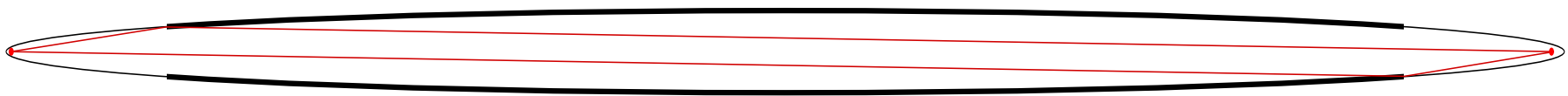
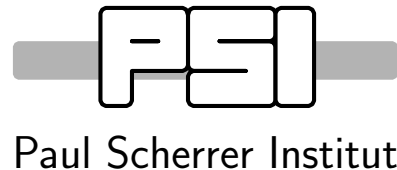


elliptic neutron guides

from the idea to the implementation



Peter Böni
Sebastian Mühlbauer
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Paul Scherrer Institut

Jochen Stahn
Murat Ay
Uwe Filges
Christian Schanzer

SwissNeutronics

elliptic neutron guides

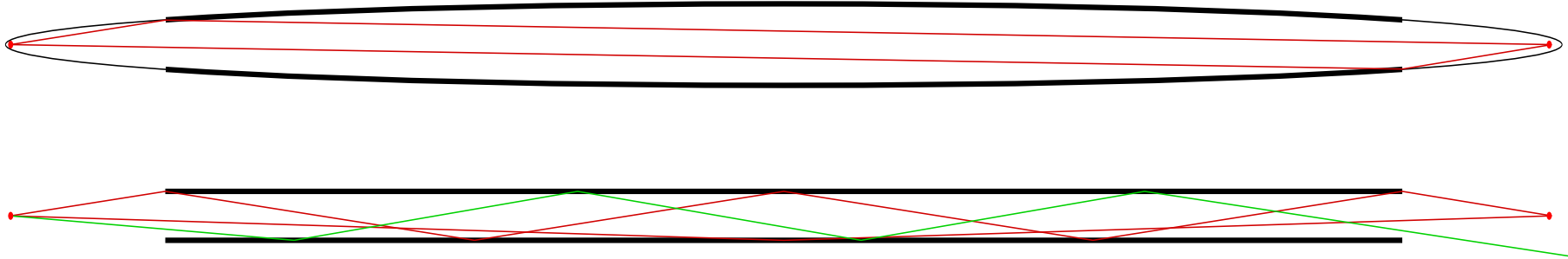
the concept

2

Idea: all walls of the guide (rectangular cross section) are elliptically tapered

the (point-like) source is in one focal point of the ellipse

the other is at the sample / the monochromator / the detector ...



only 1 reflection horizontally and vertically for a point source

high- m coatings are necessary close to the focal points, only

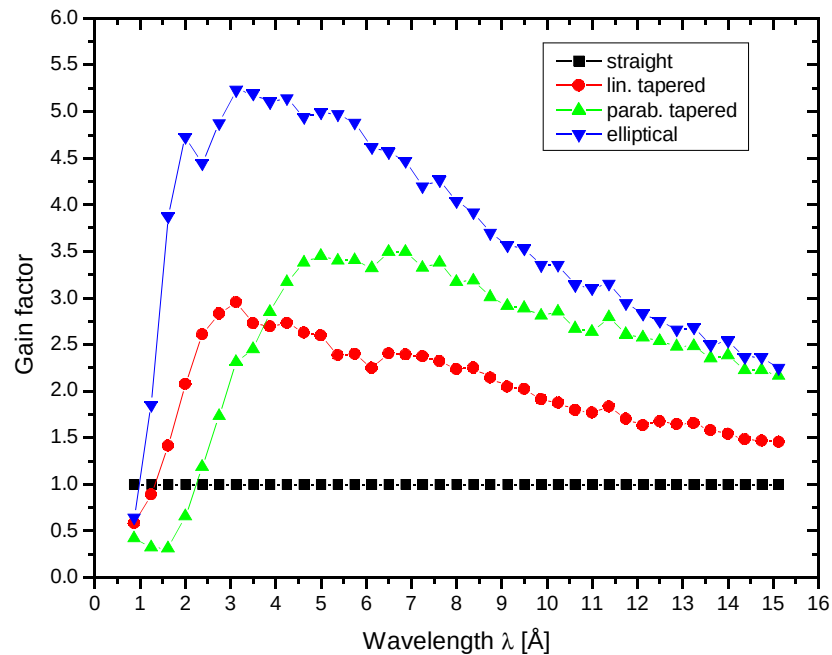
e.g. comparison of guide-types by

Monte Carlo simulations (MCstas):

guide: 40 m, source/guide and guide sample: 1.8 m

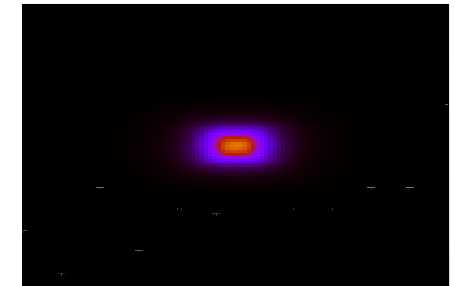
simulated gain factors for the

3-axes-spectrometer TASP at SINQ

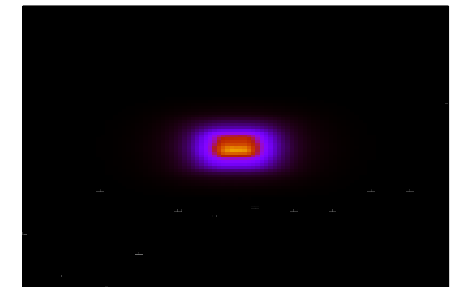


divergence after guide

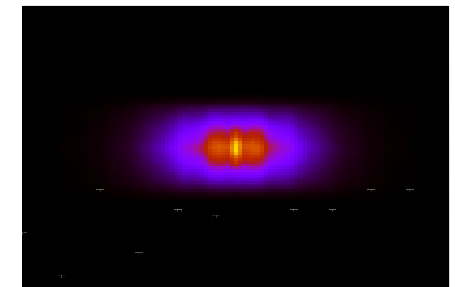
straight guide



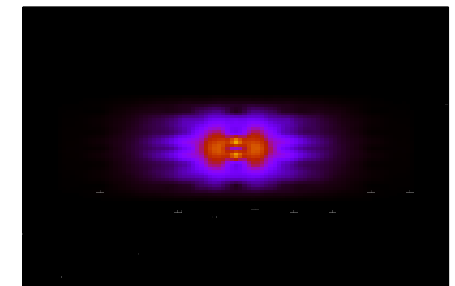
bent
straight guide

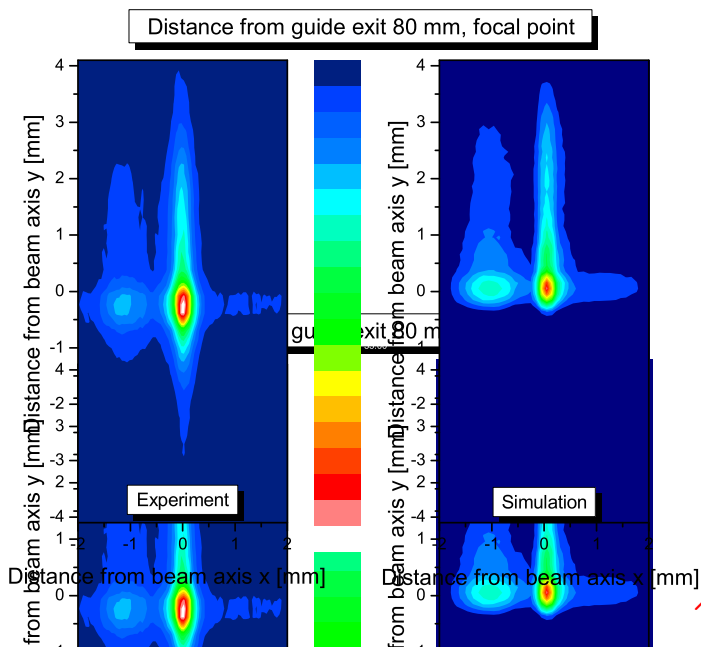
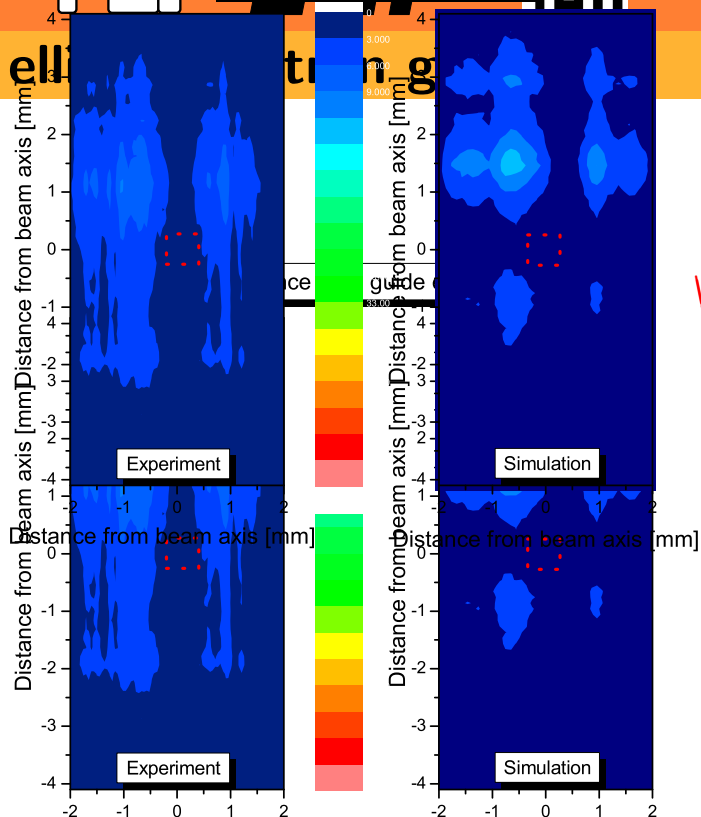


elliptic guide



elliptic guide
with absorber





test device — measurements

4



bi-elliptic guide scaled 1:10

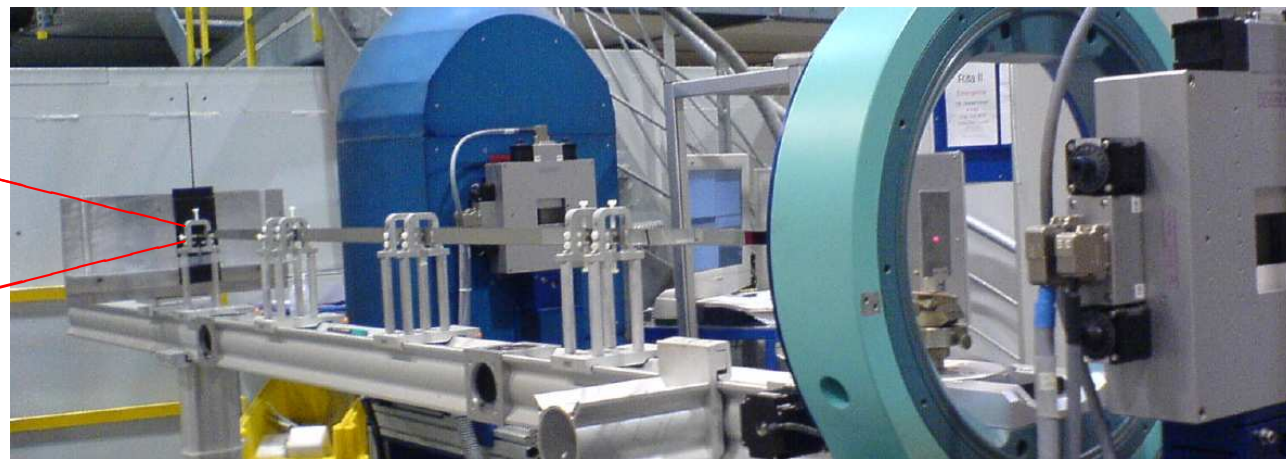
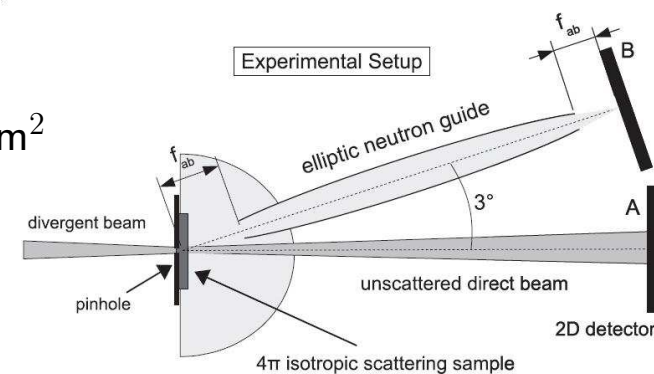
2 m long

entrance: $4 \times 8 \text{ mm}^2$ maximum dimensions: $12 \times 24 \text{ mm}^2$

measured on

Morpheus at SINQ

MIRA at FRM II



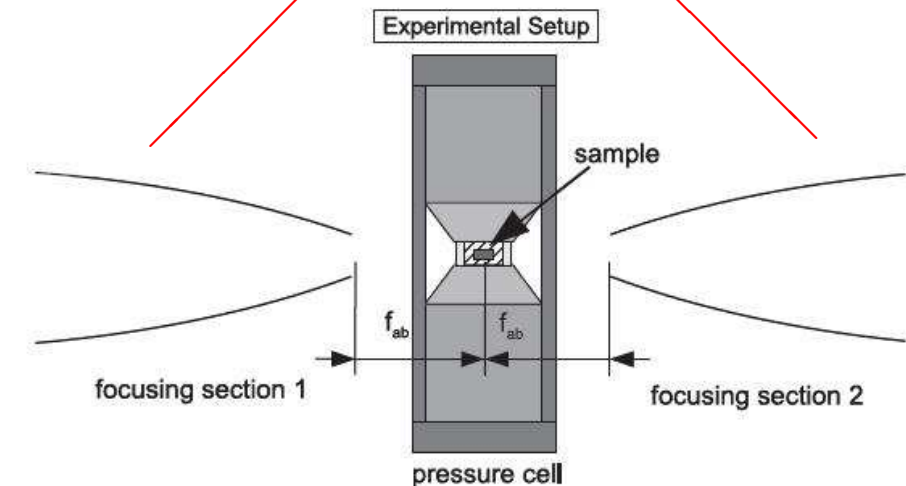
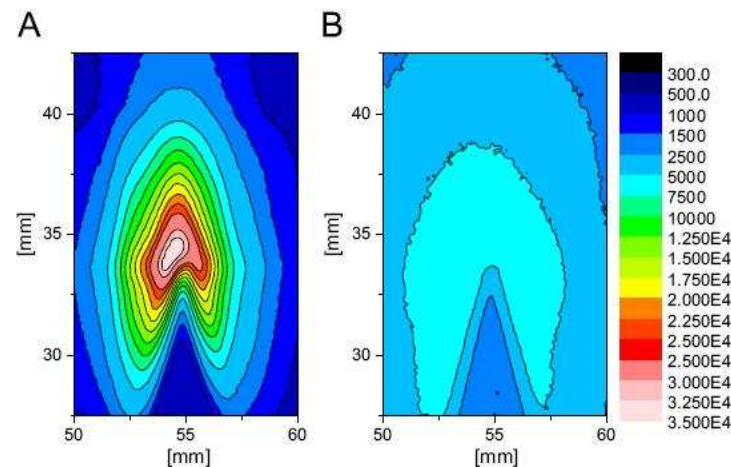
idea:

- use the end-sections of the test device to to
 - focus the beam to a tiny sample in a pressure cell
 - defocus the scattered beam to get it into the detector



tested on PANDA at FRM II

result:



modern grinding machines

⇒ non-linear shapes

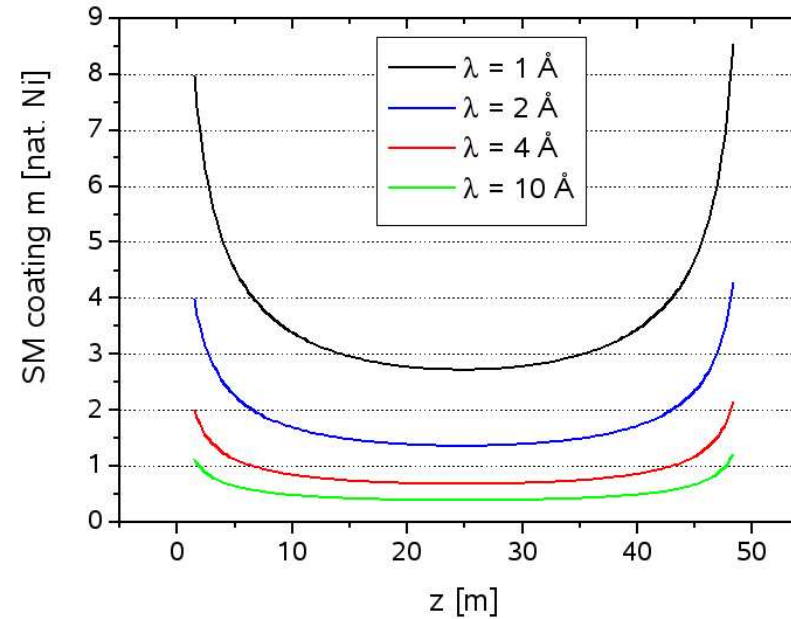
dimensions:

typically twice of straight guide

value for money:

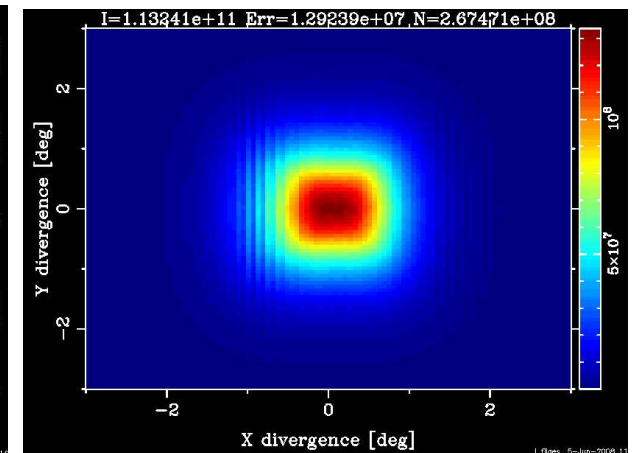
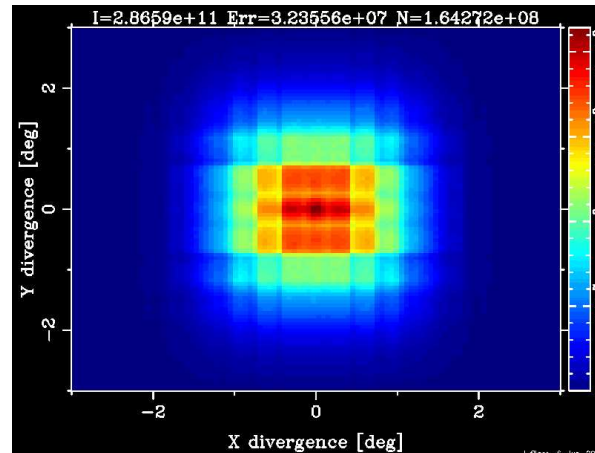
more glass, cheaper coatings

SM coating for top/bottom walls, $h = 80$ mm



direct line of sight might be a problem

divergence shows cross-pattern:



elliptic neutron guides

implementation

7

first bi-elliptical neutron guide

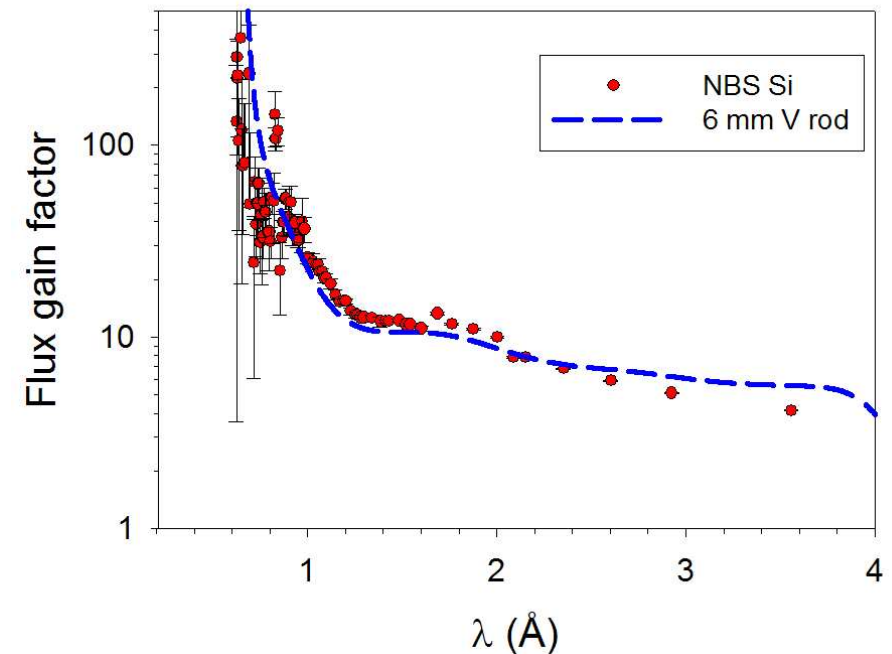
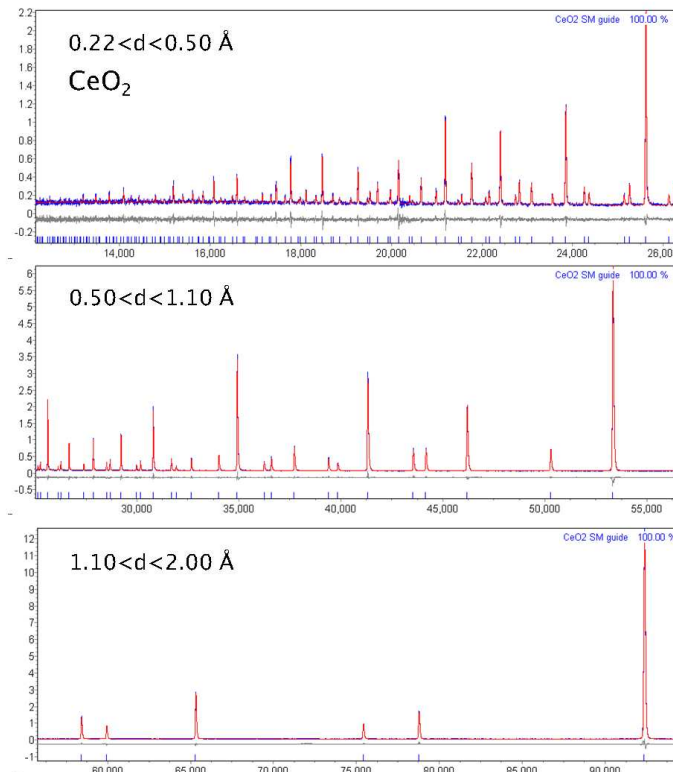
for HRPD at ISIS

length = 100 m

operational since 11. 2007

measured gain: 10 to 100

(depending on λ , relative to old guide)



Photos Courtesy ISIS - Science and Technology Facilities Council, UK

from the idea

via simulations

and test devices

to a working guide

