

# SAR TEST REPORT



The following samples were submitted and identified on behalf of the client as:

Product Name	Notebook Computer
Brand Name	HP
Model No.	HSN-I22C
Prepared for	HP Inc. 1501 Page Mill Road, Palo Alto CA 94304 USA
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013,
	KDB248227D01v02r02,KDB865664D01v01r04,
	KDB865664D02v01r02,KDB447498D01v06,
	KDB616217D04v01r02,
FCC ID	B94-8265NGWR
Date of Receipt	Nov. 26, 2018
Date of Test(s)	Dec. 01, 2018 ~ Dec. 10, 2018
<b>Date of Issue</b> In the configuration tested, the EUT	Dec. 26, 2018 complied with the standards specified above.

**Remarks:** 

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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### Signed on behalf of SGS

Clerk / Ruby Ou	Asst. Supervisor / Afu Chen	Asst. Manager / John Yeh
Ruby Ou	afer Chen	John Teh
		Date: Dec. 26, 2018

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# **Revision History**

Report Number	Revision	Description	Issue Date
EN/2018/B0040	Rev.00	Initial creation of document	Dec. 19, 2018
EN/2018/B0040	Rev.01	Modify ch1.3	Dec. 26, 2018

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# 1. General Information

# 1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory						
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Tel +886-2-2299-3279						
Fax +886-2-2298-0488						
Internet	http://www.tw.sgs.com/					

# **1.2 Details of Applicant**

Company Name	HP Inc.
Company Address	1501 Page Mill Road, Palo Alto CA 94304 USA

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# **1.3 Description of EUT**

General Information of Host:										
Equipment Under Test	Notebook Computer									
Brand Name	НР									
Model No.	HSN-122C									
Integrated Module	Brand Name : Intel									
	Model Name : 8265NGW									
FCC ID	B94-8265NGWR									
Mode of Operation	WLAN802.11 a/b/g/n(20M/40M)/ac(									
Duty Cycle	WLAN802.11 a/b/g/n(20M/40M)/ ac(20M/40M/80M)		1							
	Bluetooth		1							
	WLAN802.11 b/g/n(20M)	2412	_	2472						
	WLAN802.11 n(40M)	2422	_	2462						
	WLAN802.11 a/n(20M)/ac(20M) 5.2G	5180	_	5240						
	WLAN802.11 n(40M)/ac(40M) 5.2G	5190	_	5230						
	WLAN802.11 ac(80M) 5.2G	5210								
	WLAN802.11 a/n(20M)/ac(20M) 5.3G	5260	_	5320						
	WLAN802.11 n(40M)/ac(40M) 5.3G	5270	_	5310						
TX Frequency Range (MHz)	WLAN802.11 ac(80M) 5.3G		5290							
	WLAN802.11 a/n/ac(20M) 5.6G	5500	_	5720						
	WLAN802.11 n/ac(40M) 5.6G	5510	_	5710						
	WLAN802.11 ac(80M) 5.6G	5530	_	5690						
	WLAN802.11 a/n(20M)/ac(20M) 5.8G	5745	_	5825						
	WLAN802.11 n(40M)/ac(40M) 5.8G	5710	_	5795						
	WLAN802.11 ac(80M) 5.8G		5775							
	Bluetooth	2402	_	2480						

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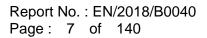
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	WLAN802.11 b/g/n(20M)	1	—	13
	WLAN802.11 n(40M)	3	—	11
	WLAN802.11 a/n(20M)/ac(20M) 5.2G	36	_	48
	WLAN802.11 n(40M)/ac(40M) 5.2G	38	_	46
	WLAN802.11 ac(80M) 5.2G		42	
	WLAN802.11 a/n(20M)/ac(20M) 5.3G	52	_	64
Channel Number (ARFCN)	WLAN802.11 n(40M)/ac(40M) 5.3G	54	_	62
	WLAN802.11 ac(80M) 5.3G		58	
	WLAN802.11 a/n/ac(20M) 5.6G	100	_	144
	WLAN802.11 n/ac(40M) 5.6G	102	_	142
	WLAN802.11 ac(80M) 5.6G	106	_	138
	WLAN802.11 a/n(20M)/ac(20M) 5.8G	149	_	165
	WLAN802.11 n(40M)/ac(40M) 5.8G	151	_	159
	WLAN802.11 ac(80M) 5.8G		155	
	Bluetooth	0	_	78

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#### AWAN

	Max. SAR (1g) (Unit: W/Kg)								
Antenna	Band	Measured	Reported	Channel	Position				
	WLAN 802.11b	0.46	0.46	1	Top side				
	WLAN 802.11n(40M) 5.2G	0.47	0.47	46	Top side				
	WLAN 802.11a 5.3G	0.37	0.37	60	Top side				
Main	WLAN 802.11n(40M) 5.3G	0.41	0.41	54	Top side				
	WLAN 802.11n(40M) 5.6G	0.57	0.57	102	Top side				
	WLAN 802.11ac(80M) 5.6G	0.85	0.85	138	Top side				
	WLAN 802.11ac(80M) 5.8G	0.90	0.90	155	Top side				
	WLAN 802.11b	0.75	0.75	1	Top side				
	Bluetooth(GFSK)	0.15	0.15	39	Top side				
	WLAN 802.11n(40M) 5.2G	0.38	0.38	38	Top side				
Aux	WLAN 802.11a 5.3G	0.47	0.47	60	Top side				
	WLAN 802.11n(40M) 5.3G	0.41	0.41	54	Top side				
	WLAN 802.11ac(80M) 5.6G	0.90	0.90	138	Top side				
	WLAN 802.11ac(80M) 5.8G	0.78	0.78	155	Top side				

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#### HONG-BO

Max. SAR (1g) (Unit: W/Kg)								
Antenna	Band	Measured	Reported	Channel	Position			
	WLAN 802.11b	0.63	0.63	1	Top side			
	WLAN 802.11n(40M) 5.2G	0.85	0.85	38	Top side			
	WLAN 802.11a 5.3G	0.96	0.97	64	Top side			
Main	WLAN 802.11n(40M) 5.3G	0.88	0.88	54	Top side			
	WLAN 802.11n(40M) 5.6G	1.03	1.04	134	Top side			
	WLAN 802.11ac(80M) 5.6G	0.92	0.92	138	Top side			
	WLAN 802.11ac(80M) 5.8G	0.96	0.96	155	Top side			
	WLAN 802.11b	1.19	1.19	1	Top side			
	Bluetooth(GFSK)	0.27	0.27	39	Top side			
	WLAN 802.11n(40M) 5.2G	0.92	0.94	46	Top side			
Aux	WLAN 802.11a 5.3G	1.00	1.01	52	Top side			
	WLAN 802.11n(40M) 5.3G	0.99	0.99	54	Top side			
	WLAN 802.11ac(80M) 5.6G	0.91	0.92	106	Top side			
	WLAN 802.11ac(80M) 5.8G	0.77	0.77	155	Top side			

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#### **Antenna Information**

Tablet mode										
Vendor		HONG-BO								
Antenna	Main Aux									
Part Number	6036B0233101(260-27273) 6036B0233001(260-27272)									
Frequency	2.4	5.2	5.3	5.6	5.8	2.4	5.2	5.3	5.6	5.8
Gain (dBi)	-2.89	-0.32	-1.11	-2.04	1.54	-1.07	-1.65	-1.65	-1.25	-0.03

	Laptop mode									
Vendor		HONG-BO								
Antenna		Main Aux								
Part Number	6036B0233101(260-27273)					6036B02	233001(26	0-27272)		
Frequency	2.4	5.2	5.3	5.6	5.8	2.4	5.2	5.3	5.6	5.8
Gain (dBi)	0.49	2.58	2.18	1.48	1.19	-1.13	1.32	1.99	1.89	1.89

	Tablet mode									
Vendor		AWAN Corporation								
Antenna		Main					Aux			
Part Number	6	6036B0234	1201(ANP	6Y-100280	))	6036B0234101(ANP6Y-100279)				
Frequency	2.4	5.2 5.3 5.6 5.8			5.8	2.4	5.2	5.3	5.6	5.8
Gain (dBi)	-3.21	0.29	-0.84	-0.18	-0.18	-3.68	-2.82	-2.44	-1.62	-1.27

	Laptop mode									
Vendor		AWAN Corporation								
Antenna		Main				Aux				
Part Number	6	036B0234	1201(ANP	6Y-100280	))	6036B0234101(ANP6Y-100279)				
Frequency	2.4 5.2 5.3 5.6 5.8			5.8	2.4	5.2	5.3	5.6	5.8	
Gain (dBi)	-2.08	0.99	-0.17	-0.68	-1.44	0.18	-1.48	-1.36	0.25	0.44

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Antenna	SI	SO	MIMO
Band	Chain 0	Chain 1	Chain0+1
WLAN802.11b	V	V	-
WLAN802.11g	V	V	-
WLAN802.11n(20M)	V	V	V
WLAN802.11n(40M)	V	V	V
WLAN802.11a	V	V	-
WLAN802.11n(20M) 5G	V	V	V
WLAN802.11n(40M) 5G	V	V	V
WLAN802.11ac(20M) 5G	V	V	V
WLAN802.11ac(40M) 5G	V	V	V
WLAN802.11ac(80M) 5G	V	V	V

#### WLAN802.11 a/b/g/n(20M/40M)/ac(20M/40M/80M) conducted power table:

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#### Tablet mode (Reduced power)

		Mair	n Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		1	2412		17.50	17.49
		6	2437		17.50	17.43
	802.11b	11	2462	1Mbps	17.50	17.41
		12	2467		14.00	13.90
		13	2472		8.00	7.92
		1	2412		16.00	15.80
		2	2417		17.50	17.26
		6	2437		17.50	17.44
	802.11g	10	2457	6Mbps	17.50	17.29
		11	2462		16.00	15.79
		12	2467		12.00	11.88
		13	2472		-3.00	-3.10
2450 MHz		1	2412		16.00	15.86
2450 1011 12		2	2417		17.50	17.34
		6	2437		17.50	17.32
	802.11n20-HT0	10	2457	MCS0	17.50	17.38
		11	2462		16.00	15.93
		12	2467		12.00	11.95
		13	2472		-3.00	-3.10
		3	2422		13.00	12.88
		4	2427		16.00	15.94
		6	2437		16.50	16.31
	802.11n40-HT0	8	2447	MCS0	15.50	15.45
		9	2452		15.00	14.86
		10	2457		12.00	11.99
		11	2462		-4.00	-4.02

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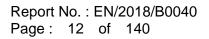
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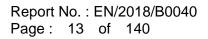




		Main <i>J</i>	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		36	5180		15.50	15.35
	802.11a	40	5200	6Mbps	15.50	15.32
	602.11a	44	5220		15.50	15.31
		48	5240		15.50	15.43
		36	5180		15.50	15.45
	802.11n20-HT0	40	5200	MCS0	15.50	15.43
		44	5220	10000	15.50	15.38
		48	5240		15.50	15.33
5.15-5.25 GHz		36	5180		15.50	15.38
	802.11ac20-VHT0	40	5200	MCS0	15.50	15.35
	002.118020-01110	44	5220	10050	15.50	15.45
		48	5240		15.50	15.32
	802.11n40-HT0	38	5190	MCS0	15.50	15.46
	002.11140-1110	46	5230	10000	15.50	15.47
	802.11ac40-VHT0	38	5190	MCS0	15.50	15.43
	802.11ac40-vH10	46	5230	10000	15.50	15.42
	802.11ac80-VHT0	42	5210	MCS0	13.00	12.97

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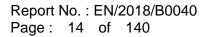


		Main	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		52	5260		15.50	15.41
	802.11a	56	5280	6Mbps	15.50	15.44
	002.11a	60	5300	olviops	15.50	15.49
		64	5320		15.50	15.45
	802.11n20-HT0	52	5260		15.50	15.31
		56	5280	MCS0	15.50	15.37
		60	5300	10000	15.50	15.41
		64	5320		15.50	15.36
5.25-5.35 GHz		52	5260		15.50	15.34
	802.11ac20-VHT0	56	5280	MCS0	15.50	15.39
	002.118620-0110	60	5300	10030	15.50	15.32
		64	5320		15.50	15.44
	802.11n40-HT0	54	5270	MCS0	15.50	15.49
	002.11140-F110	62	5310	10030	13.00	12.87
	802.11ac40-VHT0	54	5270	MCS0	15.50	15.41
	802.11ac40-VH10	62	5310	10000	13.00	12.93
	802.11ac80-VHT0	58	5290	MCS0	11.00	10.83

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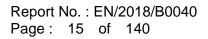
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		Main	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		100	5500		15.50	15.38
		104	5520		15.50	15.42
	000 44 -	116	5580	GMbpa	15.50	15.44
	802.11a	120	5600	6Mbps	15.50	15.40
		136	5700		15.50	15.32
		140	5700		15.50	15.43
		100	5500		15.50	15.39
		104	5520		15.50	15.45
	902 11p20 UT0	116	5580	MCS0	15.50	15.31
	802.11n20-HT0	120	5600	MCS0	15.50	15.42
		136	5680		15.50	15.43
		140	5700		15.50	15.41
		100	5500		15.50	15.39
	802.11ac20-VHT0	104	5520	MCS0	15.50	15.33
		116	5580		15.50	15.34
5600 MHz		120	5600		15.50	15.35
		136	5680		15.50	15.28
		140	5700		15.50	15.30
		144	5720		15.50	15.29
		102	5510		15.50	15.49
	802.11n40-HT0	110	5550	MCS0	15.50	15.45
	оо <u>2.1114</u> 0-п10	118	5590	IVIC30	15.50	15.43
		134	5670		15.50	15.48
		102	5510		15.50	15.31
		110	5550		15.50	15.39
	802.11ac40-VHT0	118	5590	MCS0	15.50	15.34
		134	5670		15.50	15.40
		142	5710		15.50	15.35
		106	5530		13.00	12.98
	802.11ac80-VHT0	122	5610	MCS0	15.50	15.45
		138	5690		15.50	15.49

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		Main A	Antenna			
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		149	5745		15.50	15.43
	802.11a	157	5785	6Mbps	15.50	15.42
		165	5825		15.50	15.34
		149	5745	MCS0	15.50	15.41
	802.11n20-HT0	157	5785		15.50	15.42
		165	5825		15.50	15.32
5800 MHz		149	5745		15.50	15.45
3000 1011 12	802.11ac20-VHT0	157	5785	MCS0	15.50	15.31
		165	5825		15.50	15.26
	802.11n40-HT0	151	5755	MCS0	15.50	15.39
	002.11140-010	159	5795	NCSU	15.50	15.34
	802.11ac40-VHT0	151	5755	MCS0	15.50	15.29
	002.110040-1010	159	5795	WC30	15.50	15.28
	802.11ac80-VHT0	155	5775	MCS0	15.50	15.49

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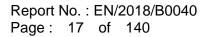


		Aux	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		1	2412		17.50	17.49
		6	2437		17.50	17.47
	802.11b	11	2462	1Mbps	17.50	17.46
		12	2467		15.00	14.84
		13	2472		8.00	7.92
		1	2412		17.00	16.83
		2	2417		17.50	17.43
		6	2437	1	17.50	17.33
	802.11g	10	2457	6Mbps	17.50	17.26
		11	2462		17.00	16.88
		12	2467		13.00	11.90
		13	2472		-3.00	-3.23
2450 MHz		1	2412		17.00	16.84
		2	2417		17.50	17.37
		6	2437		17.50	17.39
	802.11n20-HT0	10	2457	MCS0	17.50	17.28
		11	2462		17.00	16.92
		12	2467		13.00	12.87
		13	2472		-3.00	-3.11
		3	2422		16.00	15.83
		4	2427		16.00	15.93
		6	2437		16.50	16.32
	802.11n40-HT0	8	2447	MCS0	15.50	15.41
		9	2452		15.00	14.84
		10	2457		12.00	11.98
		11	2462		-4.00	-4.04

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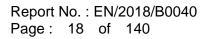


		Aux A	Intenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		36	5180		15.50	15.36
	802.11a	40	5200	6Mbps	15.50	15.26
	802.118	44	5220	olviops	15.50	15.44
		48	5240		15.50	15.38
	802.11n20-HT0	36	5180	MCS0	15.50	15.36
		40	5200		15.50	15.44
		44	5220		15.50	15.42
		48	5240		15.50	15.38
5.15-5.25 GHz		36	5180		15.50	15.40
	802.11ac20-VHT0	40	5200	MCS0	15.50	15.39
	002.118020-01110	44	5220	10030	15.50	15.43
		48	5240		15.50	15.41
	802.11n40-HT0	38	5190	MCS0	15.50	15.47
	оо <u>2.11114</u> 0-ПТО	46	5230	IVICOU	15.50	15.41
	802.11ac40-VHT0	38	5190	MCS0	15.50	15.45
	002.110040-0110	46	5230	10000	15.50	15.35
	802.11ac80-VHT0	42	5210	MCS0	13.00	12.89

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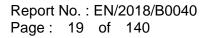
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		Aux A	Intenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		52	5260		15.50	15.44
	802.11a	56	5280	6Mbpc	15.50	15.40
	002.11a	60	5300	6Mbps	15.50	15.47
		64	5320		15.50	15.43
	802.11n20-HT0	52	5260		15.50	15.39
		56	5280	MCS0	15.50	15.31
		60	5300	10000	15.50	15.26
		64	5320		15.50	15.30
5.25-5.35 GHz		52	5260		15.50	15.26
	802.11ac20-VHT0	56	5280	MCS0	15.50	15.31
	002.118620-0110	60	5300	WC30	15.50	15.27
		64	5320		15.50	15.33
	802.11n40-HT0	54	5270	MCS0	15.50	15.49
	002.11140-010	62	5310	10030	13.00	13.00
	802.11ac40-VHT0	54	5270	MCS0	15.50	15.42
	002.11ac40-vH10	62	5310	10030	14.00	13.93
	802.11ac80-VHT0	58	5290	MCS0	12.00	11.98

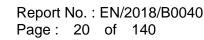
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		Aux A	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		100	5500		15.50	15.44
		104	5520		15.50	15.46
	000 44 -	116	5580	CMbaa	15.50	15.39
	802.11a	120	5600	6Mbps	15.50	15.45
		136	5700		15.50	15.40
		140	5700		15.50	15.43
		100	5500		15.50	15.39
		104	5520		15.50	15.27
	000 44×00 UT0	116	5580	MOCO	15.50	15.35
	802.11n20-HT0	120	5600	MCS0	15.50	15.33
		136	5680		15.50	15.42
		140	5700		15.50	15.45
		100	5500	MCS0	15.50	15.32
	802.11ac20-VHT0	104	5520		15.50	15.34
		116	5580		15.50	15.39
5600 MHz		120	5600		15.50	15.36
		136	5680		15.50	15.44
		140	5700		15.50	15.30
		144	5720		15.50	15.28
		102	5510		15.50	15.43
	802.11n40-HT0	110	5550	MCS0	15.50	15.41
	оо <u>2.1114</u> 0-п10	118	5590	NIC30	15.50	15.30
		134	5670		15.50	15.35
		102	5510		15.50	15.43
		110	5550		15.50	15.31
	802.11ac40-VHT0	118	5590	MCS0	15.50	15.41
		134	5670		15.50	15.35
		142	5710		15.50	15.27
		106	5530		15.50	15.47
	802.11ac80-VHT0	122	5610	MCS0	15.50	15.45
		138	5690		15.50	15.49

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		Aux A	Intenna			
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
	802.11a	149	5745		15.50	15.41
		157	5785	6Mbps	15.50	15.36
		165	5825		15.50	15.37
	802.11n20-HT0	149	5745		15.50	15.44
		157	5785	MCS0	15.50	15.47
		165	5825		15.50	15.43
5800 MHz		149	5745		15.50	15.29
5600 MHZ	802.11n40-VHT0	157	5785	MCS0	15.50	15.46
		165	5825		15.50	15.42
	802.11n40-HT0	151	5755	MCS0	15.50	15.31
	002.11140-010	159	5795	10030	15.50	15.28
	802 11ac40-\/HT0	151	5755	MCS0	15.50	15.38
	802.11ac40-VHT0	159	5795	10030	15.50	15.32
	802.11ac80-VHT0	155	5775	MCS0	15.50	15.49

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#### Notebook mode (Full power)

		Mair	n Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		1	2412		18.00	17.95
		2	2417		20.00	19.92
		6	2437		20.00	19.99
	802.11b	10	2457	1Mbps	20.00	19.95
		11	2462		19.00	18.92
		12	2467		14.00	13.87
		13	2472		8.00	7.94
		1	2412		16.00	15.80
		2	2417		19.00	18.84
		6	2437		20.00	19.82
	802.11g	10	2457	6Mbps	19.00	18.85
	_	11	2462		16.00	15.95
		12	2467	1	12.00	11.88
		13	2472		-3.00	-3.18
2450 MHz		1	2412		16.00	15.78
		2	2417		19.00	18.80
		6	2437		20.00	19.92
	802.11n20-HT0	10	2457	MCS0	19.00	18.85
		11	2462		16.00	15.86
		12	2467		12.00	11.91
		13	2472		-3.00	-3.21
		3	2422		13.00	12.77
		4	2427		16.00	15.91
		6	2437		16.50	16.39
	802.11n40-HT0	8	2447	MCS0	15.50	15.38
		9	2452		15.00	14.87
		10	2457		12.00	11.98
		11	2462		-4.00	-4.02

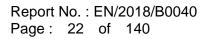
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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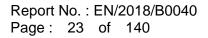


		Main <i>J</i>	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		36	5180		18.00	17.99
	802.11a	40	5200	6Mbps	20.00	19.96
	002.11a	44	5220	01vibp3	20.00	19.99
		48	5240		20.00	19.95
	802.11n20-HT0	36	5180		18.00	17.94
		40	5200	MCS0	20.00	19.87
		44	5220	101000	20.00	19.76
		48	5240		20.00	19.94
5.15-5.25 GHz		36	5180		18.00	17.77
	802.11ac20-VHT0	40	5200	MCS0	20.00	19.86
	002.118020-01110	44	5220	10050	20.00	19.82
		48	5240		20.00	19.94
	802.11n40-HT0	38	5190	MCS0	17.00	16.99
	002.11140-1110	46	5230	INC SU	20.00	19.93
	802.11ac40-VHT0	38	5190	MCS0	17.00	16.86
	602.11ac40-VH10	46	5230	WC30	20.00	19.90
	802.11ac80-VHT0	42	5210	MCS0	13.00	12.81

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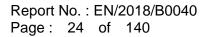
		Main	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		52	5260		20.00	19.97
	802.11a	56	5280	6Mbps	20.00	19.95
	002.11a	60	5300	olviops	20.00	19.99
		64	5320		17.00	16.95
	802.11n20-HT0	52	5260		20.00	19.88
		56	5280	MCS0	20.00	19.82
		60	5300	10030	20.00	19.86
		64	5320		17.00	16.87
5.25-5.35 GHz		52	5260		20.00	19.95
	802.11ac20-VHT0	56	5280	MCS0	20.00	19.77
	002.118020-01110	60	5300	10030	20.00	19.90
		64	5320		17.00	16.84
	802.11n40-HT0	54	5270	MCS0	20.00	19.96
	002.111 <del>4</del> 0-1110	62	5310	10000	13.00	12.92
	802.11ac40-VHT0	54	5270	MCS0	20.00	19.91
	002.11ac40-VH10	62	5310	10000	13.00	12.88
	802.11ac80-VHT0	58	5290	MCS0	11.00	10.83

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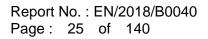
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	_	Main	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		100	5500		18.00	17.92
		104	5520		20.00	19.97
	000 44	116	5580	CMbaa	20.00	19.99
	802.11a	120	5600	6Mbps	20.00	19.91
		136	5700		20.00	19.92
		140	5700		17.00	16.95
		100	5500		18.00	17.85
		104	5520		20.00	19.95
	802.11n20-HT0	116	5580	MCS0	20.00	19.76
		120	5600	IVIC50	20.00	19.82
		136	5680		20.00	19.79
		140	5700		17.00	16.78
	802.11ac20-VHT0	100	5500		18.00	17.85
		104	5520		20.00	19.89
		116	5580		20.00	19.76
5600 MHz		120	5600	MCS0	20.00	19.88
		136	5680		20.00	19.77
		140	5700		17.00	16.80
		144	5720		19.00	18.84
		102	5510		18.00	18.00
	802.11n40-HT0	110	5550	MCS0	20.00	19.95
	002.11140-F110	118	5590	10030	20.00	19.94
		134	5670		19.00	18.98
		102	5510		18.00	17.95
		110	5550		20.00	19.83
	802.11ac40-VHT0	118	5590	MCS0	20.00	19.91
		134	5670		19.00	18.78
		142	5710		20.00	19.80
		106	5530		16.00	15.88
	802.11ac80-VHT0	122	5610	MCS0	18.00	17.87
		138	5690		20.00	19.76

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		Main A	Antenna			
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
	802.11a	149	5745		20.00	19.92
		157	5785	6Mbps	20.00	19.79
		165	5825		20.00	19.77
	802.11n20-HT0	149	5745		20.00	19.81
		157	5785	MCS0	20.00	19.86
		165	5825		20.00	19.84
5800 MHz		149	5745		20.00	19.89
3000 1011 12	802.11ac20-VHT0	157	5785	MCS0	20.00	19.85
		165	5825		20.00	19.83
	802.11n40-HT0	151	5755	MCS0	20.00	19.94
	002.11140-1110	159	5795	WC30	20.00	19.99
	802.11ac40-VHT0	151	5755	MCS0	20.00	19.91
	602.11ac40-VH10	159	5795	10030	20.00	19.93
	802.11ac80-VHT0	155	5775	MCS0	18.00	17.87

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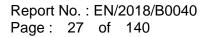


		Aux	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		1	2412		18.00	17.98
		2	2417		20.00	19.99
		6	2437		20.00	19.94
	802.11b	10	2457	1Mbps	20.00	19.93
		11	2462		19.00	18.76
		12	2467		15.00	14.89
		13	2472		8.00	7.92
		1	2412		17.00	16.89
		2	2417		19.00	18.80
		6	2437		20.00	19.85
	802.11g	10	2457	6Mbps	19.00	18.88
		11	2462	-	17.00	16.89
		12	2467		13.00	12.89
2450 MHz		13	2472		-3.00	-3.07
		1	2412		17.00	16.84
		2	2417		19.00	18.85
		6	2437		20.00	19.82
	802.11n20-HT0	10	2457	MCS0	19.00	18.78
		11	2462		17.00	16.93
		12	2467		13.00	12.92
		13	2472		-3.00	-3.16
		3	2422		16.00	15.86
		4	2427		16.00	15.91
		6	2437		16.50	16.30
	802.11n40-HT0	8	2447	MCS0	15.50	15.43
		9	2452		15.00	14.90
		10	2457		12.00	11.99
		11	2462		-4.00	-4.01

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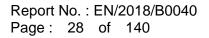
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		Aux A	Intenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		36	5180		18.00	17.97
	802.11a	40	5200	6Mbpc	20.00	19.93
	602.11a	44	5220	6Mbps	20.00	19.98
		48	5240		20.00	19.93
	802.11n20-HT0	36	5180		18.00	17.87
		40	5200	MCS0	20.00	19.95
		44	5220		20.00	19.91
		48	5240		20.00	19.78
5.15-5.25 GHz		36	5180		18.00	17.93
	802.11ac20-VHT0	40	5200	MCS0	20.00	19.78
	002.11ac20-VH10	44	5220	IVIC SU	20.00	19.87
		48	5240		20.00	19.86
	802.11n40-HT0	38	5190	MCS0	17.00	16.99
	ου2.111140 <b>-</b> Π10	46	5230	IVICOU	20.00	19.95
	802.11ac40-VHT0	38	5190	MCS0	17.00	16.80
		46	5230	10000	20.00	19.87
	802.11ac80-VHT0	42	5210	MCS0	13.00	12.86

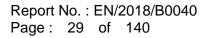
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		Aux A	Intenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		52	5260		20.00	19.99
	802.11a	56	5280	6Mbps	20.00	19.96
	802.11a	60	5300	olviops	20.00	19.91
		64	5320		17.00	16.98
	802.11n20-HT0	52	5260		20.00	19.76
		56	5280	MCS0	20.00	19.85
		60	5300	10000	20.00	19.79
		64	5320		17.00	16.89
5.25-5.35 GHz		52	5260		20.00	19.82
	802.11ac20-VHT0	56	5280	MCS0	20.00	19.77
	002.118620-0110	60	5300	NIC30	20.00	19.78
		64	5320		17.00	16.87
	802.11n40-HT0	54	5270	MCS0	20.00	19.99
	002.11140-010	62	5310	10030	14.00	13.99
	802.11ac40-VHT0	54	5270	MCS0	20.00	19.79
	602.11ac40-VH10	62	5310	10000	14.00	13.82
	802.11ac80-VHT0	58	5290	MCS0	12.00	11.89

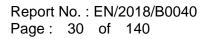
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	_	Aux A	Antenna			
Band	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
		100	5500		18.00	17.93
		104	5520		20.00	19.81
	902.110	116	5580	GMbpo	20.00	19.99
	802.11a	120	5600	6Mbps	20.00	19.94
		136	5700		20.00	19.97
		140	5700		17.00	16.92
		100	5500		18.00	17.94
		104	5520		20.00	19.90
		116	5580		20.00	19.82
	802.11n20-HT0	120	5600	MCS0	20.00	19.91
		136	5680		20.00	19.80
		140	5700		17.00	16.77
		144	5720		19.00	18.85
	802.11ac20-VHT0	100	5500	-	18.00	17.78
		104	5520		20.00	19.78
5600 MHz		116	5580		20.00	19.88
5600 MHZ		120	5600	MCS0	20.00	19.80
		136	5680		20.00	19.76
		140	5700		17.00	16.85
		144	5720		19.00	18.90
		102	5510		16.00	15.98
	802.11n40-HT0	110	5550	MCS0	20.00	19.99
	802.11140-ПТО	118	5590	IVICSU	20.00	19.96
		134	5670		19.00	18.98
		102	5510		18.00	17.77
		110	5550		20.00	19.84
	802.11ac40-VHT0	118	5590	MCS0	20.00	19.79
		134	5670		19.00	18.95
		142	5710		20.00	19.81
		106	5530		16.00	15.92
	802.11ac80-VHT0	122	5610	MCS0	18.00	17.87
		138	5690		20.00	19.93

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		Aux A	Intenna			
Mode	Mode	Channel	Frequency (MHz)	Data Rate	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
	802.11a	149	5745		20.00	19.77
		157	5785	6Mbps	20.00	19.92
		165	5825		20.00	19.95
	802.11n20-HT0	149	5745		20.00	19.89
		157	5785	MCS0	20.00	19.82
		165	5825		20.00	19.79
5800 MHz		149	5745		20.00	19.87
	802.11n40-VHT0	157	5785	MCS0	20.00	19.88
		165	5825		20.00	19.94
	802.11n40-HT0	151	5755	MCS0	20.00	19.99
	002.11140-010	159	5795	NCSU	20.00	19.91
	802.11ac40-VHT0	151	5755	MCS0	20.00	19.81
		159	5795	WC30	20.00	19.93
	802.11ac80-VHT0	155	5775	MCS0	18.00	17.91

#### Bluetooth conducted power table:

			1Mbps		2M	bps	3Mbps	
Mode	Channel	Frequency (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Average power (dBm)
	CH 00	2402	11.50	11.45	8.00	7.88	7.00	6.94
BR/EDR	CH 39	2441	11.50	11.48	8.00	7.85	7.00	6.99
	CH 78	2480	11.50	11.30	8.00	8.00	7.00	6.79

Mode	Channel	Frequency (MHz)	GFSK		
	Channer		Max. Rated Avg.Power + Max. Tolerance (dBm)	Average Output Power (dBm)	
LE	CH 00	2402	7	6.96	
	CH 19	2440		6.73	
	CH 39	2480		6.84	

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### **1.4 Test Environment**

Ambient Temperature: 22±2° C Tissue Simulating Liquid: 22±2° C

## **1.5 Operation Description**

Use chipset specific software to control the EUT, and makes it transmit in maximum power. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.

The device is a convertible laptop computer with RF feature. The device will adjust the maximum output power for different user scenario and EUT was tested as below based on KDB inquiry.

#### Tablet mode

Main/Aux antennas: Back/top/bottom/right/left sides\_0mm with reduced power

#### Laptop mode

SAR measurement for Laptop SAR with full power is not required since the distance between antenna and user is > 20cm.

Note:

802.11b DSSS SAR Test Requirements:

- 1. SAR is measured for 2.4 GHz 802.11b DSSS mode using the highest measured maximum output power channel, when the reported SAR of the highest measured maximum output power channel for the exposure configuration is  $\leq$ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

802.11g/n OFDM SAR Test Exclusion Requirements:

3. SAR is not required for 802.11g/n since the highest reported SAR for DSSS is

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adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

Initial Test Configuration:

- 4. An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band.
- SAR is measured using the highest measured maximum output power channel. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is  $\leq 1.2$ W/kg or all required channels are tested.
- 6. Since the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq$  1.2 W/kg, SAR is not required for subsequent test configuration.
- 7. BT and WLAN Aux use the same antenna path, but they can't transmit at the same time.
- 8. According to KDB447498 D01, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is  $\leq 0.8$  W/kg, when the transmission band is  $\leq$  100 MHz.
- 9. According to KDB865664 D01, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is  $\geq 0.8$  W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is  $\geq$  1.45 W/kg (~10% from the 1-g SAR limit)
- 10.SAR test exclusion evaluation (based on KDB447498D01) for the surfaces/edges of tablet mode is not required since all the applicable surfaces/edges were tested.

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### 1.6 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 5 professional system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR=  $\sigma$  (|Ei|<sup>2</sup>)/  $\rho$  where  $\sigma$  and  $\rho$  are the conductivity and mass density of the tissue-simulant.

The DASY 5 system for performing compliance tests consists of the following items:

- 1. A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- 2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
- 3. A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

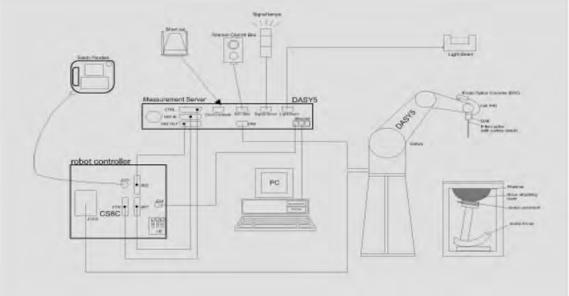


Fig. a The block diagram of SAR system

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- 4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- 5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- 6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- 7. A computer operating Windows 7.
- 8. DASY 5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- Tissue simulating liquid mixed according to the given recipes. 10.
- 11. Validation dipole kits allowing to validate the proper functioning of the system.

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### **1.7 System Components**

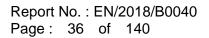
### **EX3DV4 E-Field Probe**

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)		
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 2450/5200/5300/5600/5800 MHz Additional CF for other liquids and frequencies upon request		
Frequency	10 MHz to > 6 GHz		
Directivity	$\pm$ 0.3 dB in HSL (rotation around probe axis) $\pm$ 0.5 dB in tissue material (rotation normal to probe axis)		
Dynamic	$10 \mu\text{W/g}$ to > 100 mW/g		
Range	Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)		
Dimensions	Tip diameter: 2.5 mm		
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.		

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#### PHANTOM

Model	ELI				
Construction	The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.				
Shell	2 ± 0.2 mm				
Thickness					
Filling Volume	Approx. 30 liters				
Dimensions	Major axis: 600 mm				
	Minor axis: 400 mm	A STATISTICS AND			

#### **DEVICE HOLDER**

Construction	The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin ) , which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks.	A
		Device Holder

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#### **1.8 SAR System Verification**

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 2450/5200/5300/5600/5800 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the liquid depth above the ear reference points was  $\geq$  15 cm  $\pm$  5 mm (frequency  $\leq$  3 GHz) or  $\geq$  10 cm  $\pm$  5 mm (frequency > 3 G Hz) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

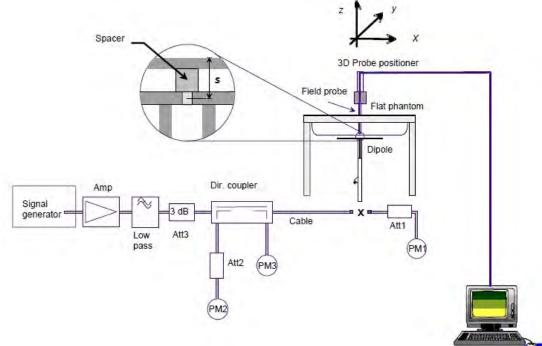


Fig. b The block diagram of system verification

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Validation Kit	S/N	Frequ (Mł	-	1W Target SAR-1g (mW/g)	Pin=250mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D2450V2	727	727 2450 Body		50.8	12.8	51.2	0.79%	Dec. 01, 2018
D2400VZ			Body	50.8	13.4	53.6	5.51%	Dec. 07, 2018

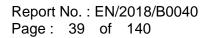
Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	Pin=100mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
		5200	Body	72.8	7.09	70.9	-2.61%	Dec. 03, 2018
		5200	Бойу	72.8	7.07	70.7	-2.88%	Dec. 07, 2018
		5300	Body	76.1	7.39	73.9	-2.89%	Dec. 04, 2018
D5GHzV2	1023	5500	БОЦУ	76.1	7.52	75.2	-1.18%	Dec. 08, 2018
03011212	1025	5600	Body	79.6	7.88	78.8	-1.01%	Dec. 05, 2018
		5000	БОЦУ	79.6	7.82	78.2	-1.76%	Dec. 09, 2018
		5800	Body	75.9	7.32	73.2	-3.56%	Dec. 06, 2018
		3000	BOUY	75.9	7.43	74.3	-2.11%	Dec. 10, 2018

Table 1. Results of system validation

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### 1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Network Analyzer.

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The measured conductivity and permittivity are all within ± 5% of the target values.

The depth of the tissue simulant in the flat section of the phantom was  $\geq 15$  cm  $\pm 5$ mm (Frequency  $\leq$ 3G) or  $\geq$  10 cm  $\pm$  5 mm (Frequency >3G) during all tests. (Fig. 2)

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev ɛr	% dev σ
		2402.00	52.764	1.904	53.735	1.903	-1.84%	0.05%
		2412.00	52.751	1.914	53.706	1.920	-1.81%	-0.31%
		2417.00	52.744	1.918	53.677	1.928	-1.77%	-0.52%
		2437.00	52.717	1.938	53.609	1.951	-1.69%	-0.67%
	Dec, 04. 2018	2441.00	52.712	1.941	53.591	1.952	-1.67%	-0.57%
		2450.00	52.700	1.950	53.577	1.974	-1.66%	-1.23%
		2457.00	52.691	1.960	53.551	1.981	-1.63%	-1.07%
		2462.00	52.685	1.967	53.546	1.985	-1.63%	-0.92%
		2480.00	52.662	1.993	53.479	2.006	-1.55%	-0.65%
		5180.00	49.041	5.276	49.459	5.141	-0.85%	2.56%
		5190.00	49.028	5.288	49.419	5.153	-0.80%	2.55%
	Dec. 04, 0040	5200.00	49.014	5.299	49.348	5.158	-0.68%	2.66%
	Dec, 04. 2018	5220.00	48.987	5.323	49.299	5.176	-0.64%	2.76%
		5230.00	48.974	5.334	49.212	5.209	-0.49%	2.34%
		5240.00	48.960	5.346	49.208	5.218	-0.51%	2.39%
		5260.00	48.933	5.369	49.122	5.260	-0.39%	2.03%
Body		5270.00	48.919	5.381	49.093	5.283	-0.36%	1.82%
	D 05 0040	5280.00	48.906	5.393	49.071	5.293	-0.34%	1.85%
	Dec, 05. 2018	5300.00	48.879	5.416	49.055	5.323	-0.36%	1.72%
		5310.00	48.865	5.428	48.968	5.335	-0.21%	1.71%
		5320.00	48.851	5.439	48.938	5.353	-0.18%	1.58%
		5510.00	48.594	5.661	48.301	5.656	0.60%	0.09%
		5530.00	48.566	5.685	48.260	5.692	0.63%	-0.12%
		5550.00	48.539	5.708	48.160	5.720	0.78%	-0.21%
	<b>D</b> 05 0040	5590.00	48.485	5.755	48.084	5.806	0.83%	-0.89%
	Dec, 05. 2018	5600.00	48.471	5.766	48.082	5.808	0.80%	-0.73%
		5610.00	48.458	5.778	48.036	5.820	0.87%	-0.73%
		5670.00	48.376	5.848	47.860	5.925	1.07%	-1.32%
		5690.00	48.349	5.872	47.784	5.978	1.17%	-1.81%
		5755.00	48.261	5.947	47.580	6.049	1.41%	-1.72%
	<b>D</b> 05 00/5	5775.00	48.234	5.971	47.507	6.095	1.51%	-2.08%
	Dec, 05. 2018	5795.00	48.207	5.994	47.455	6.137	1.56%	-2.39%
		5800.00	48.200	6.000	47.441	6.143	1.57%	-2.38%

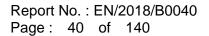
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Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev ɛr	% dev σ
		2402.00	52.764	1.904	53.793	1.916	-1.95%	-0.63%
		2412.00	52.751	1.914	53.779	1.928	-1.95%	-0.73%
		2417.00	52.744	1.918	53.779	1.941	-1.96%	-1.20%
		2437.00	52.717	1.938	53.738	1.964	-1.94%	-1.34%
	Dec, 04. 2018	2441.00	52.712	1.941	53.692	1.969	-1.86%	-1.44%
		2450.00	52.700	1.950	53.722	1.986	-1.94%	-1.85%
		2457.00	52.691	1.960	53.681	1.988	-1.88%	-1.43%
		2462.00	52.685	1.967	53.639	1.993	-1.81%	-1.32%
		2480.00	52.662	1.993	53.588	2.018	-1.76%	-1.25%
		5180.00	49.041	5.276	49.567	5.147	-1.07%	2.45%
		5190.00	49.028	5.288	49.533	5.156	-1.03%	2.50%
	Dec. 04, 2018	5200.00	49.014	5.299	49.473	5.165	-0.94%	2.53%
	Dec, 04. 2018	5220.00	48.987	5.323	49.449	5.196	-0.94%	2.39%
		5230.00	48.974	5.334	49.346	5.219	-0.76%	2.16%
		5240.00	48.960	5.346	49.339	5.225	-0.77%	2.26%
		5260.00	48.933	5.369	49.222	5.276	-0.59%	1.73%
Body		5270.00	48.919	5.381	49.214	5.293	-0.60%	1.64%
	Dec, 05. 2018	5280.00	48.906	5.393	49.193	5.302	-0.59%	1.69%
	Dec, 05. 2016	5300.00	48.879	5.416	49.159	5.338	-0.57%	1.44%
		5310.00	48.865	5.428	49.119	5.341	-0.52%	1.60%
		5320.00	48.851	5.439	49.079	5.355	-0.47%	1.54%
		5510.00	48.594	5.661	48.441	5.678	0.31%	-0.30%
		5530.00	48.566	5.685	48.401	5.701	0.34%	-0.28%
		5550.00	48.539	5.708	48.320	5.731	0.45%	-0.40%
	Dec, 05. 2018	5590.00	48.485	5.755	48.208	5.817	0.57%	-1.08%
	Dec, 05. 2018	5600.00	48.471	5.766	48.200	5.820	0.56%	-0.94%
		5610.00	48.458	5.778	48.173	5.830	0.59%	-0.90%
		5670.00	48.376	5.848	47.960	5.944	0.86%	-1.64%
		5690.00	48.349	5.872	47.872	5.984	0.99%	-1.91%
		5755.00	48.261	5.947	47.713	6.049	1.14%	-1.72%
	Dec. 05, 2019	5775.00	48.234	5.971	47.592	6.124	1.33%	-2.56%
	Dec, 05. 2018	5795.00	48.207	5.994	47.589	6.150	1.28%	-2.60%
		5800.00	48.200	6.000	47.587	6.158	1.27%	-2.63%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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#### The composition of the tissue simulating liquid:

Frequency				Ingi	redient			Total
Frequency (MHz)	Mode	DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	Total amount
2450M	Body	301.7ml	698.3ml	_	_	_	_	1.0L(Kg)

#### Body Simulating Liquids for 5 GHz. Manufactured by SPEAG:

Ingredients	Water	Esters, Emulsifiers, Inhibitors	Sodium and Salt
(% by weight)	60-80	20-40	0-1.5

Table 3. Recipes for Tissue Simulating Liquid

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### 1.10 Evaluation Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- 1. The extraction of the measured data (grid and values) from the Zoom Scan.
- 2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- 3. The generation of a high-resolution mesh within the measured volume
- 4. The interpolation of all measured values from the measurement grid to the high-resolution grid
- 5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- 6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements.

The measured volume of 30x30x30mm contains about 30g of tissue.

The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D

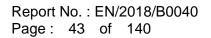
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interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

#### 1.11 Probe Calibration Procedures

For the calibration of E-field probes in lossy liquids, an electric field with an accurately known field strength must be produced within the measured liquid. For standardization purposes it would be desirable if all measurements which are necessary to assess the correct field strength would be traceable to standardized measurement procedures. In the following two different calibration techniques are summarized:

#### 1.11.1 Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field (E) and the temperature gradient ( $\delta T / \delta t$ ) in the liquid.

$$SAR = C \frac{\delta T}{\delta t}$$

whereby  $\sigma$  is the conductivity,  $\rho$  the density and c the heat capacity of the liquid.

Hence, the electric field in lossy liquid can be measured indirectly by measuring the temperature gradient in the liquid. Non-disturbing temperature probes (optical probes or thermistor probes with resistive lines) with high spatial resolution (<1-2 mm) and fast reaction time (<1 s) are available and can be easily calibrated with high precision [1]. The setup and the exciting source have no influence on the calibration; only the relative positioning uncertainties of the standard temperature probe and the E-field probe to be calibrated must be considered. However, several problems limit the available accuracy of probe calibrations with temperature probes:

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- The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.
- The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.
- The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures (~ 2% for c; much better for  $\rho$ ), there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed  $\pm 5\%$ .
- Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about ±10% (RSS) [2]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in [3]. The estimated uncertainty of the setup is  $\pm 5\%$  (RSS) when the same liquid is used for the calibration and for actual measurements and ±7-9% (RSS) when not, which is in good agreement with the estimates given in [2].

## 1.11.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.

When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

- The setup must enable accurate determination of the incident power.
- The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.
- Due to the small wavelength in liquids with high permittivity, even small

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setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

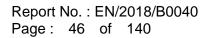
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### **1.12 Test Standards and Limits**

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1, By the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

- Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the (1) whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).
- Occupational/Controlled limits apply when persons are exposed as a (2) consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.
- Limits for General Population/Uncontrolled exposure: 0.08 W/kg as (3) averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not

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exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section. (Table 4.)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR (Brain)	1.60 W/kg	8.00 W/kg
Spatial Average SAR (Whole Body)	0.08 W/kg	0.40 W/kg
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 W/kg	20.00 W/kg

Table 4. RF exposure limits

Notes:

- 1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
- 2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

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# 2. Summary of Results

#### AWAN

## WLAN Antenna (Tablet mode)

Antenna	Mode	Position	Distance (mm)	СН	Freq. (MHz)	Max. Rated Avg. Power + Max.	Measured Avg. Power	Scaling	Averaged S (W		Plot page
			()		(	Tolerance (dBm)	(dBm)		Measured	Reported	page
		Back side	0	1	2412	17.50	17.49	100.23%	0.146	0.146	-
		Top side	0	1	2412	17.50	17.49	100.23%	0.455	0.456	61
	WLAN 802.11b	Top side**	0	1	2412	17.50	17.49	100.23%	0.438	0.439	
	WE/1002.115	Bottom side	0	1	2412	17.50	17.49	100.23%	0.025	0.025	-
		Right side	0	1	2412	17.50	17.49	100.23%	0.042	0.042	-
		Left side	0	1	2412	17.50	17.49	100.23%	0.042	0.042	-
		Back side	0	46	5230	15.50	15.47	100.69%	0.073	0.074	-
		Top side	0	46	5230	15.50	15.47	100.69%	0.465	0.468	62
	WLAN 802.11n(40M) 5.2G	Top side**	0	46	5230	15.50	15.47	100.69%	0.456	0.459	-
	WEAR 002.111(40W) 3.20	Bottom side	0	46	5230	15.50	15.47	100.69%	0.079	0.080	-
		Right side	0	46	5230	15.50	15.47	100.69%	0.012	0.012	-
		Left side	0	46	5230	15.50	15.47	100.69%	0.042	0.043	-
		Back side	0	60	5300	15.50	15.49	100.23%	0.058	0.058	-
		Top side	0	60	5300	15.50	15.49	100.23%	0.372	0.373	63
	WLAN 802.11a 5.3G	Bottom side	0	60	5300	15.50	15.49	100.23%	0.067	0.067	-
		Right side	0	60	5300	15.50	15.49	100.23%	0.008	0.008	-
		Left side	0	60	5300	15.50	15.49	100.23%	0.031	0.031	-
		Back side	0	54	5270	15.50	15.50	100.00%	0.068	0.068	-
		Top side	0	54	5270	15.50	15.50	100.00%	0.405	0.405	64
		Top side**	0	54	5270	15.50	15.50	100.00%	0.399	0.399	-
	WLAN 802.11n(40M) 5.3G	Bottom side	0	54	5270	15.50	15.50	100.00%	0.073	0.073	-
Main		Right side	0	54	5270	15.50	15.50	100.00%	0.010	0.010	-
		Left side	0	54	5270	15.50	15.50	100.00%	0.034	0.034	-
		Back side	0	102	5510	15.50	15.49	100.23%	0.083	0.083	-
		Top side	0	102	5510	15.50	15.49	100.23%	0.565	0.566	65
	WLAN 802.11n(40M) 5.6G	Bottom side	0	102	5510	15.50	15.49	100.23%	0.082	0.082	-
		Right side	0	102	5510	15.50	15.49	100.23%	0.013	0.013	-
		Left side	0	102	5510	15.50	15.49	100.23%	0.046	0.046	-
		Back side	0	138	5690	15.50	15.49	100.23%	0.131	0.131	-
		Top side	0	122	5610	15.50	15.45	101.16%	0.730	0.738	-
		Top side	0	138	5690	15.50	15.49	100.23%	0.850	0.852	66
		Top side*	0	138	5690	15.50	15.49	100.23%	0.831	0.833	-
	WLAN 802.11ac(80M) 5.6G	Top side**	0	138	5690	15.50	15.49	100.23%	0.838	0.840	-
		Bottom side	0	138	5690	15.50	15.49	100.23%	0.127	0.127	-
		Right side	0	138	5690	15.50	15.49	100.23%	0.022	0.022	-
		Left side	0	138	5690	15.50	15.49	100.23%	0.064	0.064	-
		Back side	0	155	5775	15.50	15.49	100.23%	0.144	0.144	-
		Top side	0	155	5775	15.50	15.49	100.23%	0.895	0.897	67
		Top side*	0	155	5775	15.50	15.49	100.23%	0.881	0.883	-
	WLAN 802.11ac(80M) 5.8G	Top side**	0	155	5775	15.50	15.49	100.23%	0.876	0.878	-
		Bottom side	0	155	5775	15.50	15.49	100.23%	0.132	0.132	-
		Right side	0	155	5775	15.50	15.49	100.23%	0.026	0.026	-
		Left side	0	155	5775	15.50	15.49	100.23%	0.020	0.020	
		Leit side		155	5115	10.00	13.49	100.2070	0.009	0.009	

\* - repeated at the highest SAR measurement according to the KDB 865664 D01 \*\* - 2nd Battery spotcheck

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#### WLAN Aux Antenna (Tablet mode)

Antenna	Mode	Position	Distance (mm)	СН	Freq. (MHz)	Max. Rated Avg. Power + Max.	Measured Avg. Power	Scaling	Averaged S (W		Plot page
			()		(	Tolerance (dBm)	(dBm)		Measured	Reported	F3-
		Back side	0	1	2412	17.50	17.49	100.23%	0.088	0.088	-
		Top side	0	1	2412	17.50	17.49	100.23%	0.747	0.749	68
	WLAN 802.11b	Top side**	0	1	2412	17.50	17.49	100.23%	0.738	0.740	-
	WLAN 602.11D	Bottom side	0	1	2412	17.50	17.49	100.23%	0.055	0.055	-
		Right side	0	1	2412	17.50	17.49	100.23%	0.028	0.028	-
		Left side	0	1	2412	17.50	17.49	100.23%	0.479	0.480	-
		Back side	0	39	2441	11.50	11.50	100.00%	0.016	0.016	-
		Top side	0	39	2441	11.50	11.50	100.00%	0.153	0.153	69
	Bluetooth (GFSK)	Bottom side	0	39	2441	11.50	11.50	100.00%	0.011	0.011	-
		Right side	0	39	2441	11.50	11.50	100.00%	0.010	0.010	-
		Left side	0	39	2441	11.50	11.50	100.00%	0.107	0.107	-
		Back side	0	38	5190	15.50	15.47	100.69%	0.037	0.038	-
		Top side	0	38	5190	15.50	15.47	100.69%	0.375	0.378	70
	WI AN 000 44- (400 5 00	Top side**	0	38	5190	15.50	15.47	100.69%	0.366	0.369	-
	WLAN 802.11n(40M) 5.2G	Bottom side	0	38	5190	15.50	15.47	100.69%	0.016	0.016	-
		Right side	0	38	5190	15.50	15.47	100.69%	0.013	0.013	-
		Left side	0	38	5190	15.50	15.47	100.69%	0.216	0.217	-
		Back side	0	60	5300	15.50	15.47	100.69%	0.042	0.043	-
		Top side	0	60	5300	15.50	15.47	100.69%	0.469	0.472	71
		Top side**	0	60	5300	15.50	15.47	100.69%	0.457	0.460	-
	WLAN 802.11a 5.3G	Bottom side	0	60	5300	15.50	15.47	100.69%	0.020	0.020	-
Aux		Right side	0	60	5300	15.50	15.47	100.69%	0.017	0.018	-
		Left side	0	60	5300	15.50	15.47	100.69%	0.311	0.313	-
		Back side	0	54	5270	15.50	15.49	100.23%	0.039	0.039	-
		Top side	0	54	5270	15.50	15.49	100.23%	0.410	0.411	72
	WLAN 802.11n(40M) 5.3G	Bottom side	0	54	5270	15.50	15.49	100.23%	0.018	0.018	-
		Right side	0	54	5270	15.50	15.49	100.23%	0.014	0.014	-
		Left side	0	54	5270	15.50	15.49	100.23%	0.243	0.244	-
		Back side	0	138	5690	15.50	15.49	100.23%	0.082	0.082	-
		Top side	0	106	5530	15.50	15.47	100.69%	0.448	0.451	-
		Top side	0	138	5690	15.50	15.49	100.23%	0.895	0.897	73
		Top side*	0	138	5690	15.50	15.49	100.23%	0.871	0.873	-
	WLAN 802.11ac(80M) 5.6G	Top side**	0	138	5690	15.50	15.49	100.23%	0.887	0.889	-
		Bottom side	0	138	5690	15.50	15.49	100.23%	0.038	0.038	-
		Right side	0	138	5690	15.50	15.49	100.23%	0.033	0.033	-
		Left side	0	138	5690	15.50	15.49	100.23%	0.552	0.553	-
		Back side	0	155	5775	15.50	15.49	100.23%	0.073	0.074	-
		Top side	0	155	5775	15.50	15.49	100.23%	0.780	0.782	74
		Top side**	0	155	5775	15.50	15.49	100.23%	0.774	0.776	-
	WLAN 802.11ac(80M) 5.8G	Bottom side	0	155	5775	15.50	15.49	100.23%	0.037	0.037	-
		Right side	0	155	5775	15.50	15.49	100.23%	0.032	0.032	-
		Left side	0	155	5775	15.50	15.49	100.23%	0.511	0.512	-

\* - repeated at the highest SAR measurement according to the KDB 865664 D01

\*\* - 2nd Battery spotcheck

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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## **HONG-BO**

## WLAN Antenna (Tablet mode)

Antenna	Mode	Position	Distance (mm)	СН	Freq. (MHz)	Max. Rated Avg. Power + Max.	Measured Avg. Power	Scaling	Averaged S (W		Plot page
			. ,		` '	Tolerance (dBm)	(dBm)		Measured	Reported	1.3.
		Back side	0	1	2412	17.50	17.49	100.23%	0.143	0.143	-
		Top side	0	1	2412	17.50	17.49	100.23%	0.630	0.631	75
	WLAN 802.11b	Top side**	0	1	2412	17.50	17.49	100.23%	0.623	0.624	-
	TE TO OLITIO	Bottom side	0	1	2412	17.50	17.49	100.23%	0.005	0.005	-
		Right side	0	1	2412	17.50	17.49	100.23%	0.004	0.004	-
		Left side	0	1	2412	17.50	17.49	100.23%	0.125	0.125	-
		Back side	0	46	5230	15.50	15.47	100.69%	0.195	0.196	-
		Top side	0	38	5190	15.50	15.46	100.93%	0.846	0.854	76
		Top side**	0	38	5190	15.50	15.46	100.93%	0.841	0.849	-
	WLAN 802.11n(40M) 5.2G	Top side	0	46	5230	15.50	15.47	100.69%	0.803	0.809	-
		Bottom side	0	46	5230	15.50	15.47	100.69%	0.006	0.006	-
		Right side	0	46	5230	15.50	15.47	100.69%	0.007	0.008	-
		Left side	0	46	5230	15.50	15.47	100.69%	0.177	0.178	-
		Back side	0	60	5300	15.50	15.49	100.23%	0.274	0.275	-
		Top side	0	60	5300	15.50	15.49	100.23%	0.945	0.947	-
		Top side	0	64	5320	15.50	15.45	101.16%	0.957	0.968	77
	WLAN 802.11a 5.3G	Top side**	0	64	5320	15.50	15.45	101.16%	0.945	0.956	-
		Bottom side	0	60	5300	15.50	15.49	100.23%	0.010	0.010	-
		Right side	0	60	5300	15.50	15.49	100.23%	0.011	0.011	-
		Left side	0	60	5300	15.50	15.49	100.23%	0.185	0.185	-
		Back side	0	54	5270	15.50	15.50	100.00%	0.217	0.217	-
		Top side	0	54	5270	15.50	15.50	100.00%	0.877	0.877	78
Main	WLAN 802.11n(40M) 5.3G	Top side	0	62	5310	13.00	12.98	100.46%	0.492	0.494	-
	WLAN 802.111(40W) 5.3G	Bottom side	0	54	5270	15.50	15.50	100.00%	0.008	0.008	-
		Right side	0	54	5270	15.50	15.50	100.00%	0.008	0.008	-
		Left side	0	54	5270	15.50	15.50	100.00%	0.179	0.179	-
		Back side	0	102	5510	15.50	15.49	100.23%	0.255	0.256	-
		Top side	0	102	5510	15.50	15.49	100.23%	0.926	0.928	-
		Top side	0	134	5670	15.50	15.48	100.46%	1.030	1.035	79
	WLAN 802.11n(40M) 5.6G	Top side**	0	134	5670	15.50	15.48	100.46%	0.995	1.000	-
		Bottom side	0	102	5510	15.50	15.49	100.23%	0.010	0.010	-
		Right side	0	102	5510	15.50	15.49	100.23%	0.009	0.009	-
		Left side	0	102	5510	15.50	15.49	100.23%	0.184	0.184	-
		Back side	0	138	5690	15.50	15.49	100.23%	0.243	0.244	-
		Top side	0	122	5610	15.50	15.45	101.16%	0.902	0.912	-
	W/ AN 000 44 (000 5 5 00	Top side	0	138	5690	15.50	15.49	100.23%	0.918	0.920	80
	WLAN 802.11ac(80M) 5.6G	Bottom side	0	138	5690	15.50	15.49	100.23%	0.009	0.009	-
		Right side	0	138	5690	15.50	15.49	100.23%	0.008	0.008	-
		Left side	0	138	5690	15.50	15.49	100.23%	0.182	0.182	-
		Back side	0	155	5775	15.50	15.49	100.23%	0.288	0.289	-
		Top side	0	155	5775	15.50	15.49	100.23%	0.959	0.961	81
	W// AN 000 44 /0016	Top side**	0	155	5775	15.50	15.49	100.23%	0.951	0.953	-
	WLAN 802.11ac(80M) 5.8G	Bottom side	0	155	5775	15.50	15.49	100.23%	0.011	0.011	-
		Right side	0	155	5775	15.50	15.49	100.23%	0.010	0.010	-
		Left side	0	155	5775	15.50	15.49	100.23%	0.186	0.186	-

\* - repeated at the highest SAR measurement according to the KDB 865664 D01 \*\* - 2nd Battery spotcheck

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#### WLAN Aux Antenna (Tablet mode)

Antenna	Mode	Position	Distance (mm)	СН	Freq. (MHz)	Max. Rated Avg. Power + Max.	Measured Avg. Power	Scaling		AR over 1g /kg)	Plot page
			(11111)		(111112)	Tolerance (dBm)	(dBm)		Measured	Reported	page
		Back side	0	1	2412	17.50	17.49	100.23%	0.413	0.414	-
		Top side	0	1	2412	17.50	17.49	100.23%	1.190	1.193	82
		Top side**	0	1	2412	17.50	17.49	100.23%	1.100	1.103	-
	WLAN 802.11b	Top side	0	6	2437	17.50	17.47	100.69%	1.170	1.178	-
		Bottom side	0	1	2412	17.50	17.49	100.23%	0.022	0.022	-
		Right side	0	1	2412	17.50	17.49	100.23%	0.021	0.021	-
		Left side	0	1	2412	17.50	17.49	100.23%	0.394	0.395	-
		Back side	0	39	2441	11.50	11.50	100.00%	0.088	0.088	-
		Top side	0	39	2441	11.50	11.50	100.00%	0.270	0.270	83
	Bluetooth (GFSK)	Bottom side	0	39	2441	11.50	11.50	100.00%	0.005	0.005	-
		Right side	0	39	2441	11.50	11.50	100.00%	0.003	0.003	-
		Left side	0	39	2441	11.50	11.50	100.00%	0.077	0.077	-
		Back side	0	38	5190	15.50	15.47	100.69%	0.226	0.228	-
		Top side	0	38	5190	15.50	15.47	100.69%	0.901	0.907	-
		Top side	0	46	5230	15.50	15.41	102.09%	0.923	0.942	84
	WLAN 802.11n(40M) 5.2G	Top side**	0	46	5230	15.50	15.41	102.09%	0.910	0.929	-
		Bottom side	0	38	5190	15.50	15.47	100.69%	0.019	0.019	-
		Right side	0	38	5190	15.50	15.47	100.69%	0.016	0.016	-
		Left side	0	38	5190	15.50	15.47	100.69%	0.179	0.180	-
		Back side	0	60	5300	15.50	15.47	100.69%	0.253	0.255	-
		Top side	0	52	5260	15.50	15.44	101.39%	1.000	1.014	85
		Top side**	0	52	5260	15.50	15.44	101.39%	0.975	0.989	-
Aux	WLAN 802.11a 5.3G	Top side	0	60	5300	15.50	15.47	100.69%	0.933	0.939	-
		Bottom side	0	60	5300	15.50	15.47	100.69%	0.020	0.020	-
		Right side	0	60	5300	15.50	15.47	100.69%	0.017	0.017	-
		Left side	0	60	5300	15.50	15.47	100.69%	0.182	0.183	-
		Back side	0	54	5270	15.50	15.49	100.23%	0.261	0.262	-
		Top side	0	54	5270	15.50	15.49	100.23%	0.987	0.989	86
	WLAN 802.11n(40M) 5.3G	Top side	0	62	5310	13.00	13.00	100.00%	0.571	0.571	-
	WLAN 602.111(40W) 5.3G	Bottom side	0	54	5270	15.50	15.49	100.23%	0.021	0.021	-
		Right side	0	54	5270	15.50	15.49	100.23%	0.018	0.018	-
		Left side	0	54	5270	15.50	15.49	100.23%	0.187	0.187	-
		Back side	0	138	5690	15.50	15.49	100.23%	0.221	0.222	-
		Top side	0	106	5530	15.50	15.47	100.69%	0.910	0.916	87
		Top side**	0	106	5530	15.50	15.47	100.69%	0.905	0.911	-
	WLAN 802.11ac(80M) 5.6G	Top side	0	138	5690	15.50	15.49	100.23%	0.817	0.819	-
		Bottom side	0	138	5690	15.50	15.49	100.23%	0.018	0.018	-
		Right side	0	138	5690	15.50	15.49	100.23%	0.015	0.015	-
		Left side	0	138	5690	15.50	15.49	100.23%	0.156	0.156	-
		Back side	0	155	5775	15.50	15.49	100.23%	0.204	0.204	-
		Top side	0	155	5775	15.50	15.49	100.23%	0.770	0.772	88
	WLAN 802.11ac(80M) 5.8G	Top side**	0	155	5775	15.50	15.49	100.23%	0.766	0.768	-
	11 L-11 0U2. 1 140(00101) 5.80	Bottom side	0	155	5775	15.50	15.49	100.23%	0.016	0.016	-
		Right side	0	155	5775	15.50	15.49	100.23%	0.013	0.013	-
		Left side	0	155	5775	15.50	15.49	100.23%	0.158	0.158	-

\* - repeated at the highest SAR measurement according to the KDB 865664 D01

\*\* - 2nd Battery spotcheck

Note:

Scaling =  $\frac{\text{reported SAR}}{\text{measured SAR}} = \frac{P2(mW)}{P1(mW)} = 10^{\left(\frac{P2-P1}{10}\right)(dBm)}$ Reported SAR = measured SAR \* (scaling) Where P2 is maximum specified power, P1 is measured conducted power

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## 3. Simultaneous Transmission Analysis

## Simultaneous Transmission Scenarios:

Simultaneous Transmit Configurations	Body
2.4GHz WLAN MIMO	Yes
5GHz WLAN MIMO	Yes
BT + 2.4GHz WLAN Main	Yes
BT + 5GHz WLAN Main	Yes

Note:

1. Bluetooth and WLAN Aux share the same antenna path, and BT can transmit with WLAN Main simultaneously.

2. For 2.4/5GHz WLAN Main and Aux antennas, the maximum output power of each antenna during simultaneous transmission is the same with that used in standalone transmission, and we used the sum of 1-g SAR provision in KDB447498D01 to exclude the simultaneous transmitted SAR measurement.

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### 3.1 Estimated SAR calculation

According to KDB447498 D01v06 – When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

Estimated SAR =  $\frac{\text{Max.tune up power (mW)}}{\text{Min.test separation distance(mm)}} \times \frac{\sqrt{f(GHz)}}{7.5}$ 

If the minimum test separation distance is < 5mm, a distance of 5mm is used for estimated SAR calculation. When the test separation distance is >50mm, the 0.4W/kg is used for SAR-1g.

#### 3.2 SPLSR evaluation and analysis

Per KDB447498D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR sum to peak location separation ratio(SPLSR).

The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion.

The ratio is determined by (SAR1 + SAR2)^1.5/Ri, rounded to two decimal digits, and must be  $\leq$  0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

SAR1 and SAR2 are the highest reported or estimated SAR for each antenna in the pair, and Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna.

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#### AWAN

2.4 GHz WLAN MIMO

No.	Conditions	Position	Max. WLAN Main	Max. WLAN Aux	SAR Sum	SPLSR
		Back side	0.146	0.088	0.234	ΣSAR<1.6, Not required
		Top side	0.456	0.749	1.205	ΣSAR<1.6, Not required
1	2.4 GHz WLAN Main + WLAN Aux	Bottom side	0.025	0.055	0.080	ΣSAR<1.6, Not required
		Right side	0.042	0.028	0.070	ΣSAR<1.6, Not required
		Left side	0.042	0.480	0.522	ΣSAR<1.6, Not required

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#### **5 GHz WLAN MIMO**

No.	Conditions	Position	Max. WLAN Main	Max. WLAN Aux	SAR Sum	SPLSR
		Back side	0.144	0.082	0.226	ΣSAR<1.6, Not required
		Top side	0.897	0.897	1.794	Analyzed as below
2	5 GHz WLAN Main + WLAN Aux	Bottom side	0.132	0.038	0.170	ΣSAR<1.6, Not required
		Right side	0.026	0.033	0.059	ΣSAR<1.6, Not required
		Left side	0.069	0.553	0.622	ΣSAR<1.6, Not required

#### 5 GHz WLAN MIMO

Conditions	Position	SAR Value	Coordinates (cm)			ΣSAR (W/kg)	Peak Location Separation	SPLSR	Simultaneous Transmission
		(W/kg)	х	У	z	(vv/kg)	Distance (mm)		SAR Test
WLAN Main	Top side	0.897	-1.08	-6.92	-0.30	1.794	80.61	0.030	SPLSR<0.04,
WLAN Aux	LAN Aux		-1.30	7.16	-0.32	1.794	00.01	0.030	Not required

Top View			
-	_		-
WLAN Aux	WLAN Main		
-			

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#### **BT+ 2.4GHz WLAN Main**

No.	Conditions	Position	Max. WLAN Main	BT	SAR Sum	SPLSR
		Back side	0.146	0.016	0.162	ΣSAR<1.6, Not required
		Top side	0.456	0.153	0.609	ΣSAR<1.6, Not required
3	2.4 GHz WLAN Main + BT	Bottom side	0.025	0.011	0.036	ΣSAR<1.6, Not required
		Right side	0.042	0.010	0.052	ΣSAR<1.6, Not required
		Left side	0.042	0.107	0.149	ΣSAR<1.6, Not required

#### **BT+ 5GHz WLAN Main**

No.	Conditions	Position	Max. WLAN Main	BT	SAR Sum	SPLSR
		Back side	0.144	0.016	0.160	ΣSAR<1.6, Not required
		Top side	0.897	0.153	1.050	ΣSAR<1.6, Not required
4	5 GHz WLAN Main + BT	Bottom side	0.132	0.011	0.143	ΣSAR<1.6, Not required
		Right side	0.026	0.010	0.036	ΣSAR<1.6, Not required
		Left side	0.069	0.107	0.176	ΣSAR<1.6, Not required

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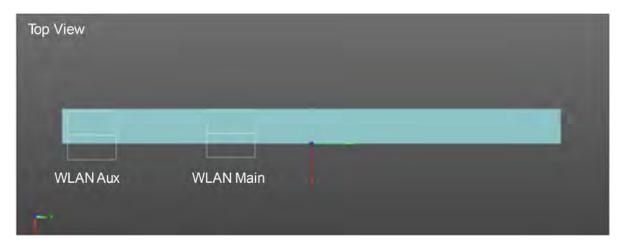
#### **HONG-BO**

2.4 GHz WLAN MIMO

No.	Conditions	Position	Max. WLAN Main	Max. WLAN Aux	SAR Sum	SPLSR
		Back side	0.143	0.414	0.557	ΣSAR<1.6, Not required
		Top side	0.631	1.193	1.824	Analyzed as below
1	2.4 GHz WLAN Main + WLAN Aux	Bottom side	0.005	0.022	0.027	ΣSAR<1.6, Not required
		Right side	0.004	0.021	0.025	ΣSAR<1.6, Not required
		Left side	0.125	0.395	0.520	ΣSAR<1.6, Not required

#### 2.4 GHz WLAN MIMO

Conditions	Position	SAR Value	Coordinates (cm)			ΣSAR	Peak Location Separation	SPLSR	Simultaneous Transmission
		(W/kg)	x	У	z	(W/kg)	Distance (mm)		SAR Test
WLAN Main	Top side	0.631	-0.64	-5.18	-0.22	1.824	04 02	0.029	SPLSR<0.04,
WLAN Aux	Top side	1.193	-0.42	-13.66	-0.21	1.024	1.824 84.83		Not required



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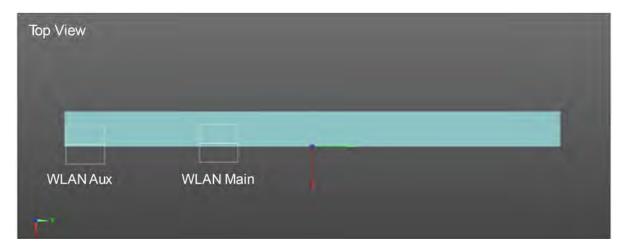


#### **5 GHz WLAN MIMO**

No.	Conditions	Position	Max. WLAN Main	Max. WLAN Aux	SAR Sum	SPLSR
		Back side	0.289	0.262	0.551	ΣSAR<1.6, Not required
		Top side	1.035	1.014	2.049	Analyzed as below
2	5 GHz WLAN Main + WLAN Aux	Bottom side	0.011	0.021	0.032	ΣSAR<1.6, Not required
		Right side	0.011	0.018	0.029	ΣSAR<1.6, Not required
		Left side	0.186	0.187	0.373	ΣSAR<1.6, Not required

#### **5 GHz WLAN MIMO**

Conditions	Position	SAR Value	Coordinates (cm)			ΣSAR	Peak Location Separation	SPLSR	Simultaneous Transmission
		(W/kg)	x	У	z	(W/kg)	Distance (mm)		SAR Test
WLAN Main	Top side	1.035	-1.06	-6.82	-0.29	2.040	84.21	0.035	SPLSR<0.04,
WLAN Aux	TOP SIDE	1.014	-1.08	7.64	7.64 -0.23 2.049		04.21	0.035	Not required



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#### **BT+ 2.4GHz WLAN Main**

No.	Conditions	Position	Max. WLAN Main	BT	SAR Sum	SPLSR
		Back side	0.143	0.088	0.231	ΣSAR<1.6, Not required
		Top side	0.631	0.270	0.901	ΣSAR<1.6, Not required
3	2.4 GHz WLAN Main + BT	Bottom side	0.005	0.005	0.010	ΣSAR<1.6, Not required
		Right side	0.004	0.003	0.007	ΣSAR<1.6, Not required
		Left side	0.125	0.077	0.202	ΣSAR<1.6, Not required

#### **BT+ 5GHz WLAN Main**

No.	Conditions	Position	Max. WLAN Main	BT	SAR Sum	SPLSR
		Back side	0.289	0.088	0.377	ΣSAR<1.6, Not required
		Top side	1.035	0.270	1.305	ΣSAR<1.6, Not required
4	5 GHz WLAN Main + BT	Bottom side	0.011	0.005	0.016	ΣSAR<1.6, Not required
		Right side	0.011	0.003	0.014	ΣSAR<1.6, Not required
		Left side	0.186	0.077	0.263	ΣSAR<1.6, Not required

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# 4. Instruments List

Manufacturer	Device	Туре	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	3770	Apr.25,2018	Apr.24,2019
SPEAG	System Validation Dipole	D2450V2	727	Apr.24,2018	Apr.23,2019
		D5GHzV2	1023	Jan.25,2018	Jan.24,2019
SPEAG	Data acquisition Electronics	DAE4	856	Apr.21,2018	Apr.20,2019
SPEAG	Software	DASY 52 52.10.1	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	ELI	N/A	Calibration not required	Calibration not required
Agilent	Network Analyzer	E5071C	MY46107530	Feb.26,2018	Feb.25,2019
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY52180142	Jul.04,2018	Jul.03,2019
		778D	MY52180302	Jul.05,2018	Jul.04,2019
Agilent	Signal Generator	N5181A	MY50144143	Mar.15,2018	Mar.14,2019
Agilent	Power Meter	E4417A	MY52240003	Feb.01,2018	Jan.31,2019
Agilent	Power Sensor	E9301H	MY52200003	Feb.01,2018	Jan.31,2019
			MY52200004	Feb.01,2018	Jan.31,2019
Changzhou Xinwang	Digital thermometer	PT1	EC14011603	Jul.06,2018	Jul.05,2019
TECPEL	Digital thermometer	DTM-303A	TP130077	Mar.09,2018	Mar.08,2019

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## 5. Measurements

Date: 2018/12/1

## WLAN 802.11b Body Top side CH 1 Main 0mm

Communication System: WLAN 2.45G; Frequency: 2412 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz;  $\sigma$  = 1.92 S/m;  $\epsilon_r$  = 53.706;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 21.7°C

DASY5 Configuration:

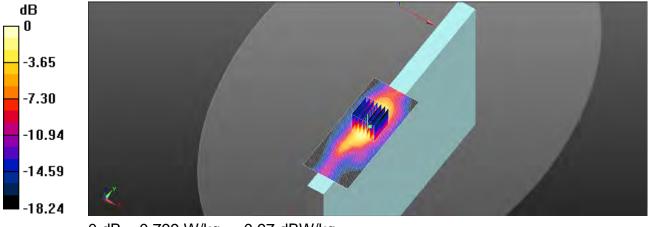
- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x121x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.862 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 2.422 V/m; Power Drift = 0.16 dB Peak SAR (extrapolated) = 1.20 W/kg SAR(1 g) = 0.455 W/kg; SAR(10 g) = 0.212 W/kg

Maximum value of SAR (measured) = 0.799 W/kg



0 dB = 0.799 W/kg = -0.97 dBW/kg

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Date: 2018/12/3

## WLAN 802.11n(40M) 5.2G\_Body\_Top side\_CH 46\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5230 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5230 MHz;  $\sigma$  = 5.209 S/m;  $\epsilon_r$  = 49.212;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.8°C; Liquid temperature: 22.0°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.830 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.271 V/m: Power Drift = 0.11 dB

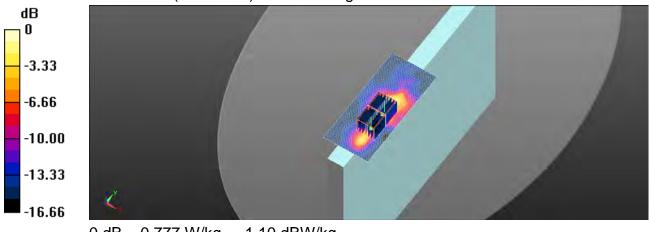
Peak SAR (extrapolated) = 1.97 W/kg

SAR(1 g) = 0.465 W/kg; SAR(10 g) = 0.146 W/kg

Maximum value of SAR (measured) = 0.945 W/kg

Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.271 V/m; Power Drift = 0.11 dB Peak SAR (extrapolated) = 1.57 W/kg

SAR(1 g) = 0.358 W/kg; SAR(10 g) = 0.102 W/kg Maximum value of SAR (measured) = 0.777 W/kg



0 dB = 0.777 W/kg = -1.10 dBW/kg

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Date: 2018/12/4

## WLAN 802.11a 5.3G\_Body\_Top side\_CH 60\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5300 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5300 MHz;  $\sigma$  = 5.323 S/m;  $\epsilon_r$  = 49.056;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.9°C; Liquid temperature: 21.6°C **DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25 •
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.664 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.599 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.59 W/kg

SAR(1 g) = 0.372 W/kg; SAR(10 g) = 0.128 W/kg

Maximum value of SAR (measured) = 0.736 W/kg

Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.599 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.320 W/kg; SAR(10 g) = 0.090 W/kg

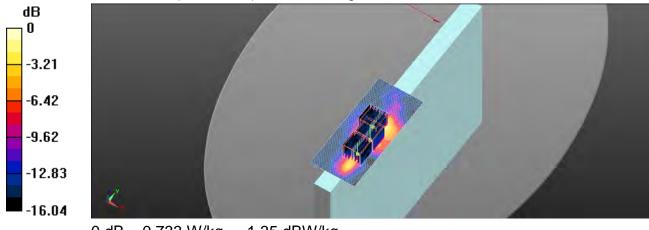
Maximum value of SAR (measured) = 0.701 W/kg

Zoom Scan (7x7x12)/Cube 2: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.599 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 0.297 W/kg; SAR(10 g) = 0.124 W/kg

Maximum value of SAR (measured) = 0.733 W/kg



0 dB = 0.733 W/kg = -1.35 dBW/kg

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Date: 2018/12/4

## WLAN 802.11n(40M) 5.3G\_Body\_Top side\_CH 54\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5270 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5270 MHz;  $\sigma$  = 5.283 S/m;  $\epsilon_r$  = 49.093;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 21.6°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x121x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.736 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.021 V/m: Power Drift = 0.14 dB

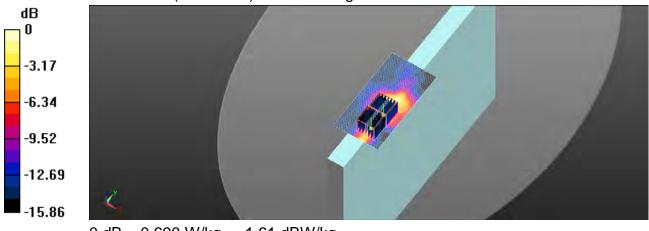
Peak SAR (extrapolated) = 1.77 W/kg

SAR(1 g) = 0.405 W/kg; SAR(10 g) = 0.133 W/ka

Maximum value of SAR (measured) = 0.792 W/kg

Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.021 V/m; Power Drift = 0.14 dB Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.327 W/kg; SAR(10 g) = 0.093 W/kg Maximum value of SAR (measured) = 0.690 W/kg



0 dB = 0.690 W/kg = -1.61 dBW/kg

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Date: 2018/12/5

## WLAN 802.11n(40M) 5.6G\_Body\_Top side\_CH 102\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5510 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5510 MHz;  $\sigma$  = 5.656 S/m;  $\epsilon_r$  = 48.301;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 22.0°C; Liquid temperature: 21.8°C

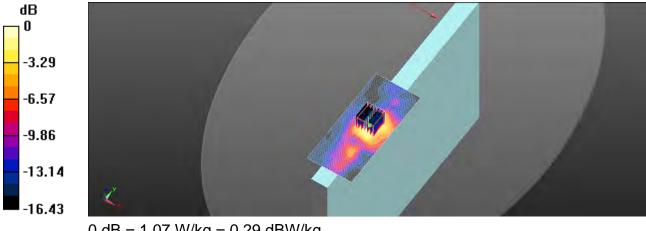
**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.06, 4.06, 4.06); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.04 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.581 V/m: Power Drift = 0.12 dB Peak SAR (extrapolated) = 2.22 W/kg SAR(1 g) = 0.565 W/kg; SAR(10 g) = 0.215 W/kg

Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.07 W/kg = 0.29 dBW/kg

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Date: 2018/12/5

## WLAN 802.11ac(80M) 5.6G\_Body\_Top side\_CH 138\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5690 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5690 MHz;  $\sigma$  = 5.978 S/m;  $\epsilon_r$  = 47.784;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 22.0°C; Liquid temperature: 21.8°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm

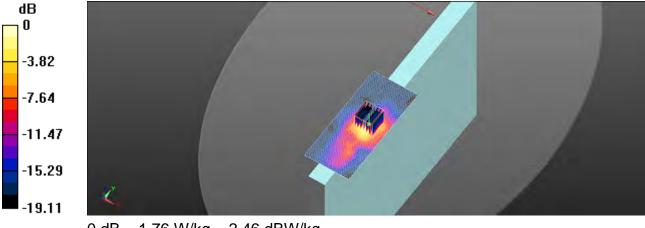
Maximum value of SAR (interpolated) = 1.71 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.958 V/m: Power Drift = 0.13 dB

Peak SAR (extrapolated) = 3.69 W/kg

SAR(1 g) = 0.850 W/kg; SAR(10 g) = 0.282 W/kg

Maximum value of SAR (measured) = 1.76 W/kg



0 dB = 1.76 W/kg = 2.46 dBW/kg

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Date: 2018/12/6

## WLAN 802.11ac(80M) 5.8G\_Body\_Top side\_CH 155\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5775 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5775 MHz;  $\sigma$  = 6.095 S/m;  $\epsilon_r$  = 47.507;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.86 W/kg

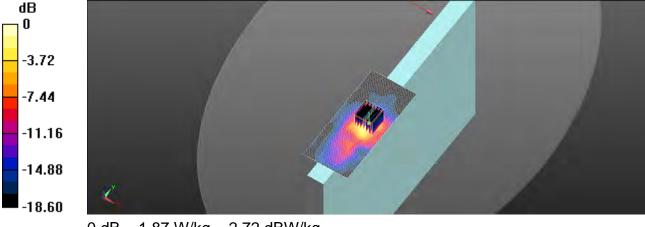
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.076 V/m: Power Drift = 0.11 dB

Peak SAR (extrapolated) = 4.11 W/kg

SAR(1 g) = 0.895 W/kg; SAR(10 g) = 0.285 W/kg

Maximum value of SAR (measured) = 1.87 W/kg



0 dB = 1.87 W/kg = 2.72 dBW/kg

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Date: 2018/12/1

## WLAN 802.11b\_Body\_Top side\_CH 1\_Aux\_0mm

Communication System: WLAN 2.45G; Frequency: 2412 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz;  $\sigma$  = 1.92 S/m;  $\epsilon_r$  = 53.706;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.9°C; Liquid temperature: 21.7°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x101x1): Interpolated grid: dx=12 mm, dy=12 mm

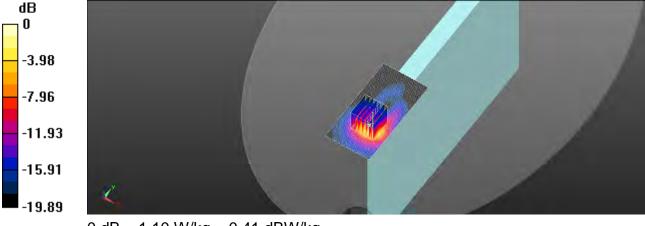
Maximum value of SAR (interpolated) = 1.33 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 1.869 V/m: Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.64 W/kg

SAR(1 g) = 0.747 W/kg; SAR(10 g) = 0.314 W/ka

Maximum value of SAR (measured) = 1.10 W/kg



0 dB = 1.10 W/kg = 0.41 dBW/kg

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Date: 2018/12/1

## Bluetooth(GFSK)\_Body\_Top side\_CH 39\_Aux\_0mm

Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2441 MHz;  $\sigma$  = 1.952 S/m;  $\epsilon_r$  = 53.591;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 21.7°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x91x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.278 W/kg

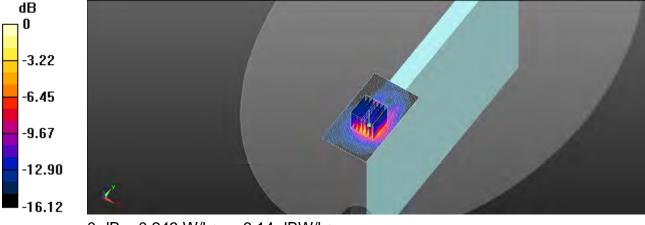
## Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.514 V/m: Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.343 W/kg

SAR(1 g) = 0.153 W/kg; SAR(10 g) = 0.065 W/kg

Maximum value of SAR (measured) = 0.243 W/kg



0 dB = 0.243 W/kg = -6.14 dBW/kg

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Date: 2018/12/3

## WLAN 802.11n(40M) 5.2G\_Body\_Top side\_CH 38\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5190 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5190 MHz;  $\sigma$  = 5.153 S/m;  $\epsilon_r$  = 49.419;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.8°C; Liquid temperature: 22.0°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

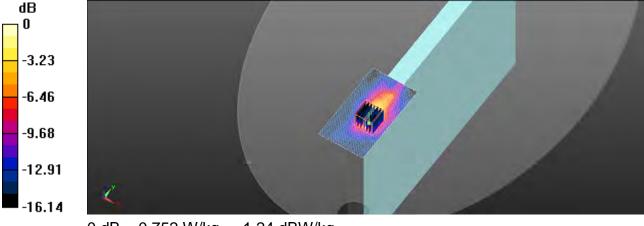
Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.698 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.109 V/m: Power Drift = 0.06 dB

Peak SAR (extrapolated) = 1.63 W/kg

SAR(1 g) = 0.375 W/kg; SAR(10 g) = 0.120 W/ka

Maximum value of SAR (measured) = 0.752 W/kg



0 dB = 0.752 W/kg = -1.24 dBW/kg

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Date: 2018/12/4

## WLAN 802.11a 5.3G\_Body\_Top side\_CH 60\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5300 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5300 MHz;  $\sigma$  = 5.323 S/m;  $\epsilon_r$  = 49.056;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.9°C; Liquid temperature: 21.6°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

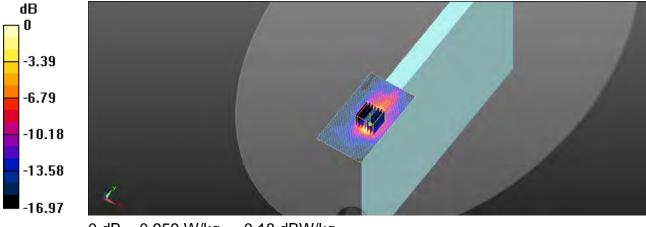
Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.846 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.994 V/m: Power Drift = 0.03 dB

Peak SAR (extrapolated) = 2.18 W/kg

SAR(1 g) = 0.469 W/kg; SAR(10 g) = 0.144 W/kg

Maximum value of SAR (measured) = 0.959 W/kg



0 dB = 0.959 W/kg = -0.18 dBW/kg

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Date: 2018/12/4

## WLAN 802.11n(40M) 5.3G\_Body\_Top side\_CH 54\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5270 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5270 MHz;  $\sigma$  = 5.283 S/m;  $\epsilon_r$  = 49.093;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.9°C; Liquid temperature: 21.6°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 0.751 W/kg

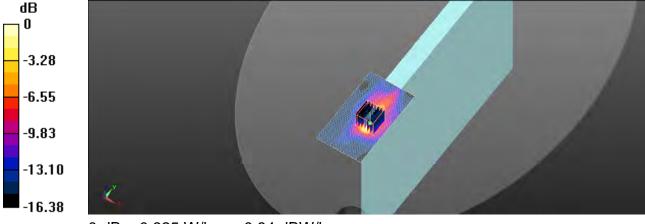
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.092 V/m: Power Drift = 0.11 dB

Peak SAR (extrapolated) = 1.84 W/kg

SAR(1 g) = 0.410 W/kg; SAR(10 g) = 0.134 W/kg

Maximum value of SAR (measured) = 0.825 W/kg



0 dB = 0.825 W/kg = -0.84 dBW/kg

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Date: 2018/12/5

## WLAN 802.11ac(80M) 5.6G\_Body\_Top side\_CH 138\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5690 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5690 MHz;  $\sigma$  = 5.978 S/m;  $\epsilon_r$  = 47.784;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 22.0°C; Liquid temperature: 21.8°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm

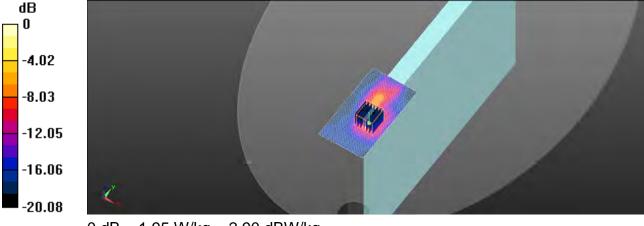
Maximum value of SAR (interpolated) = 1.66 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.131 V/m: Power Drift = 0.07 dB Peak SAR (extrapolated) = 4.75 W/kg

SAR(1 g) = 0.895 W/kg; SAR(10 g) = 0.236 W/kg

Maximum value of SAR (measured) = 1.95 W/kg



0 dB = 1.95 W/kg = 2.90 dBW/kg

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Date: 2018/12/6

## WLAN 802.11ac(80M) 5.8G\_Body\_Top side\_CH 155\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5775 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5775 MHz;  $\sigma$  = 6.095 S/m;  $\epsilon_r$  = 47.507;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.56 W/kg

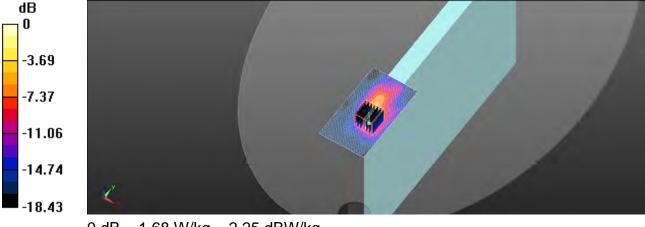
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.016 V/m: Power Drift = 0.02 dB

Peak SAR (extrapolated) = 4.09 W/kg

SAR(1 g) = 0.780 W/kg; SAR(10 g) = 0.212 W/kg

Maximum value of SAR (measured) = 1.68 W/kg



0 dB = 1.68 W/kg = 2.25 dBW/kg

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Date: 2018/12/7

## WLAN 802.11b\_Body\_Top side\_CH 1\_Main\_0mm

Communication System: WLAN 2.45G; Frequency: 2412 MHz Medium parameters used: f = 2412 MHz;  $\sigma$  = 1.928 S/m;  $\epsilon_r$  = 53.779;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x121x1): Interpolated grid: dx=12 mm, dy=12 mm

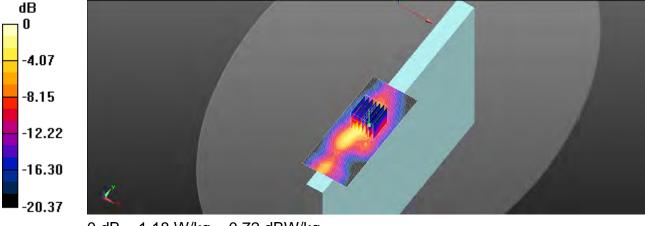
Maximum value of SAR (interpolated) = 1.21 W/kg

# Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.415 V/m: Power Drift = 0.17 dB Peak SAR (extrapolated) = 1.92 W/kg

SAR(1 g) = 0.630 W/kg; SAR(10 g) = 0.264 W/kg

Maximum value of SAR (measured) = 1.18 W/kg



0 dB = 1.18 W/kg = 0.72 dBW/kg

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# WLAN 802.11n(40M) 5.2G\_Body\_Top side\_CH 38 \_Main\_0mm

Communication System: WLAN 5G; Frequency: 5190 MHz Medium parameters used: f = 5190 MHz;  $\sigma$  = 5.156 S/m;  $\epsilon_r$  = 49.533;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

**DASY5** Configuration:

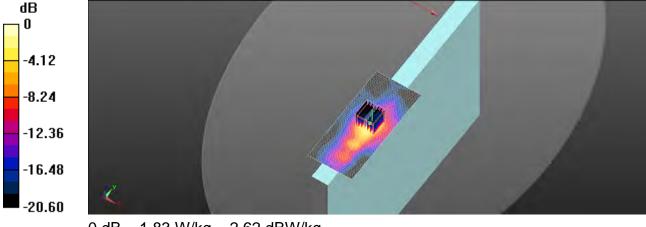
- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.58 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.338 V/m: Power Drift = -0.09 dB Peak SAR (extrapolated) = 3.99 W/kg SAR(1 g) = 0.846 W/kg; SAR(10 g) = 0.271 W/kg

Maximum value of SAR (measured) = 1.83 W/kg



0 dB = 1.83 W/kg = 2.62 dBW/kg

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Date: 2018/12/8

## WLAN 802.11a 5.3G\_Body\_Top side\_CH 64\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5320 MHz Medium parameters used: f = 5320 MHz;  $\sigma$  = 5.355 S/m;  $\epsilon_r$  = 49.079;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

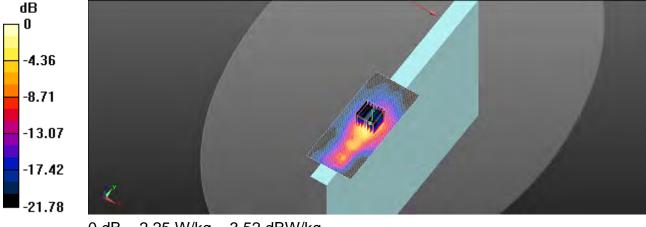
- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.63 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.968 V/m: Power Drift = 0.13 dB Peak SAR (extrapolated) = 5.02 W/kg SAR(1 g) = 0.957 W/kg; SAR(10 g) = 0.284 W/kg

Maximum value of SAR (measured) = 2.25 W/kg



0 dB = 2.25 W/kg = 3.52 dBW/kg

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# WLAN 802.11n(40M) 5.3G\_Body\_Top side\_CH 54\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5270 MHz Medium parameters used: f = 5270 MHz;  $\sigma$  = 5.293 S/m;  $\epsilon_r$  = 49.214;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm

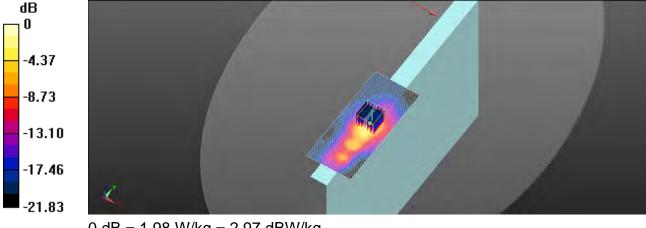
Maximum value of SAR (interpolated) = 1.58 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 2.157 V/m: Power Drift = -0.12 dB

Peak SAR (extrapolated) = 4.40 W/kg

SAR(1 g) = 0.877 W/kg; SAR(10 g) = 0.273 W/kg

Maximum value of SAR (measured) = 1.98 W/kg



0 dB = 1.98 W/kg = 2.97 dBW/kg

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Date: 2018/12/9

## WLAN 802.11n(40M) 5.6G\_Body\_Top side\_CH 134\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5670 MHz Medium parameters used: f = 5670 MHz;  $\sigma$  = 5.944 S/m;  $\epsilon_r$  = 47.96;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.06, 4.06, 4.06); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

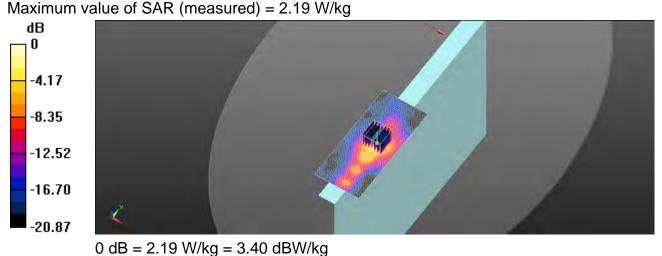
Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 2.03 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.340 V/m: Power Drift = 0.02 dB

Peak SAR (extrapolated) = 5.14 W/kg

SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.319 W/kg



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## WLAN 802.11ac(80M) 5.6G\_Body\_Top side\_CH 138\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5690 MHz Medium parameters used: f = 5690 MHz;  $\sigma$  = 5.984 S/m;  $\epsilon_r$  = 47.872;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.84 W/kg

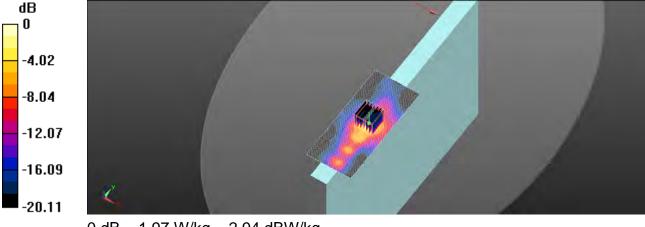
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.894 V/m: Power Drift = 0.16 dB

Peak SAR (extrapolated) = 4.54 W/kg

SAR(1 g) = 0.918 W/kg; SAR(10 g) = 0.288 W/kg

Maximum value of SAR (measured) = 1.97 W/kg



0 dB = 1.97 W/kg = 2.94 dBW/kg

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## WLAN 802.11ac(80M) 5.8G\_Body\_Top side\_CH 155\_Main\_0mm

Communication System: WLAN 5G; Frequency: 5775 MHz Medium parameters used: f = 5775 MHz;  $\sigma$  = 6.124 S/m;  $\epsilon_r$  = 47.592;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

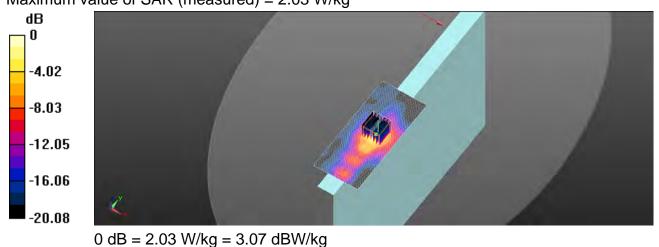
**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x141x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 1.88 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.721 V/m: Power Drift = 0.01 dB Peak SAR (extrapolated) = 4.93 W/kg SAR(1 g) = 0.959 W/kg; SAR(10 g) = 0.312 W/kg Maximum value of SAR (measured) = 2.03 W/kg



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## WLAN 802.11b\_Body\_Top side\_CH 1\_Aux\_0mm

Communication System: WLAN 2.45G; Frequency: 2412 MHz Medium parameters used: f = 2412 MHz;  $\sigma$  = 1.928 S/m;  $\epsilon_r$  = 53.779;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

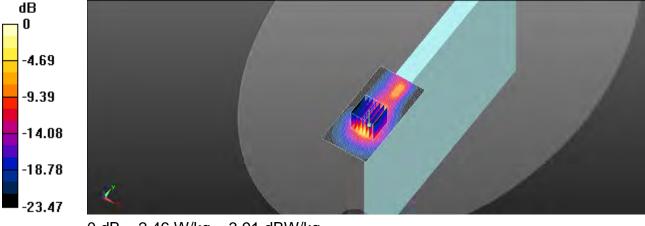
Area Scan (51x101x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 2.19 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.305 V/m: Power Drift = 0.06 dB

- Peak SAR (extrapolated) = 3.52 W/kg
- SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.425 W/kg

Maximum value of SAR (measured) = 2.46 W/kg



0 dB = 2.46 W/kg = 3.91 dBW/kg

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## Bluetooth(GFSK)\_Body\_Top side\_CH 39\_Aux\_0mm

Communication System: Bluetooth; Frequency: 2441 MHz Medium parameters used: f = 2441 MHz;  $\sigma$  = 1.969 S/m;  $\epsilon_r$  = 53.692;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (51x101x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 0.504 W/kg

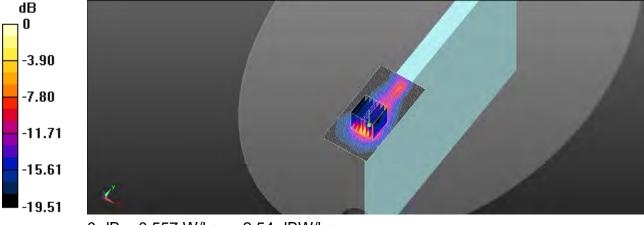
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.410 V/m: Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.798 W/kg

SAR(1 g) = 0.270 W/kg; SAR(10 g) = 0.098 W/kg

Maximum value of SAR (measured) = 0.557 W/kg



0 dB = 0.557 W/kg = -2.54 dBW/kg

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## WLAN 802.11n(40M) 5.2G\_Body\_Top side\_CH 46\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5230 MHz Medium parameters used: f = 5230 MHz;  $\sigma$  = 5.219 S/m;  $\epsilon_r$  = 49.346;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

**DASY5** Configuration:

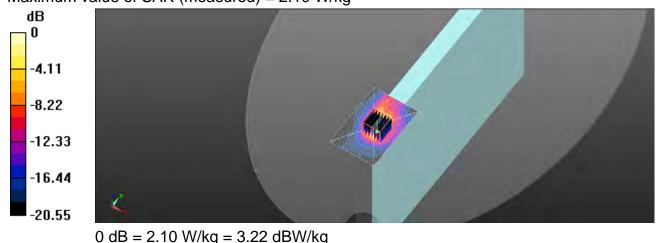
- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65) @ 5230 MHz; Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x91x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.74 W/kg

**Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.934 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 5.16 W/kg SAR(1 g) = 0.923 W/kg; SAR(10 g) = 0.252 W/kg

Maximum value of SAR (measured) = 2.10 W/kg



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## WLAN 802.11a 5.3G\_Body\_Top side\_CH 52\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5260 MHz Medium parameters used: f = 5260 MHz;  $\sigma$  = 5.276 S/m;  $\epsilon$ r = 49.214;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

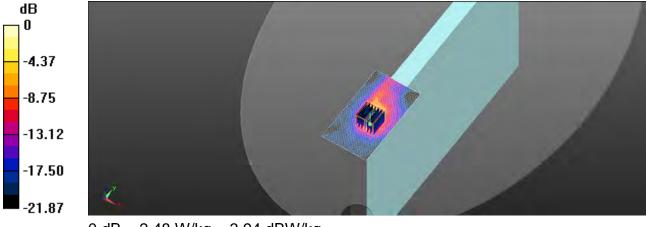
- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x111x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.88 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.951 V/m: Power Drift = 0.08 dB Peak SAR (extrapolated) = 5.61 W/kg SAR(1 g) = 1 W/kg; SAR(10 g) = 0.263 W/kg

Maximum value of SAR (measured) = 2.48 W/kg



0 dB = 2.48 W/kg = 3.94 dBW/kg

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# WLAN 802.11n(40M) 5.3G\_Body\_Top side\_CH 54\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5270 MHz Medium parameters used: f = 5270 MHz;  $\sigma$  = 5.293 S/m;  $\epsilon_r$  = 49.222;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x101x1): Interpolated grid: dx=10 mm, dy=10 mm

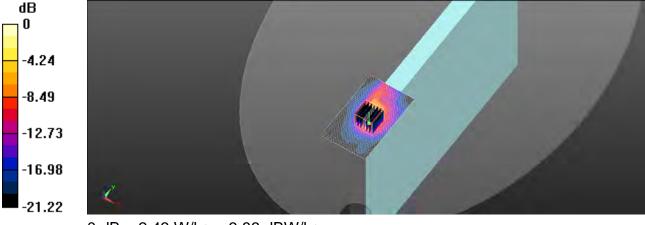
Maximum value of SAR (interpolated) = 1.87 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.838 V/m: Power Drift = 0.13 dB Peak SAR (extrapolated) = 5.56 W/kg

SAR(1 g) = 0.987 W/kg; SAR(10 g) = 0.260 W/ka

Maximum value of SAR (measured) = 2.43 W/kg



0 dB = 2.43 W/kg = 3.86 dBW/kg

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# WLAN 802.11ac(80M) 5.6G\_Body\_Top side\_CH 106\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5530 MHz Medium parameters used: f = 5530 MHz;  $\sigma$  = 5.701 S/m;  $\epsilon_r$  = 48.401;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.06, 4.06, 4.06); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.85 W/kg

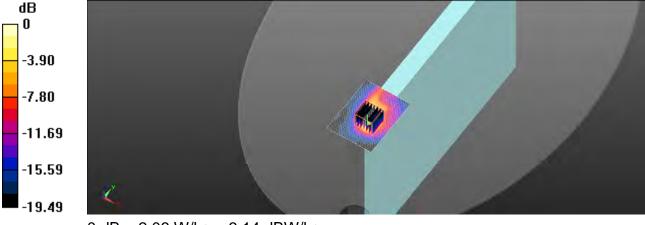
Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.116 V/m: Power Drift = 0.12 dB

Peak SAR (extrapolated) = 5.10 W/kg

SAR(1 g) = 0.910 W/kg; SAR(10 g) = 0.275 W/kg

Maximum value of SAR (measured) = 2.06 W/kg



0 dB = 2.06 W/kg = 3.14 dBW/kg

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## WLAN 802.11ac(80M) 5.8G\_Body\_Top side\_CH 155\_Aux\_0mm

Communication System: WLAN 5G; Frequency: 5775 MHz Medium parameters used: f = 5775 MHz;  $\sigma$  = 6.124 S/m;  $\epsilon_r$  = 47.592;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Area Scan (61x81x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 1.63 W/kg

Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.950 V/m: Power Drift = 0.06 dB

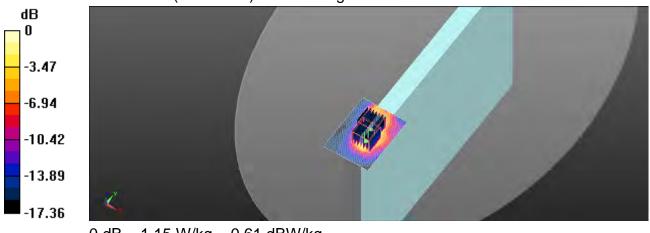
Peak SAR (extrapolated) = 4.61 W/kg

SAR(1 g) = 0.770 W/kg; SAR(10 g) = 0.256 W/ka

Maximum value of SAR (measured) = 1.81 W/kg

Zoom Scan (7x7x12)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.950 V/m; Power Drift = 0.06 dB Peak SAR (extrapolated) = 2.58 W/kg

SAR(1 g) = 0.586 W/kg; SAR(10 g) = 0.231 W/kg Maximum value of SAR (measured) = 1.15 W/kg



0 dB = 1.15 W/kg = 0.61 dBW/kg

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# 6. SAR System Performance Verification

## Dipole 2450 MHz SN:727

Date: 2018/12/1

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.974 S/m;  $\epsilon_{r}$  = 53.577;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 21.7°C

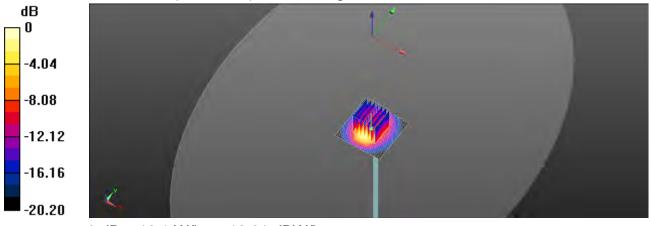
## **DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59) @ 2450 MHz; Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856: Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Pin=250mW/Area Scan (51x51x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 20.4 W/kg

# Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,

dz=5mm Reference Value = 100.2 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 24.9 W/kg SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6.14 W/kgMaximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg = 12.81 dBW/kg

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## Dipole 2450 MHz SN:727

Communication System: CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.986 S/m;  $\epsilon_r$  = 53.722;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(7.59, 7.59, 7.59); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Pin=250mW/Area Scan (51x51x1): Interpolated grid: dx=12 mm, dy=12 mm Maximum value of SAR (interpolated) = 21.4 W/kg

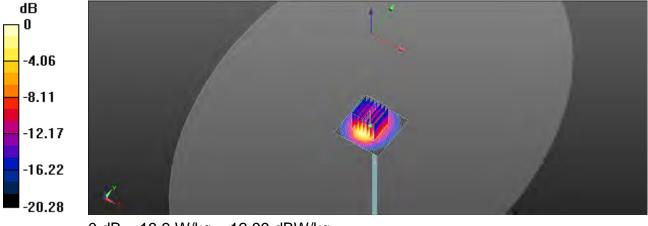
# Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,

dz=5mm

Reference Value = 100.6 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 26.0 W/kg

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.38 W/kg

Maximum value of SAR (measured) = 19.9 W/kg



0 dB = 19.9 W/kg = 12.99 dBW/kg

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# Dipole 5200 MHz SN:1023

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz;  $\sigma$  = 5.158 S/m;  $\epsilon_r$  = 49.348;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.8°C; Liquid temperature: 22.0°C

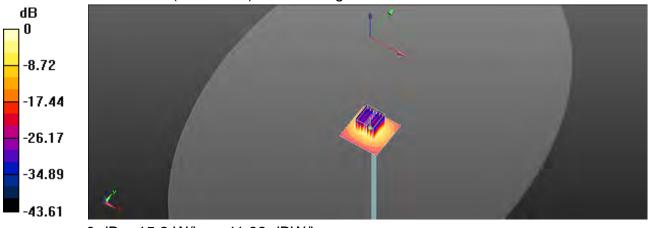
**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65) @ 5200 MHz; Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 14.6 W/kg

Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 54.81 V/m; Power Drift = 0.15 dB Peak SAR (extrapolated) = 34.3 W/kg SAR(1 g) = 7.09 W/kg; SAR(10 g) = 1.97 W/kgMaximum value of SAR (measured) = 15.2 W/kg



0 dB = 15.2 W/kg = 11.82 dBW/kg

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## Dipole 5200 MHz\_SN:1023

Communication System: CW; Frequency: 5200 MHz Medium parameters used: f = 5200 MHz;  $\sigma$  = 5.165 S/m;  $\epsilon_r$  = 49.473;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

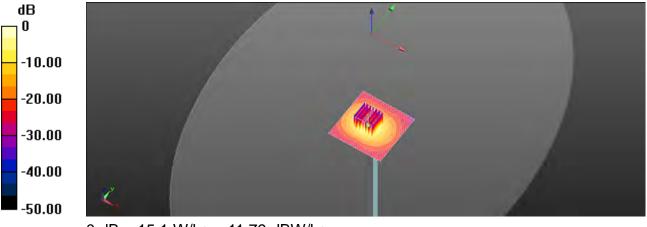
Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 14.6 W/kg

## Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 54.88 V/m; Power Drift = 0.21 dB Peak SAR (extrapolated) = 30.1 W/kg

## SAR(1 g) = 7.07 W/kg; SAR(10 g) = 1.99 W/kg

Maximum value of SAR (measured) = 15.1 W/kg



0 dB = 15.1 W/kg = 11.79 dBW/kg

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# Dipole 5300 MHz SN:1023

Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5300 MHz;  $\sigma$  = 5.323 S/m;  $\epsilon_r$  = 49.055;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 21.6°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.8.8(1258); SEMCAD X 14.6.11(7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 15.3 W/kg

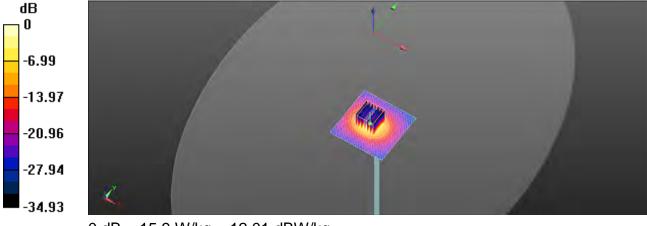
# Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm,

dz=2mm

Reference Value = 55.07 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 31.9 W/kg

SAR(1 g) = 7.39 W/kg; SAR(10 g) = 2.07 W/kg

Maximum value of SAR (measured) = 15.9 W/kg



0 dB = 15.9 W/kg = 12.01 dBW/kg

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## Dipole 5300 MHz SN:1023

Communication System: CW; Frequency: 5300 MHz Medium parameters used: f = 5300 MHz;  $\sigma$  = 5.338 S/m;  $\epsilon_r$  = 49.159;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.65, 4.65, 4.65); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 15.7 W/kg

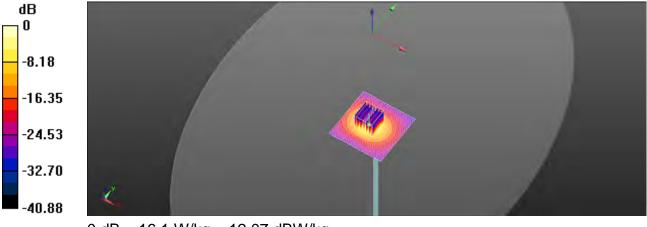
# Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm,

dz=2mm

Reference Value = 55.21 V/m; Power Drift = 0.06 dB Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 7.52 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 16.1 W/kg



0 dB = 16.1 W/kg = 12.07 dBW/kg

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# Dipole 5600 MHz SN:1023

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5600 MHz;  $\sigma$  = 5.808 S/m;  $\epsilon_r$  = 48.082;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 22.0°C; Liquid temperature: 21.8°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.06, 4.06, 4.06); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.8.8(1258); SEMCAD X 14.6.11(7439)

Pin=100mW/Area Scan (81x81x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 15.7 W/kg

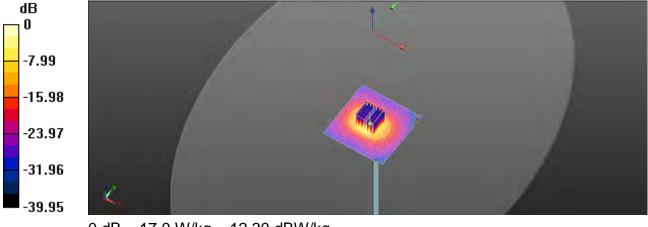
# Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm,

dz=2mm

Reference Value = 54.01 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 36.1 W/kg

SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.18 W/kg

Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

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## Dipole 5600 MHz SN:1023

Communication System: CW; Frequency: 5600 MHz Medium parameters used: f = 5600 MHz;  $\sigma$  = 5.82 S/m;  $\epsilon$ r = 48.2;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.06, 4.06, 4.06); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Pin=100mW/Area Scan (81x81x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 15.9 W/kg

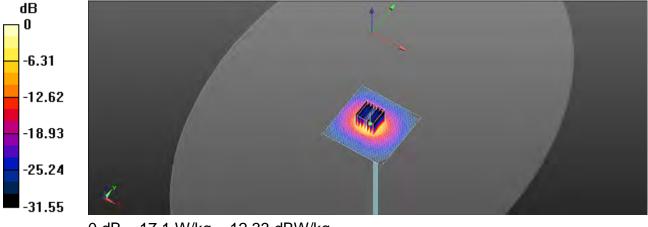
# Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm,

dz=2mm

Reference Value = 54.83 V/m; Power Drift = 0.17 dB Peak SAR (extrapolated) = 36.2 W/kg

SAR(1 g) = 7.82 W/kg; SAR(10 g) = 2.15 W/kg

Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg = 12.33 dBW/kg

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# Dipole 5800 MHz SN:1023

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5800 MHz;  $\sigma$  = 6.143 S/m;  $\epsilon_r$  = 47.441;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.7°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.8.8(1258); SEMCAD X 14.6.11(7439)

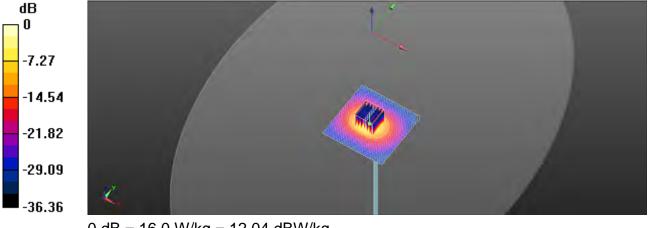
Pin=100mW/Area Scan (81x81x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 14.7 W/kg

## Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 51.70 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 35.6 W/kg

SAR(1 g) = 7.32 W/kg; SAR(10 g) = 2.03 W/kg

Maximum value of SAR (measured) = 16.0 W/kg



0 dB = 16.0 W/kg = 12.04 dBW/kg

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# Dipole 5800 MHz SN:1023

Communication System: CW; Frequency: 5800 MHz Medium parameters used: f = 5800 MHz;  $\sigma$  = 6.158 S/m;  $\epsilon_r$  = 47.587;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Ambient temperature: 21.6°C; Liquid temperature: 21.9°C

**DASY5** Configuration:

- Probe: EX3DV4 SN3770; ConvF(4.38, 4.38, 4.38); Calibrated: 2018/4/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2018/4/21
- Phantom: ELI
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

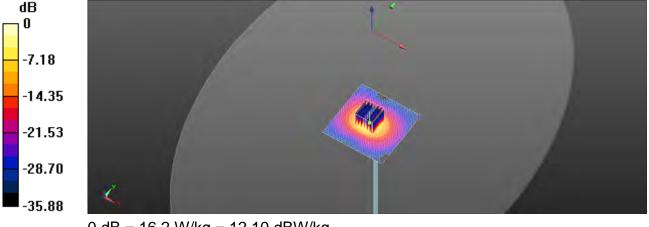
Pin=100mW/Area Scan (81x81x1): Interpolated grid: dx=10 mm, dy=10 mm Maximum value of SAR (interpolated) = 15.0 W/kg

## Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 51.77 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 36.0 W/kg

SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.07 W/kg

Maximum value of SAR (measured) = 16.2 W/kg



0 dB = 16.2 W/kg = 12.10 dBW/kg

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# 7. DAE & Probe Calibration Certificate

Schmid & Partner Engineering AG Inghausstrasse 43, 8004 Zuri	ery of		Service suisse d'étaionnage Servizio avizzero di taratura
Accredited by the Swiss Accredit The Swiss Accreditation Servi Multilateral Agreament for the	ce is one of the signatorie:	s to the EA	m No.: SCS 0108
Client SGS-TW (Aud	en)	Certificate N	lo: DAE4-856_Apr18
CALIBRATION	CERTIFICATE		
Object	DAE4 - SD 000 D	004 BM - SN: 856	
Calibration procedure(s)	QA CAL-06.v29 Calibration proces	dure for the data acquisition ele	ctronics (DAE)
Calibration dents	April 21, 2018		
The measurements and the unc	ertaintias with confidence pr kted in the closed laboratory	snal standards, which realize the physical of obbility are given on the following pages a pholity: environment temperature $(22\pm3)^4$	nd are part of the certificate.
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The measurements and the unc All calibrations have been condu Calibration Equipment used (MB Primary Standards Kaliblay Multimeter Type 2001 Secondary Standards Nato DAE Calibration Unit	Antantias with confidence pr kted in the closed iscontany (TE critical for calibration) iD # SN: 0810278 1D # SE UWS 053 AA 1001	obsbillty are given on the following pages a y facility: environment temperature (22 ± 3)* Cal Date (Certificate No.) 31-Aug-17 (No:21082) Check Date (In house) 04-Jan-18 (In house check) 04-Jan-18 (In house check)	nd ere peri of the certificate. C and humidity < 70%. Scheduled Calibration Aug-18 Scheduled Check In house check: Jan-19 In house check: Jan-19
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## Report No. : EN/2018/B0040 Page: 100 of 140

Calibration Laboratory of Schmid & Partner Engineering AG Nghausstrases 45, 0064 Zurich, Switzerland



Schwazerischer Kalibrierdier Service suisse d'étalonnage C Servizio svizzaro di laratura Swiss Calibration Service

Accreditation Ma.: SCS 0108

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#### Glossary

DAE Connector angle

data acquisition electronics information used in DASY system to align probe sensor X to the robot coordinate system.

#### Methods Applied and Interpretation of Parameters

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- ٠ Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a ٠ result from the performance test and require no uncertainty.
  - ÷ DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement.
  - Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage:
  - AD Converter Values with Inputs shorted: Values on the internal AD converter corresponding to zero input voltage
  - Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurements.
  - Input Offset Current: Typical value for information; Maximum channel Input offset current, not considering the input resistance.
  - ÷ Input resistance: Typical value for information: DAE input resistance at the connector. during internal auto-zeroing and during measurement.
  - Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated.
  - Power consumption: Typical value for information. Supply currents in various operating modes.

Certificate No: DAE4-885 April 6

Page 2 cl 6

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## DC Voltage Measurement

AVD - Converter Meso	lution nominal			
High Range:	1LSB =	6.1µV,	full range =	-100+300 mV
Low Range:	1LSB =	61nV .	full range =	-1 +3mV
DASY measurement p	parameters: Aut	o Zero Time: 3	sec; Measuring	time: 3 sec

Calibration Factors	x	Y	z
High Range	403.380 ± 0.02% (k=2)	404.500 ± 0.02% (k=2)	403.824 ± 0.02% (k=2)
Low Range	3.97569 ± 1.50% (k=2)	3.98803 ± 1.50% (k=2)	3.94148 ± 1.50% (k=2)

## Connector Angle

1	Connector Angle to be used in DASY system	264.5°±1°	
L	a second a s	204.5 * ± 1 *	

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## Appendix (Additional assessments outside the scope of SCS0108)

#### 1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	199991.32	-3.93	-0.00
Channel X	+ Input	20000.89	-0.73	-0.00
Channel X	- Input	-19999.72	1.38	-0.01
Channel Y	+ Input	199995.30	0.19	0.00
Channel Y	+ Input	19999.58	-1.96	-0.01
Channel Y	- Input	-20002.18	-0.91	0.00
Channel Z	+ input	199995.15	0.22	0.00
Channel Z	+ Input	19998.23	-3.34	-0.02
Channel Z	- Input	-20002.45	-1.22	0.01

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2001.18	-0.15	-0.01
Channel X	+ Input	202.02	0.40	0.20
Channel X	- Input	-197.78	0.37	-0.19
Channel Y	+ Input	1999.81	-1.28	-0.06
Channel Y	+ Input	201.37	-0.27	-0.13
Channel Y	- Input	-199.29	-0.94	0.47
Channel Z	+ Input	2000.80	-0.29	-0.01
Channel Z	+ Input	201.21	-0.19	-0.10
Channel Z	- Input	-199.51	-1.1B	0.60

## 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	-13.71	-15.90
	- 200	17.59	16.11
Channel Y	200	-2.20	-2.52
	- 200	0.55	-0.02
Channel Z	200	11.04	10.58
	- 200	-12.61	-12.99

#### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Channel X         200         -         2.30         -2.46           Channel Y         200         7.31         -         3.25           Channel Z         200         2.00         1.10         3.25		Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
	Channel X	200	-	2.30	-2.46
Channel Z 200 2.00 1.00	Channel Y	200	7.31	-	3.25
Chammer 2 200 8.90 4,49 -	Channel Z	200	8.90	4.49	-

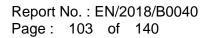
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#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16218	15730
Channel Y	15957	16114
Channel Z	15879	16093

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec Input 10MΩ

	Avcrage (µV)	min. Offset (µV)	max. Offset (µV)	Std. Deviation (µV)
Channel X	-0.35	-1.46	1.21	0.40
Channel Y	-0.34	-1.68	0.58	0.46
Channel Z	-0.03	-1.43	1.45	0.57

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

## 7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

## 8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

#### 9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)	
Supply (+ Vcc)	+0.01	+6	+14	
Supply (- Vcc)	-0.01	-8	-9	

Certificate No: DAE4-856\_Apr18

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N delEnations have been cond Unitoration Clautement used IM Primary Standards Power meter NRP Power sensor NRP 201 Power sensor NRP 201 Reference 20 dB Attenuistor Reference Pictal ES3DV2 DAE4 Secondary Standards Power sensor E4412A Power sensor E4412A	8TE stubied for calibration( SN: 1047728 SN: 1047728 SN: 103244 SN: 105245 SN: 55277 (20s) SN: 3013 SN: 55277 ID SN: 560 SN: 560	Gal Oate (Certificate No.)           Gal Oate (Certificate No.)           DA-Apr. 18 (No. 217-026729/02673)           D4-Apr. 18 (No. 217-026729)           D4-Apr. 18 (No. 217-026729)           D4-Apr. 18 (No. 217-026873)           D4-Apr. 19 (No. 217-026873)           D4-Apr. 10 (No. 2004 Certor 10, 1000 Certor)           D5-Apr. 10 (In Insuee Cheros 100-10)           D6 Apr. 16 (In Insuee Cheros 100-10)	Scheduled Calibration Apr-10 Apr-19 Apr-19 Der-18 Der-18 Der-18 Scheduled Check In home check: Jan (18 In home check: Jan (18 In home check: Jan (18
Al delbrations have been cond Calibration Equipment used IM Primary Standards Power sensor NRP-251 Rower sensor NRP-251 Relations 20 BR-251 Relations 20 BR-251 Relati	8TE subod for calibration( SN: 103778 SN: 103778 SN: 103245 SN: 3015 SN: 3015 SN: 3015 SN: 680 ID SN: 681283074 SN: 0111210 SN: US36-20011020	Call One (Certificate No.)           O4-Apr-18 (No. 217-026720/2673)           O4-Apr-18 (No. 217-026720/2673)           O4-Apr-18 (No. 217-02672)           O4-Apr-19 (No. 201-000, Dec17)           Check Date (In Insue Check Jun-16)           O5-Apr-16 (In Insue Check Jun-16)	Scheduled Catbration April 9 April 9 April 9 April 9 April 9 Den 19 Den
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Certificate No: EX3-3770\_Apr18

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**Calibration Laboratory of** Schmid & Partner Engineering AG augheumtrase #1, 90% Zurith, Seitzerland Zetigh



Schweizerischer Kalthnardienst 5 Service wateres d'étalonneos C Servizio svizzero di tantura. S. **Swiss Calibration Service** 

Ascrediment No.: SCS 0108

Virgestilled by the Selen Addred putters Selevan (SAU) The Switts Accreditation Bervice is one of the signatories to the EA Ministerial Agreement for the moguition of calibration cartificates

#### Glossary

TSL	tesue simulating liquid
NORMANZ	sensibility in free space
CanvE	setsitivity in TEL / NORMX.V.z
DCP	diode compressian point
CF	crest factor (1/duty cycle) of the RF signer
A, B, C, Q	modulation dependent linearization parameters
Polarization a	e rotation around probe role
Polarization 3	3 rotation around an axis that is in the plane normal to probe axis (at measurement conter),
Connector Anale	i.e., h = 0 ≤ normal to probe axis
Capitration would	information used in DASY system to align probe sensor X to the rabol coordinate system

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, TEEE Recommended Practice for Determining the Pask Spatial-Averaged Specific a) Absorption Rate (SAR) in the Human Haint from Windows Communications Devices: Measu
- Absorption rester (24VK) in the numer numer numer from Winners Communications: Devices: Measurement Techniques: June 2013 TeC E2008-1; " Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear ((requency range of 300 MHz to 5 GHz)" July 2010 TeC E2209-2; Procedure to adstructions the Specific Absorption Rate (SAR) for wreates communication devices used in close provimity to the human body (frequency range of 30 MHz to 5 GHz)" March 2010 b)
- CI.
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Methods Applied and Interpretation of Parameters:

- NORMs, y.z. Assessed for E-field polarization 6 = 0 (f ≤ 900 MHz in TEM-cell, f > 1600 MHz; R22 waveguide). NORMs, y.z. are only intermediate values, ...s. The uncertainties of NORMs, y.z. does not affect the E-field
- winestainty inside TSL (see below ConvF), NORM(7)x, y, z = NORMx, y, z \* Bequericy, response (see Frequency Response Chert). This inelatization is indemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included. It the stated uncertainty of ConvF. DOPx.y.z: DOP are numerical linearization parameters assessed based on the data of power sweep with CW.
- signal (no uncertainty required) DCP does not depend on traguency nor media PAR: PAR is the Peak to Average Rabo likat is not calibrated but determined based on the signal
- cheracteristic
- AX, Y, Z, BX, Y, Z, CX, Y, Z, OX, Y, Z, VRX, Y, Z, A, B, C, D are numerical linearization parameters assessed based ine data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voitage across the diode. real based on
- ConvF and Boundary Effect Parameters: Assessed in Ital phantom using E-field (or Temperature Transfer Standard for t < 800 MHz) and inside waveguide using analytical field distributions based on power measurements for t > 800 MHz. The same setups are used for assessment of the parameters applied for measurements for t > 600 MHz. The same setups are used for assessment of the parameters applied for boundary compensative (wiphs, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sense value of TSL corresponds to NORMx,y,z \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from s 50 MHz to ± 100. MH2
- Spherical (totmp) (30 deviation from (sotropy); in a field of low gradients realized using a flat phantam exposed by a patch antenno. Sensor Offset: The sensul offset corresponds in the offset of virtual measurement carter from the probe tip
- (on proce axis). No tolerance moulreid.
- Connector Angle. The angle is assessed using inn information gained by determining the NORMs (no uncertainty required).

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EX3DV4 - SN:3770

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April 25, 2018

# Probe EX3DV4

# SN:3770

Manufactured: Calibrated:

July 6, 2010 April 25, 2018

Calibrated for DASY/EASY Systems (Note: non-compatible with DASY2 system!)

Certificate No: EX3-3770\_Apr18

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EX3DV4- SN:3770

April 25, 2018

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

#### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( <sub>E</sub> V/(V/m) <sup>2</sup> ) <sup>A</sup>	0.30	0.60	0.38	± 10.1 %
DCP (mV) <sup>8</sup>	101.9	101.9	101.5	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dBõV	c	D dB	VR mV	Unc <sup>L</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	138.1	±3.5 %
		Y	0.0	0.0	1.0		134.7	
		Z	0.0	0.0	1.0		135.6	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>a</sup> The uncertainties of Norm X, Y, Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).
<sup>a</sup> Numerical linearization parameter: uncertainty not required.
<sup>b</sup> Uncertainty is determined using the max, deviation from linear response applying ractangular distribution and is expressed for the square of the field value.

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EX3DV4- SN:3770

April 25, 2018

f (MHz) <sup>C</sup>	Relative Permittivity	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha®	Depth <sup>0</sup> (mm)	Unc (k=2)
450	43.5	0.87	11,20	11.20	11.20	0.13	1.25	±13.3 9
750	41.9	0.89	10.05	10.05	10.05	0.43	0.80	± 12.0 9
835	41.5	0.90	9.55	9.55	9.55	0.35	0.97	± 12.0 9
900	41.5	0.97	9.36	9.36	9.36	0.27	1.10	± 12.0 9
1750	40.1	1.37	8.48	8.48	8.48	0.35	0.80	± 12.0 %
1900	40.0	1.40	8.22	8.22	8.22	0.32	0.80	± 12.0 %
2000	40.0	1.40	8.15	8.15	8.15	0.38	0,80	± 12.0 9
2300	39.5	1.67	7.78	7.78	7.78	0.33	0.84	± 12.0 %
2450	39.2	1.80	7.43	7.43	7.43	0.38	0.80	± 12.0 5
2600	39.0	1.96	7.20	7.20	7.20	0.35	0.84	± 12.0 9
5250	35.9	4.71	5.25	5.25	5.25	0.40	1.80	_± 13.1 9
5600	35.5	5.07	4.92	4,92	4.92	0.40	1.80	± 13.1 9
5750	35.4	5.22	5.21	5.21	5.21	0.40	1.80	± 13.1 9

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v1.4 and higher (see Page 2), else k is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF eccessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity calibration frequency validity can be extended to ± 100 MHz.
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters (a and a) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. After quencies a thread to the validity of issue parameters.
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters (a and a) can be relaxed to ± 10% if liquid compensation formula is applied to the measured SAR values. After frequencies below 3 GHz, the validity of tissue parameters.
<sup>6</sup> AlphaDepth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz, and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diamater from the boundary.

Certificate No: EX3-3770 Apr18

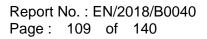
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EX3DV4-- SN:3770

April 25, 2018

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

Calibration Parameter Determined in Boo	ly Tissue Simulating Media
---	----------------------------

f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>0</sup> (mm)	Une (k=2)
450	56.7	0.94	10.68	10.68	10.68	0.08	1.25	±13.3 %
750	56.5	0.96	9.97	9.97	9.97	0.39	0.95	± 12.0 %
835	55.2	0.97	9.72	9.72	9.72	0.45	0.88	± 12.0 %
900	55.0	1.05	9.64	9.64	9.64	0.44	0.85	± 12.0 %
1750	53.4	1.49	8.26	8.26	8.26	0.43	0.80	± 12.0 %
1900		1.52	8.00	8.00	8.00	0.37	0.87	± 12.0 %
2000	53.3	1.52	7.97	7.97	7.97	0.29	1.00	± 12.0 %
2300	52.9	1.81	7.68	7.68	7.68	0.42	0.84	± 12.0 %
2450	52.7	1.95	7.59	7.59	7.59	0.41	0.84	± 12.0 %
2600	52.5	2.16	7.37	7.37	7.37	0.15	0.98	± 12.0 %
5250	48.9	5.36	4.65	4.65	4.65	0.50	1.90	±13.1 %
5600	48.5	5.77	4.06	4.06	4.06	0.50	1.90	± 13.1 %
5750	48.3	5.94	4.38	4.38	4.38	0.60	1.90	± 13.1 %

<sup>6</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else k is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity as be extended to ± 10, 25, 40, 59 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity as be extended to ± 110 MHz.
<sup>6</sup> At frequencies below 3 GHz, the validity of tissue parameters (x and y) can be released to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (x and y) is restricted to ± 5%. The uncertainty for indicated target itsue parameters.
<sup>6</sup> At frequencies below 3 GHz, the validity of tissue parameters (x and y) is restricted to ± 5%. The uncertainty for indicated target itsue parameters.
<sup>6</sup> At an extended to the domining calibration. SPEAQ warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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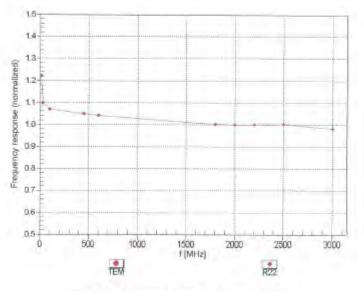


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EX30V4-SN:3770

April 25, 2018

Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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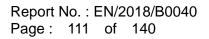
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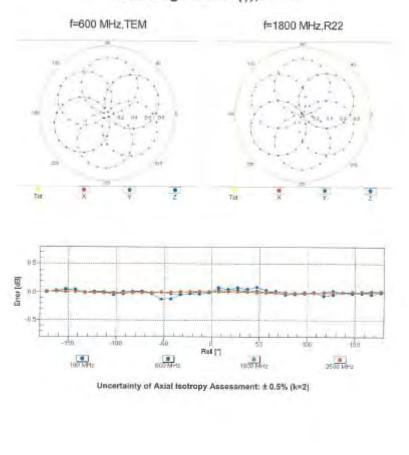
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EX3DV4-SN:3770

SG

April 25, 2018



Receiving Pattern (\$), 9 = 0°

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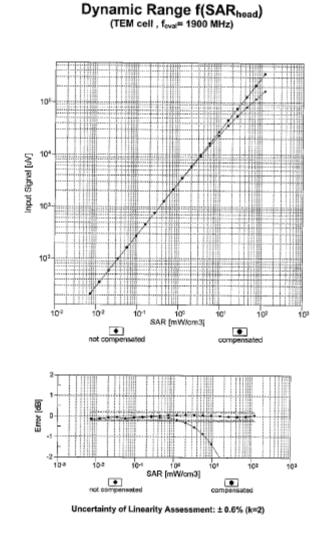
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EX3DV4-- SN:3770

April 25, 2018



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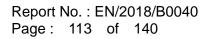
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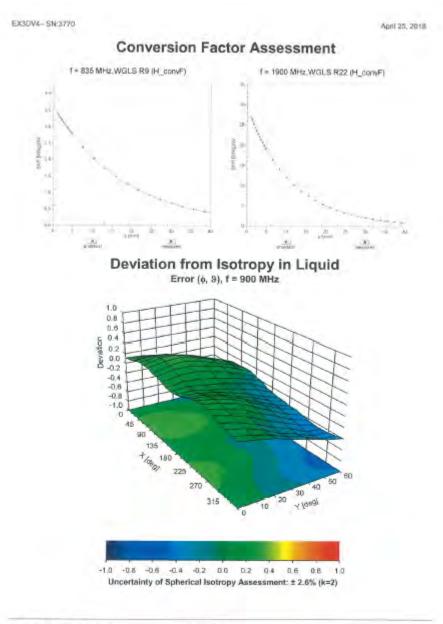
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EX3DV4- SN:3770

April 25, 2018

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

#### Other Probe Parameters

Sensor Arrangement	Triangutar
Connector Angle (")	-32.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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# 8. Uncertainty Budget

A	с	D	е		f	g	h=c*f/e	i=c*g∕e	k
	o Tolerance/	Probability		5			Standard	Standard	
Source of Uncertainty	Uncertainty	Distributio	Div	Div Value	ci (1g)	ci (10g)	uncertainty	uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.55%	Ν	1	1	1	1	6.55%	6.55%	80
lsotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	00
lsotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	00
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	~
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	œ
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	00
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	80
Readout Electronics	0.30%	Ν	1	1	1	1	0.30%	0.30%	80
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	00
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	80
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	00
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	00
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	00
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	œ
Probe Positioning with respect to phantom shell	2.90%	R	√3	1.732	1	1	1.67%	1.67%	00
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	œ
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	00
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	00
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	00
Liquid permittivity (mea.)	1.57%	N	1	1	0.64	0.43	1.00%	0.68%	М
Liquid Conductivity (mea.)	2.76%	Ν	1	1	0.6	0.49	1.66%	1.35%	М
Combined standard uncertainty		RSS					11.88%	11.80%	
Expant uncertainty (95% confidence interval), K=2							23.75%	23.61%	

Measurement Uncertainty evaluation template for DUT SAR test (3-6G)

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A	с	D	е		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability Distributio	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.00%	N	1	1	1	1	6.00%	6.00%	~
lsotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	~
lsotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	$\infty$
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	$\infty$
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Probe Positioning with respect to phantom shell	2.90%	R	√3	1.732	1	1	1.67%	1.67%	$\infty$
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	$\infty$
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	$\infty$
Test Sample related									
Test sample positioning	2.90%	Ν	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	~
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	~
Liquid permittivity (mea.)	1.96%	N	1	1	0.64	0.43	1.25%	0.84%	М
Liquid Conductivity (mea.)	1.85%	N	1	1	0.6	0.49	1.11%	0.91%	М
Combined standard uncertainty		RSS					11.54%	11.48%	
Expant uncertainty (95% confidence interval), K=2							23.08%	22.95%	

Measurement Uncertainty evaluation template for DUT SAR test (0.3-3G)

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# 9. Phantom Description

Schmid & Partner Engineering AG

s e а D a

Zeughausstrasse 43, 8004 Zurich, Switzerland Phone +41 44 245 9700, Fax +41 44 245 9779 info@speag.com, http://www.speag.com

#### Certificate of Conformity / First Article Inspection

Item	Oval Flat Phantom ELI 5.0	
Type No	QD OVA 002 A	
Series No	1108 and higher	
Manufacturer	Untersee Composites Knebelstrasse 8, CH-8268 Mannenbach, Switzerland	

Tests

Complete tests were made on the prototype units QD OVA 001 A, pre-series units QD OVA 001 B as well as on some series units QD OVA 001 B. Some tests are made on all series units QD OVA 002 A.

Test	Requirement	Details	Units tested
Shape	Internal dimensions, depth and sagging are compatible with standards	Bottom elliptical 600 x 400 mm, Depth 190 mm, dimension compliant with [1] for f > 375 MHz	Prototypes
Material thickness	Bottom: 2.0mm +/- 0.2mm	dimension compliant with [3] for f > 800 MHz	all
Material parameters	rel. permittivity 2 – 5, loss tangent ≤ 0.05, at f ≤ 6 GHz	rel. permittivity 3.5 +/- 0.5 loss tangent ≤ 0.05	Material samples
Material resistivity	Compatibility with tissue simulating liquids .	Compatible with SPEAG liquids. **	Phantoms, Material sample
Sagging	Sagging of the flat section in tolerance when filled with tissue simulating liquid.	within tolerance for filling height up to 155 mm	Prototypes, samples

Note: Compatibility restrictions apply certain liquid components mentioned in the standard, containing e.g. DGBE, DGMHE or Triton X-100. Observe technical note on material compatibility.

#### Standards

\*\*

- OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition 01-01
   IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific
- Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003
- [3] IEC 62209-1 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)\*, 2005-02-18 [4] IEC 62209-2 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted
- wireless communication devices Human models, instrumentation, and procedures Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", 2010-03-30

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of body-worn SAR measurements and system performance checks as specified in [1-4] and further standards

Date 25.7.2011 Signature / Stamp

eag s

nd & Barther Engineering AG bayestrassa 43, 8004 Kulch, Shiteriar 8/441 44/25-9708 Fext-44 44/55 9779

Doc No 881 - QD OVA 002 A - A

Page 1(1)

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# **10.System Validation from Original Equipment Supplier**

e Swiss Accreditation Service is one of the signaturies to the EA Alilebraic Agreement for the recognition of calibration certificates and SGS-TW (Auden) Centre Centre Cance Calibration proceedures (S) D2450V2 - SN:727 atomic processive(s) QA CAL-05.V10 Calibration proceedure for dipole validation kits above 700 MHz atomicn state: April 24, 2018 this calibration certificate documents the traceability is national standards, which realize the physical units of measurements (S) the measurements, and the uncertainties with confidence protosticity are given on the tolowing pages and are part of the confidence atomic state: D1 atomic state: D1 atomic state: D2 atomic state: D2 atom	ghausstrasse 43, 8004 Zurich,	Switzerland		S Schweizertscher Kalbnerdiens C Service sulsse d'étalonnage Service ovizzer of laratura S swiss Calibration Service
Description     D2450V2 - SN/727       Categories     D2450V2 - SN/727       Categories     D24 CAL-05 v10 Calibration procedure for dipole validation kits above 700 MHz       Categories     D24 CAL-05 v10 Calibration procedure for dipole validation kits above 700 MHz       Categories     April 24, 2018       This coloration certificate documents the traosobility to national standards, which natize the physical units of measurements (Sinta massurements, and the uncertainties with confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the totowing pages and are part of the confidence prototelity are given on the	Swiss Accreditation Service	is one of the signatories	- ALL CARACTERS	Accreditation No.: SCS 0108
Dayor:         D2450V2 - SN/727           Catenation percendure(s)         QA CAL-05 v 10 Calibration proceedure for dipole validation kits above 700 MHz           Catenation date:         April 24, 2016           This calibration and the uncertainties with confidence prototolity are given on the toloxing pages and are part of the control the uncertainties with confidence prototolity are given on the toloxing pages and are part of the control the constrainties with confidence prototolity are given on the toloxing pages and are part of the control the constrainties with confidence prototolity are given on the toloxing pages and are part of the control the constrainties with confidence prototolity are given on the toloxing pages and are part of the control the constrainties with confidence prototolity are given on the toloxing pages and are part of the control to a constrainties (SI fina measurement set) (M87E critical for celleration)           Prevent pages with Pages and are part of the control to a constrainties (SI fina measurement set) (SE 104778 04-40-18 (No. 217-02672) April 9 Prevent pages with Pages Si N 102244 04-40-18 (No. 217-02672) April 9 Prevent pages with Pages Si N 102245 04-40-18 (No. 217-02673) April 9 Prevent pages with Pages Si N 1022 04-40-18 (No. 217-02673) April 9 Prevent pages with Pages Si N 1022 04-20 (No. DAE-4001 Det17) Des 18 Descenator Proto EX3DV4 Si N 6837480704 07-60-15 (In incuse dreek Det-16) In fouse check Pages conston HP 9401A Si N 10372 02728 Si Or-00-15 (In incuse dreek Det-16) In fouse check N 100072 15-10072 15-10 (In fouse check Det-16) In fouse chec	Collection of Action of	*	12 B 10 S. S.	***: D2450V2-727_Apr18
Calibration processive(s)       QA CAL-05,v10 Calibration procedure for dipole validation kits above 700 MHz         Calibration date:       April 24, 2018         This calibration certificate documents the thousability to national standards, which realize the physical units of measurements (s) frameautements and the uncertainties with certificate protostility are given on the totowing pages and are part of the calibration frameautements and the uncertainties with certificate protostility are given on the totowing pages and are part of the calibration frameautements and the uncertainties with certificate protostility are given on the totowing pages and are part of the calibration frameautement and the uncertainties with certificate protostility are given on the totowing pages and are part of the calibration frameautement and the uncertainties with certificate interview.         All calibration Equipment used (MSTE critical for cellsmitton)         Permany Standards       D A       Cal Calibration (217-02672)       Apr-19         Power sensor NIP-231       SN: 103244       OH-Apr-18 (No. 217-02673)       Apr-19         Power sensor NIP-231       SN: 103245       OH-Apr-18 (No. 217-02673)       Apr-19         Reference 20 dB Athemation       SN: 00322       OH-Apr-18 (No. 217-02673)       Apr-19         Reference 20 dB Athemation       SN: 00322       OH-Apr-19       Apr-19         Reference 20 dB Athemation       SN: 00322       OH-Apr-18 (No. 217-026532)       Apr-19         Da54       SN: 00322       OH-Apr-18 (No. 217-026532) <th>ALIBRATION C</th> <th>ERTIFICATE</th> <th></th> <th></th>	ALIBRATION C	ERTIFICATE		
Calibration procedure for clipple validation kits above 700 MHz       Calibration date:     April 24, 2018       This calibration certificate documents the tradisability to national standards, which realize the physical units of measurements (3)       This calibration certificate documents the tradisability to national standards, which realize the physical units of measurements (3)       This calibration certificate documents the tradisability to national standards, which realize the physical units of measurements (3)       This calibration Equipment used (M&TE critical for cellbration)       Prover sensor NRP-291     Stit 104778     OHApr-18 (No. 217-0267200573)     April 9       Prover sensor NRP-291     Stit 104778     OHApr-18 (No. 217-02672)     April 9       Reference 20 dB Attenuator     Stit 5058 (20K)     OHApr-18 (No. 217-02672)     April 9       Reference 20 dB Attenuator     Stit 5058 (20K)     OHApr-18 (No. 217-02672)     April 9       Spect ensor NRP-291     Stit 5058 (20K)     OHApr-18 (No. 217-02672)     April 9       Reference 20 dB Attenuator     Stit 5058 (20K)     OHApr-18 (No. 217-02682)     April 9       Spect ensor NRP-291     Stit 5058 (20K)     OHApr-18 (No. 217-02682)     April 9       Reference 20 dB Attenuator     Stit 5058 (20K)     OHApr-18 (No. 217-02682)     April 9       Spectadary Seandards     ID #     Check Date (n house)     Sciented doine document       Spectadary Seandards <th< td=""><td>ject</td><td>D2450V2 - SN:72</td><td>27</td><td></td></th<>	ject	D2450V2 - SN:72	27	
This calibration certificate documents the trabalability to national standards, which realize the physical units of measurements (3)         The measurements, and the uncertainties with confidence probability are given on the tollowing pages and are part of the cartical         All calibration Equipment used (M&TE critical for celebration)         Primery Standards       ID #       Cal Data (Certificate No.)       Screedued Calibration         Privary Standards       ID #       Cal Data (Certificate No.)       Screedued Calibration         Privary Standards       ID #       Cal Data (Certificate No.)       Screedued Calibration         Privary Standards       ID #       Cal Data (Certificate No.)       Screedued Calibration         Privary Standards       ID #       Cal Data (Certificate No.)       Screedued Calibration         Privary Standards       ID #       Cal Data (Certificate No.)       April 19         Power secon NRIP-291       SN: 103244       OH-April 8 (No. 217-02672)       April 19         Power secon NRIP-291       SN: 5058 (20K)       OH-April 8 (No. 217-02672)       April 19         Retering 20 dB Attenuation       SN: 5047 (2 / 05027       OH-April 8 (No. 217-02672)       April 19         Retering Probe EXECV4       SN: 601       22-04-07 (No. DAE-401 Data 7)       Doc 18         DaE-4       SN: 601       22-04-07 (No. DAE-401 Data 7) <td< td=""><td>Remain procedure(s)</td><td></td><td>dure for dipole validation kits r</td><td>above 700 MHz</td></td<>	Remain procedure(s)		dure for dipole validation kits r	above 700 MHz
Power mater NRP         SN: 104778         OH-Apr-18 (No. 217-02672X2673)         Apr-19           Power sensor NRP-291         SN: 103244         OH-Apr-18 (No. 217-02672)         Apr-19           Power sensor NRP-291         SN: 103244         OH-Apr-18 (No. 217-02672)         Apr-19           Reterence 20 dB Attenuator         SN: 5033 (20K)         OH-Apr-18 (No. 217-02672)         Apr-19           Reterence 20 dB Attenuator         SN: 5043 (20K)         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 5047 (2 / 06327         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 5047 (2 / 06327         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 5047 (2 / 06327         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 5047 (2 / 06327         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 5047 (2 / 06327         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 5047 (2 / 06327         OH-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 dB Attenuator         SN: 601         25-Odr-17 (No. DAE54901_Dec17)         Dec-18           Secondary Samdarets         ID #         Checod (1 fo)	libitation date:	April 24, 2018		
All calibrations have been conducted in the closed laboratory facility: environment temptersture (22 ± 37°C and humkity < 70%.         Calibration Equipment used (M&TE critical for celebration)         Prover match NRP       ID #       Cal Data (Certificate No.)       Scheduled Celebration         Prover match NRP       SN: 104778       DitApr-18 (No. 217-02672/02673)       Apr-19         Power sensor NRP-291       SN: 103244       OH-Apr-18 (No. 217-02672)       Apr-19         Pewer sensor NRP-291       SN: 103245       OH-Apr-18 (No. 217-02672)       Apr-19         Reference 20 dB Attenuator       SN: 5053 (20K)       OH-Apr-18 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-19 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-19 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-18 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-19 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-19 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-19 (No. 217-02682)       Apr-19         Reference 20 dB Attenuator       SN: 5047 (2083)       OH-Apr-18 (No. 217-0				
Date         Date         Date         Calibration         Screeduad         Calibration           Prower mater NRP         SN: 104778         04-Apr-18 (No. 217-03672/02673)         Apr-19           Power sensor NRP-291         SN: 103244         04-Apr-18 (No. 217-02672/02673)         Apr-19           Power sensor NRP-291         SN: 103244         04-Apr-18 (No. 217-02672/02673)         Apr-19           Reterence 20 tilt Antenusion         SN: 5058 (2016)         04-Apr-18 (No. 217-02672)         Apr-19           Reterence 20 tilt Antenusion         SN: 5058 (2016)         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 tilt Antenusion         SN: 5058 (2016)         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 tilt Antenusion         SN: 5058 (2017)         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 tilt Antenusion         SN: 5057 (2002)         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 tilt Antenusion         SN: 5047 2 / 06327         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 tilt Antenusion         SN: 5047 2 / 06327         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 20 tilt Antenusion         SN: 5047 2 / 06327         04-Apr-18 (No. 217-02682)         Apr-19           Reterence 2000 tilt Antenusion         SN: 50	e measurements and the uncert	tainties with confidence p	robability are given on the following page	is and are part of the contribute
Power sensor NRIP-291         SN: 103244         O4-Apr-18 (No. 217-03672)         Apt-19           Power sensor NRIP-291         SN: 103244         O4-Apr-18 (No. 217-02672)         Apt-19           Reterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02673)         Apt-19           Reterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02653)         Apt-19           Reterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02653)         Apt-19           Raterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02653)         Apt-19           Raterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02653)         Apt-19           Raterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02653)         Apt-19           Raterence 20 dB Attenuation         SN: 5058 (20k)         O4-Apr-18 (No. 217-02653)         Apt-19           Raterence 20 dB Attenuation         SN: 5047 2 / 06327         O4-Apr-18 (No. 217-02653)         Apt-19           Bale 4         SN: 601         25-Odr-17 (No. DAE5+601_Doi-17)         Doi-18         Socheduled Chec           Socientary Standards         ID #         Dreck Date (in house)         Scheduled Chec         In fouse check           Power sensor HP 6401A         SN. UB37202783	calibrations have been conduct	ed in the closed laborator	ry tacility: environment lemperature (22 ±	37°C and humicity < 70%
Power series / NBP-291         SN: 103245         O4-Apr-18 (No. 217-02673)         Apr-19           Reference 20 dt6 Attentister         SN: 5055 (20k)         O4-Apr-18 (No. 217-02652)         Apr-19           Type-N mismatch combination         SN: 5047 2 / 06327         O4-Apr-18 (No. 217-02653)         Apr-19           Reference Probe EX3DV4         SN: 5047 2 / 06327         O4-Apr-18 (No. 217-02653)         Apr-19           DaE4         SN: 5047 2 / 06327         O4-Apr-17 (No. EX3-7349, Dac17)         Dac-18           DaE4         SN: 501         25-Oct-17 (No. DAE4-601_Oct17)         Oct-18           Secondary Sandards         ID #         Drack Date (in house)         Scheduled Check           Power mater EPM-442A         SN: GB37450704         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 6461A         SN U8372512783         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 6461A         SN U8372512783         07-Oct-15 (in house check Oct-16)         In house check           RF generator R&S SMT-06         SN: US37360551         16-Oct-01 (in house check Oct-17)         In house check           RF generator R&S SMT-06         SN: US37360555         16-Oct-01 (in focuse check Oct-17)         In house check           Calinnated by:         Jacor Kastmin         Laborat	libration Equipment used (M&T)	E critical for calibration)		37°C and humidity < 70%. Scheduled Calibration
Beterence 20 dB Attenuation Type-N mismatch combination Reterence Probe EX30V4         SN: 5058 (20k)         O4-Apr-18 [No. 217-02882]         Apr-19           Reterence Probe EX30V4         SN: 5047 2 / 06327         O4-Apr-18 [No. 217-02883]         Apr-19           Batemine Probe EX30V4         SN: 5047 2 / 06327         O4-Apr-18 [No. 217-02883]         Apr-19           DAE4         SN: 501         26-Ott-17 [No. EX3-7349_Dact7]         Dac-18           Sacondary Standards         ID #         Drack Date (in house)         Scheduled Ches           Power meter EPM-442A         SN: GB37450704         07-Ott-15 (in house check Oct-16)         In fouse check           Power sensor HP 9401A         SN: MY41002517         07-Ott-15 (in house check Oct-16)         In house check           Power sensor RAS SMT-66         SN: US37390585         18-Oct-01 (in fouse check Oct-17)         In house check           Netwer weiser HP 8401A         SN: US37390585         18-Oct-01 (in fouse check Oct-16)         In house check           Netwer weiser HP 8451A         SN: US37390585         18-Oct-01 (in fouse check Oct-17)         In house check           Notme         Function         Signature         Signature           Caking tHP 84554         Jacon Kastmin         Externated by         Signature	libralion Equipment used (M&T) many Standards	E ortical for calibration)	Cal Data (Cettificale No.)	Scheduled Calibration
Type-N mismatch combination         SN: 5047 2 / 06327         O4-Apr-18 [No. 217-02983]         Apr-19           Ratewarea Probe EX3DV4         SN: 7349         30-Dec-17 (No. EX3-7349_Dec17)         Dec-18           DaE4         SN: 501         26-Dec-17 (No. DAE4-601_Dec17)         Dec-18           Secondary Standards         ID #         Dec. B         Dec-16           Power meter EPM-442A         SN: GB37450704         07-Oct-15 (in house)         Scheduled Check           Power meter EPM-442A         SN: GB37450704         07-Oct-15 (in house theck Oct-16)         In Acuse check           Power meter EPM-442A         SN: US37280783         07-Oct-15 (in house theck Oct-16)         In Acuse check           Power sensor HP 9481A         SN: MY41002517         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 8481A         SN: US37380585         18-Oct-01 (in house check Oct-16)         In house check           Regressator HP 8451A         SN: US37390585         18-Oct-01 (in house check Oct-17)         In house check           Network Analyzer HP 8753E         SN: US37390585         18-Oct-01 (in house check Oct-17)         In house check           Name         Function         Signature         Signature         Signature           Cakingted by         Jeron Kastmin         Laboratory Technicten	ilbration Equipment used (M87) many Standards war malar MR <sup>a</sup>	E critical for calibration) ID a SN: 104778	Cal Date (Certificate No.) D4-Apr-18 (No. 217-02672/02673)	Scheduled Calibration Apr-19
Nationance Proble EX3DV4         SN: 7349         30-Dire-17 (No. EX3-7349_Dec17)         Dec-18           DAE4         SN: 601         25-Od-17 (No. DAE4-801_Det17)         Dec-18           Secondary Sandards         ID #         Chack Date (in house)         Scheduled Chec           Power mater EPM-442A         SN: GB37450704         07-Od-15 (in house check Det-16)         In house check           Power sensor HP 6461A         SN: US37292783         07-Od-15 (in house check Det-16)         In house check:           Power sensor HP 6461A         SN: US37292783         07-Od-15 (in house check Det-16)         In house check:           Power sensor HP 6461A         SN: US37292783         07-Od-15 (in house check Det-16)         In house check:           Power sensor HP 6461A         SN: US37292783         07-Od-15 (in house check Det-16)         In house check:           RF generator PAS SMT-06         SN: 100/92         15-Jun-15 (in house check Det-16)         In house check:           SN: US37390595         18-Od-Ot (in house check Det-17)         In house check:         In house check           SN: US37390595         18-Od-Ot (in house check Det-17)         In house check           Caktmated by:         Jecon Kastmati         Eaboratory Technicien         Signature	libration Equipment used (M&T) many Standards war mater MRP war sensor NRP-291	E ortical for calibration) ID a SN: 104778 SN: 103244	Cal Data (Cerificaté No.) D4-Apr-18 (No. 217-0267202673) D4-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673)	Screedured Calibration Apr-19 Apr-19 Apr-19
DaE4         SN: 601         26-Oct-17 (No: DAE4-601_Oct17)         Oct-18           Secondary Sandards         ID #         Drack Date (in house)         Scheduled Ches           Power mater EPM_442A         SN: GB37450704         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 6461A         SN: UB37292783         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 6461A         SN: UB37292783         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 6461A         SN: UB37292783         07-Oct-15 (in house check Oct-16)         In house check           Power sensor HP 6461A         SN: UB372912783         07-Oct-15 (in house check Oct-16)         In house check           RF generator PAS SMT-05         SN: UB372901925         15-Jun-15 (in house check Oct-17)         In house check           SN: UB373901925         18-Jun-15 (in house check Oct-17)         In house check         In house check           SN: UB373901925         18-Oct-01 (in fouse check Oct-17)         In house check         In house check           Cakbrated by:         Jecon Kastrali         Laboratory Techniciden         Bignature	Ilbration Equipment used (M&T) mary Standards war mator NRP war sensor NRP-Z91 war sensor NRP-Z91	E critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k)	Cal Data (Certificaté No.) D4-Apr-16 (No. 217-02672/02673) D4-Apr-18 (No. 217-02672) O4-Apr-18 (No. 217-02673) O4-Apr-18 (No. 217-02673)	Scheduled Calibration Apr-19 Apr-19 Apr-19 Apr-19
Power matter EPM-442A         SN: GB37480704         07-0d-15 (in incuse check Oci-16)         In Acuse check           Power sensor HP 6461A         SN: U837260783         07-0d-15 (in house check Oci-16)         In Acuse check           Power sensor HP 6461A         SN: U837260783         07-0d-15 (in house check Oci-16)         In Acuse check           Power sensor HP 6461A         SN: U837260787         07-0d-15 (in house check Oci-16)         In Acuse check           RF generator R&S SMT-06         SN: 400972         15-Jun-15 (in bouse check Oci-16)         In house check           RF generator R&S SMT-06         SN: US37390595         15-Jun-15 (in bouse check Oci-17)         In house check           Network Analyzer HP 8753E         SN: US37390595         18-Oci-01 (in focuse check Oci-17)         In house check           Caltinated by:         Jeron Kastrali         Exboratory Technician         Signature	Ilbration Equipment used (M&T) war map: NRP war sensor NRP-291 war sensor NRP-291 serence 20 dis Attenuator performatch combination	E onlical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327	Cal Data (Certificate No.) 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02622) 04-Apr-18 (No. 217-02682)	Screedued Calibration Apr-19 Apr-19 Apr-19 Apr-19 Apr-19
Power sensor HP 9481A Power sensor HP 9481A RF generator R&S SMT-06 Network Analyzer HP 8753E Caktrated by Caktrated by Ca	Ilbration Equipment used (M&T) war mater MRP war sensor NRP-291 war sensor NRP-291 sterenog 20 dB Atternustor perk mismisch combination bleance Probe EX30V4	E ontical for calibration) ID 4 SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5058 (20k) SN: 50547.2 / 08327 SN: 7349	Cal Data (Cetificate No.) D4-Apr-18 (No. 217-02672/CG673) D4-Apr-18 (No. 217-02672) O4-Apr-18 (No. 217-02673) O4-Apr-18 (No. 217-02682) O4-Apr-18 (No. 217-02683) 30-Dec-17 (Mo. EX3-7349_Dec17)	Schedured Calibration Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dsc-18
Power sensor HP 9481A RF generator R&S SMT-06 Network Analyzer HP 8753E Caltinated by Caltinated by Caltin	Ibration Equipment used (M&T) many Standards war mator NRP war sensor NRP-Z91 war sensor NRP-Z91 serence 20 d6 Attenuator perfy mismatch combination sterence Probe EX30V4 4E4	E critical for celibration) ID 8 SN: 104778 SN: 103244 SN: 103245 SN: 5055 (20k) SN: 5047.2 / 06327 SN: 5047.2 / 06327 SN: 601	Cal Data (Certificaté No.) D4-Apr-18 (No. 217-0267/202673) O4-Apr-18 (No. 217-0267/2) O4-Apr-18 (No. 217-02672) O4-Apr-18 (No. 217-02682) O4-Apr-18 (No. 217-02683) 30-Dec-17 (No. DAE4-601_Dci17) 26-Oc-17 (No. DAE4-601_Dci17)	Schedured Calibration Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Doc-18 Oct-18 Scheduled Check
RF generator R&S SMT-06         SN-100072         15-Jun-15 (in house check QcL-18)         In house check           Network Analyzer HP 8753E         SN: US37390585         18-Oct-01 (in house check QcL-17)         In house check           Network Analyzer HP 8753E         SN: US37390585         18-Oct-01 (in house check QcL-17)         In house check           Name         Function         Signature           Calibrated by         Jeron Kasitial         Exboratory Technicitien	Ilibration Equipment used (M&T) war mater MRP war sensor MRP-291 war sensor MRP-291 serence 20 66 Atterustor perferminisch combination aterance Probe EX30V4 AE4 sciondary Standards	E ontical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601	Cal Data (Certificate No.) 04-Apr-18 (No. 217-026722(C6673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02632) 04-Apr-18 (No. 217-02632) 04-Apr-18 (No. 217-02632) 30-Dec-17 (No. EX3-7349_Dec17) 25-Oct-17 (No. DAE4-601_Oct17) Check Bate (in house) 07-Oct-15 (in house check Oct-16)	Schedured Calibration Apr-19 Apr-19 Apr-19 Apr-19 Dac-18 Dac-18 Dat-18 Scheduled Check In focuse check: Oct-18
Network Analyzer HP 8753E SN: US373entres 18-Dor-D1 (in house check Oct-17) In house check Name Function Signature Calibrated by Laboratory Technician Function	Ilbration Equipment used (M8.7) war mator NRP war mator NRP.291 war sensor NRP.291 war sensor NRP.291 second 20 dB Atterustor per-N mismatch combination aterance Probe EX30V4 NE4 scondary Samdards wer mater EPM.442A wer sensor HP 8481A	E ontical for calibration) ID 4 SN: 104778 SN: 103244 SN: 103244 SN: 5058 (20K) SN: 5047.2 / 06327 SN: 5047.2 / 06327 SN: 5047 SN: 5047.2 / 06374 SN: 501 ID # SN: GB37480704 SN: GB37202783	Cal Data (Certificate No.) Di-Apr-18 (No. 217-02672/02673) Di-Apr-18 (No. 217-02672) Oi-Apr-18 (No. 217-02673) Oi-Apr-18 (No. 217-02653) Di-Apr-18 (No. 217-02653) Di-Dac-17 (No. DA54-601_Dat17) 25-Oct-17 (No. DA54-601_Dat17) Check Date (in bouse) 07-Oct-15 (in bouse check Oct-16) 07-Oct-15 (in bouse check Oct-16)	Schedured Calibration Apr-19 Apr-19 Apr-19 Apr-19 Dac-18 Dac-18 Dac-18 Schedaled Check In focuse check: Oct-18 In focuse check: Oct-18
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This calibration cartificate shall not be reproduced except in full without written approval of the laboratory.	Ibration Equipment used (M8.7) war mater MRP war mater MRP. war sensor NRP.291 serence 20 dB Attenuator serence 20 dB Attenuator serence 20 dB Attenuator serence 20 dB Attenuator serence Probe EX30V4 454 sondary Sandards wer sensor HP 6461A wer sensor HP 6461A "generator R&S 9MT-06 Heimit Analyzet HP 8753E stimuted by:	E ontical for calibration) ID 4 SN: 104778 SN: 103244 SN: 103244 SN: 5058 (20K) SN: 5058	Cal Data (Certificate No.)           04-Apr-18 (No. 217-026722(C6673))           04-Apr-18 (No. 217-02673)           04-Apr-18 (No. 217-02682)           04-Apr-18 (No. 217-02683)           30-Deo-17 (No. EX3-7349_Dec17)           25-Oc-17 (No. DAE4-601_Oc17)           Dracs Date (in house check Oc1-16)           07-Oc-15 (in house check Oc1-16)           07-Oc-15 (in house check Oc1-16)           07-Oc-15 (in house check Oc1-16)           07-Oc-16 (in house check Oc1-16)           07-Oc-17 (in house check Oc1-16)           07-Oc-16 (in house check Oc1-16)           07-Oc-17 (in house check Oc1-16)           07-Oc-16 (in house check Oc1-16)           15-Jun-15 (in house check Oc1-16)           1	Schedured Calibration Apr-19 Apr-19 Apr-19 Apr-19 Dac-18 Oct-18 Scheduled Check In focuse check: Oct-18 In focuse check: Oct-18

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# Report No. : EN/2018/B0040 Page: 119 of 140

Calibration Laboratory of Schmid & Partner

Engineering AG rases 43, 8904 Zurich, Switzerland



Sanweizerischer Kallbrierdi s Service suisse d'étalormagé C Servizio evizzoro di tarabura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of caliberation coefficience Glossary:

TSL

tissue simulating liquid sensitivity in TSL / NORM x,y,z ConvF N/A not applicable or not measured

## Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless
- Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010.
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented. parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D2450V2-727\_Apr18

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#### Measurement Conditions

DASY system configuration, as far as not given on page 1

DASY Version	DASYS	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	da, dy, dz. = 5 mm	
Frequency	2450 MHz = 1 MHz	

#### **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 "C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.3 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	-	

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	hormalized to 1W	52.1 W/kg ± 17.0 % (k=2)
SAB averaged over 10 cm <sup>3</sup> (10 cl of Head TSI:	contino	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	8.16 W/kg

#### **Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mhd/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	2.01 mho/m = 6 %
Body TSL temperature change during test	< 0,5 °C	_	

## SAR result with Body TSL

SAR sveraged over 1 cm <sup>2</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.8 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 o) of Body TSL	contilion	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power	6.00 W/kg

Centricale No: D2450V2-727\_Apr18

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## Appendix (Additional assessments outside the scope of SCS 0108)

## Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.2 Ω + 2.7 jΩ	
Return Loss	= 25.1 dB	-

#### Antenna Parameters with Body TSL

Impledance, transformed to lead point	51.2 Q + 5.8 Q
Fietum Loss	- 25.0 dB

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semingid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end capaare added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole emits, because they might bend or the soldered connections near the feedpoint may be damaged.

## Additional EUT Data

Manufactured by	SPEAG	
Manufactured on	January 09, 2003	

Certificate No: D2450V2+727\_Apr18

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## **DASY5 Validation Report for Head TSL**

Date: 24.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727

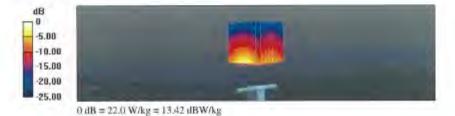
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma = 1.86$  S/m;  $\varepsilon_t = 38.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.88, 7.88, 7.88); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection) ٠
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017 .
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001 ٠
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 116.0 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.16 W/kg Maximum value of SAR (measured) = 22.0 W/kg



Certificate No: D2450V2-727 April8

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

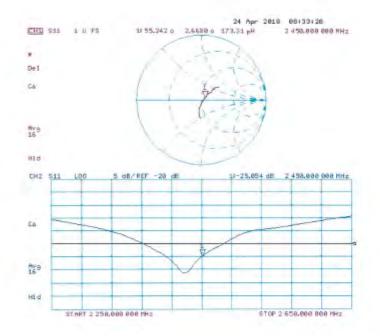
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#### Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-727 Apr18

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## **DASY5 Validation Report for Body TSL**

Date: 24.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

## DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727

Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma = 2.01$  S/m;  $\varepsilon_r = 52.5$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

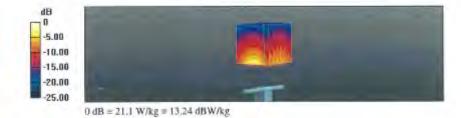
DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.01, 8.01, 8.01); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52:10.0(1446); SEMCAD X 14.6.10(7417)

## Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.4 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 25.5 W/kg SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6 W/kg

Maximum value of SAR (measured) = 21.1 W/kg



Certificate No: D2450V2-727 April8

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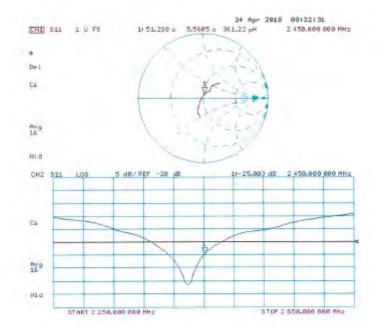
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## Impedance Measurement Plot for Body TSL



Certificate No: D2450V2-727\_Apr18

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credited by the Swiss Accredita e Swiss Accreditation Service ultilateral Agreement for the m	e is one of the signatories	s to the EA	creditation No.; SCS 0108
ient SGS-TW (Aude	en)	Certificate No	: D5GHzV2-1023_Jan18
ALIBRATION	CERTIFICATE		
bject	D5GHzV2 - SN:1	023	
Calibration procedure(s)	QA CAL-22.v2 Calibration proce	dure for dipole validation kits bet	ween 3-6 GHz
Calibration date:	January 25, 2018		
All calibrations have been condu	cled in the closed laborato	robability are given on the following pages an ry facility: environment temperature (22 $\pm$ 3)*(	
All calibrations have been condu	cted in the closed laborato	ry facility: environment temperature (22 $\pm$ 3)%	
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All calibrations have been condu Calibration Equipment used (M& Primary Standards Power mater NRP	cled in the closed taborato TE critical for calibration)	ry facility: environment temperature (22 ± 3) <sup>e</sup> Cal Date (Certificate No.)	C and humidity < 70%. Scheduled Calibration
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All calibrations have been condu Calibration Equipment used (M& Primary Standards Power meter NRP- Power sensor NRP-291 Power sensor NRP-291	clad in the closed laborato TE critical for calibration) ID # SN: 104776 SN: 103244	ry facility: environment temperature (22 ± 3) <sup>4</sup> Cal Data (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521)	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18
All calibrations have been condu Calibration Equipment used (M& Primary Standards Power mater NRP Power sensor NRP-291 Reference 20 dB Attenuator	clad in the closed laborato TE critical for calibration) ID # SN: 104776 SN: 103244 SN: 103245	ry facility: environment temperature (22 ± 3)* Cal Data (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529)	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18
All calibrations have been condu Calibration Equipment used (M& Primary Standards Power mentor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	ID #           ID #           SN: 104776           SN: 103244           SN: 103245           SN: 5058 (20k)           SN: 5054 7.2 / 06327           SN: 3503	ry facility: environment temperature (22 ± 3)% Cal Data (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 30-Dec-17 (No. EX3-3503_Dec17)	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18
All calibrations have been condu Calibration Equipment used (M& Primary Standards Power meter NRP Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	clati in the closed laborato TE critical for calibration) ID # SN: 104776 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 5061	ry facility: environment temperature (22 ± 3)% Cal Data (Certificate No.) 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 00-Dec-17 (No. EX3-3503_Dec17) 26-Oct-17 (No. DAE4-601_Oct17)	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Oct-18
All calibrations have been condu Calibration Equipment used (M& Primary Standards Power ansaior NRP-291 Power sensor NRP-291 Perference 20 dB Attenuator Type-N mismatch combination Referance Probe EX3DV4 DAE4 Secondary Standards	clad in the closed laborato TE critical for calibration) ID # SN: 104776 SN: 103245 SN: 103245 SN: 5058 (20k) SN: 5047 2 / 06327 SN: 3503 SN: 601 ID #	ry facility: environment temperature (22 ± 3)% Cal Data (Certificate No.) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 30-Dec-17 (No. EX3-3503_Dec17) 26-Oct-17 (No. DAE4-601_Oct17) Check Date (in house)	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Dec-18 Dec-18 Scheduled Check
All calibrations have been condu Calibration Equipment used (M& Primary Standards Power meter NRP-291 Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A	cled in the closed laborato TE critical for calibration) ID # SN: 104776 SN: 103244 SN: 103245 SN: 5058 (20(6) SN: 5057 (20(6) SN: 5057 (20(6) SN: 5073 SN: 601 ID # SN: GB37480704	ry facility: environment temperature (22 ± 3)% <u>Gal Data (Certificate No.)</u> 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02528) 30-Dec-17 (No. 213-02528) 30-Dec-17 (No. 213-02528) 30-Dec-17 (No. 213-02528) 26-Oct-17 (No. DAE4-601_Oct17) <u>Check Date (in house)</u> 07-Oct-15 (in house check Oct-16)	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Oct-18
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All calibrations have been condu Calibration Equipment used (M& Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Referance Probe EX3DV4 DAE4 Secondary Standards Power sensor HP 8481A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E	clad in the closed laborato           TE critical for calibration)           ID #           SN: 104776           SN: 103245           SN: 103245           SN: 5058 (20k)           SN: 5058 (20k)           SN: 601           ID #           NN: 6837480704           SN: US37292783           SN: 10972           SN: 10972           SN: 10972           SN: 10972           SN: 10972           Name	Cal Data (Certificate No.)         04-Apr-17 (No. 217-02521/02522)         04-Apr-17 (No. 217-02521)         04-Apr-17 (No. 217-02521)         04-Apr-17 (No. 217-02522)         07-Apr-17 (No. 217-02528)         07-Apr-17 (No. 217-02528)         07-Apr-17 (No. 217-02528)         30-Dec-17 (No. 217-02528)         07-Oct-15 (in house check Oct-16)         07-Oct-15 (in house check Oct-16)         07-Oct-15 (in house check Oct-16)         15-Jun-15 (in house check Oct-16)         18-Oct-01 (in house check Oct-17)         Eunction	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Dec-18 Dec-18 Dec-18 Dec-18 Scheduled Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18
All calibrations have been condu Calibration Equipment used (M& Primary Standards Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Referance Probe EX3DV4 DAE4 Secondary Standards Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E	clati in the closed laborato TE critical for calibration) ID # SN: 104778 SN: 103245 SN: 5058 (20%) SN: 5047 2 / 06327 SN: 5057 (20%) SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US37390585	ry facility: environment temperature (22 ± 3)% Od-Apr-17 (No. 217-02521/02522) Od-Apr-17 (No. 217-02521) Od-Apr-17 (No. 217-02522) O7-Apr-17 (No. 217-02522) O7-Apr-17 (No. 217-02528) O7-Apr-17 (No. 217-02528) O7-Apr-18 (No. 217-02528) O7-Apr-19 (No. 217-0258) O7-Apr-19 (No. 217-025	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Deo-18 Det-18 Deo-18 Dct-18 Scheduled Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18
	clad in the closed laborato           TE critical for calibration)           ID #           SN: 104776           SN: 103245           SN: 103245           SN: 5058 (20k)           SN: 5058 (20k)           SN: 601           ID #           ID #           SN: 601           ID #           SN: 601           SN: 601           SN: 0337480704           SN: 1037292783           SN: 100972           SN: 100972           SN: 1037390585           Name	Cal Data (Certificate No.)         04-Apr-17 (No. 217-02521/02522)         04-Apr-17 (No. 217-02521)         04-Apr-17 (No. 217-02521)         04-Apr-17 (No. 217-02522)         07-Apr-17 (No. 217-02528)         07-Apr-17 (No. 217-02528)         07-Apr-17 (No. 217-02528)         30-Dec-17 (No. 217-02528)         07-Oct-15 (in house check Oct-16)         07-Oct-15 (in house check Oct-16)         07-Oct-15 (in house check Oct-16)         15-Jun-15 (in house check Oct-16)         18-Oct-01 (in house check Oct-17)         Eunction	C and humidity < 70%. Scheduled Calibration Apr-18 Apr-18 Apr-18 Apr-18 Deo-18 Deo-18 Dct-18 Scheduled Check In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18 In house check: Oct-18

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Calibration Laboratory of Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossarv:

tissue simulating liquid TSL sensitivity in TSL / NORM x,y,z ConvF N/A not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless
- Communications Devices: Measurement Techniques", June 2013 b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate
- (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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#### Measurement Conditions

far as not given DASY

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5600 MHz ± 1 MHz	

#### Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.3 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.72 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.3 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 100 mW input power	2.22 W/kg

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#### Head TSL parameters at 5300 MHz

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.60 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	÷	

## SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.9 W / kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 100 mW input power	2.32 W/kg

## Head TSL parameters at 5600 MHz

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

## SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.9 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 100 mW input power	2.34 W/kg

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## Head TSL parameters at 5800 MHz

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.11 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	-	-

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.0 W/kg ± 19.9 % (k=2)
	contition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	contiition	
	condition 100 mW input power	2.25 W/kg

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## Body TSL parameters at 5200 MHz

	parameters			

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3±6%	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		-

#### SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	70.9 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 100 mW input power	2.00 W/kg

# Body TSL parameters at 5300 MHz

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.54 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

# SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.34 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	72.9 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 100 mW input power	2,06 W/kg

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## Body TSL parameters at 5600 MHz

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.81 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.6 W/kg ± 19.9 % (k=2)
SAR for nominal Body TSL parameters	normalized to 1W	77.6 W/kg ± 19.9 % (
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	

SAR measured	100 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.7 W/kg ± 19.5 % (k=2)

# Body TSL parameters at 5800 MHz

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.22 mho/m ± 6 %

# Body TSL temperature change during test SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.1 W/kg ± 19.9 % (k=2)
	o contra S	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 100 mW input power	2.07 W/kg

< 0.5 °C

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## Appendix (Additional assessments outside the scope of SCS 0108)

## Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.1 Ω - 8.1 jΩ	_
Return Loss	- 21.9 dB	

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.5 Ω - 2.3 jΩ	
Return Loss	- 32.7 dB	

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.9 Ω - 0.7 jΩ	
Return Loss	- 28.4 dB	

## Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.3 Ω + 2.6 jΩ
Return Loss	- 25.1 dB

#### Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.8 Ω - 6.9 jΩ	
Return Loss	- 23.2 dB	

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	50.9 Ω - 0.9 jΩ	
Return Loss	- 37.9 dB	_

# Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.0 Ω + 0.5 jΩ	-
Return Loss	- 24.9 dB	

## Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	56.6 Ω + 2.3 jΩ	
Return Loss	- 23.7 dB	

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#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 05, 2004

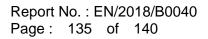
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#### **DASY5 Validation Report for Head TSL**

Date: 25.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW: Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz,

Frequency: 5800 MHz Medium parameters used: f=5200 MHz;  $\sigma=4.5$  S/m;  $c_r=36.3; \, \rho=1000$  kg/m<sup>3</sup> . Medium parameters used: f = 5300 MHz;  $\sigma = 4.6 \text{ S/m}$ ;  $\epsilon_r = 36.2$ ;  $\rho = 1000 \text{ kg/m}^3$ . Medium parameters used: f = 5600 MHz;  $\sigma = 4.9 \text{ S/m}$ ;  $\epsilon_r = 35.8$ ;  $\rho = 1000 \text{ kg/m}^3$ . Medium parameters used: f = 5800 MHz;  $\sigma = 5.11 \text{ S/m}$ ;  $\epsilon_r = 35.5$ ;  $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

SG

- Probe: EX3DV4 SN3503; ConvF(5.75, 5.75, 5.75); Calibrated: 30.12.2017. ConvF(5.5, 5.5, 5.5); Calibrated: 30.12.2017, ConvF(5.05, 5.05, 5.05); Calibrated: 30.12.2017. ConvF(4.96, 4.96, 4.96); Calibrated: 30.12.2017;
- · Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 70.47 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 27.5 W/kg SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.22 W/kg Maximum value of SAR (measured) = 17.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 74.63 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 29.6 W/kg SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.32 W/kg Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4nim, dy=4mm, dz=1.4mm Reference Value = 70.79 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 31.5 W/kg SAR(1 g) = 8.19 W/kg; SAR(10 g) = 2,34 W/kg Maximum value of SAR (measured) = 19.6 W/kg

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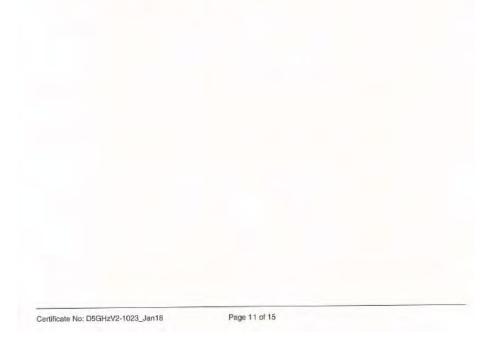


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Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 69.22 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 31.2 W/kg SAR(1 g) = 7.9 W/kg; SAR(10 g) = 2.25 W/kg Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 17,7 W/kg = 12.48 dBW/kg



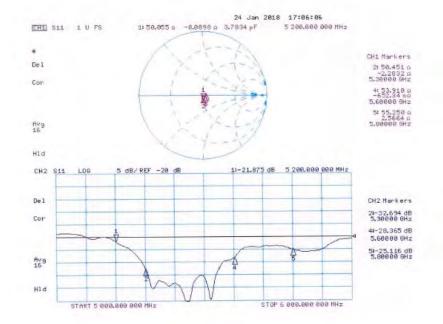
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#### Impedance Measurement Plot for Head TSL



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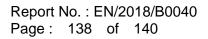
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Date: 23.01.2018

#### **DASY5 Validation Report for Body TSL**

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz,

Frequency: 5800 MHz Medium parameters used: f = 5200 MHz;  $\sigma = 5.41$  S/m;  $e_t = 47.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>. Medium parameters used: f = 5300 MHz;  $\sigma = 5.54$  S/m;  $\epsilon_r = 47.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used: f = 5600 MHz;  $\sigma = 5.94$  S/m;  $\epsilon_r = 47.1$ ; p = 1000 kg/m<sup>3</sup>, Medium parameters used: f = 5600 MHz;  $\sigma = 5.94$  S/m;  $\epsilon_r = 46.6$ ; p = 1000 kg/m<sup>3</sup>, Medium parameters used: f = 5800 MHz;  $\sigma = 6.22$  S/m;  $\epsilon_r = 46.2$ ; p = 1000 kg/m<sup>3</sup> Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

SG

- Probe: EX3DV4 SN3503; ConvF(5.35, 5.35, 5.35); Calibrated: 30.12.2017, ConvF(5.15, 5.15, 5.15); Calibrated: 30.12.2017, ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2017, ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 66.00 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 26.4 W/kg SAR(1 g) = 7.14 W/kg; SAR(10 g) = 2 W/kg Maximum value of SAR (measured) = 16.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 65.19 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 28.4 W/kg SAR(1 g) = 7.34 W/kg; SAR(10 g) = 2.06 W/kg Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 66.21 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 32.8 W/kg SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.19 W/kg Maximum value of SAR (measured) = 19.1 W/kg

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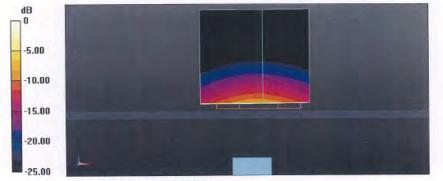
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Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 64.05 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 32.3 W/kg SAR(1 g) = 7.46 W/kg; SAR(10 g) = 2.07 W/kg Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

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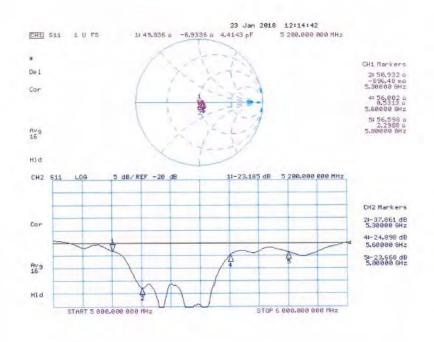
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#### Impedance Measurement Plot for Body TSL





- End of report -

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