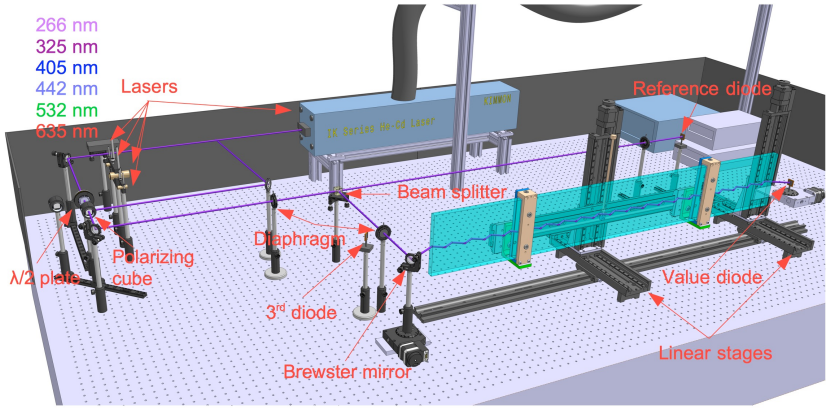
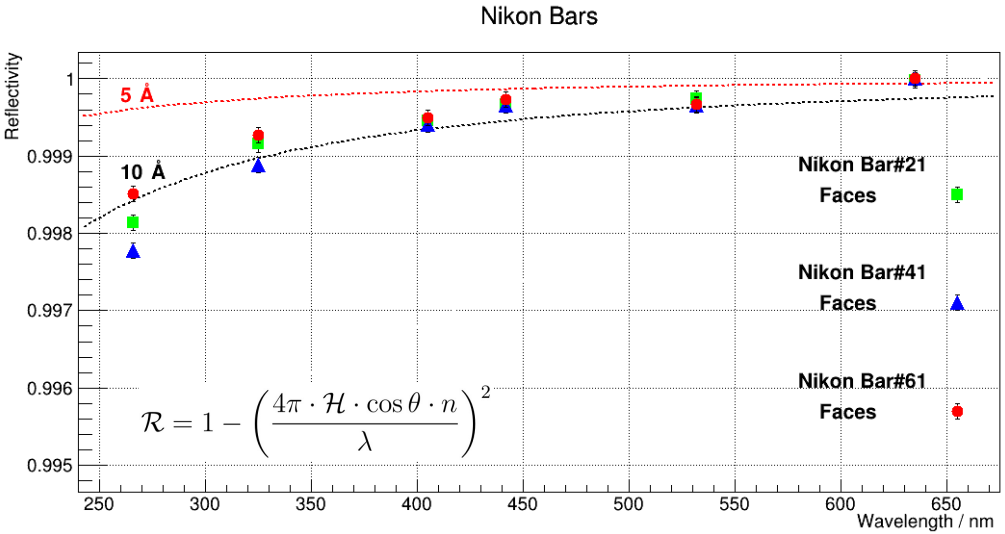
Preliminary Bar Measurement Results during Material Screening

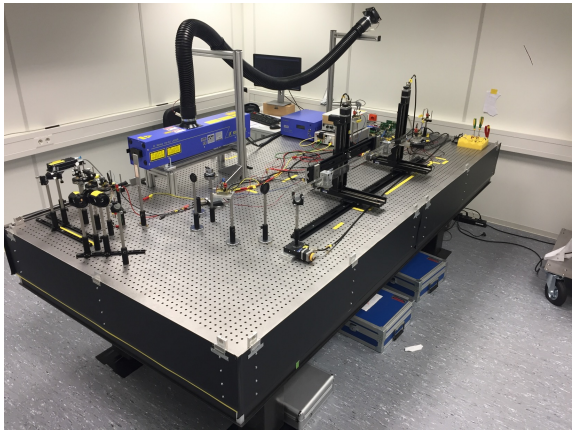
PANDA week March 2023, Bochum Germany,
Georg Schepers

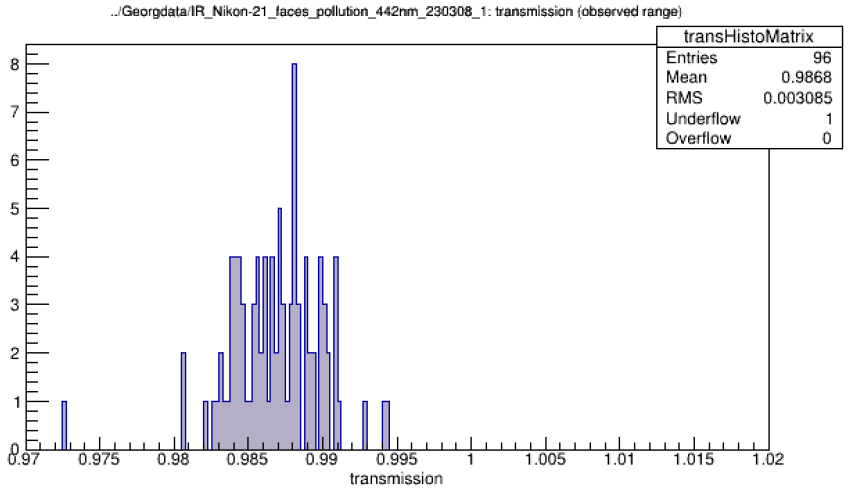
Laser setup

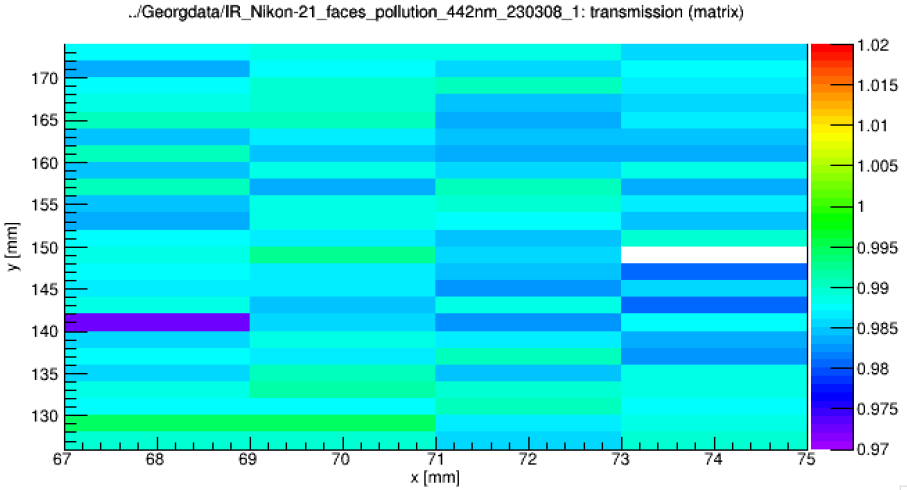
Determination of the surface roughness $\mathcal{H}$
with help of the internal reflectivity $\mathcal{R}$ of
6 laser wave lengths
via Scalar Scattering Theory (dotted lines)





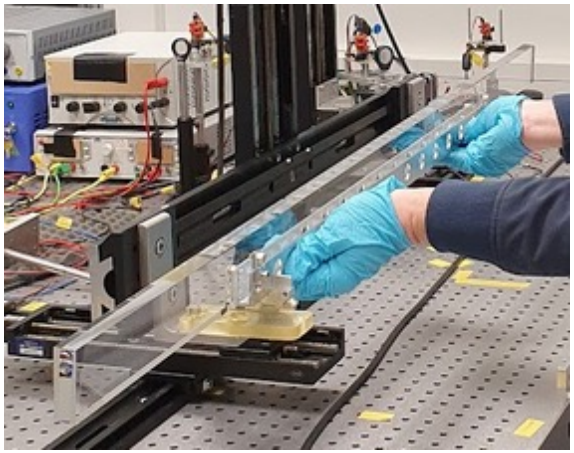




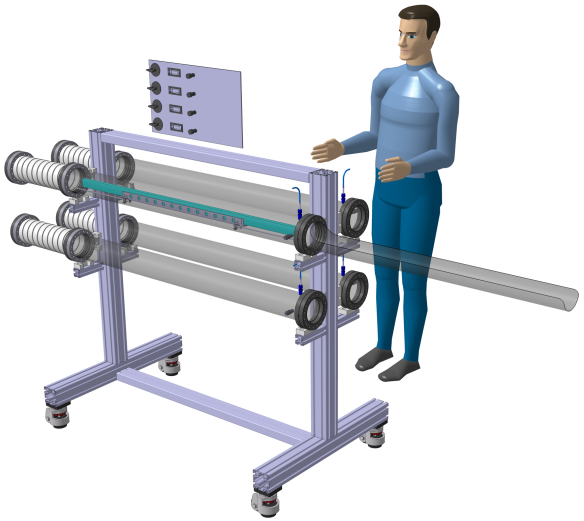


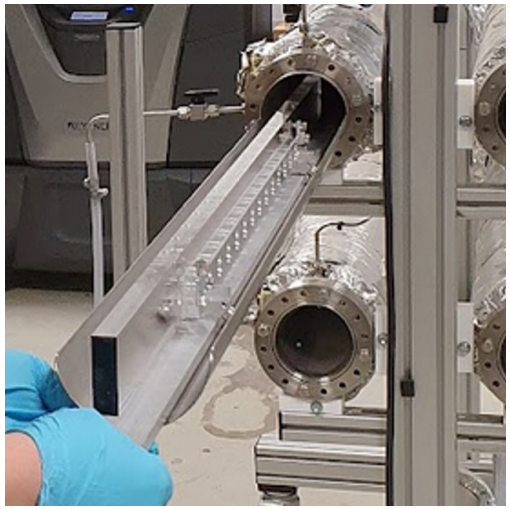
Distribution of Transmission after 48 internal Reflections

Laser Setup



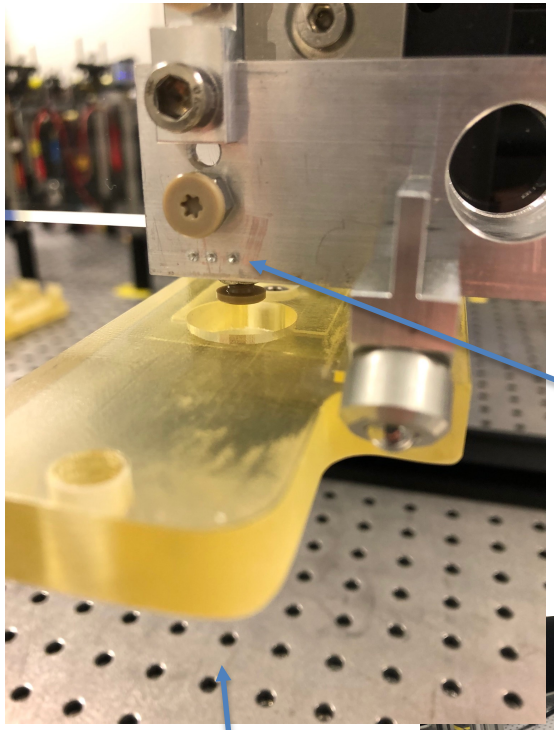
Material Screening setup

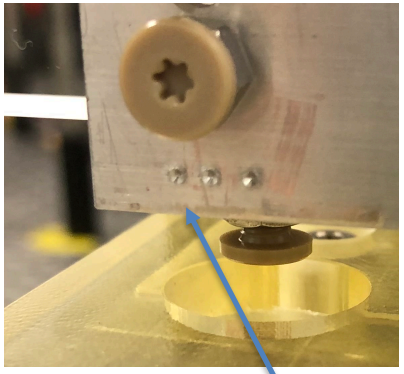




Same bar holder is used in the Laser setup as in the Material screening setup

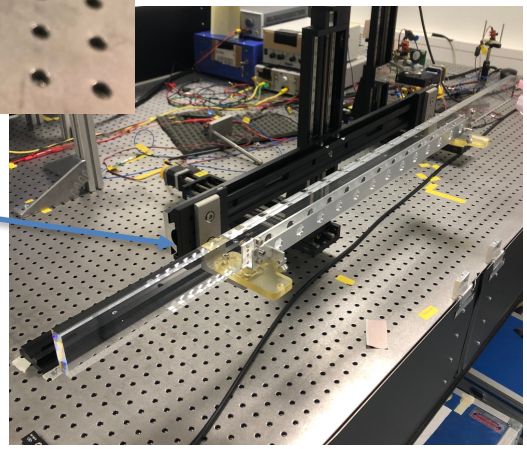
- No manipulation of the bar surface needed
- Only faces of the bars accessible

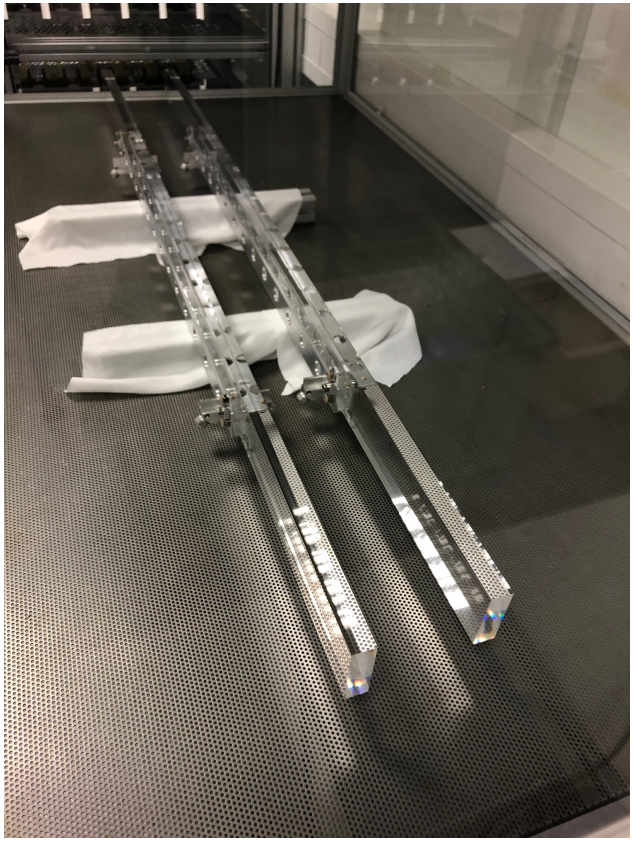




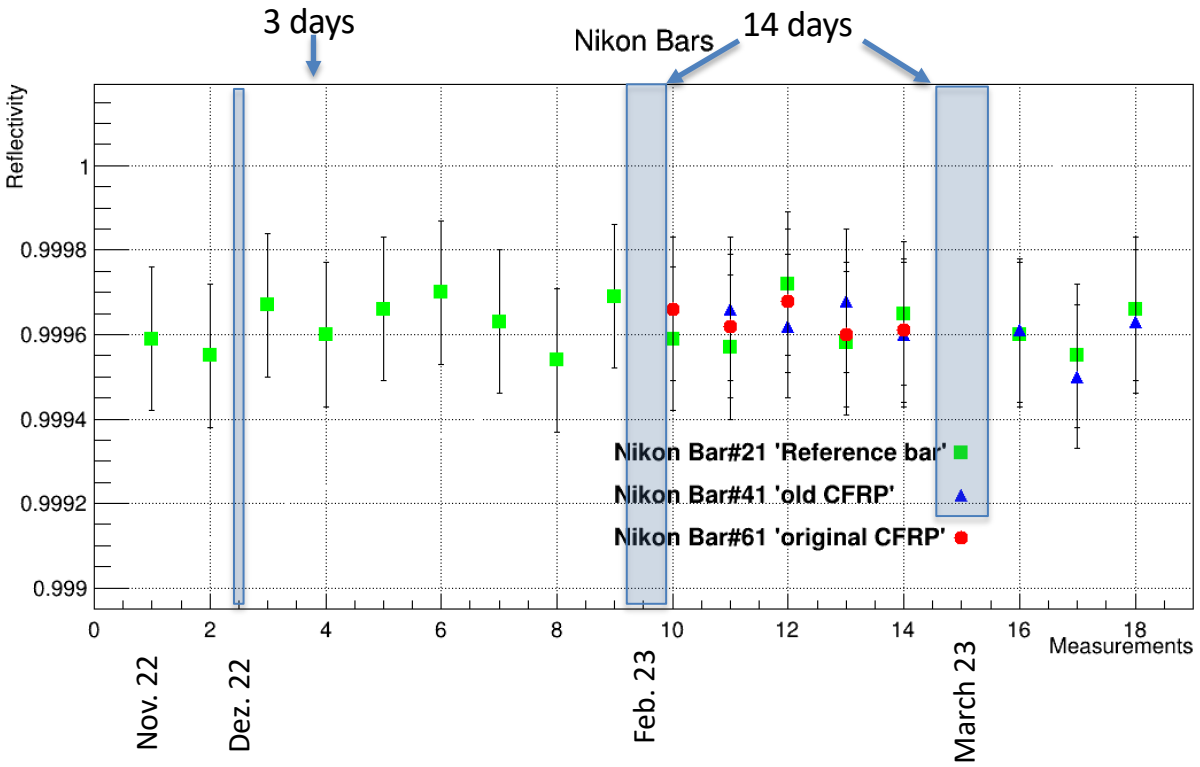
Mark

3D printed support





Storage in sledge
under heap-filter



Time in the Material screening setup

Nikon Bar #21 stays in Nitrogen air flow only (Reference bar)

Nikon Bar #41 stays in Nitrogen air flow over large amount of “old” CFRP

Nikon Bar #61 about to go into Nitrogen air flow over “original” CFRP

Longer periods (several months) in the material screening setup needed

Summary and Outlook

Nikon Bar #21 stays in Nitrogen air flow only (Reference bar)

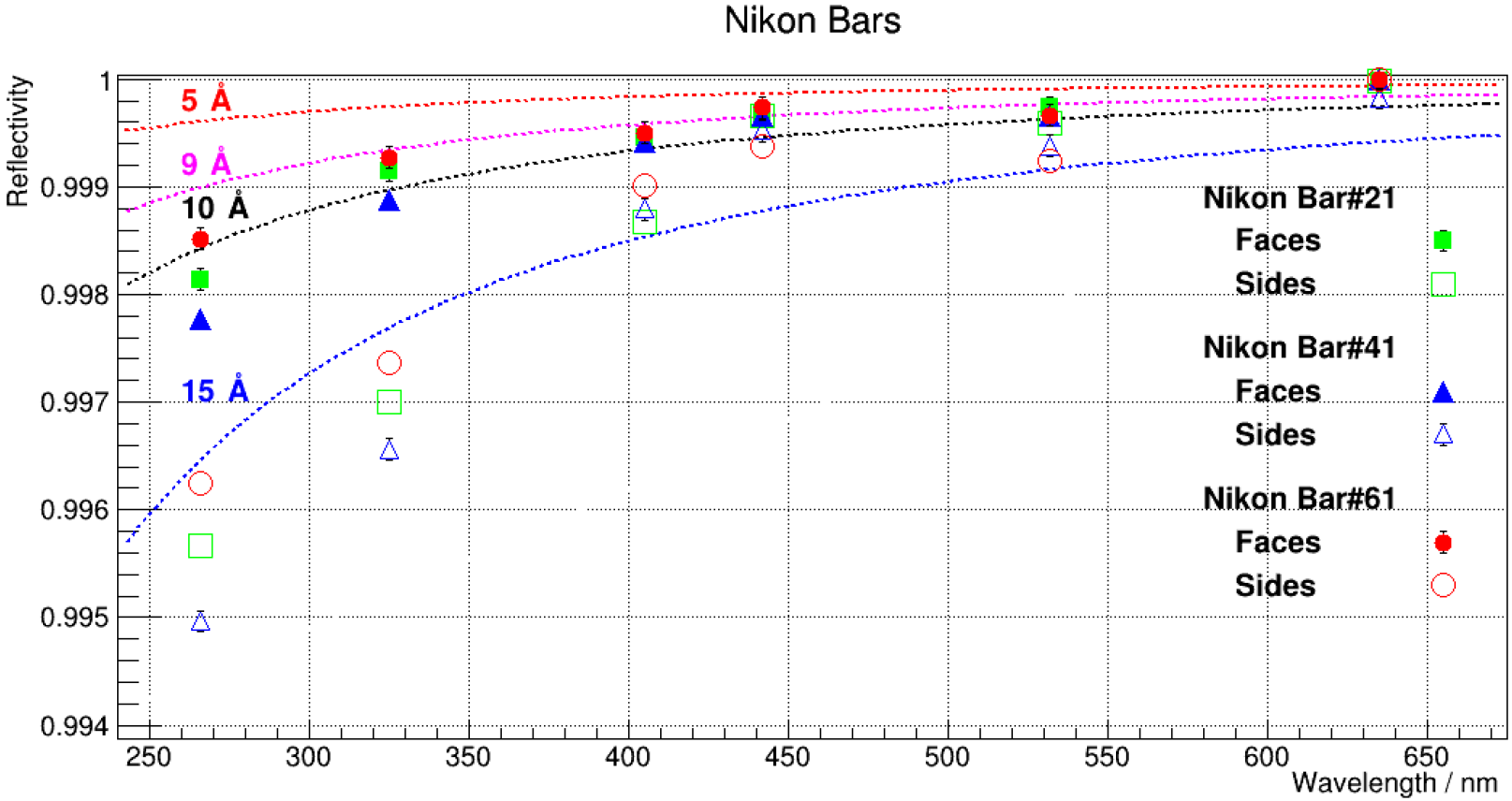
Nikon Bar #41 stays in Nitrogen air flow over large amount of “old” CFRP

Nikon Bar #61 about to go into Nitrogen air flow over “original” CFRP

Longer periods (several months) in the material screening setup needed

PANDA Technical Notes in preparation

Backup slides


Nikon Bars
Reflectivity
1
0.999
0.998
0.997
0.996
0.995
0.994
250
300
350
400
450
500
550
600
650
Wavelength / nm
5 Å
9 Å
10 Å
15 Å
Nikon Bar#21
Faces
Sides
Nikon Bar#41
Faces
Sides
Nikon Bar#61
Faces
Sides

Carbon Fiber vs Aluminum

Vergleichswerte verschiedener Werkstoffe im Bezug zu CFK

Werkstoff	Einheit	Kiefernholz	Dural-Alu	Titan	Stahl	GFK*	CFK*
Dichte	g/cm^3	0,5	2,8	4,5	7,8	2,1	1,5
Zugfestigkeit	MPa	100	350	800	1100	720	900
E-Modul	MPa	12000	75000	110000	210000	30000	88000
Spez. Festigkeit Reißlänge	km	20	13	18	14	34	60
Spez. E-Modul	km	2400	2700	2400	2700	1400	5900

or 120000
Stefan Koch

- GFK/CFK = quasiisotrope Laminate, nahezu gleiche Festigkeit in jede Richtung

Bei Leichtbauteilen entscheidet eine mit herkömmlichen Werkstoffen vergleichbare Festigkeit bei geringerem Gewicht über die Verwendung.
Bei gleichem Gewicht hat CFK (Carbon Gewebe) die fünffache Zugfestigkeit und Steifigkeit von Stahl. 1 kg CFK kann 5 kg Stahl ersetzen.

part	$X_o(g/cm^2)$	$\rho_o(g/cm^3)$	$X_o(mm)$	g/m^2	d (mm)	$X/X_o(\%)$
Rohacell	40.8	0.075	5440		16	0.294
fibers	45.2	0.068	6647		32	0.481
carbon fiber	42.7	1.8	237	190		0.045
mylar	45.2	0.9	503		0.024	0.005
Aluminum	24.01	2.7	88.9		0.006	0.007
Glue	42.6	1.2	354.9	150		0.035
Air	37.1	0.0012	318425.2		31.4	0.01
Sum						0.877