Calibration Certificate

Irradiance Calibration Report:

AvaSphere-50-LS-HAL-CAL-S1

Calibrated Lightsource Specification:

Lightsource:

Serial-Nr.:	**1603008**
Type:	AvaSphere-50-LS-HAL-CAL-S1 Calibrated Integrating Sphere with halogen light source
Stability:	+/- 0.1%
Manufacturer:	Avantes
Calibration Lab:	Avantes

Calibrated with:

FC-IR200-2-ME

Power supply:

Serial-Nr.:	**1603008-PS**
Type:	FW7530/24
Input :	100-240 V – 50/60HZ 660 mA
Offical output:	24 VDC 1,25 A @ 230V
Ripple noise:	<100 mV

Calibration Reference Specification:

Reference Laboratory:

VIS/NIR Transfer standard supplied by: Labsphere Inc.

Traceability to:

VIS/NIR calibration:

NIST

National Institute of Standards and Technology.

Test No: **844/278592-09**

Lightsource Specification

VIS/NIR Lightsource:

Type :	Wolfram Halogen 6390 - DZA

Power supply:

Type:	Agilent Technologies E3632A
Offical output:	0-15 VDC / 0-7A @ 230V
Measured output:	2.779A +/- 0.2% +10mA

Calibration Setup:

Calibration Specifications:

VIS/NIR calibration:

Range:	300 - 1100 nm, VIS/NIR - Halogen
Calibration data units:	µW/cm²/nm
Data resolution:	10 nm

Lightsource settings:

Time to stabilize:	≥ 15 min
Voltage:	24.0 V +/- 0.5%

Light entrance calibration specifications:

Entrance:	FC-IR200-2-ME
Sample port diameter:	200 µm

VIS/NIR Reference Calibration Specifications:

Calibration distance:	0.08 m

(distance = WS-2 -> reference pointsource.)

Lightsource settings:

Time to stabilize:	≥ 15 min
Current:	2.779A+/- 0.2%

Last calibration:

Last calibration:	01-02-2016

Transferstandard:

Last calibration:	27-10-2010

Calibration Uncertainties:

Following Uncertainties $\Delta E_{(\lambda)}/E_{(\lambda)}$ are valid for following ranges:

Wavelength Range (nm)	Relative uncertainties of the source	Relative uncertainties of the calibration	Stability of AvaLight-Hal-Cal
< 380	+/- 12 %	+/- 5 %	+/- 0,1 % [60 hours]
380 till 1100	+/- 9,5 %	+/- 2,5 %	+/- 0,1 % [60 hours]

Notes:

Any adjustment to the Halogen light output will invalidate both the VIS/NIR calibration files.

Addendums:

-Calibration data sheet
- VIS/NIR data sheet 5 nm resolution without WS-2
- VIS/NIR data sheet 5 nm resolution with WS-2

-Cdrom with calibration data

Date: 8-3-2016 **Calibrated by:** R. van de Pol

Signature: .....

Calibration data for AvaSphere-50-LS-HAL-CAL-S1 nr. 1603008, calibrated with WS-2

Wavelength [nm]	Intensity [uW/cm^2.nm]	Wavelength [nm]	Intensity [uW/cm^2.nm]	Wavelength [nm]	Intensity [uW/cm^2.nm]
300	0.00000	570	129.97620	840	371.03483
305	0.89550	575	135.21661	845	373.65519
310	0.91710	580	140.49153	850	376.30744
315	0.82637	585	145.78200	855	378.77147
320	0.94734	590	151.08476	860	381.34716
325	0.94373	595	156.44249	865	384.06689
330	0.94137	600	161.82854	870	386.88221
335	0.94083	605	167.23040	875	389.96090
340	0.94277	610	172.67529	880	393.51677
345	1.00856	615	178.11499	885	397.13541
350	1.16296	620	183.56174	890	400.92404
355	1.41936	625	188.97796	895	404.63994
360	1.80203	630	194.38676	900	408.39184
365	2.33244	635	199.84817	905	411.92687
370	3.03289	640	205.32570	910	415.55326
375	3.91811	645	210.76984	915	418.85196
380	4.97649	650	216.20107	920	421.92739
385	6.19519	655	221.61637	925	424.92524
390	7.55696	660	227.05451	930	427.66629
395	9.05824	665	232.44513	935	430.53491
400	10.69500	670	237.76226	940	433.35531
405	12.42796	675	243.02833	945	436.01144
410	14.25630	680	248.22610	950	438.54511
415	16.17374	685	253.40049	955	441.22311
420	18.18304	690	258.45596	960	443.62529
425	20.30159	695	263.40981	965	446.11609
430	22.50820	700	268.25040	970	448.35576
435	24.81000	705	272.95450	975	450.37637
440	27.23780	710	277.56301	980	452.18443
445	29.78150	715	282.07287	985	453.95729
450	32.47056	720	286.49114	990	455.28321
455	35.26901	725	290.83664	995	456.55774
460	38.14586	730	295.03687	1000	457.49973
465	41.09124	735	299.19474	1005	458.01993
470	44.17690	740	303.28650	1010	458.83917
475	47.38927	745	307.22031	1015	459.05773
480	50.71867	750	311.09570	1020	459.85309
485	54.14180	755	314.90394	1025	460.17003
490	57.70460	760	318.68087	1030	460.12047
495	61.42587	765	322.41647	1035	460.16661
500	65.31464	770	326.04950	1040	459.10736
505	69.28473	775	329.65343	1045	457.97930
510	73.35984	780	333.25656	1050	455.93371
515	77.52096	785	336.74977	1055	452.20239
520	81.79347	790	340.12466	1060	449.52689
525	86.14230	795	343.38317	1065	445.71906
530	90.58360	800	346.68343	1070	440.21819
535	95.12560	805	349.87726	1075	436.02139
540	99.80526	810	352.96164	1080	432.68066
545	104.58151	815	355.96646	1085	426.49248
550	109.48123	820	359.09893	1090	419.36326
555	114.48521	825	362.23510	1095	411.16011
560	119.57776	830	365.27079	1100	0.00000
565	124.74849	835	368.19893		

Calibration data for AvaSphere-50-LS-HAL-CAL-S1 nr. 1603008, calibrated without WS-2

Wavelength [nm]	Intensity [uW/cm^2.nm]	Wavelength [nm]	Intensity [uW/cm^2.nm]	Wavelength [nm]	Intensity [uW/cm^2.nm]
300	0.00000	570	68.98491	840	206.74891
305	0.47680	575	71.80584	845	208.26390
310	0.50390	580	74.65203	850	209.75876
315	0.44839	585	77.50811	855	211.13167
320	0.51389	590	80.37539	860	212.49126
325	0.51379	595	83.27607	865	213.97611
330	0.51201	600	86.19856	870	215.39201
335	0.51229	605	89.13864	875	216.92706
340	0.51524	610	92.11140	880	218.74636
345	0.55380	615	95.08870	885	220.61191
350	0.64201	620	98.06806	890	222.54694
355	0.78723	625	101.05039	895	224.48600
360	0.99991	630	104.03117	900	226.37061
365	1.29297	635	107.04099	905	228.17979
370	1.67713	640	110.06270	910	230.03294
375	2.15456	645	113.07067	915	231.70116
380	2.72304	650	116.07684	920	233.26284
385	3.37197	655	119.08614	925	234.73236
390	4.08987	660	122.10693	930	236.06994
395	4.87936	665	125.11716	935	237.47496
400	5.73387	670	128.09249	940	238.87304
405	6.63520	675	131.04007	945	240.16664
410	7.58693	680	133.95960	950	241.37131
415	8.58249	685	136.86744	955	242.58873
420	9.62639	690	139.72883	960	243.72301
425	10.73047	695	142.53876	965	244.89617
430	11.88140	700	145.28949	970	245.95391
435	13.08417	705	147.96044	975	246.83417
440	14.35960	710	150.60257	980	247.69044
445	15.69499	715	153.19593	985	248.50101
450	17.10737	720	155.75096	990	249.08514
455	18.58207	725	158.25161	995	249.65109
460	20.09787	730	160.69820	1000	249.99679
465	21.65034	735	163.11366	1005	250.15866
470	23.27976	740	165.53451	1010	250.37401
475	24.97034	745	167.86884	1015	250.33480
480	26.72784	750	170.17207	1020	250.71207
485	28.53943	755	172.45013	1025	250.77769
490	30.42637	760	174.72709	1030	250.64893
495	32.39864	765	176.97430	1035	250.58327
500	34.46613	770	179.19400	1040	249.99383
505	36.57957	775	181.39096	1045	249.42343
510	38.74633	780	183.58220	1050	248.19523
515	40.96329	785	185.73120	1055	246.11019
520	43.23891	790	187.83804	1060	244.76879
525	45.55097	795	189.89981	1065	242.78611
530	47.91447	800	191.95183	1070	239.93650
535	50.33287	805	193.95957	1075	237.54891
540	52.82080	810	195.86659	1080	235.71286
545	55.37187	815	197.74494	1085	232.43971
550	57.99207	820	199.66843	1090	228.70721
555	60.66610	825	201.55116	1095	224.46157
560	63.39623	830	203.31987	1100	0.00000
565	66.17456	835	205.08559		