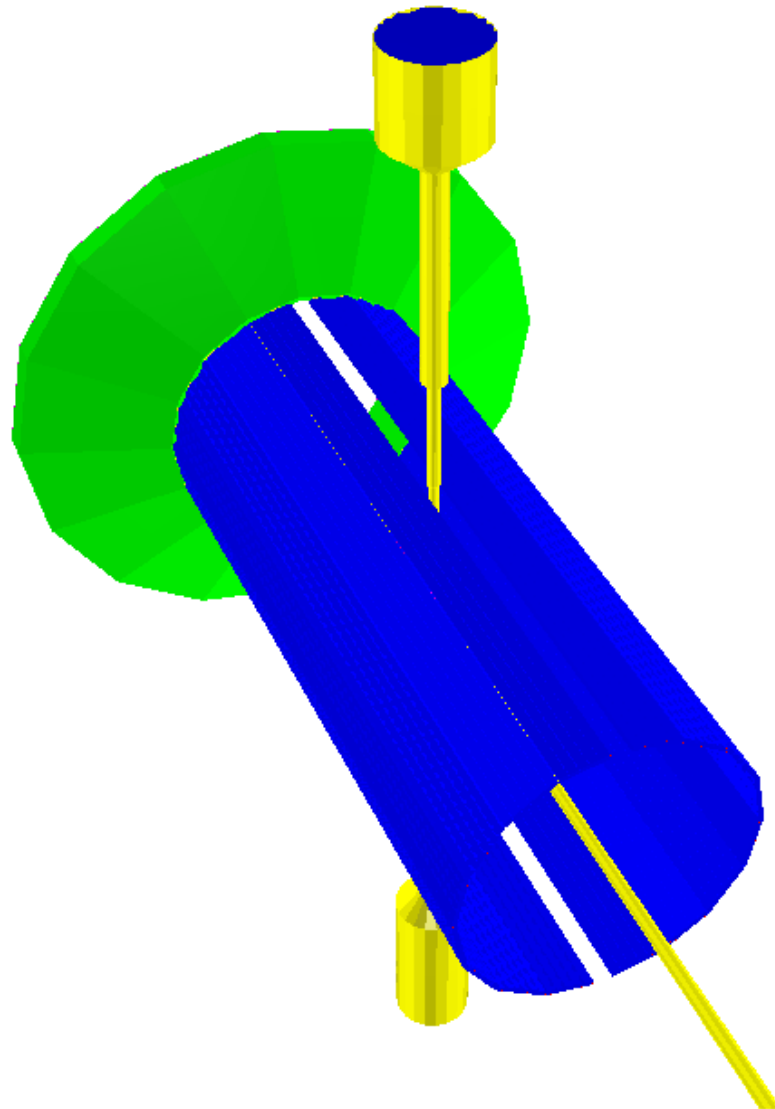# Progress report of GSI activities
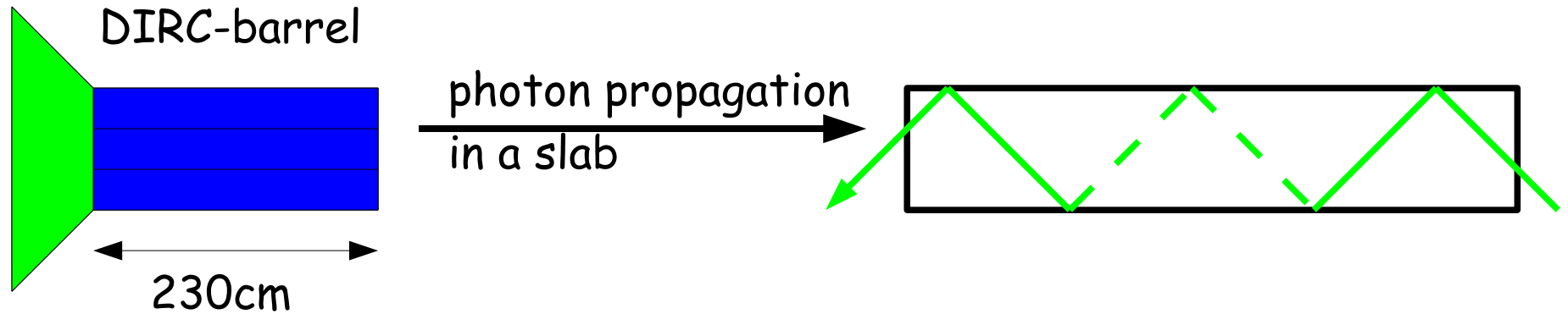
Roland Hohler , GSI
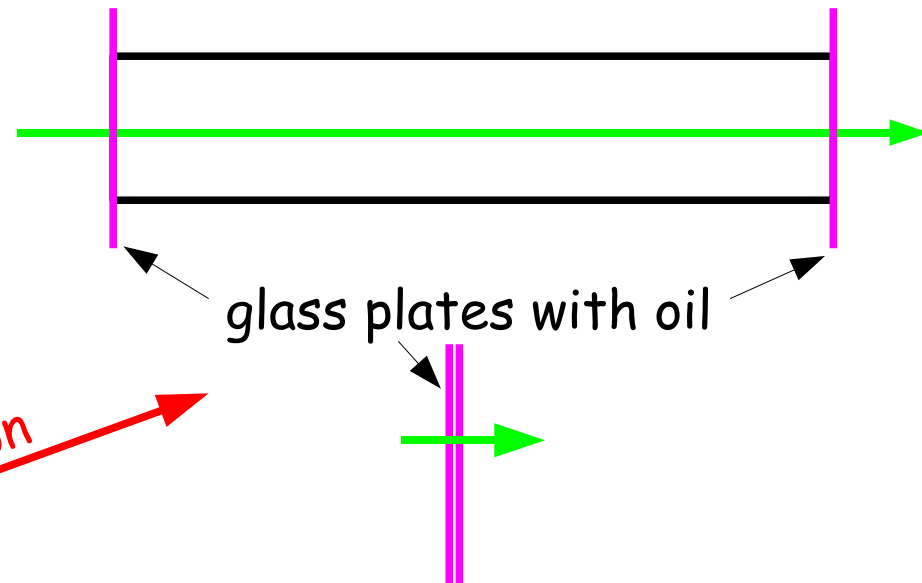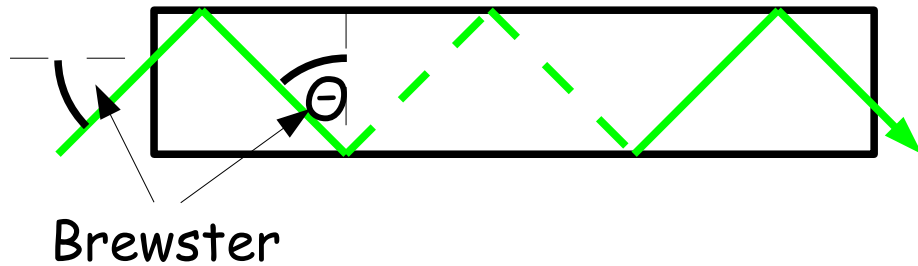
# Radiator quality test

Main item: determination of the reflection coefficient R

DIRC-barrel

photon propagation
in a slab

230cm

$R > 0.998 \Rightarrow 0.998^{100} \approx 82\%$  $(0.99^{100} \approx 37\%)$

Measuring method:

$\Theta$

Brewster

glass plates with oil
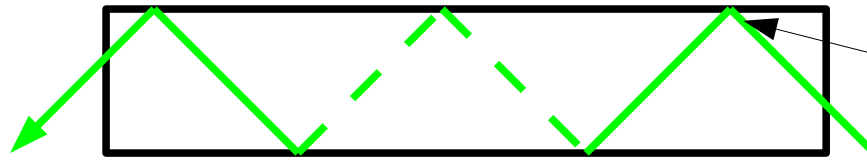
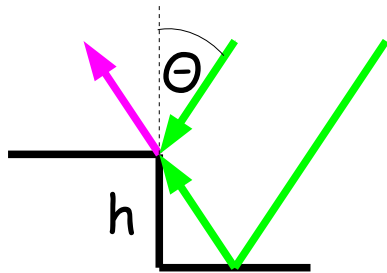$$T = R^N \exp\left(-\frac{L}{\Lambda}\right)$$

attenuation

# Reflection coeff. and roughness



total internal reflection

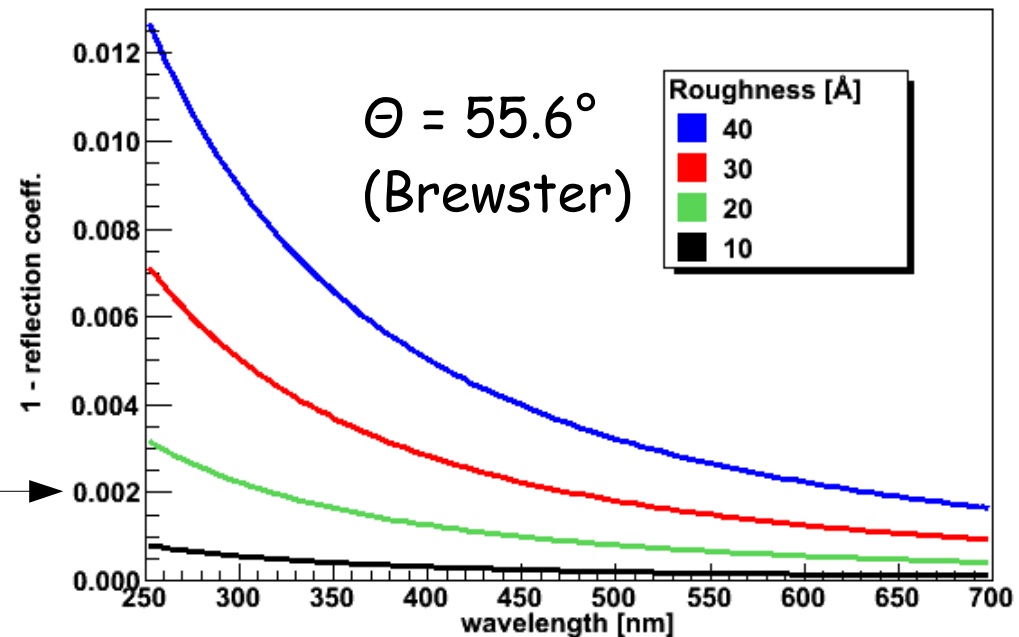Two photon interference:



$$1 - R = \left( \frac{4\pi \cdot \sigma \cdot \cos \Theta}{\lambda} \right)^2$$

=> able to check surface specification

$\Theta = 55.6°$
(Brewster)

R = 0.998

# Bars from Heraeus (production accidents)



35mm

17mm

r = (1.2 ± 0.4) mm

front surfaces very roughly polished

r = (1.5 ± 0.4) mm

=> reflection prob. by radius ≈ 0.96

exaggerated illustration
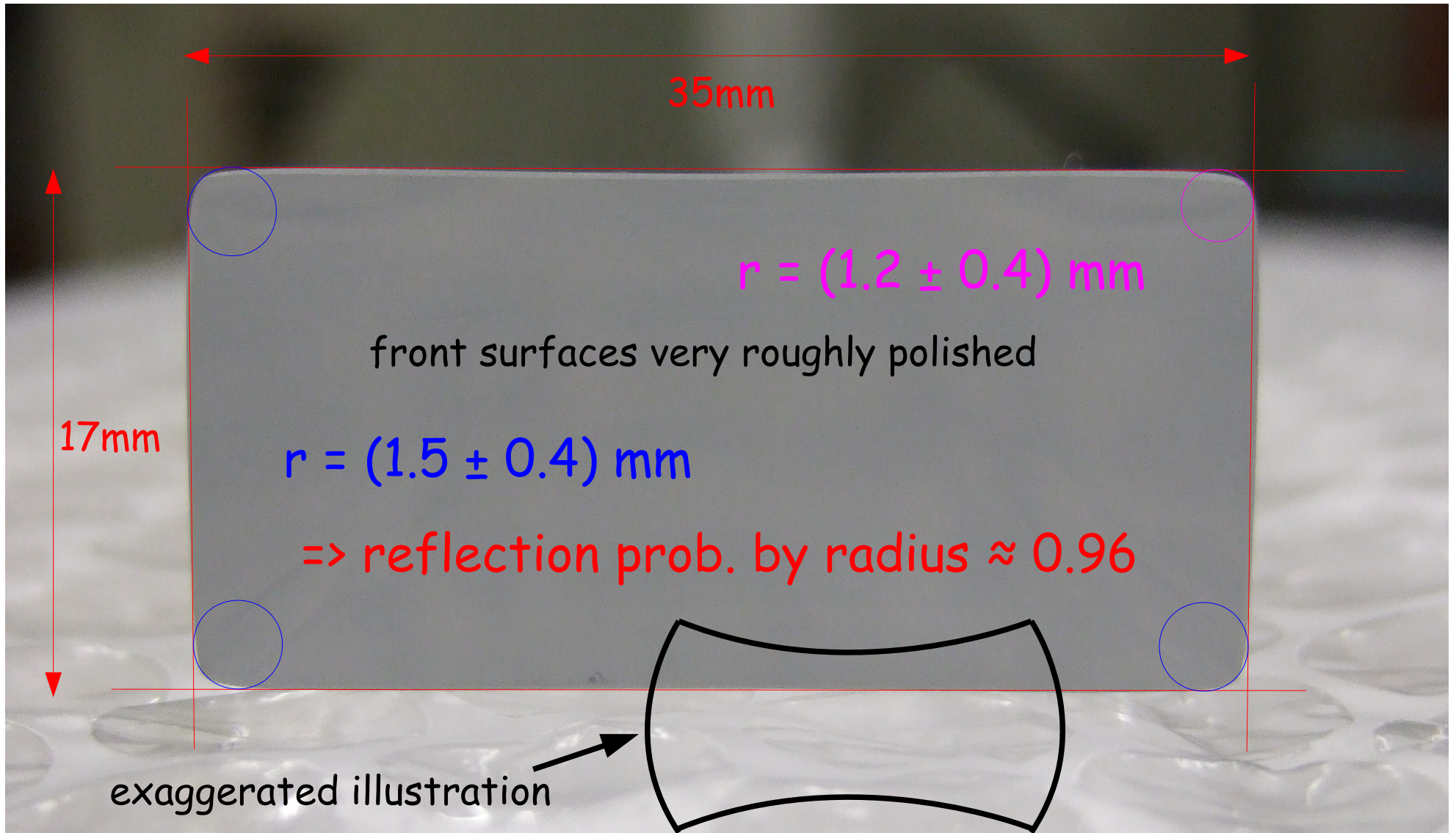
bar with parallel sides and much smaller edge radii possible (produced but not yet received)

# Bulk attenuation (Heraeus)



090324_bulk_H2_Glass18And12_spot131-25_covered: transmission (uncor., offset cor. per run)
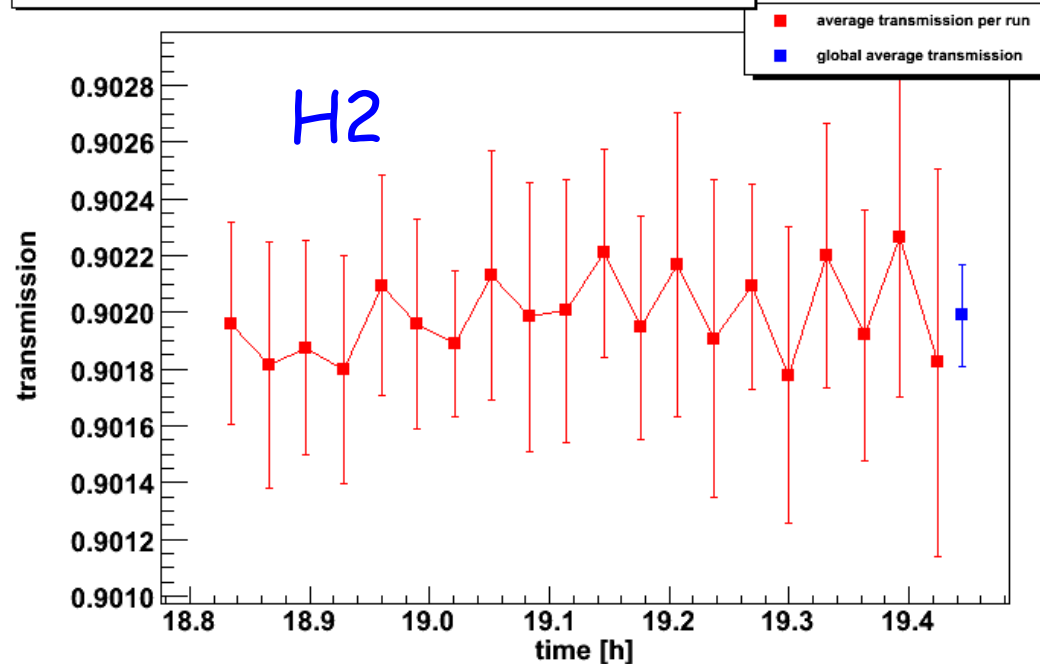
■ average transmission per run
■ global average transmission

H2

$T = 0.9020 \pm 0.0002$

only stat. error

transmittance per m
(fresnel corrected):

$T_{cor/m} = 0.9830 \pm 0.0004$

attenuation length:

$\Lambda = 58.4 \pm 1.4$ m

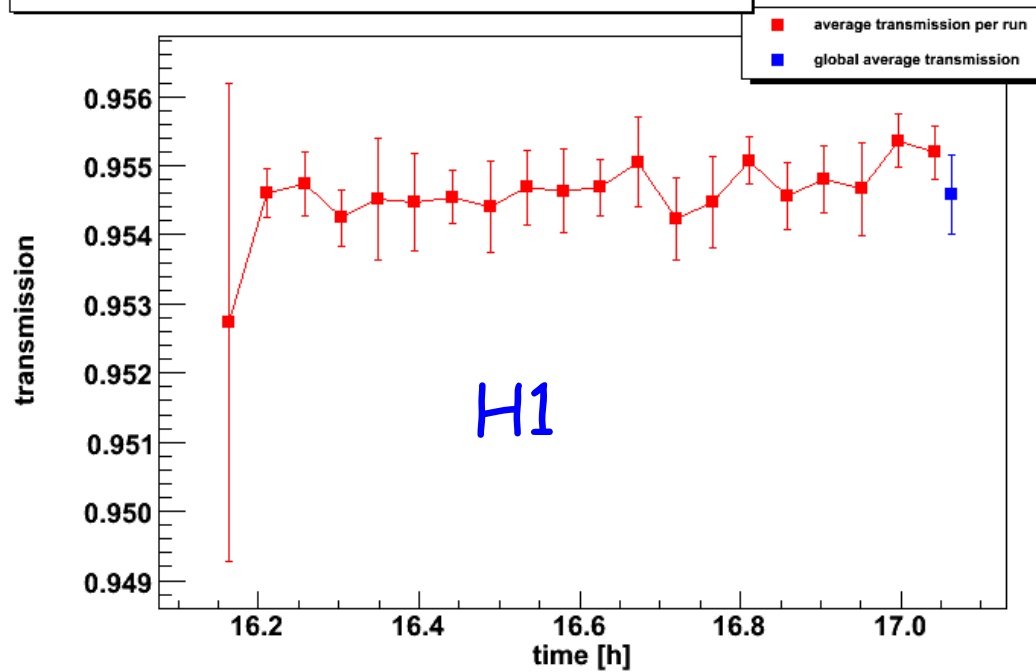|              | H1                  | H3                  |
|--------------|---------------------|---------------------|
| $T_{cor/m}$  | $0.9783 \pm 0.0004$ | $0.9866 \pm 0.0007$ |
| $\Lambda$ [m] | $45.5 \pm 0.9$     | $74.4 \pm 3.8$      |

# Reflection coeff. (Heraeus)



090324_trans_H1_Glass18And12_spot108-22_13refl_covered: transmission (cor., offset cor. per run)

- ■ average transmission per run
- ■ global average transmission

H1

$T = 0.9546 \pm 0.0006$

only stat. error

reflection coeff. (15 reflections):

$R = 0.99802 \pm 0.00006$

roughness:

$\sigma = 32.9 \pm 0.7 \ \text{Å}$

|  | H2 | H3 |
|---|---|---|
| R | 0.99739 ± 0.00005 | 0.99853 ± 0.00006 |
| σ [Å] | 37.8 ± 0.7 | 28.4 ± 0.7 |

# Russian bars

produced in Miass
polished by Litkarynov
(spec: $\sigma = 20$ Å)

dirt inclusion

glued with oil

R2

R3

35cm

35cm
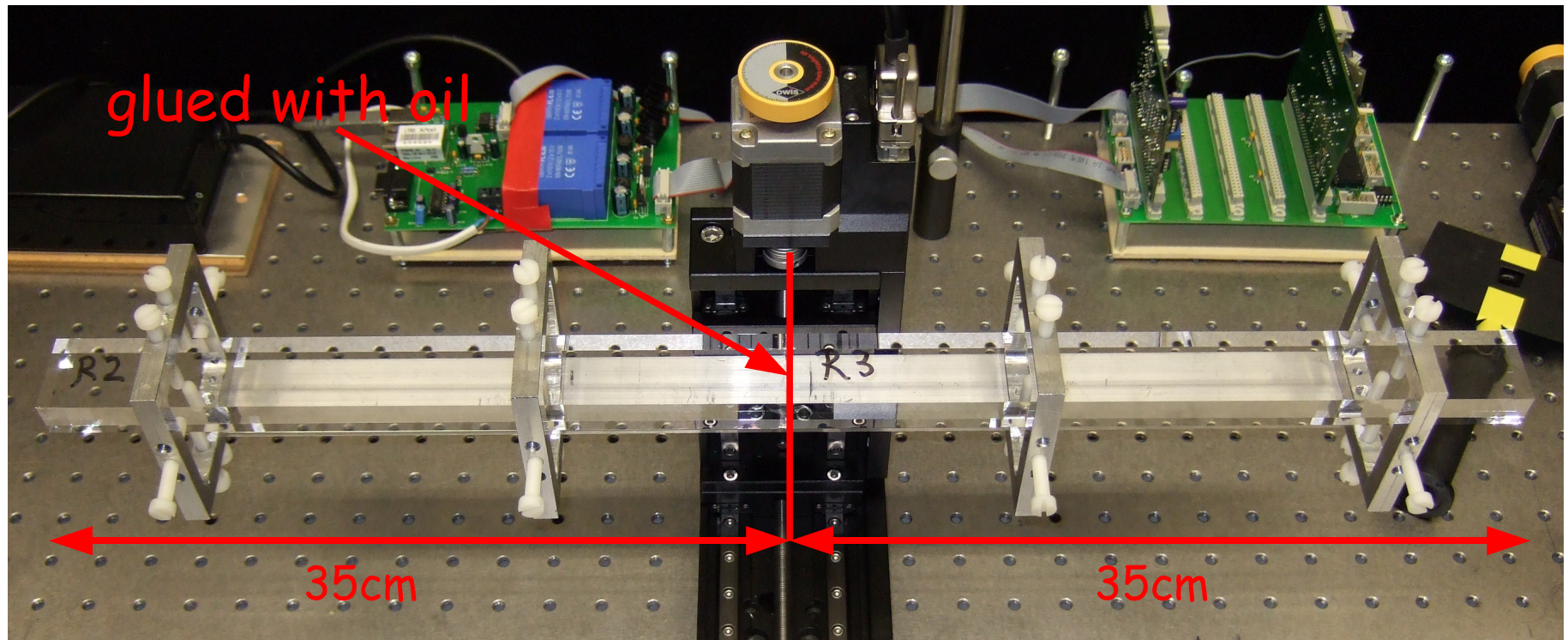
# Preliminary results (Russian)



090508_bulk_R2R3_covered: transmission (uncor., offset cor. per run)

- average transmission per run
- global average transmission



090510_trans_R2R3_12refl_covered: transmission (cor., offset cor. per run)

- average transmission per run
- global average transmission
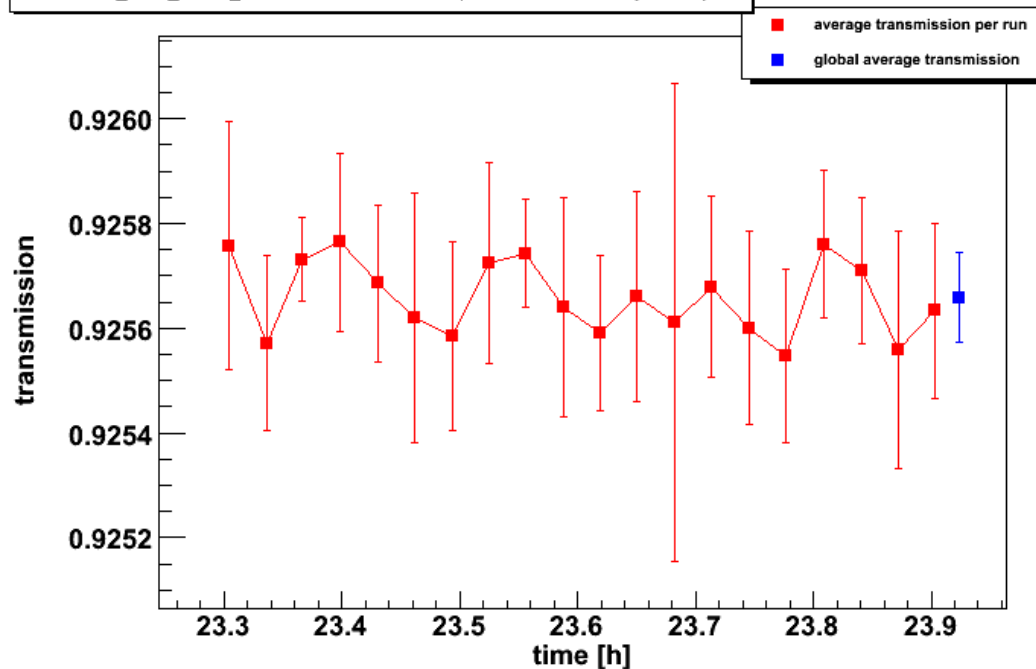
T = 0.9257 ± 0.0001

only stat. error

T = 0.9830 ± 0.0002

only stat. error

transmittance per m (fresnel corrected):

$T_{cor/m}$ = 0.9915 ± 0.0002

reflection coeff. (12 reflections):

R = 0.99915 ± 0.00002

attenuation length:

$\Lambda$ = 117.6 ± 2.1  m

roughness:

$\sigma$ = 21.8 ± 0.3  Å

# Beam test in September

4 MCPs

box with oil

lens

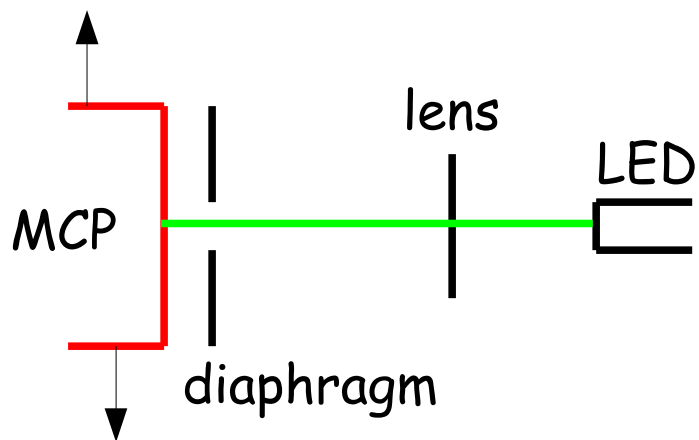quartz bar

$\Theta$

scintillator

proton trajectory
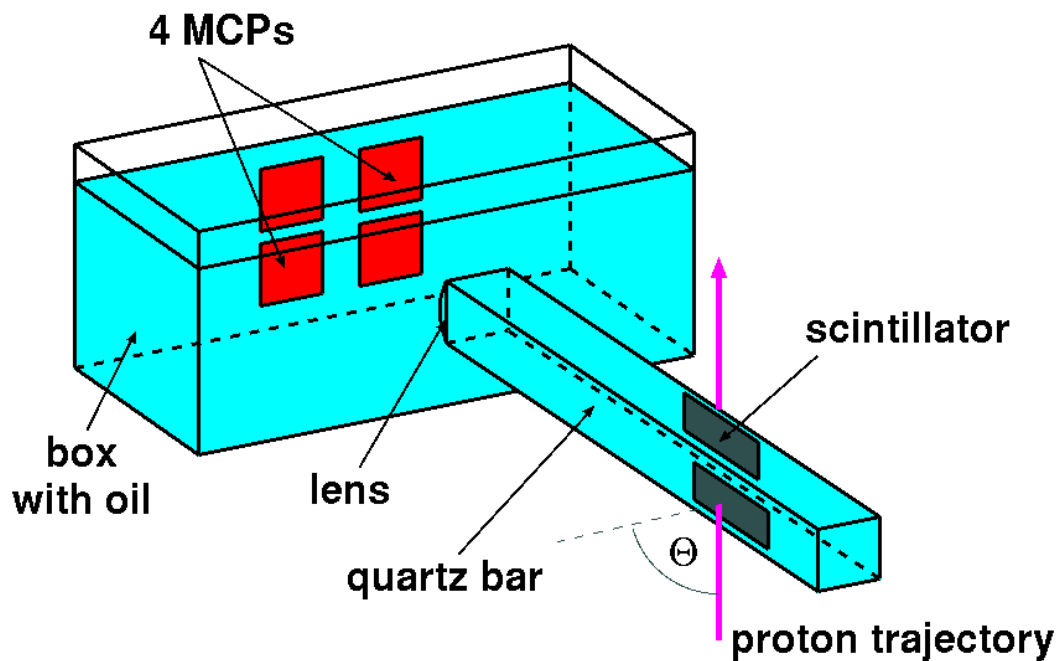
same setup as for the first beam test last year but with 4 MCPs

new MCP holder for a better contact to the box (in process)

spring
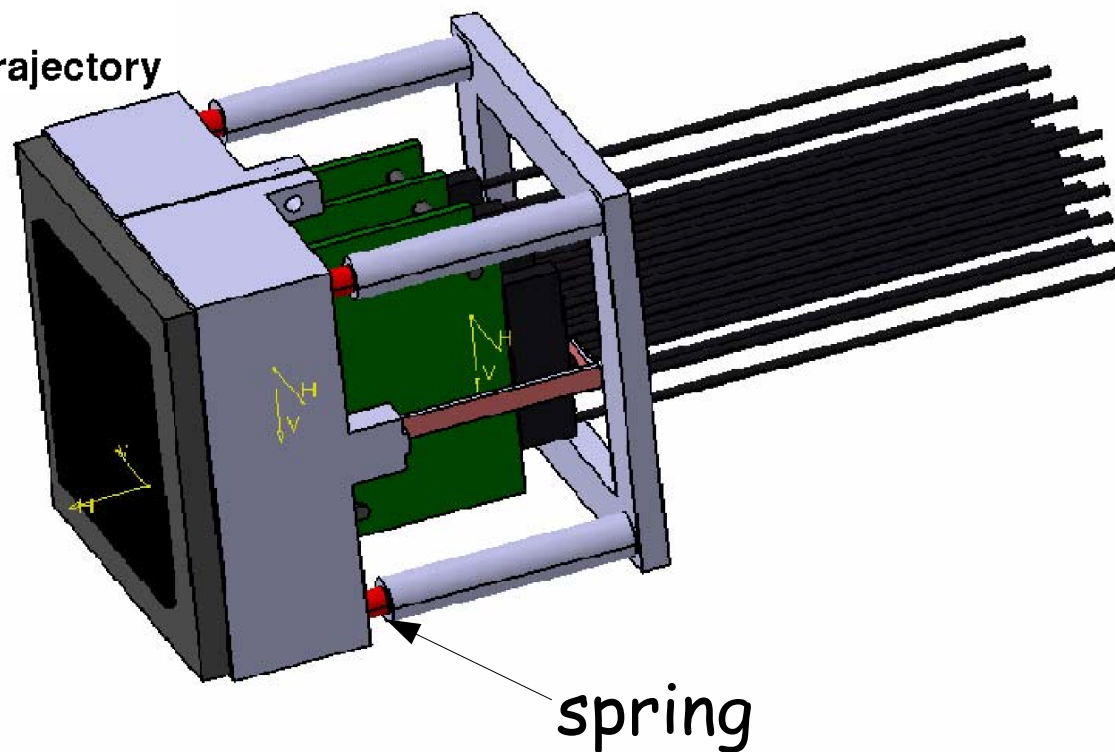
# Photomultiplier test

MCP test with single photons to adjust the discriminator (NINO) threshold for each pixel

## SiPM: Light catcher mask for an array of APDs

3mm

6.5mm

≈ 4.5mm (α ≈ 38°)

Simulation
Θ = 30°

| | |
|---|---|
| p0 | 0.1941 ± 0.02049 |
| p1 | 0.06261 ± 0.01084 |
| p2 | -0.00735 ± 0.001344 |

efficiency

height [nm]