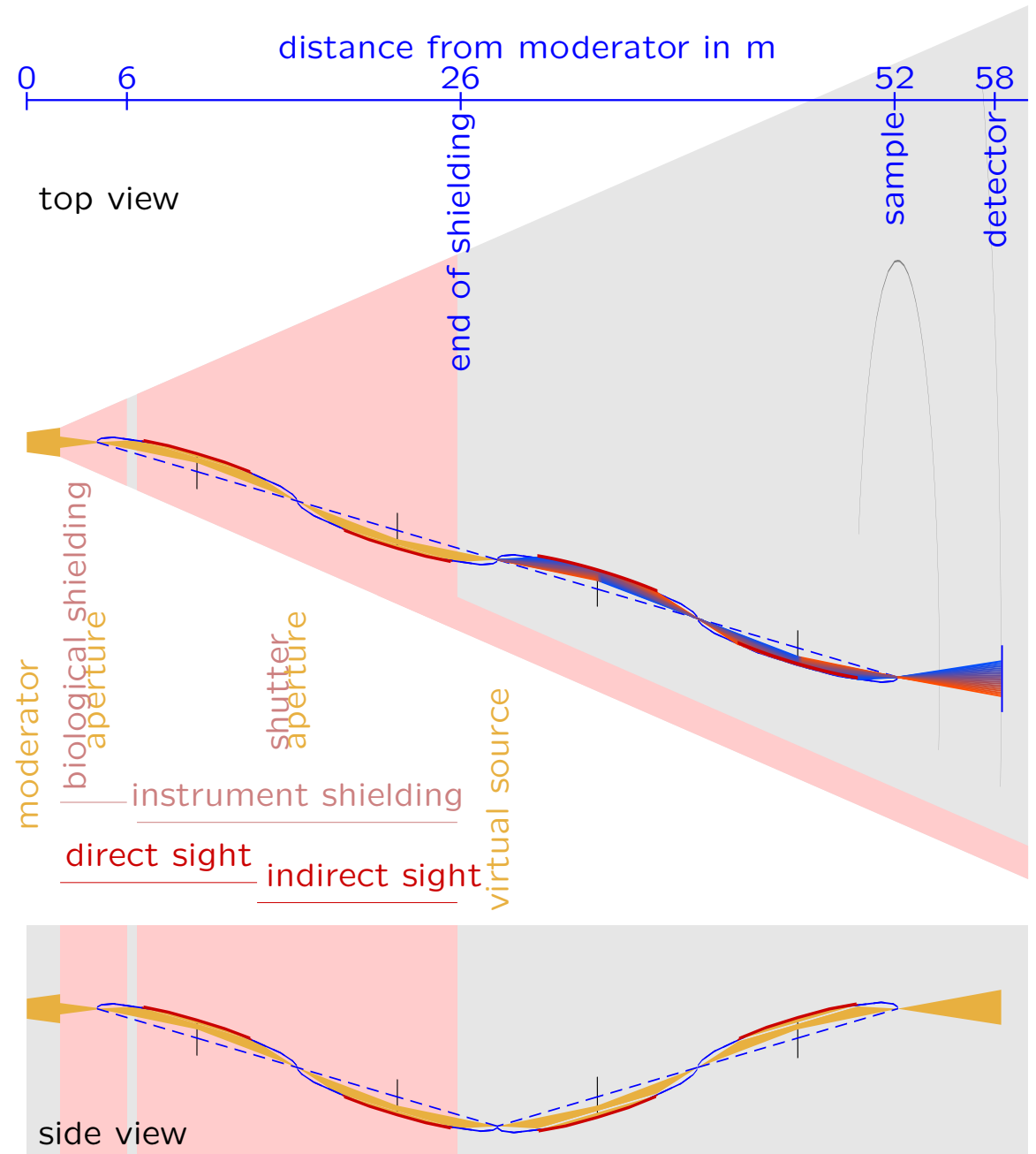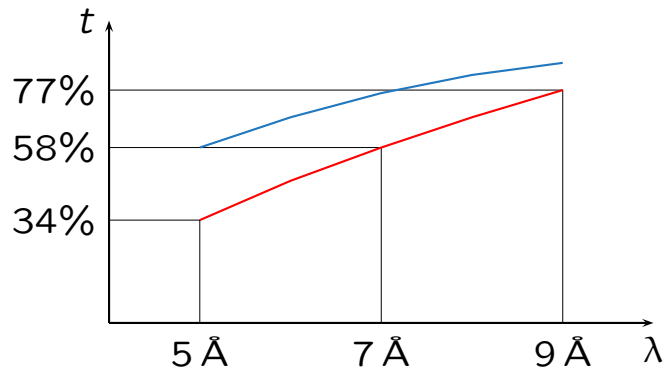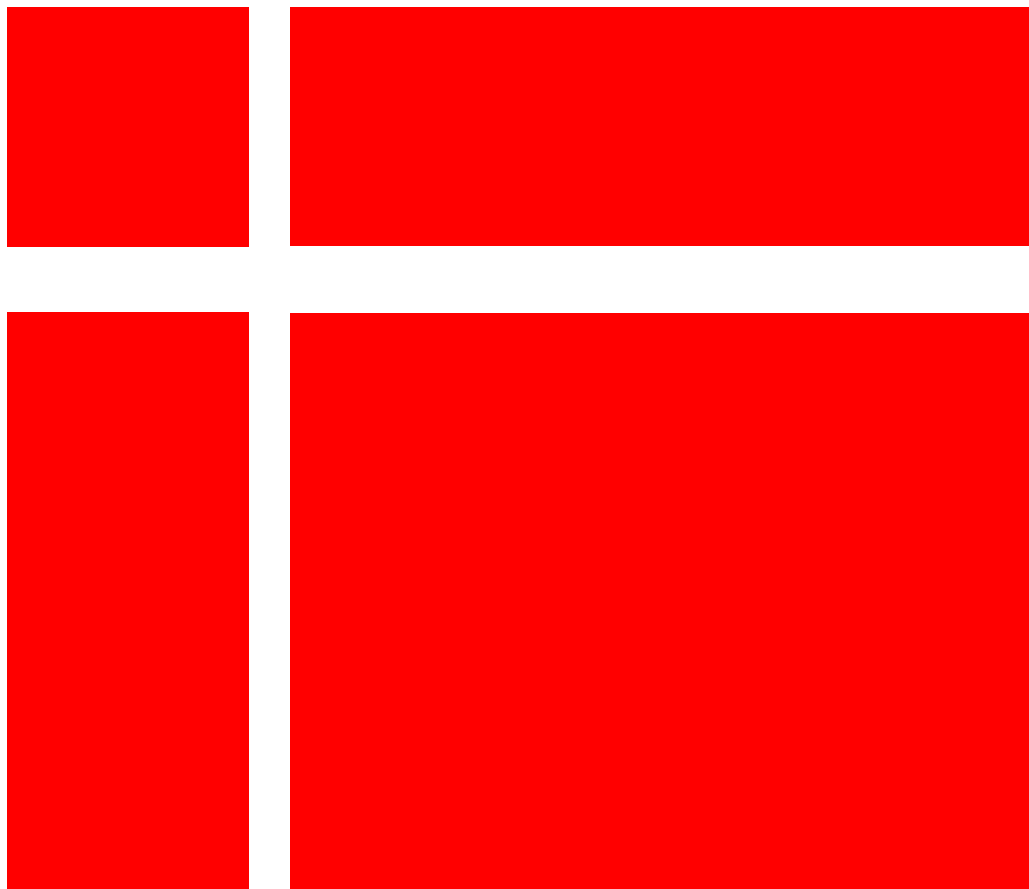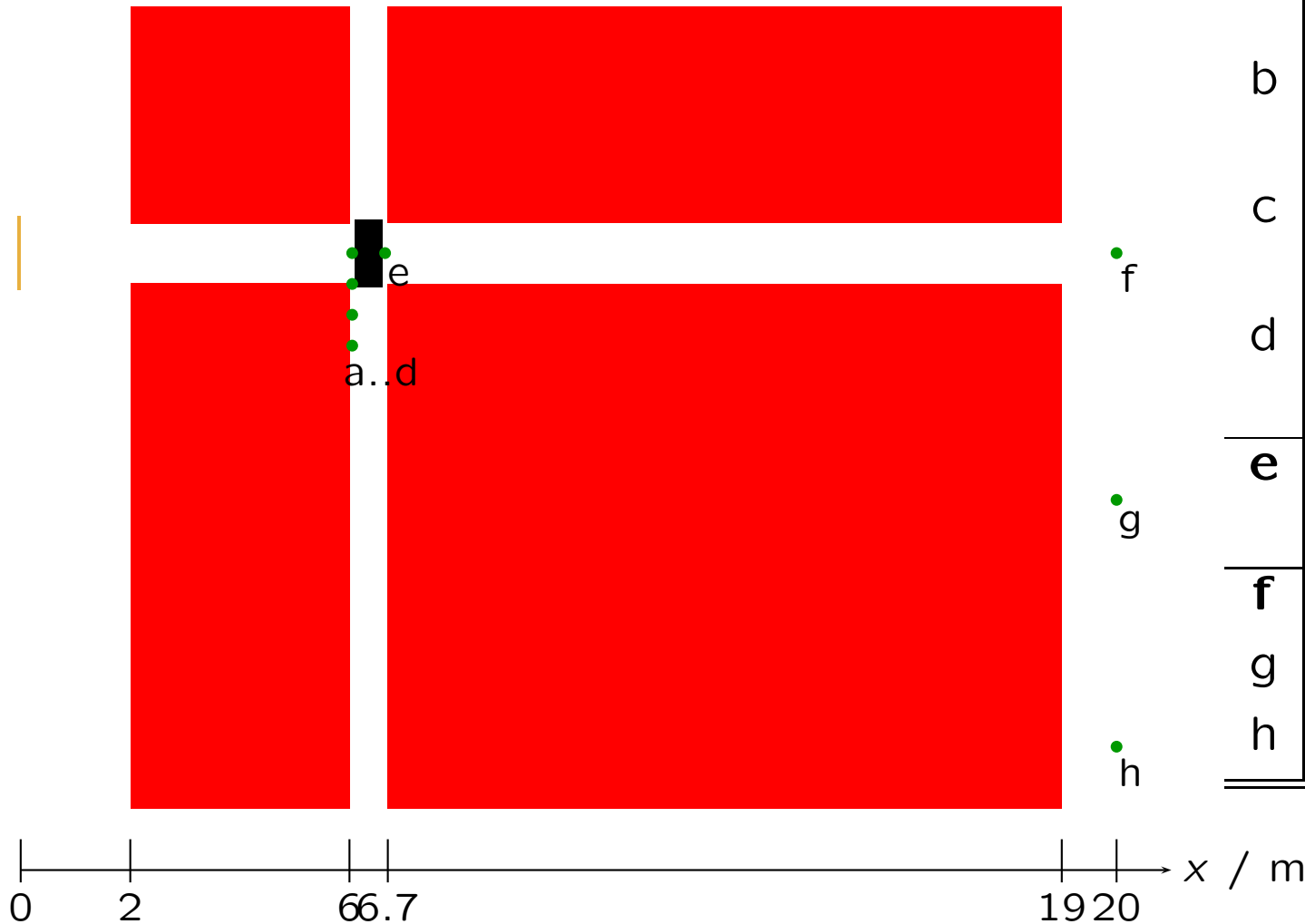
shielding

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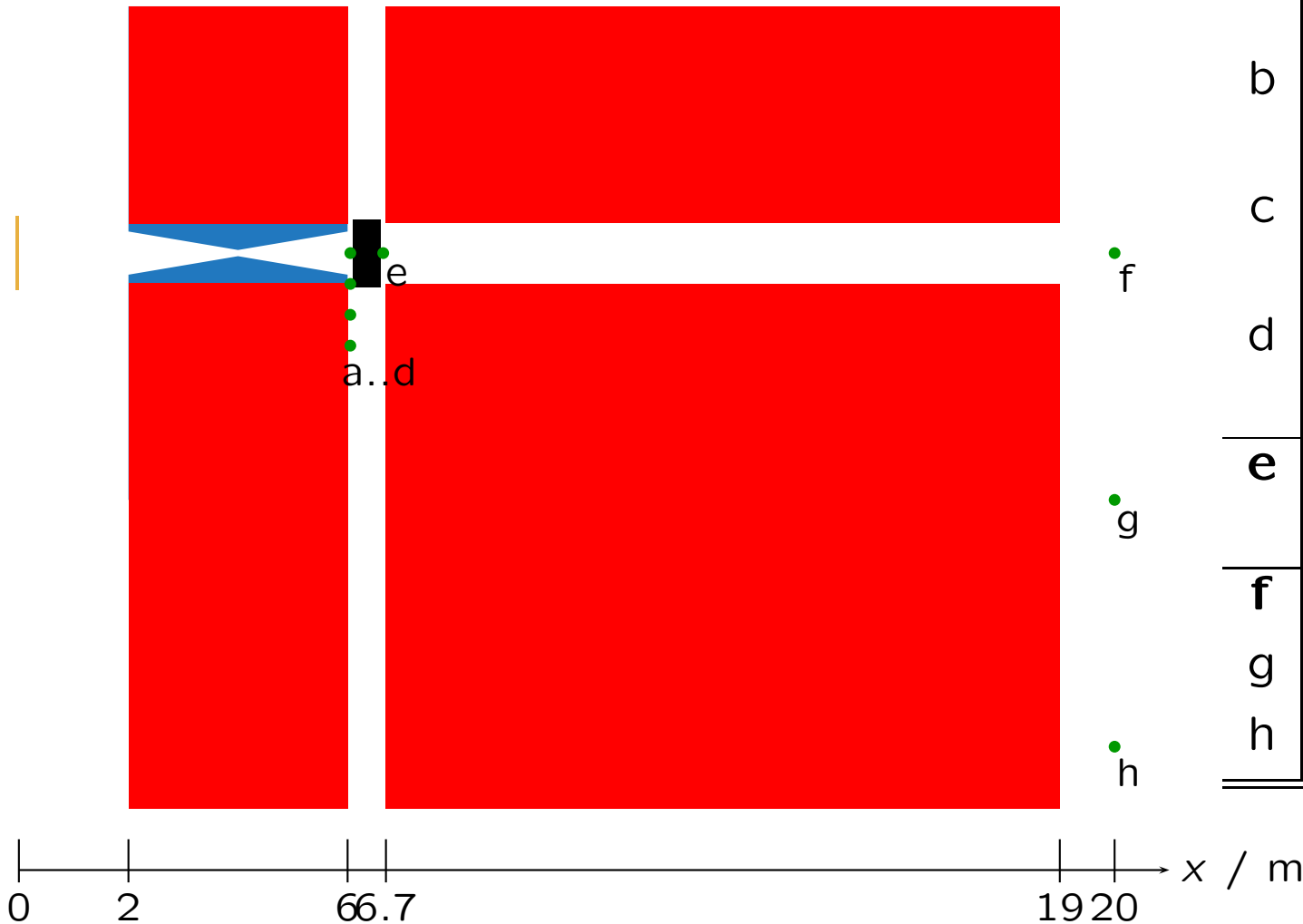
	γ Sv/h	n Sv/h	n-flux $1/\mathrm{cm}^2\,\mathrm{s}$
a	5e+1	8e+3	2e+10
	2e+0	5e+2	1e+9
b	3e+1	4e+3	1e+10
	6e-1	4e+1	9e+7
c	1e+1	3e+2	6e+8
	2e-1	7e+0	1e+7
d	6e+0	2e+2	3e+8
	1e-1	5e+0	7e+6
e	8e-2	3e+1	3e+7
	1e-3	2e+0	2e+6
f	2e-7	1e-1	5e+5
g	1e-7	3e-4	1e+4
h	2e-7	4e-4	2e+4

shielding

flux spectra at selected points
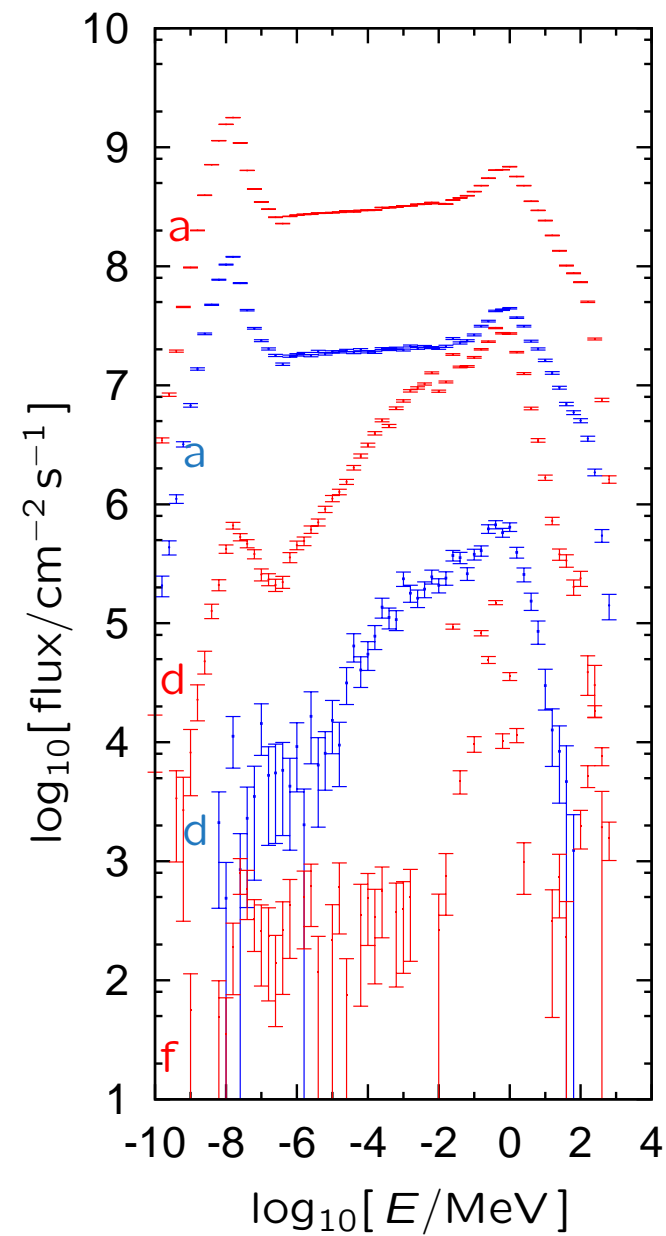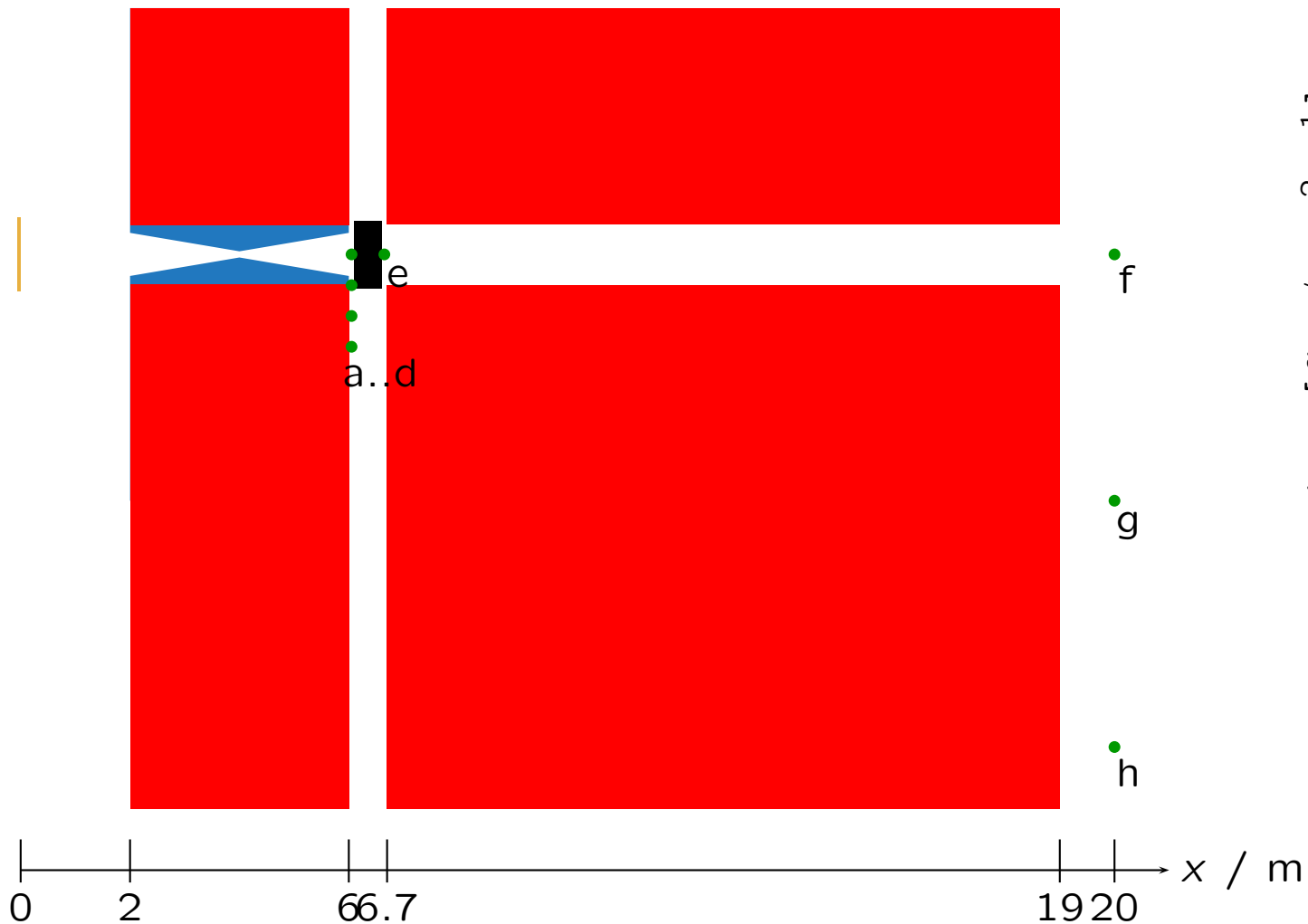
shielding

proposed guide shielding for *Selene* guide