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LOW OPTICAL ABSORPTION MEASUREMENT REPORT

SAMPLE: CAM71_MS_CH

Request from		Testing institute	
Address	OPTOMAN Ukmergės pl. 427 LT-14183 Vilnius Lithuania	Address	UAB Lidaris Saulėtekio al. 10 10223 Vilnius Lithuania
Contact person	Vaida Grašytė	Tester	Edvinas Zacharovas
Inquiry ID	Inquiry 4206	Sale order	SO5183
Purchase order	PO9841	Test ID	EVR2BY
		Test date	2024-10-18

Specimen

Name	CAM71_MS_CH
Type	HR Dielectric Coating (HR@1030)
Dimensions	Ø25.4 x 6.4 mm
Packaging	Plastic box
Storage before test	Normal laboratory conditions
Dust blow-off	Canned air
Cleaning	None

Measurement

Method	Photothermal common-path interferometry (PCI)
Regime	Transmission
Protocols	Longitudinal scan, Time scan, Transverse scan

TEST EQUIPMENT

Definitions and test description

Photothermal common-path interferometry (PCI) for low absorption measurements is based on spatially resolved pump-probe techinque: low power probe beam senses the heating effect of an absorbed pump beam [1]. Several different scanning protocols are performed to measure the absorption of the sample.

Irradiation sources	Pump laser	Probe laser
Manufacturer	Ekspla	Lumentum
Model	Atlantic 80	1122P
Type	Mode-locked Nd:YVO4	Continuous wave HeNe
Central wavelength	1064 nm	632.8 nm
Angle of incidence	(45.0 ± 1.0) deg	(52.0 ± 1.0) deg
Polarization state	Linear P	Linear S
Spatial beam profile in target plane	TEM00	TEM00
Beam diameter in target plane (1/e2)	(66.2 ± 5) µm	(210 ± 5) µm
Average power	various	(2.00 ± 0.05) mW

Measurement setup calibration	Surface
Calibration sample	UVFS Reference Surface Sample
Absorption	22.2 %
Correction factor	1.0
Responsivity	$10.22^{+0.20}_{-0.25}$ 1/W

Power meter	
Manufacturer	Ophir
Model	3A-PF-12
Calibration due date	2025-05

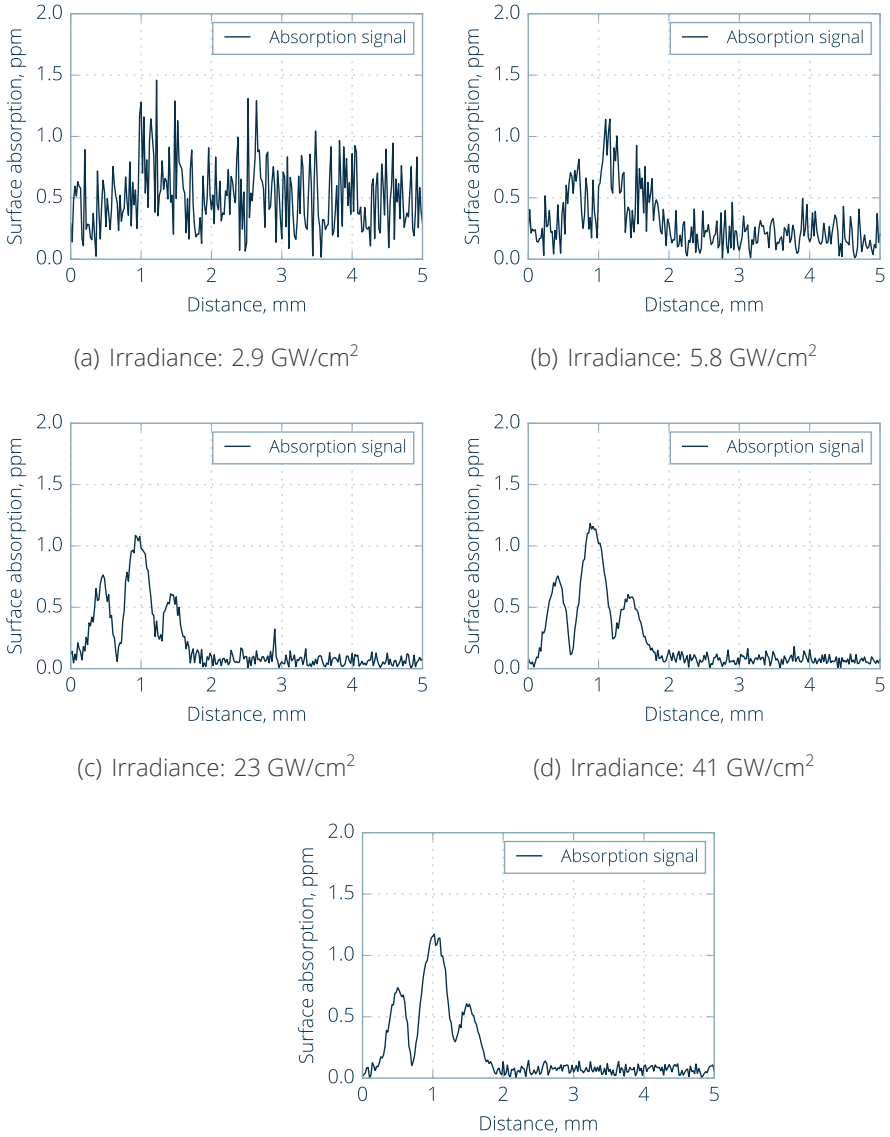
Test environment	
Environment	Air
Cleanroom class (ISO 14644-1)	ISO7
Pressure	1 bar
Temperature	23 C
Humidity	27 %

[1] A. Alexandrovski, M. Fejer, A. Markosian, and Roger Route "Photothermal common-path interferometry (PCI): new developments", Proc. SPIE 7193, Solid State Lasers XVIII: Technology and Devices, 71930D (28 February 2009)

LONGITUDINAL SCAN (L-SCAN) RESULTS

Scan parameters

Scanning axis	Longitudinal (from S1 to S2)
Scanning distance	5.0 mm
Scanning step	20 µm
Pump laser power	0.5, 1, 4, 7, 10 W
Number of scans	5



(a) Irradiance: 2.9 GW/cm^2

(b) Irradiance: 5.8 GW/cm^2

(c) Irradiance: 23 GW/cm^2

(d) Irradiance: 41 GW/cm^2

(e) Irradiance: 58 GW/cm^2

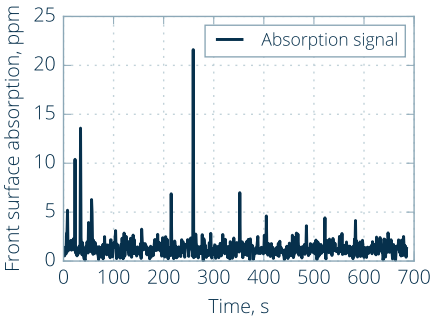
Figure 1. Longitudinal scan.

TIME SCAN RESULTS

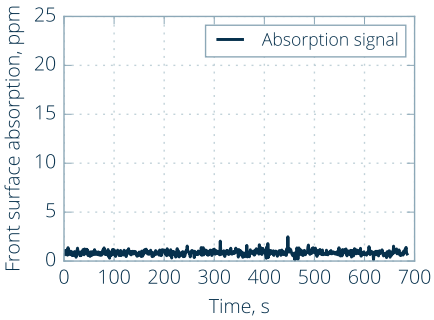
FRONT SURFACE (S1)

Scan parameters

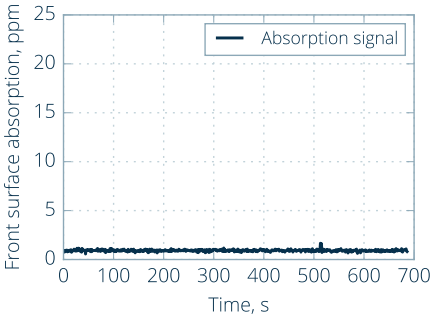
Scanning axis	Time
Scanning duration	700 s
Scanning step	1 s
Pump laser power	0.5, 1, 4, 7, 10 W
Number of scans	5



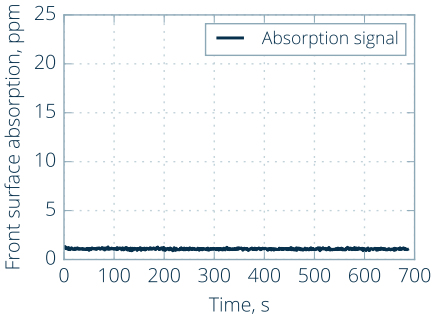
(a) Irradiance: 2.9 GW/cm^2



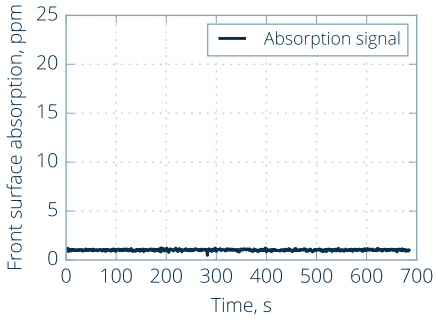
(b) Irradiance: 5.8 GW/cm^2



(c) Irradiance: 23 GW/cm^2



(d) Irradiance: 41 GW/cm^2



(e) Irradiance: 58 GW/cm^2

Figure 2. Time scan on front surface (S1).

TRANSVERSE SCAN (T-SCAN) RESULTS

FRONT SURFACE (S1)

Definitions and protocol description

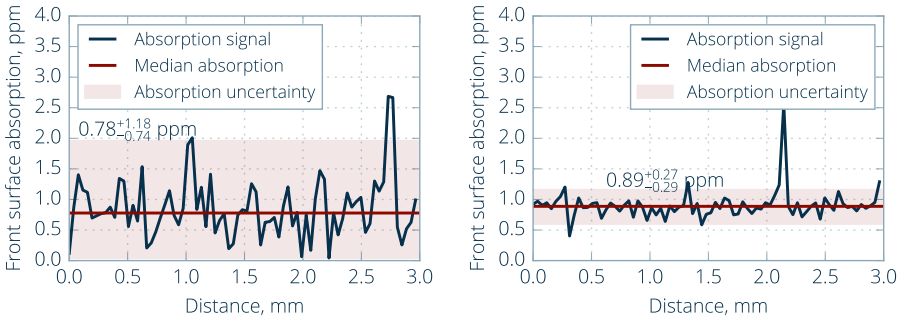
Sample absorption is defined as median absorption value of T-scan measurement. Uncertainty is evaluated as minimum and maximum absorption values of T-scan measurement without outliers, i.e. within range [Q1 - 1.5 · IQR, Q3 + 1.5 · IQR], where Q1 - first quartile, Q3 - third quartile, IQR - interquartile range.

Scan parameters

Scanning axis	Transverse (vertical)
Scanning distance	3.0 mm
Scanning step	39 µm
Pump laser power	0.5, 1, 4, 7, 10 W
Number of scans	5

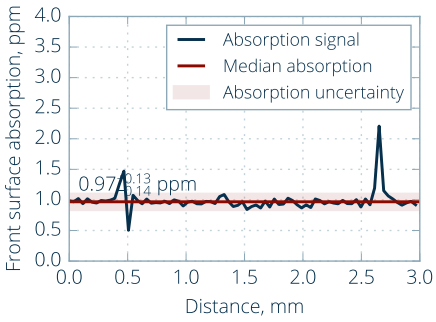
Sample absorption

Irradiance: 2.9 GW/cm^2	$0.78^{+1.18}_{-0.74}$ ppm
Irradiance: 5.8 GW/cm^2	$0.89^{+0.27}_{-0.29}$ ppm
Irradiance: 23 GW/cm^2	$0.97^{+0.13}_{-0.14}$ ppm
Irradiance: 41 GW/cm^2	$1.109^{+0.101}_{-0.092}$ ppm
Irradiance: 58 GW/cm^2	$1.028^{+0.072}_{-0.073}$ ppm

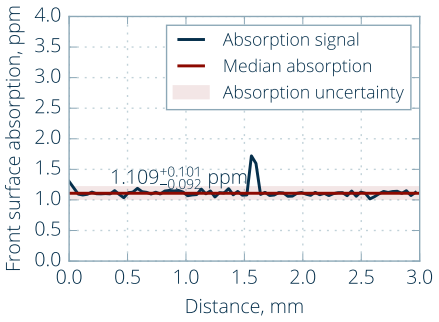


(a) Irradiance: 2.9 GW/cm^2

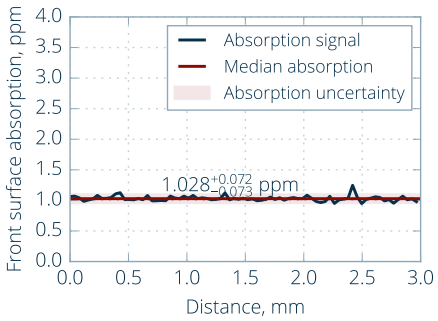
(b) Irradiance: 5.8 GW/cm^2



(c) Irradiance: 23 GW/cm^2



(d) Irradiance: 41 GW/cm^2



(e) Irradiance: 58 GW/cm^2

Figure 3. Transverse scan on front surface (S1).

FRONT SURFACE ABSORPTION DEPENDENCE ON IRRADIATION

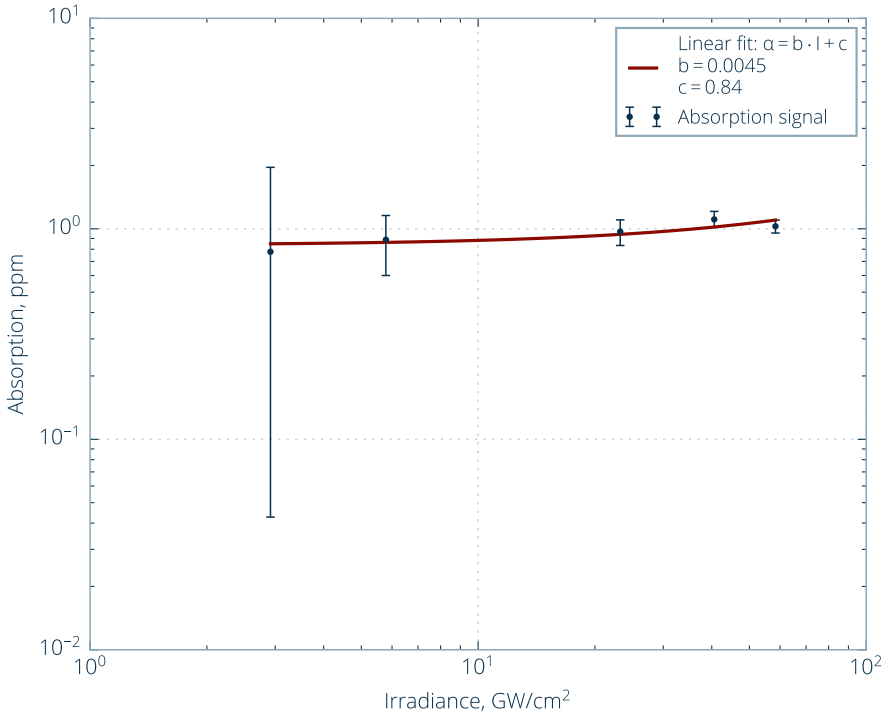


Figure 4. Front surface (S1) absorption dependence on irradiation.

TESTING LOCATION

FRONT SURFACE (S1)

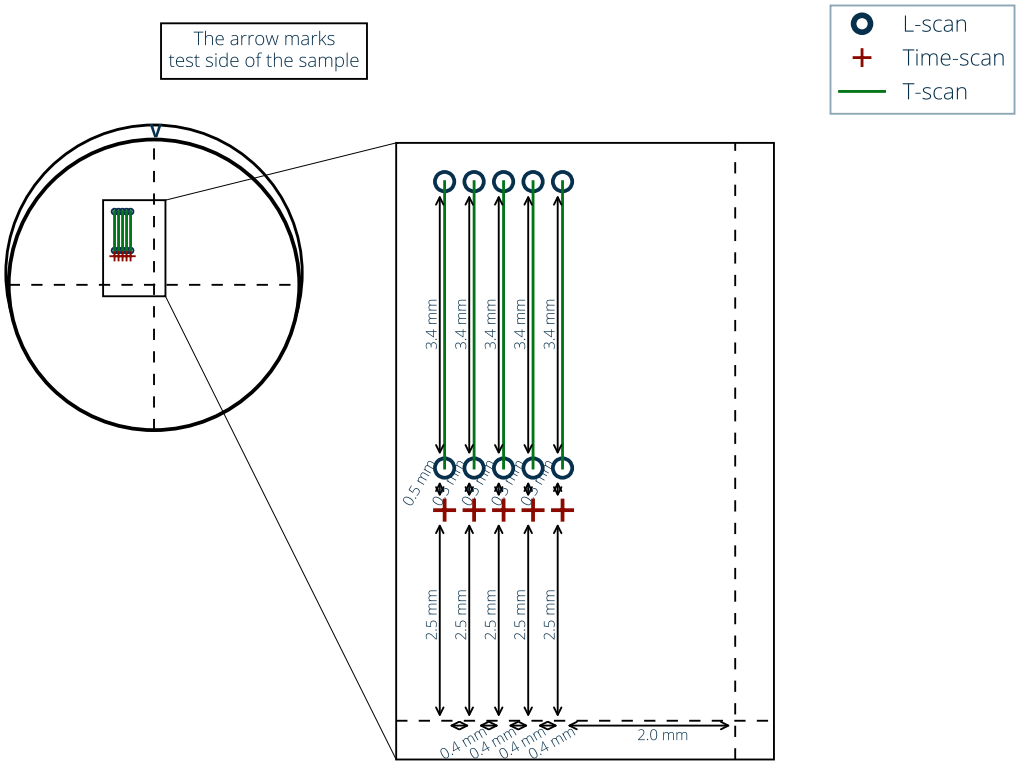


Figure 5. Measured sites on the sample.