Reflectometry
Proposal Review Meeting
Lund, 15. 01. 2014

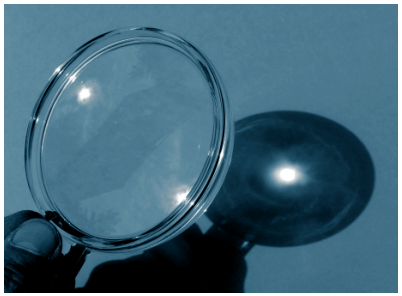
Estia, Εστία

a

focusing reflectometer for small samples

based on the

Selene guide concept



J. Stahn

main critics

"The STAP will not be able to justify an instrument that can only investigate hard condensed matter samples to the SAC."

"information on the Q-resolution and Qmax required to address the scientific case"

"justification needs to be given why the proposers have chosen to go for a double rather than a single Selene system."

importance of the fast movement of the slit

challenges of guide alignment and accuracy

comparison to an existing instrument

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design criteria

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Εστία is optimised for small samples
— most of which are hard matter nowadays

Εστία will deliver brilliant results also for large samples,
or samples with intrinsic background

Εστία = *Selene*-guide + reflectometer
is a concept which can be adapted to a science case

the SAP has the expertise to define a science case
(especially for "a very fast moving area of science.")

design criteria

STAP	very general (complement to the vertical instrument)	
		small samples
		polarisation
		higher resolution
	take care for background	
		double *Selene* guide
	avoid prompt pulse	
		length
		λ-range
ESS	shielding, source, distances	
		length
		pin-hole
		double *Selene* guide
me	science case, operation modes	
		small footprint
		wide divergence

instrument

Εστία

is a

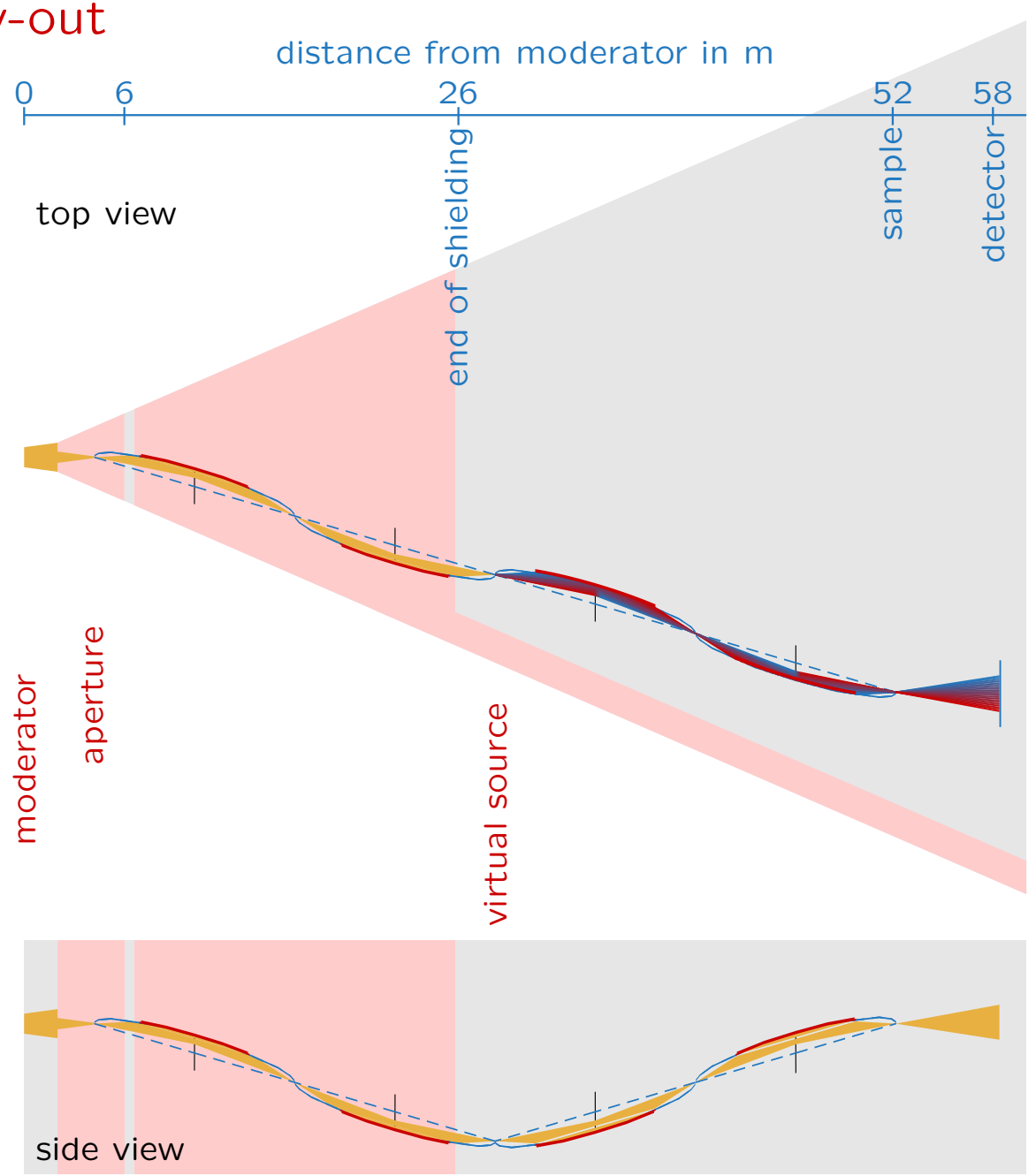
TOF reflectometer

with

- horizontal scattering plane
- max footprint $10 \times 50\,\mathrm{mm}^2$
- intrinsic resolution 2 to 4%
- various options

not all options can be used for all kinds of experiments

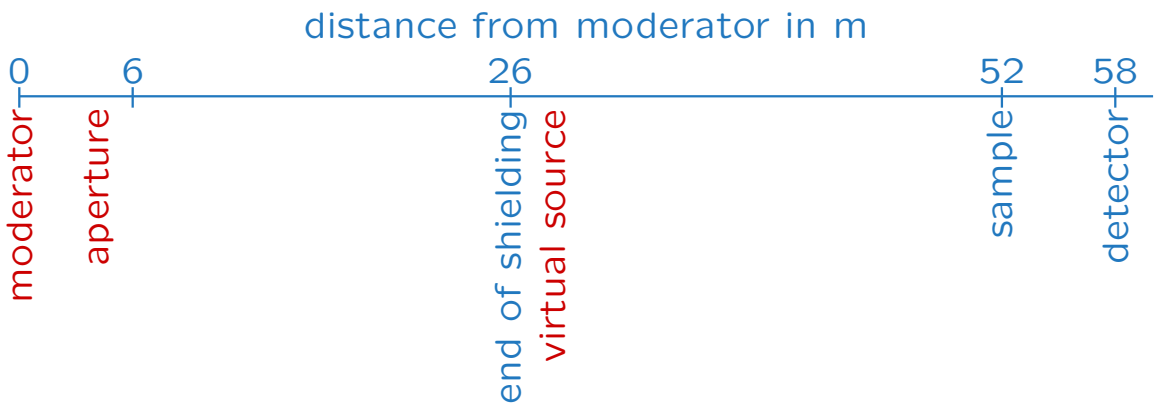
lay-out



guide accuracy - options

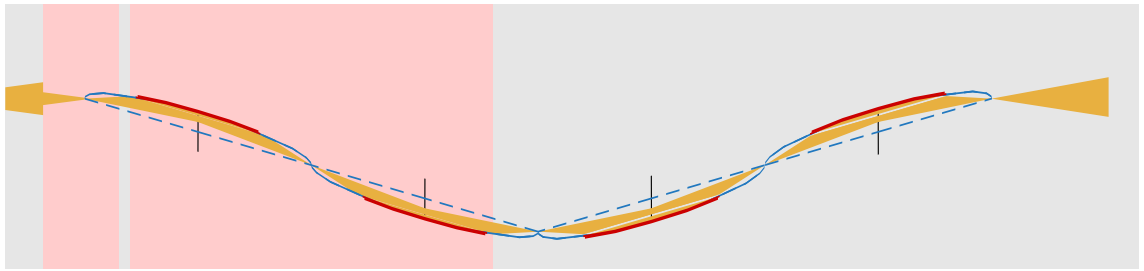
frame of reference:

- pin-hole in the extraction unit
- 1st guide segment



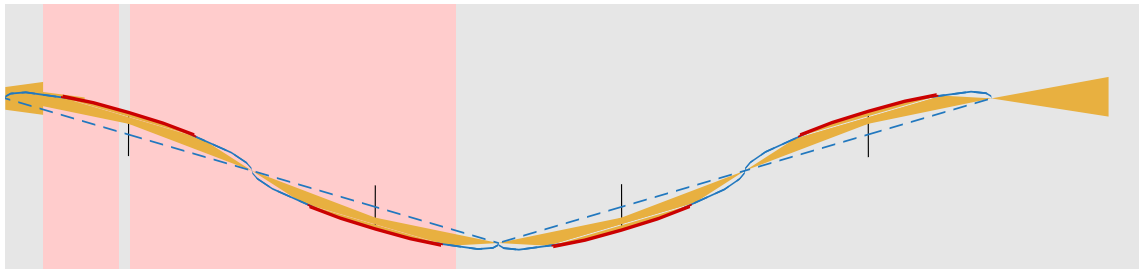
as submitted

optimised for low radiation



aperture removed

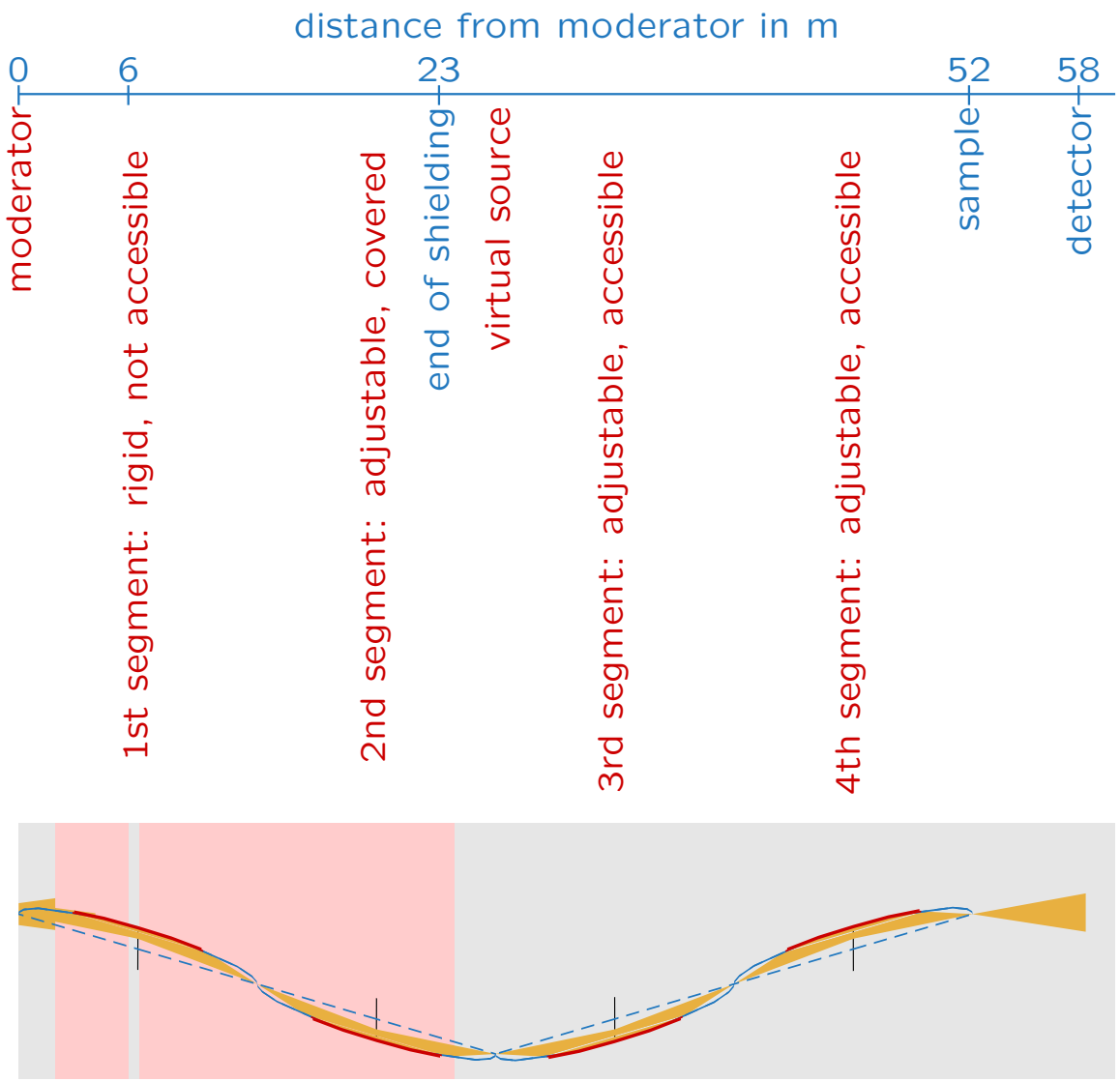
guide stretched



guide accepts only neutrons
originating form a $10 \times 10\,\mathrm{mm}^2$ spot on the monitor

guide accuracy - access

	access	tolerance
moderator	none	size/2
1st segment	none	—
2nd segment	difficult	$< 1\,\mathrm{mm}$
3rd segment 4th segment	easy	$\ll 1\,\mathrm{mm}$



technical aspects

- detector

feedback from R. Hall-Wilton: no principle problem, no risk.

challenge: high simultaneous dynamic range across the detector area

- polarisation

performed before the virtual source

$\Rightarrow$ no problems with diffuse / off-specular scattering

guide field $\approx 26\,\mathrm{m}$ long, with cross-section $\leq 80 \times 80\,\mathrm{mm}^2$

- polarisation analysis

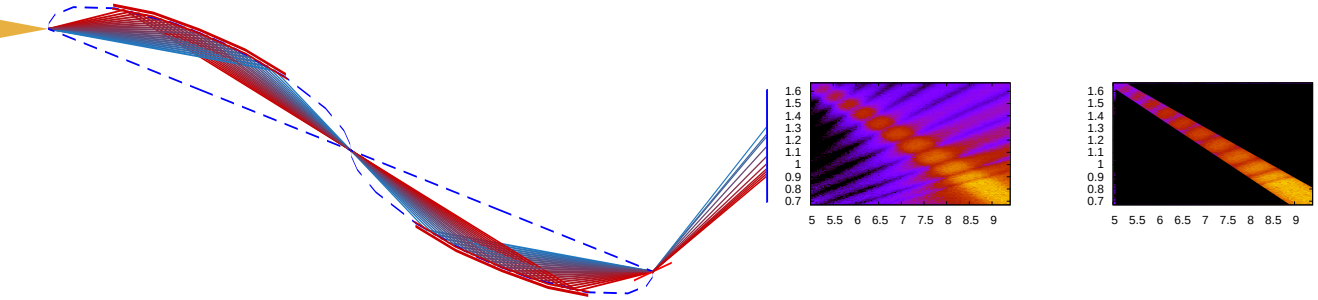
various options, none perfect for area detectors

common problem to all reflectometers

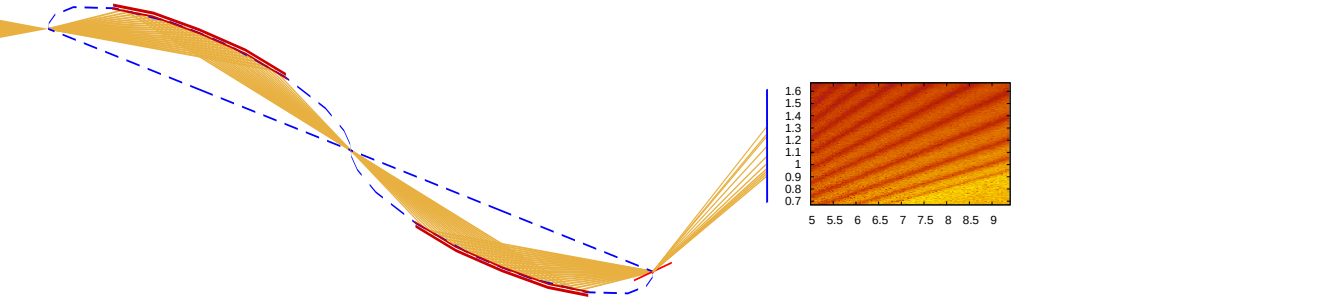
technical aspects

- fast slit system

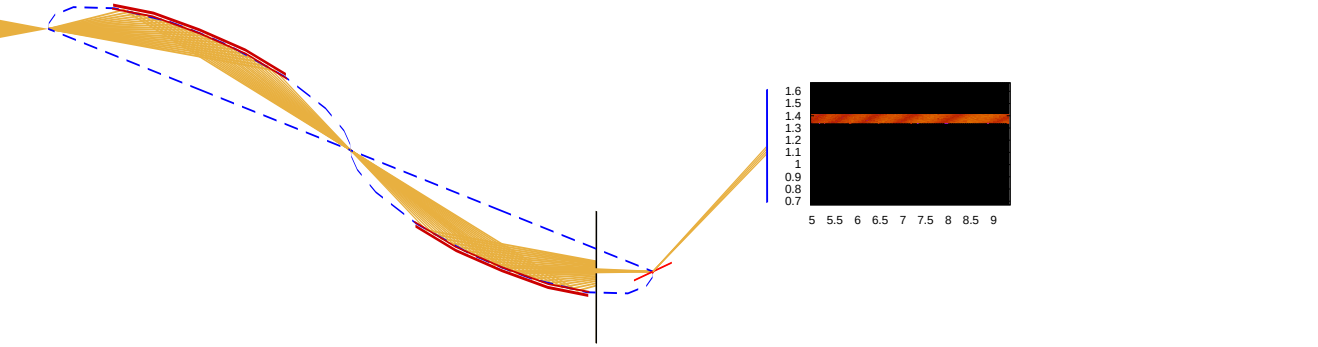
λ-θ encoding



high-intensity specular reflectivity



almost conventional



technical aspects

- fast slit system

type	importance	risk
some conventional slit	essential	none
" changing position by dropping pulses	essential	none
" changing position (< 80 mm) within 10 ms	nice to have	moderate
2 blades scanning independently < 80 mm within 60 ms and resetting in 10 ms	very nice... †	high
alternative: double disk chopper		none

upgradable any time

† if not available:
λ-θ-encoding is contaminated with specular non-Bragg scattering from monochromator

normalisation

common problem for all TOF reflectometers

- direct beam (used on Amor)

\+ simple and fast
– intensity might be too high
– detector inhomogeneities are problematic
– different (virtual) footprint

- reference sample (works with *Selene* prototype)

\+ illumination correction included
\+ detector inhomgeneities no problem
– limited q_z-range
– long counting times

reference can be characterised in angle-dispersive mode

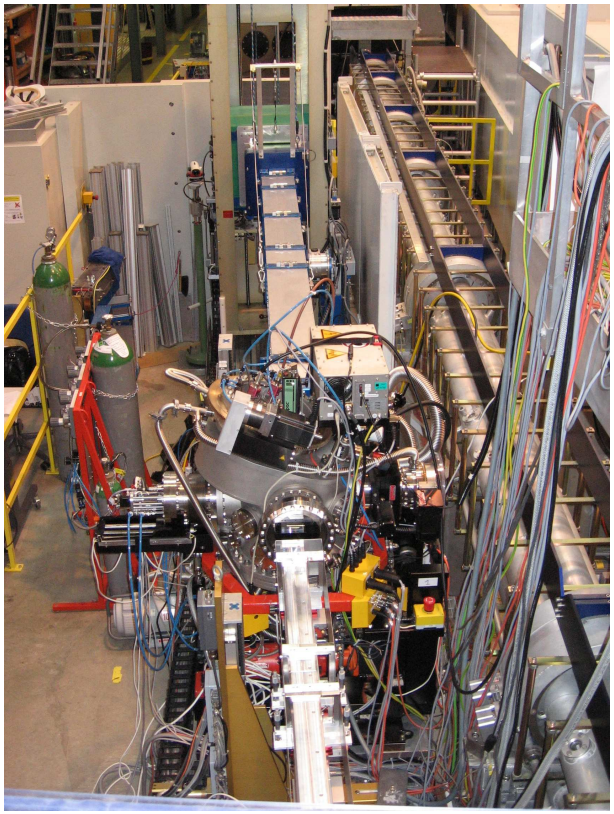
- computed

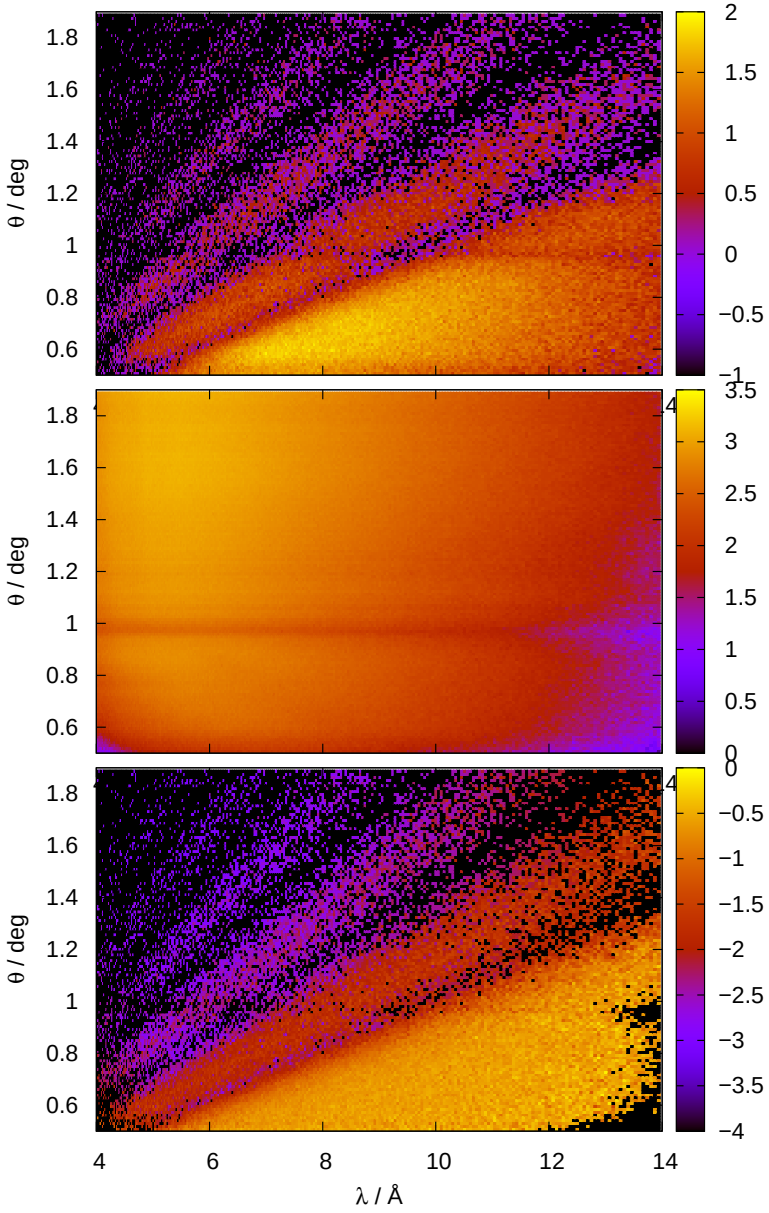
\+ time saving
\+ flexible
– no experience

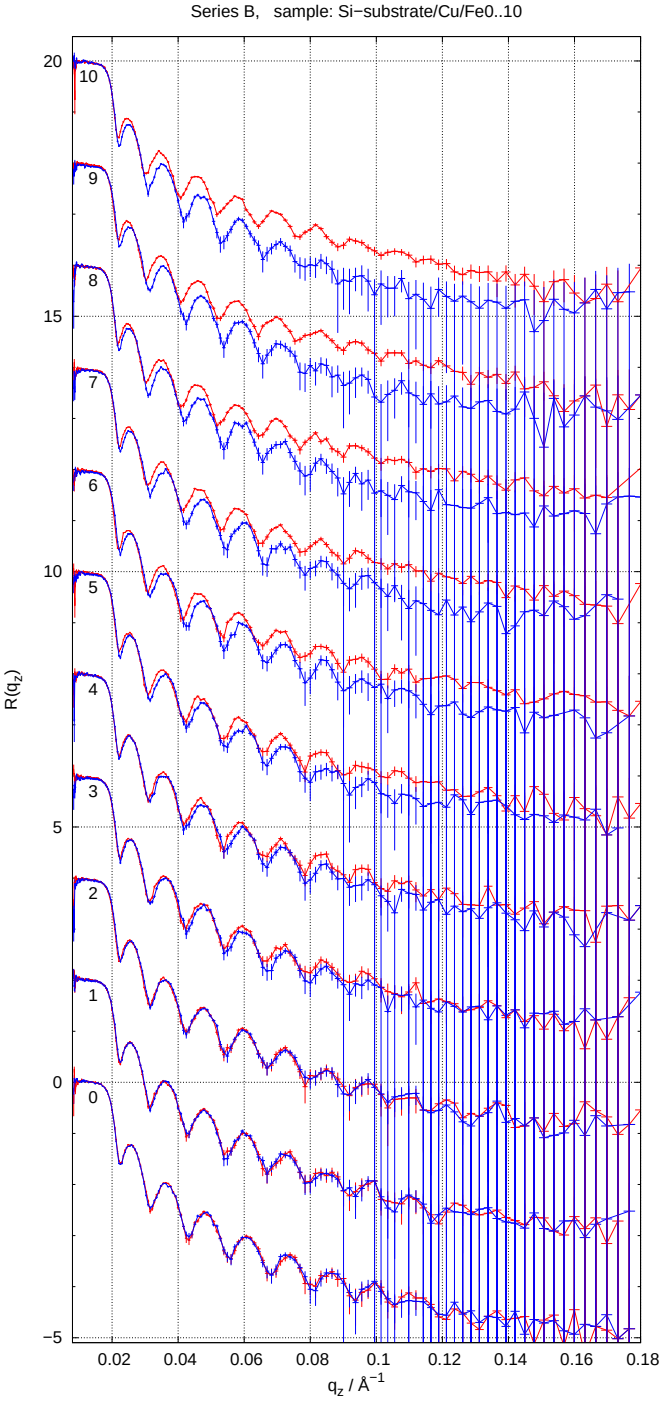
recent measurements

in-situ growth of
Fe on Co

(B. Wiedemann, TUM)







costing

in the proposal: 5 M € for hardware

not in the proposal: + R&D on fast slit and detector

+ man power for design, construction, fabrication and assembly

my guess of total costs: 10 to 12 M €.

my guess is nothing the ESS should use to make their budget

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but it matches the estimate of R. Connaster

is this sufficient?

if not: will ESS help?

the proposal

- is to long (it hardly exceeds the requested size)
- contains only half of the requested science case
- has too many details (makes it complicated)
- does not give enough details (see STAP question list)

help me

SAP please provide me with a science case and
the resulting key features: $\Delta q/q$, q_z-range, time resolution

soft matter

very fast moving area of science

TAP how detailed should the proposal be?
which options should be mentioned?

polarisation

measurement modes

ESS what are the reliable parameters / requests?

exclusion of prompt pulse

radiation / background

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too late for the proposal!

exclusion of prompt pulse

radiation / background