eurofins | Product Service

SAR TEST REPORT

FCC 47 CFR Part 2.1093
Industry Canada RSS-102

RF-Exposure evaluation of portable equipment

Report Reference No. .... :	G0M-1407-3954-TFC093S-V06
Testing Laboratory .... :	Eurofins Product Service GmbH
Address .... :	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation .... :	A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A
Applicant's name .... :	Datalogic ADC SRL
Address .... :	Via San Vitalino, 13 40012 Lippo di Calderara di Reno, Bologna Italy
Test specification:	
Standard.. :	FCC 47 CFR Part 2 §2.1093 FCC OET Bulletin 65 Supplement C 01-01 IEEE Std. 1528 - 2003 IEEE Std. 1528 – 2013 IC RSS-102 Issue 4 Safety Code 6 (2009)
Non-standard test method…………..:	None
Test scope………….. .... :	complete Radio compliance test
Equipment under test (EUT):	
Product description	Handheld
Model No.	Datalogic FalconX3
Additional Models	None
Hardware version	None
Firmware / Software version	None
	FCC-ID: U4GFX3P IC: 3862E-FX3P
Test result	**Passed**

eurofins | Product Service

Possible test case verdicts:	
- neither assessed nor tested ....:	N/N
- required by standard but not appl. to test object........:	N/A
- required by standard but not tested...........................:	N/T
- not required by standard for the test object ....:	N/R
- test object does meet the requirement.......................:	P (Pass)
- test object does not meet the requirement.................:	F (Fail)

Testing:		
Date of receipt of test item ....:	2014-07-10	
Date (s) of performance of tests ....:	2014-07-17 - 2014-09-01	
Compiled by .... :	Matthias Handrik	
Tested by (+ signature).................... : (Testing Manager)	Matthias Handrik	[signature] ....
Approved by (+ signature) .... : (Test Lab Manager)	Christian Weber	C. Weber ....
Date of issue .... :	2014-09-03	
Total number of pages .... :	104	

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

eurofins | Product Service

Version History

Version	Issue Date	Remarks	Revised by
01	2014-05-13	Initial Release	
02	2014-08-28	Replaced document: G0M-1407-3954-TFC093S-V01 Replaced by: G0M-1407-3954-TFC093S-V02 Changes : Results for 5725 – 5850 MHz U-NII Band added Additional result plots added Antenna details added DAE calibration data added	C. Weber
03	2014-08-29	Replaced document: G0M-1407-3954-TFC093S-V02 Replaced by: G0M-1407-3954-TFC093S-V03 Changes : Issue date of V02 corrected IEEE 1528-2013 reference added Operating frequency range for 2.4 GHz and 5 GHz WiFi corrected Test dates for 5 GHz and 2.4 GHz WiFi corrected	C. Weber
04	2014-09-01	Replaced document: G0M-1407-3954-TFC093S-V03 Replaced by: G0M-1407-3954-TFC093S-V04 Changes : Results for 5150 – 5250 MHz U-NII Band added	C. Weber
05	2014-09-02	Replaced document: G0M-1407-3954-TFC093S-V04 Replaced by: G0M-1407-3954-TFC093S-V05 Changes : Test dates of SAR result plots and system validations corrected Reported SAR ConvF values changed to correct values used for measurement Referenced KDBs adjusted	C. Weber
06	2014-09-03	Replaced document: G0M-1407-3954-TFC093S-V05 Replaced by: G0M-1407-3954-TFC093S-V06 Changes : Test dates of SAR result plots and system validations corrected	C. Weber

REPORT INDEX

1 EQUIPMENT (TEST ITEM) DESCRIPTION 6

1.1 Equipment photos 7
1.2 Equipment setup photos 9
1.3 Reference Documents 10
1.4 Supporting Equipment Used During Testing 11
1.5 Supported standalone operating modes 12
1.6 Supported concurrent (multi-transmitter) operating modes 13
1.7 Supported use cases 14
1.8 Radio Test Modes 15
1.9 Conducted Power Values Bluetooth 17
1.10 Conducted Power Values WLAN 2.4 GHz 17
1.11 Conducted Power Values WLAN 5 GHz 19
1.12 Test Positions 21
1.13 Test Equipment Used During Testing 22

2 RESULT SUMMARY 23

3 DEFINITIONS 24

3.1 Controlled Exposure 24
3.2 Uncontrolled Exposure 24
3.3 Localized SAR 24

4 LOCALIZED SAR MEASUREMENT EQUIPMENT 25

4.1 Complete SAR DASY5 Measurement System 25
4.2 Robot Arm 27
4.3 Data Acquisition Electronics 27
4.4 Isotropic E-Field Probe ≤ 3 GHz 28
4.5 Isotropic E-Field Probe ≤ 6 GHz 29
4.6 Test phantom and positioner 30
4.7 System Validation Dipoles 31

5 SINGLE-BAND SAR MEASUREMENT 32

5.1 General measurement description 32
5.2 SAR measurement description 32
5.3 Reference lines and points for Handsets 33

5.4	Test positions relative to the Head	34
5.5	Test positions relative to the human body	35
5.6	Measurement Uncertainty	36
6	**TEST CONDITIONS AND RESULTS**	**37**
6.1	Test Conditions and Results – Tissue Validation	37
6.2	Test Conditions and Results – System Validation	39
6.3	Test Conditions and Results – Standalone SAR Measurement	41
ANNEX A	Calibration Documents	43
ANNEX B	System Validation Reports	92
ANNEX C	SAR Measurement Reports	98

1 Equipment (Test item) Description

Description	Handheld	
Model	Datalogic FalconX3	
Additional Models	None	
Serial number	None	
Hardware version	None	
Software / Firmware version	None	
FCC-ID	U4GFX3P	
IC	3862E-FX3P	
Equipment type	End product	
Prototype or production unit	Identical Prototype	
Device category	Handset	
Environment	General public	
Radio technologies	Bluetooth, WLAN IEEE 802.11a,b,g,n	
Operating frequency ranges	2.4 GHz : 2.4 GHz : 5 GHz :	2402 – 2480 MHz (Bluetooth) 2412 – 2462 MHz (WLAN 20 MHz / 1 Stream) 5180 – 5240 MHz (WLAN 20 MHz / 1 Stream) 5260 – 5320 MHz (WLAN 20 MHz / 1 Stream) 5500 – 5700 MHz (WLAN 20 MHz / 1 Stream) 5745 – 5825 MHz (WLAN 20 MHz / 1 Stream)
Modulations	Bluetooth: GFSK / PI/4-DQPSK / 8-DPSK WLAN: CCK / DSSS / OFDM	
Antenna: MAIN	Type	integrated
	Model	chip antenna
	Manufacturer	unspecified
	Gain	2.4 GHz = 3.01 dBi, 5 GHz = 4.15 dBi
Antenna: AUX	Type	integrated
	Model	chip antenna
	Manufacturer	unspecified
	Gain	2.4 GHz = 0.99 dBi, 5 GHz = 1.96 dBi
Power supply	V_{NOM}	3.7 VDC (Lithium Battery)
Accessories	None	
Manufacturer	Datalogic ADC SRL Via San Vitalino, 13 40012 Lippo di Calderara di Reno, Bologna Italy	

1.3 Reference Documents

Document
KDB Publication 447498 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Polices
KDB Publication 865664: RF Exposure Compliance Reporting and Documentation Considerations
KDB Publication 648474 : SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas
KDB Publication 648474 : Review and Approval Policies for SAR Evaluation of Handsets with Multiple Transmitters and Antennas
KDB Publication 865664 : SAR measurement procedures for devices operating between 100 MHz to 6 GHz
KDB Publication 248227 : SAR Measurement Procedures for 802.11 a/b/g Transmitters
KDB Publication 450824 : SAR Probe Calibration and System Verification considerations for measurements from 150 MHz to 3 GHz

1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
None				

***Note:** Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or

SIM : Simulator (Not Subjected to Test)

CABL : Connecting cables

1.5 Supported standalone operating modes

Mode	Modulation	Frequency range	Maximum Duty cycle
Bluetooth	FHSS, GFSK	2402 – 2480 MHz	0.775
Bluetooth	FHSS, PI/4-DQPSK	2402 – 2480 MHz	0.775
Bluetooth	FHSS, 8-DPSK	2402 – 2480 MHz	0.775
802.11b/n 20MHz	DSSS	2412 – 2462 MHz	1.0
802.11g/n 20MHz	OFDM	2412 – 2462 MHz	1.0
802.11a/n 20 MHz	OFDM	5180 – 5240 MHz	1.0
802.11a/n 20 MHz	OFDM	5260 – 5320 MHz	1.0
802.11a/n 20 MHz	OFDM	5500 – 5700 MHz	1.0
802.11a/n 20 MHz	OFDM	5725 – 5850 MHz	1.0

1.6 Supported concurrent (multi-transmitter) operating modes

The EUT contains a fixed WLAN transceiver and a Bluetooth BR+EDR transceiver.

All two transceiver (WLAN, Bluetooth) can operate simultaneously.

According to KDB 447498 D01 v05r02 for standalone SAR evaluation the test exclusion power condition is given by

$$\frac{\max Power, mW}{test\ distance, mm} \cdot \sqrt{f_{GHz}} \leq 3.0$$

With the maximum source-base time averaged conducted power level of 0.92 dBm the test exclusion condition gives (test distance 5 mm for distances ≤ 5 mm) = 0.39 which is below the exclusion threshold of 3.

Hence the test exclusion condition for the Bluetooth transmitter for standalone operation is fulfilled.

For simultaneous transmission SAR the following SAR estimation exists:

$$\frac{\max Power,\ mW}{test\ distance, mm} \cdot \frac{\sqrt{f_{GHz}}}{7.5}$$

For the maximum power level and the test distance of 5 mm the following SAR value estimation is given: 0.05 W/kg

Taking this SAR estimation into account the maximum SAR value for the WLAN transceiver has to be lower or equal to 1.6 – 0.05 = 1.55. As long as the maximum SAR value for the WLAN transmitter is lower than 1.55 W/kg that WLAN transmitter complies with the SAR limit.

1.7 Supported use cases

Use case	Distance to human body	corresponding test configuration
EUT placed at human body; Display faces to the human body	0 mm (worst case)	body-worn device
EUT held in the human hand (Back side of EUT at human body)	0 mm (worst case)	body-worn device

1.8 Radio Test Modes

Mode	Settings
Bluetooth DH5	Mode = Bluetooth Modulation = FHSS, GFSK Duty cycle = 77.5% Data rate = 1 Mbps Power level = maximum Antennas = integrated
Bluetooth 2-DH5	Mode = Bluetooth Modulation = FHSS, PI/4-DQPSK Duty cycle = 77.5% Data rate = 2 Mbps Power level = maximum Antennas = integrated
Bluetooth 3-DH5	Mode = Bluetooth Modulation = FHSS, 8-DPSK Duty cycle = 77.5% Data rate = 3 Mbps Power level = maximum Antennas = integrated
IEEE 802.11b	Mode = 802.11b/n 20MHz Modulation = DSSS Duty cycle = 100% Data rate = 1, 2, 5.5, 11 Mbps Power level = maximum Antennas = integrated
IEEE 802.11g	Mode = 802.11g/n 20MHz Modulation = OFDM Duty cycle = 100% Data rate = 6, 9, 12, 18, 24, 36, 48, 54 Mbps Power level = maximum Antennas = integrated
IEEE 802.11g/n	Mode = 802.11g/n 20MHz Modulation = OFDM Duty cycle = 100% Data rate = MCS0-7 Power level = maximum Antennas = integrated

IEEE 802.11a	Mode = 802.11a/n 20MHz Modulation = OFDM Duty cycle = 100% Data rate = 6, 9, 12, 18, 24, 36, 48, 54 Mbps Power level = maximum Antennas = integrated
IEEE 802.11a/n	Mode = 802.11a/n 20MHz Modulation = OFDM Duty cycle = 100% Data rate = MCS0-7 Power level = maximum Antennas = integrated

1.9 Conducted Power Values Bluetooth

Bluetooth							
Channel	Frequency [MHz]	Peak (Burst) RMS Power [dBm]			Source-based time averaged Power [dBm]		
		BR (GFSK)	EDR (PI/4-DQPSK)	EDR (8-DPSK)	BR (GFSK)	EDR (PI/4-DQPSK)	EDR (8-DPSK)
		DH5	2-DH5	3-DH5	DH5	2-DH5	3-DH5
0	2402	0.42	0.55	0.52	-0.69	-0.56	-0.59
39	2441	1.91	2.02	2.03	**0.80**	0.91	0.92
78	2480	1.85	1.95	1.98	0.74	0.84	0.87

1.10 Conducted Power Values WLAN 2.4 GHz

The conducted power values for the various operating modes of the Wireless LAN transmitter were measured according to KDB 248227 v01r02:

antenna AUX

IEEE 802.11b						
Mode	Channel	Frequency	Source-based time average power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
IEEE 802.11b	1	2412	13.00	13.27	13.18	13.00
	6	2437	14.51	14.76	14.56	14.60
	11	2462	**15.20**	15.43	15.30	15.10

antenna MAIN

IEEE 802.11b						
Mode	Channel	Frequency	Source-based time average power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
IEEE 802.11b	1	2412	13.95	14.17	14.00	13.86
	6	2437	15.00	15.24	15.00	14.90
	11	2462	**15.66**	15.90	15.71	15.50

antenna AUX

IEEE 802.11g										
Mode	Channel	Frequency	Source-based time average power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
IEEE 802.11g	1	2412	10.75	10.04	9.96	9.81	9.67	9.26	9.02	8.56
	6	2437	12.50	12.38	12.28	12.15	11.87	11.55	11.22	10.44
	11	2462	**12.95**	12.90	12.80	12.60	12.40	12.10	11.80	10.97

antenna MAIN

IEEE 802.11g										
Mode	Channel	Frequency	Source-based time average power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
IEEE 802.11g	1	2412	11.81	11.78	11.68	11.48	11.24	10.95	10.60	9.80
	6	2437	12.80	12.80	12.70	12.53	12.40	12.00	11.70	10.87
	11	2462	**13.30**	13.27	13.18	13.15	12.85	12.55	12.25	11.40

antenna AUX

IEEE 802.11n / 20 MHz / 1 Stream												
Mode	Channel	Frequency	Bandwidth [MHz]	Guard Interval [ns]	Source-based time average power [dBm]							
					Data Rate [Mbps]							
					MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
					6.5/7.2	13/14.4	19.5/21.7	26/28.9	39/43.3	52/57.8	58.5/65	65/72.2
IEEE 802.11n	1	2412	20	800/400	11.00	10.31	10.15	10.00	8.61	8.57	8.47	8.40
	6	2437	20	800/400	12.13	12.23	11.57	11.33	9.94	9.92	9.81	9.74
	11	2462	20	800/400	12.55	12.40	12.26	11.92	10.37	10.53	10.44	10.35

antenna MAIN

IEEE 802.11n / 20 MHz / 1 Stream												
Mode	Channel	Frequency	Bandwidth [MHz]	Guard Interval [ns]	Source-based time average power [dBm]							
					Data Rate [Mbps]							
					MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
					6.5/7.2	13/14.4	19.5/21.7	26/28.9	39/43.3	52/57.8	58.5/65	65/72.2
IEEE 802.11n	1	2412	20	800/400	10.86	10.69	10.36	10.23	8.72	8.51	8.42	8.12
	6	2437	20	800/400	11.61	11.46	11.34	11.39	9.97	9.72	9.62	9.54
	11	2462	20	800/400	11.52	11.16	11.01	10.87	9.50	9.30	8.96	8.89

According to KDB 248227 v01r02 SAR measurements for 802.11g are not necessary because the conducted power values are not more than ¼ dB higher than the power values for 802.11b.

According to KDB 248227 v01r02 SAR measurements for 802.11n are not necessary because the conducted power values are not more than ¼ dB higher than the power values for 802.11b.

According to KDB 248227 v01r02 SAR measurements are performed for 802.11b and the lowest data rate of 1 Mbps.

1.11 Conducted Power Values WLAN 5 GHz

The conducted power values for the various operating modes of the Wireless LAN transmitter were measured according to KDB 248227 v01r02:

antenna AUX

IEEE 802.11a											
Mode	Band	Channel	Frequency	Source-based time average power [dBm]							
				Data Rate [Mbps]							
				6	9	12	18	24	36	48	54
IEEE 802.11a	U-NII-1	36	5180	**9.60**	9.44	9.47	9.24	9.05	8.77	5.00	4.90
		40	5200	8.81	8.69	8.62	8.47	8.31	8.04	4.30	4.23
		44	5220	8.17	8.13	8.07	7.92	7.78	7.50	3.80	3.62
		48	5240	7.59	7.50	7.35	7.18	7.02	6.76	2.97	2.88
	U-NII-2	52	5260	**7.04**	6.92	6.83	6.66	6.52	6.24	2.45	2.27
		56	5280	6.70	6.48	6.40	6.21	6.04	5.76	2.10	2.00
		60	5300	6.13	6.04	5.96	5.81	5.67	5.41	1.66	1.52
		64	5320	5.89	5.83	5.74	5.52	5.32	4.99	1.38	1.27
	U-NII-2e	100	5500	7.40	7.29	7.19	7.04	6.91	6.60	2.10	2.11
		104	5520	7.72	7.69	7.56	7.34	7.19	6.92	2.41	2.28
		108	5540	8.08	7.98	7.88	7.71	7.58	7.33	2.94	2.85
		112	5560	8.60	8.51	8.35	8.20	8.04	7.76	3.43	3.27
		116	5580	9.12	9.05	8.98	8.84	8.70	8.33	3.99	3.81
		120	5600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		124	5620	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		128	5640	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		132	5660	12.28	12.21	12.14	11.99	11.86	11.41	7.30	7.14
		136	5680	13.24	13.16	13.03	12.76	12.61	12.36	8.18	8.11
		140	5700	**13.45**	13.38	13.29	13.18	13.04	12.57	8.81	8.60
	U-NII-3	149	5745	16.17	16.02	15.88	15.71	15.56	15.30	12.05	12.00
		153	5765	16.34	16.19	16.08	15.89	15.70	15.45	12.00	12.12
		157	5785	16.33	16.23	16.15	15.92	15.84	15.52	12.05	11.96
		161	5805	**16.43**	16.30	16.14	15.99	15.85	15.58	12.03	11.85
		165	5825	16.35	16.27	16.19	16.04	15.87	15.48	12.25	12.00

antenna MAIN

IEEE 802.11a											
Mode	Band	Channel	Frequency	Source-based time average power [dBm]							
				Data Rate [Mbps]							
				6	9	12	18	24	36	48	54
IEEE 802.11a	U-NII-1	36	5180	15.82	15.73	15.61	15.49	15.29	15.00	11.00	10.92
		40	5200	**15.86**	15.76	15.65	15.50	15.35	15.10	11.19	11.04
		44	5220	15.75	15.69	15.60	15.43	15.28	15.01	11.18	11.10
		48	5240	15.72	15.62	15.55	15.30	15.12	14.82	11.21	11.06
	U-NII-2	52	5260	**15.51**	15.30	15.21	15.08	14.90	14.65	11.02	10.96
		56	5280	15.21	15.12	15.04	14.89	14.76	14.50	10.70	10.80
		60	5300	15.15	15.00	14.89	14.70	14.51	14.16	10.48	10.40
		64	5320	14.89	14.81	14.74	14.50	14.29	14.02	10.37	10.24
	U-NII-2e	100	5500	**15.76**	15.71	15.63	15.48	15.34	15.08	11.09	11.03
		104	5520	15.74	15.53	15.44	15.31	15.17	14.79	10.86	10.74
		108	5540	15.39	15.36	15.28	15.13	14.98	14.73	10.60	10.53
		112	5560	15.15	15.08	15.01	14.87	14.74	14.50	10.30	10.17
		116	5580	15.03	15.00	14.91	14.75	14.60	14.14	9.93	9.80
		120	5600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		124	5620	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		128	5640	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		132	5660	14.18	14.14	14.06	13.90	13.77	13.51	8.99	8.92
		136	5680	14.19	14.10	14.01	13.56	13.42	13.18	8.91	8.77
		140	5700	13.46	13.28	13.17	13.01	12.87	12.62	8.35	8.29
	U-NII-3	149	5745	15.13	15.06	14.99	14.85	14.51	14.23	10.51	10.39
		153	5765	15.28	15.25	15.17	15.02	14.74	14.41	10.61	10.41
		157	5785	15.44	15.36	15.29	15.14	14.79	14.55	10.62	10.55
		161	5805	15.47	15.44	15.35	15.21	15.07	14.80	10.76	10.64
		165	5825	**15.61**	15.51	15.25	15.12	14.98	14.74	10.93	10.80

antenna AUX

IEEE 802.11n / 20 MHz / Long Guard Interval / 1 Stream													
Mode	Band	Channel	Frequency	Bandwidth [MHz]	Guard Interval [ns]	Source-based time average power [dBm]							
						Data Rate [Mbps]							
						MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
						6.5/7.2	13/14.4	19.5/21.7	26/28.9	39/43.3	52/57.8	58.5/65	65/72.2
IEEE 802.11n	U-NII-1	36	5180	20	800/400	8.92	8.73	8.57	8.42	8.15	7.92	4.44	4.34
		40	5200			8.21	8.07	7.84	7.69	7.43	7.18	3.74	3.62
		44	5220			7.60	7.40	7.23	7.06	6.82	6.56	3.09	2.98
		48	5240			7.03	6.79	6.61	6.44	6.21	5.93	2.44	2.36
	U-NII-2	52	5260	20	800/400	6.46	6.29	6.12	5.96	5.69	5.42	2.00	1.88
		56	5280			5.96	5.75	5.59	5.44	5.18	4.95	1.56	1.46
		60	5300			5.54	5.33	5.15	5.01	4.75	4.52	1.05	0.91
		64	5320			5.24	5.06	4.89	4.74	4.41	4.13	0.67	0.60
	U-NII-2e	100	5500	20	800/400	6.67	6.49	6.25	6.05	5.75	5.53	1.50	1.33
		104	5520			6.84	6.65	6.47	6.31	6.04	5.84	1.83	1.77
		108	5540			7.33	7.07	6.89	6.75	6.49	6.30	2.09	2.05
		112	5560			7.76	7.54	7.38	7.23	6.98	6.76	2.73	2.49
		116	5580			8.30	8.13	7.98	7.85	7.60	7.34	3.23	3.08
		120	5600			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		124	5620			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		128	5640			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		132	5660			11.50	11.35	11.21	11.08	10.56	10.36	6.47	6.28
		136	5680			12.43	12.22	12.06	11.92	11.67	11.47	7.43	7.41
		140	5700			13.46	13.08	12.92	12.80	12.52	12.37	8.47	8.49
	U-NII-3	149	5745	20	800/400	16.08	15.89	15.71	15.52	15.16	14.90	11.77	11.73
		153	5765			16.20	15.94	15.79	15.65	15.38	15.10	12.00	11.87
		157	5785			16.30	16.09	15.92	15.71	15.38	15.17	11.96	11.93
		161	5805			16.26	16.11	15.95	15.69	15.43	15.23	11.99	11.83
		165	5825			16.28	16.06	15.89	15.74	15.49	15.08	11.85	11.79

antenna MAIN

IEEE 802.11n / 20 MHz / Long Guard Interval / 1 Stream													
Mode	Band	Channel	Frequency	Bandwidth [MHz]	Guard Interval [ns]	Source-based time average power [dBm]							
						Data Rate [Mbps]							
						MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
						6.5/7.2	13/14.4	19.5/21.7	26/28.9	39/43.3	52/57.8	58.5/65	65/72.2
IEEE 802.11n	U-NII-1	36	5180	20	800/400	15.30	15.09	14.91	14.76	14.45	14.13	10.51	10.44
		40	5200			15.18	14.95	14.77	14.62	14.37	14.17	10.67	10.55
		44	5220			15.11	14.91	14.72	14.56	14.30	14.08	10.67	10.60
		48	5240			15.24	15.07	14.91	14.74	14.36	14.01	10.56	10.45
	U-NII-2	52	5260	20	800/400	15.11	14.91	14.71	14.48	14.06	13.71	10.44	10.32
		56	5280			14.86	14.71	14.56	14.42	14.09	13.75	10.20	10.10
		60	5300			14.51	14.30	14.12	13.96	13.68	13.43	10.04	9.96
		64	5320			14.32	14.12	13.91	13.73	13.47	13.25	9.88	9.77
	U-NII-2e	100	5500	20	800/400	15.11	14.90	14.73	14.74	14.35	14.11	10.44	10.39
		104	5520			14.91	14.73	14.58	14.44	14.17	13.92	10.24	10.08
		108	5540			14.73	14.54	14.35	14.20	13.95	13.74	9.92	9.86
		112	5560			14.54	14.31	14.13	13.96	13.72	13.51	9.62	9.45
		116	5580			14.34	14.15	13.94	13.77	13.39	13.16	9.22	9.16
		120	5600			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		124	5620			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		128	5640			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		132	5660			13.51	13.38	13.12	12.88	12.61	12.40	8.33	8.26
		136	5680			13.42	13.08	12.91	12.78	12.54	12.34	8.21	8.05
		140	5700			13.37	13.19	13.00	12.80	12.41	12.17	8.04	7.97
	U-NII-3	149	5745	20	800/400	14.90	14.72	14.59	14.46	14.22	14.05	10.24	10.32
		153	5765			15.12	14.95	14.80	14.66	14.30	14.22	10.39	10.33
		157	5785			15.20	15.04	14.90	14.78	14.33	14.11	10.56	10.40
		161	5805			15.33	15.14	14.97	14.84	14.59	14.39	10.65	10.60
		165	5825			15.60	15.26	15.11	14.98	14.75	14.33	10.68	10.73

According to KDB 248227 v01r02 SAR measurements for 802.11n are not necessary because the conducted power values are not more than ¼ dB higher than the power values for 802.11a.

According to KDB 248227 v01r02 SAR measurements are performed for 802.11a and the lowest data rate of 6 Mbps.

1.12 Test Positions

Position	Description
FRONT-0MM	EUT top side directly touching the phantom.
BACK-0MM	EUT rear side directly touching the phantom.

eurofins Product Service

1.13 Test Equipment Used During Testing

SAR Measurement					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Stäubli Robot	Stäubli	RX90B L	EF00271	functional test	functional test
Stäubli Robot Controller	Stäubli	CS7MB	EF00272	functional test	functional test
DASY 5 Measurement Server	Schmid & Partner		EF00273	functional test	functional test
Control Pendant	Stäubli		EF00274	functional test	functional test
Dell Computer	Schmid & Partner	Intel	EF00275	functional test	functional test
Data Acquisition Electronics	Schmid & Partner	DAE3V1	EF00276	2013-09	2014-09
Dosimetric E-Field Probe	Schmid & Partner	ET3DV6	EF00279	2013-09	2014-09
Dosimetric E-Field Probe	Schmid & Partner	EX3DV4	EF00826	2013-09	2014-09
System Validation Kit	Schmid & Partner	D300V3	EF00299	2012-09	2015-09
System Validation Kit	Schmid & Partner	D450V3	EF00300	2012-09	2015-09
System Validation Kit	Schmid & Partner	D900V2	EF00281	2012-09	2015-09
System Validation Kit	Schmid & Partner	D1800V2	EF00282	2012-09	2015-09
System Validation Kit	Schmid & Partner	D1900V2	EF00283	2012-09	2015-09
System Validation Kit	Schmid & Partner	D2450V2	EF00284	2012-09	2015-09
System Validation Kit	Schmid & Partner	D5GHZV2	EF00827	2012-11	2015-11
Flat phantom	Schmid & Partner	V 4.4	EF00328	no calibration required	no calibration required
Oval flat phantom	Schmid & Partner	ELI 4	EF00289	functional test	functional test
Mounting Device	Schmid & Partner	V 3.1	EF00287	functional test	functional test
Millivoltmeter	Rohde & Schwarz	URV 5	EF00126	2013-08	2016-08
Power sensor	Rohde & Schwarz	NRV-Z2	EF00125	2013-04	2015-04
RF signal generator	Rohde & Schwarz	SMP 02	EF00165	2013-05	2015-05
Insertion unit	Rohde & Schwarz	URV5-Z4	EF00322	2013-08	2014-08
Directional Coupler	HP	HP 87300B	EF00288	functional test	functional test
Radio Communication Tester	Rohde & Schwarz	CMD65	EF00625	ICO (initial calibration only)	ICO (initial calibration only)
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	EF00304	2014-05	2015-05
Network Analyzer 300 kHz to 6 GHz	Agilent	8752C	EF00140	2014-06	2015-06
Dielectric Probe Kit	Agilent	85070C	EF00291	functional test	functional test

2 Result Summary

OET Bulletin 65 Supplement C, RSS-102					
Product Specific Standard Section	**Requirement – Test**	**Reference Method**	**Maximum SAR [W/kg]**	**Result**	**Remarks**
OET Bulletin 65 Suppl. C Section 2 RSS-102 Section 3	Single-band conformity	KDB Publication 447498 KDB Publication 248227 KDB Publication 865664	0.529	PASS	
OET Bulletin 65 Suppl. C Section 2 RSS-102 Section 3	Multi-band conformity	KDB Publication 447498 KDB Publication 648474 KDB Publication 865664	0.529 + 0.05 = 0.579	PASS	
Remarks:					

3 Definitions

The specific absorption rate (SAR) is defined as the time derivative of the incremental energy (*dW*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element *(dV*) of a given density (ρ_t), expressed in watts per kilogram (W/kg)

$$SAR = d/dt\ (dW/dm) = d/dt\ (dW/\rho_t dV) = \sigma/\rho_t\ |E_t|^2$$

where

$$dW/dt = \int_V E\ J\ dV = \int_V \sigma E^2\ dV$$

3.1 Controlled Exposure

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category and the general population/uncontrolled exposure limits apply to these devices.

3.2 Uncontrolled Exposure

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on the risk of potential exposure and instructions on methods to minimize such exposure risks.

3.3 Localized SAR

Compliance with the localized SAR limits is demonstrated using the head and trunk limit because this SAR limit is only half the limbs limit value. The values are obtained by SAR measurements according to EN 62209-2.

4 Localized SAR Measurement Equipment

The measurements were performed with Dasy5 automated near-field scanning system comprised of high precision robot, robot controller, computer, e-field probe, probe alignment unit, phantoms, non-conductive phone positioned and software extension.

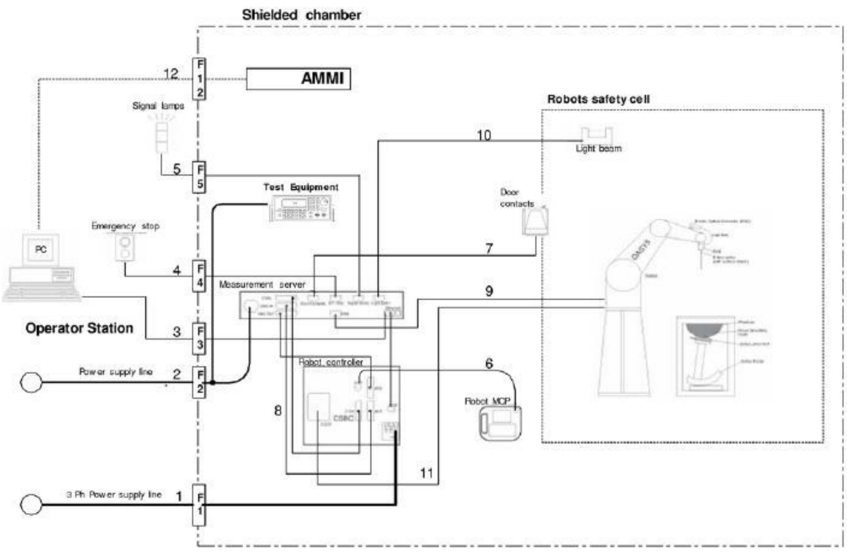
4.1 Complete SAR DASY5 Measurement System

Measurements are performed using the DASY5 automated assessment system made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland.

DASY 5 SAR Measurement Setup

The following Diagram show the elements involved in the measurement setup.

DASY 5 SAR Measurement Diagram



The DASY5 system for performing compliance tests consists of the following items:

DASY5 SAR Measurement System	
Device	Description:
RX90BL	A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software.
Probe Alignment Unit	A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
Teach Pendant	The Manual Control Pendant (MCP), also called the manual teach pendant, is the user interface to the robot. In DASY, it is used for certain installation and teach procedures
Signal Lamps	External warning lamp which indicates when the robot arm is powered-on and if the robot is under software control or in manual mode (controlled with the teach pendant).
DAE	The 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.
E-Field Probes	Isotropic E-Field probe optimized and calibrated for E-field measurements in free space.
EOC	The electro-optical converter (EOC) performs the conversion between optical and electrical signals
Measurement Server	The functions of the measurement server is to perform the time critical task such as signal filtering, surveillance of the robot operation, fast movement interrupts.
Control Computer	A computer operating Windows 2000 or Windows NT with DASY 4 Software.
Control Software	DASY4 and SEMCAD post processing Software
SAM Twin Phantom	The SAM twin phantom enabling testing left-hand and right-hand usage.
Flat Phantom	Flat Phantom (only for body-mounted transceivers operating below 800 MHz).
Tissue simulating liquid	Tissue simulating liquid mixed according to the given recipes.
Device Holder	The device holder for handheld mobile phones.
System Validation Dipoles	System validation dipoles allowing to validate the proper functioning of the system.

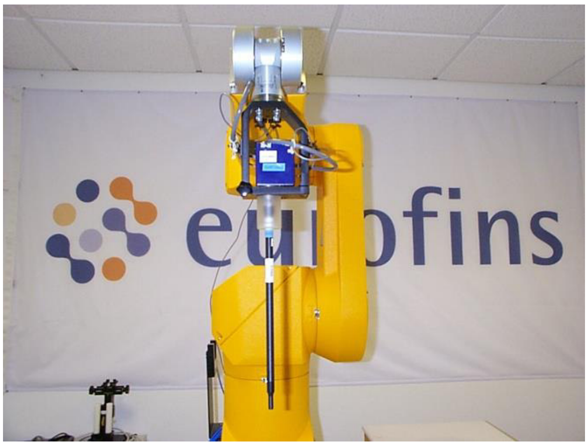
4.2 Robot Arm

The DASY5 system uses the high precision robots RX90BL type out of the newer series from Stäubli SA (France).

The RX robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

Robot arm

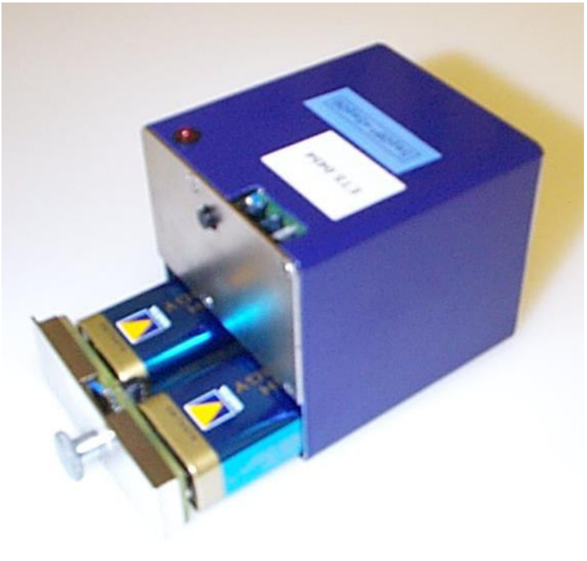


4.3 Data Acquisition Electronics

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

Data Acquisition Electronics



4.4 Isotropic E-Field Probe ≤ 3 GHz

Probe Specifications

Construction:

One dipole parallel, two dipoles normal to probe axis built-in shielding against static charges.

Calibration:

In air from 10 MHz to 2.5 GHz,
In brain and muscle simulating tissue at Frequencies of 835MHz, 900MHz, 1800MHz, 1900 MHz and 2450 MHz

Frequency:

10MHz to > 3GHz,
Linearity ±0.2dB (30MHz to 3GHz)

Directivity:

±0.2dB in HSL (rotation around probe axis)
±0.4dB in HSL (rotation normal to probe axis)

Dynamic Range:

5µW/g to > 100mW/g

Linearity:

±0.2dB

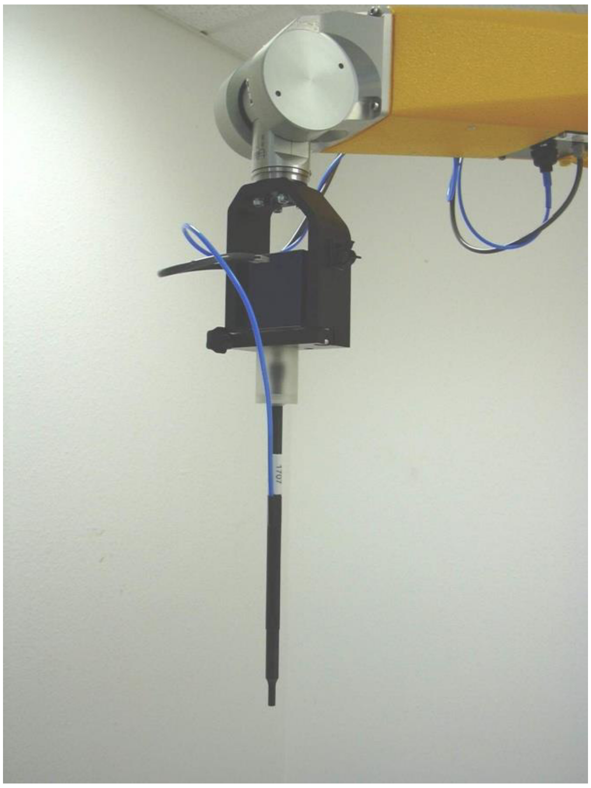
Dimensions:

Overall Length: 330mm (Tip: 16mm),
Tip Diameter: 6.8mm (Body: 12mm),
Distance from probe tip to dipole centers: 2.7mm

Application:

General dosimetry up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms

Isotropic E-Field Probe ET3DV6



4.5 Isotropic E-Field Probe ≤ 6 GHz

Probe Specifications

Isotropic E-Field Probe EX3DV4

Construction:

One dipole parallel, two dipoles normal to probe axis built-in shielding against static charges.

Calibration:

In air from 10 MHz to 6 GHz,
In brain and muscle simulating tissue at
Frequencies of 5200, 5500, 5800

Frequency:

10MHz to 6GHz,
Linearity ±0.2dB (30MHz to 6GHz)

Directivity:

±0.3dB in HSL (rotation around probe axis)
±0.5dB in tissue material (rotation normal to probe axis)

Dynamic Range:

10µW/g to > 100mW/g

Linearity:

±0.2dB

Dimensions:

Overall Length: 337mm (Tip: 20mm),
Tip Diameter: 2.5mm (Body: 12mm),
Distance from probe tip to dipole centers: 1mm

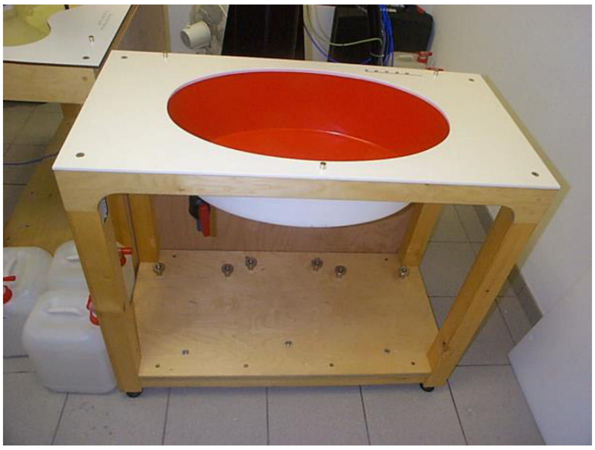
Application:

General dosimetry up to 6 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms

4.6 Test phantom and positioner

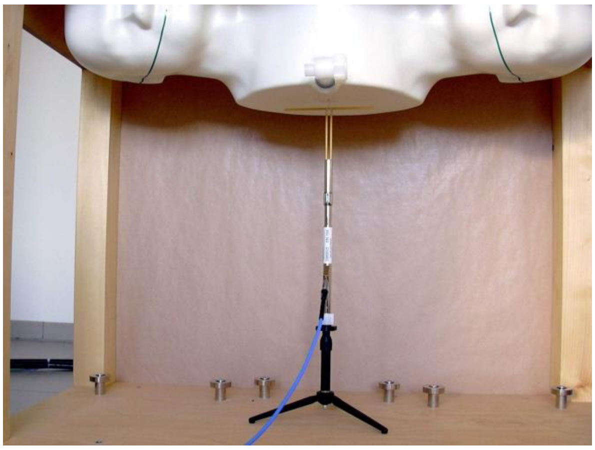
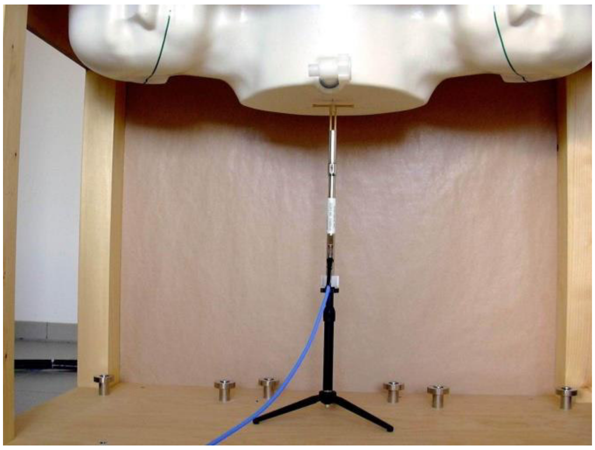
The positioner and test phantoms are manufactured by SPEAG. The test phantoms are used for all tests i.e. for both validation testing and device testing. The positioner and test phantom conforms to the requirements of EN 62209 and IEEE 1528.

The SPEAG device holder was used to position the test device in all tests whilst a tripod was used to position the validation dipoles in the test arch.

Probe Positioner	SAM Twin Phantom
	
ELI4 phantom	**Flat phantom**
	

4.7 System Validation Dipoles

A set of calibration dipoles (D900V2, D1900V2, D2450V2, D5GHzV2) is included as a part of the SAR measurement setup. These are used for the validation of the test setup after its installation and prior to the EUT measurements. The calibration dipole is placed in the position normally occupied by the EUT. All calibration dipoles have the same height which allows an exact fitting below the center point of the test phantom. The dipole center is 10mm below the surface of the test phantom.

900MHz Dipole	1900MHz Dipole
	
2450MHz Dipole	**5000MHz Dipole**
	

5 Single-band SAR Measurement

After successful completion of the tissue and system verification the SAR values of the EUT are measured according to the following description.

5.1 General measurement description

The measurement is performed for each frequency band of the device. If the width of the transmit frequency band exceeds 1% of its center frequency, than the channels at the lowest and highest frequencies should also be tested. Furthermore, if the width of the transmit band exceeds 10% of its center frequency the following formula is used to determine the number of channels:

$$N_C=2 \cdot \text{roundup}[10\cdot(f_{high} - f_{low})/f_c] + 1$$

First the device is tested on the center channel of each frequency band used by the device. An operation mode and configuration with maximum transmit power is established. If battery operated equipment is used, the batteries are fully charged.

SAR measurements are performed using the steps outlined in the next section for all relevant operational modes, EUT configurations and measurement positions.

For the condition (position, configuration, operational mode) that provides the highest spatial-average SAR value on the center channel, the other channels are also tested.

Additionally all other conditions where the spatial-average SAR value is within 3dB of the SAR limit are also tested on all determined test frequencies.

5.2 SAR measurement description

First the local SAR value at a test point within 10mm or less in normal direction from the inner surface of the phantom is measured. This SAR value is used to determine the measurement drift during SAR measurement.

Next an area scan is performed over an area larger than the projection of the EUT with antenna on the surface of the phantom with a spatial grid step of 10mm.

From the scanned SAR distribution the position of maximum SAR value is identified as well as any local SAR maxima within 2dB of the maximum value that are not within the zoom scan volume. (The additional peaks are only measured when the primary peak is within 2dB of the SAR limit.)

The zoom-scan volume constructed on the peak SAR position is scanned with a grid step of 5mm. The measured data are extracted and the local SAR value for each measurement point is calculated. The measured values are interpolated over a fine-mesh within the scan volume and the average SAR value over 10g mass is calculated.

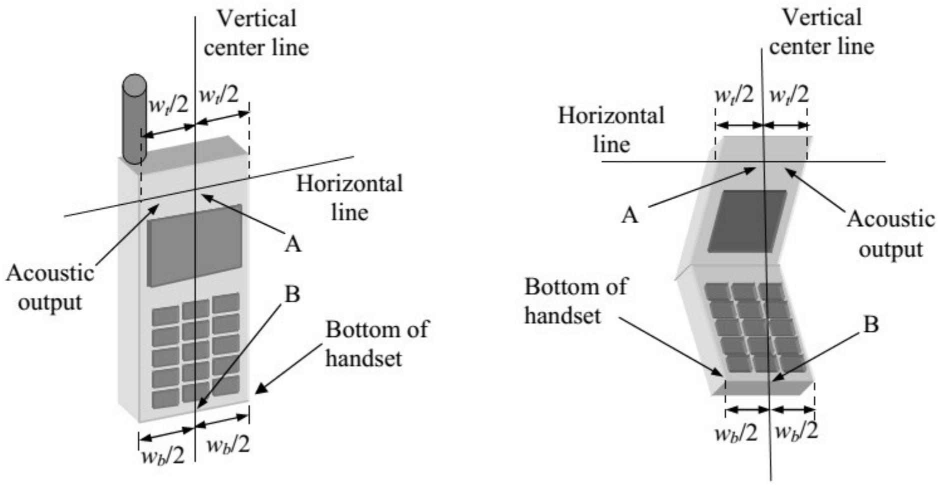
At the end of the measurement the reference point measured at the beginning of the measurement is measured again and from the difference the drift is calculated.

5.3 Reference lines and points for Handsets

For all measurement positions of the EUT, the EUT has to be place in a specific orientation with respect to the phantom. The orientation of the EUT relative to the phantom is defined by reference lines and points.

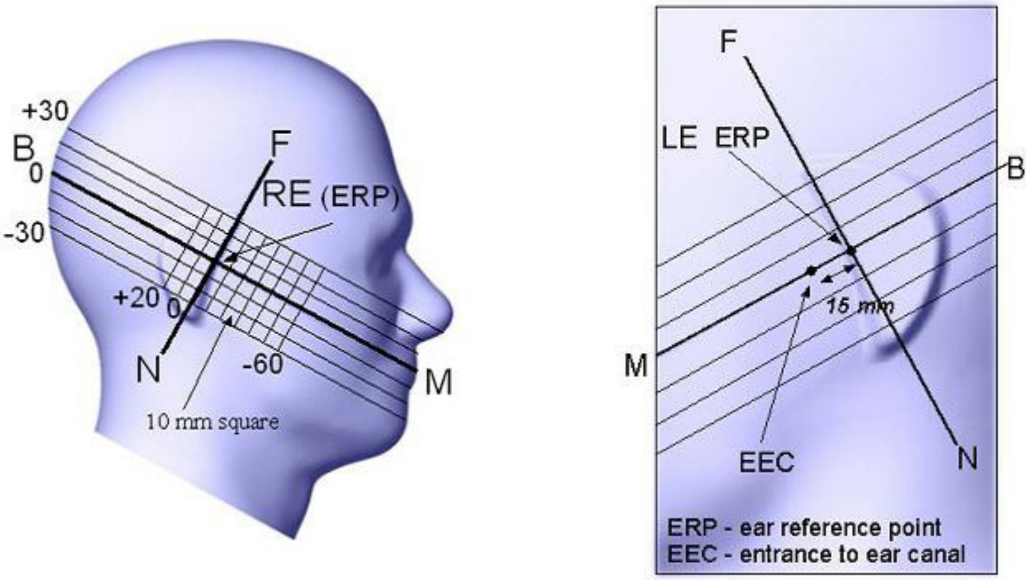
According to IEEE 1528, the reference lines and points shall be positioned at the EUT as shown in the following figure.

Reference lines and points on EUT acc. to IEEE 1528



a) Fixed case b) Clamshell case

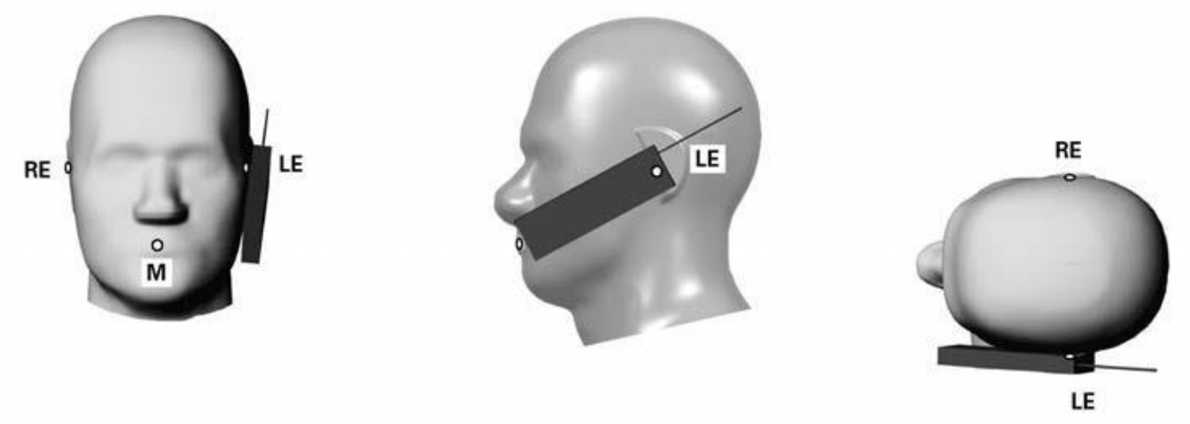
Reference lines and points on human head acc. to IEEE 1528



5.4 Test positions relative to the Head

Cheek position

Cheek positions according to IEEE 1528

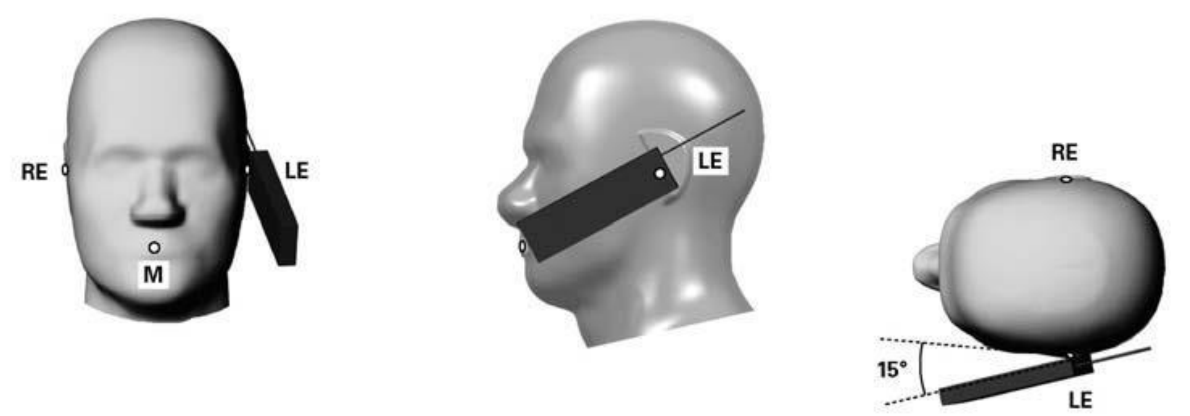


The handset is positioned close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom. Next the handset is translated towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.

While the handset is maintained in this plane, it is rotated around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane. Then it is rotated around the vertical centerline until the handset (horizontal line) is parallel to the N-F line. While the vertical centerline is maintained in the Reference Plane, point A is kept on the line passing through RE and LE, and the handset is maintained in contact with the pinna, the handset is rotated about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek.

Tilt position

Tilt positions according to IEEE 1528

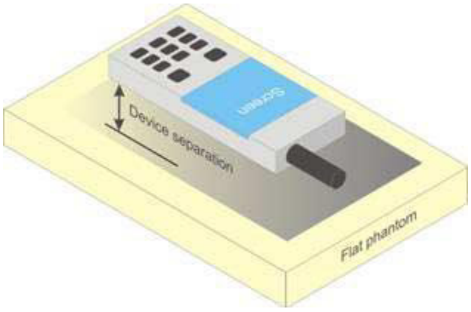


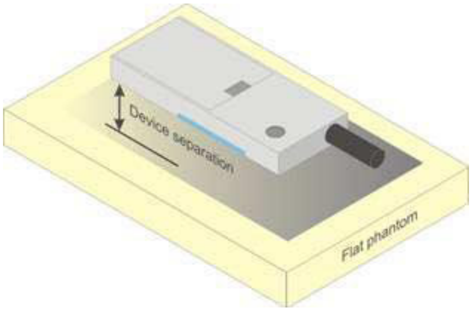
First the EUT is placed in the cheek position. Next the handset is moved away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°. Then the handset is rotated around the horizontal line by 15°.

The handset is moved towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point on the handset is in contact with the phantom, e.g., the antenna with the back of the head

5.5 Test positions relative to the human body

Body positions according to IEEE 1528





In body worn configuration the device is positioned parallel to the phantom surface with either top or bottom side of the EUT facing against the phantom.

The separation distance of the EUT is selected according to the use case of the EUT (e.g. with belt clip or holster).

5.6 Measurement Uncertainty

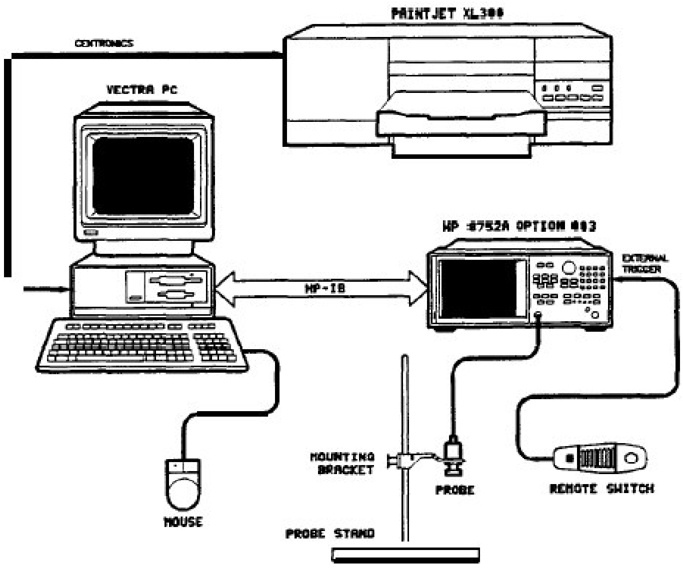
Measurement Uncertainty according to IEEE 1528							
Error Description	**Uncertainty Value**	**Probability Distribution**	**Div.**	**c_i (1g)**	**c_i (10g)**	**Std. Unc. 1g**	**Std. Unc. 10g**
Measurement System							
Probe Calibration	±6.55%	N	1	1	1	±6.55%	±6.55%
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%
Modulation Response	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%
Boundary effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%
Probe Positioning	±6.7%	R	$\sqrt{3}$	1	1	±3.9%	±3.9%
Post processing	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%
Test Sample Related							
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%
Test Sample Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%
Power Scaling	±0%	R	$\sqrt{3}$	1	1	±0%	±0%
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%
Phantom and Setup Related							
Phantom Uncertainty	±7.9%	R	$\sqrt{3}$	1	1	±4.6%	±4.6%
SAR correction	±1.9%	R	$\sqrt{3}$	1	0.84	±1.1%	±0.9%
Liquid conductivity (measured)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%
Liquid permittivity (measured)	±2.5%	N	1	0.26	0.26	±0.1%	±0.1%
Temperature uncertainty - Conductivity	±5.2%	R	$\sqrt{3}$	0.78	0.71	±2.3%	±2.1%
Temperature uncertainty - Permittivity	±0.8%	R	$\sqrt{3}$	0.23	0.26	±0.1%	±0.1%
Combined Standard Uncertainty						±12.8%	±12.7%
Expanded Standard Uncertainty						**±25.6%**	**±25.4%**

6 Test Conditions and Results

6.1 Test Conditions and Results – Tissue Validation

Tissue Validation acc. to FCC OET Bulletin 65 Suppl. C / IC RSS-102					**Verdict: PASS**
Test according to measurement reference		Reference Method			
		OET Bulletin 65 Supplement C			
Target Values					
Frequency [MHz]	Head		Body		Permitted tolerance [%]
	Relative dielectric constant ε_r	Conductivity σ [S/m]	Relative dielectric constant ε_r	Conductivity σ [S/m]	
150	52.3	0.76	61.9	0.80	≤ ±5
300	45.3	0.87	58.2	0.92	≤ ±5
450	43.5	0.87	56.7	0.94	≤ ±5
835	41.5	0.90	55.2	0.97	≤ ±5
900	41.5	0.97	55.0	1.05	≤ ±5
915	41.5	0.98	55.0	1.06	≤ ±5
1450	40.5	1.20	54.0	1.30	≤ ±5
1610	40.3	1.29	53.8	1.40	≤ ±5
1800 – 2000	40.0	1.40	53.3	1.52	≤ ±5
2450	39.2	1.80	52.7	1.95	≤ ±5
3000	38.5	2.40	52.0	2.73	≤ ±5
5200	36.0	4.66	49.0	5.30	≤ ±5
5500	35.6	4.96	48.6	5.65	≤ ±5
5800	35.3	5.27	48.2	6.00	≤ ±5

Test setup



Test procedure

1. The dielectric probe kit is calibrated using the standards air, short circuit and deionized water
2. The tissue simulating liquid is measured using the dielectric probe
3. Target values are compared to the measurement values and deviations are determined

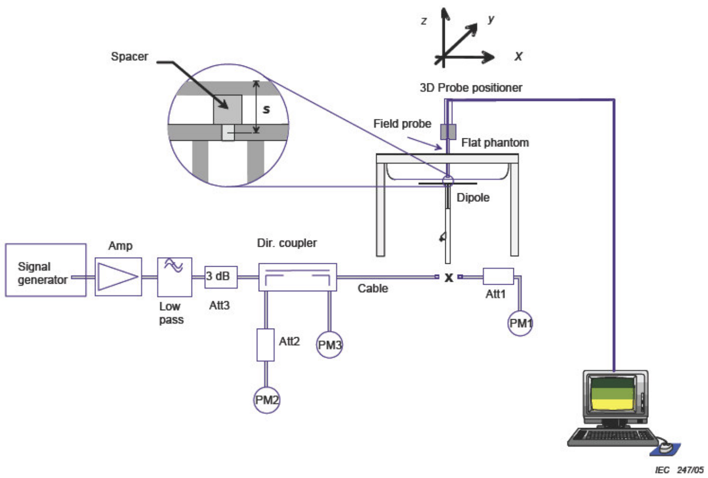
Test results

Frequency [MHz]	Tissue	Measured ε_r	Target ε_r	Delta ε_r [%]	Measured σ [S/m]	Target σ [S/m]	Delta σ [%]
2450	Body	50.56	52.7	-04.06	2.02	1.95	03.59
5200	Body	47.4	49.0	-03.27	5.30	5.30	00.00
5500	Body	46.7	48.6	-03.91	5.68	5.65	00.53
5800	Body	48.4	48.2	00.41	6.29	6.00	04.83

Comments:

6.2 Test Conditions and Results – System Validation

System Validation acc. to FCC OET Bulletin 65 Suppl. C / IC RSS-102		Verdict: PASS
Test according to measurement reference	Reference Method	
	OET Bulletin 65 Supplement C / IEEE 1528	
Test frequency range	Tested frequencies	
	2450 MHz , 5200 MHz, 5500 MHz, 5800 MHz	
Test mode	unmodulated CW	
Target Values		
Frequency [MHz]	Target SAR value [W/kg (1g)]	Permitted tolerance [%]
2450	12.9 @ 250mW	≤ ±10
5200	7.42 @ 100mW	≤ ±10
5500	7.97 @ 100mW	≤ ±10
5800	7.43 @ 100mW	≤ ±10
The target reference values are taken from the calibration sheets (see annex)		
Test setup		



Test procedure

1. The dipole antenna input power is set to 250mW
2. The reference dipole is positioned under the phantom
3. With the dipole antenna powered the SAR value is measured
4. The measured SAR values are compared to the target SAR values

Test results				
Frequency [MHz]	Input power [mW]	Measured SAR value [W/kg (1g)]	Target SAR value [W/kg (1g)]	Delta [%]
2450	250	13.6	12.9	9.49
5200	100	8.03	7.42	8.22
5200	100	8.02	7.42	8.09
5500	100	8.35	7.97	4.77
5800	100	7.25	7.43	-2.42
Comments:				

6.3 Test Conditions and Results – Standalone SAR Measurement

Standalone SAR acc. to FCC OET Bulletin 65 Suppl. C / IC RSS-102	**Verdict: PASS**
Test according to measurement reference	Reference Method: FCC OET Bulletin 65 Supplement C / IC RSS-102 Issue 4
Room temperature	22.0 – 23.0 °C
Liquid depth	15.5 cm
Environment	general public

Limits

Region	Occupational SAR values [W/kg]	General public SAR values [W/kg]
Whole body average SAR	0.4	0.08
Localized SAR (Head and trunk) SAR averaging mass = 10g	8	1.6
Localized SAR (Limbs) SAR averaging mass = 10g	20	4

Test results

Mode	Position	Channel	Frequency [MHz]	Drift [dB]	Average SAR [W/kg (1g)]	Scaling Factor**	Reported SAR [W/kg (1g)]	SAR Limit [W/kg (1g)]	Plot No.
Antenna: MAIN									
IEEE 802.11b	FRONT-0MM	11	2462	0.05	0.037	1.202	0.045	1.55*	
IEEE 802.11b	BACK-0MM	11	2462	-0.16	0.112	1.202	0.135	1.55*	1
IEEE 802.11a	FRONT-0MM	40	5200	-0.10	0.123	1.033	0.127	1.55*	
IEEE 802.11a	BACK-0MM	40	5200	-0.08	0.178	1.033	0.184	1.55*	2
IEEE 802.11a	FRONT-0MM	52	5260	-0.09	0.105	1.119	0.118	1.55*	
IEEE 802.11a	BACK-0MM	52	5260	0.07	0.258	1.119	0.289	1.55*	3
IEEE 802.11a	FRONT-0MM	100	5500	0.18	0.193	1.057	0.204	1.55*	
IEEE 802.11a	BACK-0MM	100	5500	-0.07	0.429	1.057	0.453	1.55*	4
IEEE 802.11a	FRONT-0MM	165	5825	-0.03	0.097	1.016	0.098	1.55*	
IEEE 802.11a	BACK-0MM	165	5825	0.06	0.333	1.016	0.338	1.55*	5

Antenna: AUX									
IEEE 802.11b	FRONT-0MM	11	2462	-0.17	0.040	1.072	0.040	1.55*	
IEEE 802.11b	BACK-0MM	11	2462	0.17	0.092	1.072	0.099	1.55*	
IEEE 802.11a	FRONT-0MM	36	5180	0.02	0.013	1.096	0.014	1.55*	
IEEE 802.11a	BACK-0MM	36	5180	0.00	0.059	1.096	0.065	1.55*	
IEEE 802.11a	FRONT-0MM	52	5260	0.01	0.000	1.112	0.000	1.55*	
IEEE 802.11a	BACK-0MM	52	5260	0.10	0.065	1.112	0.072	1.55*	
IEEE 802.11a	FRONT-0MM	140	5700	0.00	0.002	1.012	0.002	1.55*	
IEEE 802.11a	BACK-0MM	140	5700	0.05	0.035	1.012	0.035	1.55*	
IEEE 802.11a	FRONT-0MM	161	5805	-0.10	0.097	1.227	0.119	1.55*	
IEEE 802.11a	BACK-0MM	161	5805	0.10	0.431	1.227	**0.529**	1.55*	6
Overall maximum SAR value [W/kg (1g)]							**0.529**	1.55*	
Comments: * See section 1.6 multi-transmitter operation modes **tune up tolerance / conducted power = scaling factor									

SAR measurements were started with the highest power channel of the transmission band under investigation. Other measurement channels were omitted when the SAR value of the highest power channel was below 0.8 W/kg according to KDB 248227 v01r02.

According to KDB 865664 D02 v01r01 only the SAR plots for the highest SAR results for each EUT configuration and operating condition are given in the "SAR Results" part of the report.