SAR TEST REPORT

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

Equipment Under Test	Tablet
Brand Name	HP
Model No.	HSN-I07C
Company Name	HP Inc.
Company Address	3390 East Harmony Road Fort Collins, Colorado 80528 United States
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013, KDB248227D01v02r02,KDB865664D01v01r04, KDB865664D02v01r02,KDB941225D01v03r01, KDB447498D01v06,KDB616217D04v01r02
FCC ID	B94HNI07CWR2
Date of Receipt	Nov. 11, 2016
Date of Test(s)	Dec. 06, 2016 ~ Feb. 08, 2017
Date of Issue	Feb. 16, 2017

In the configuration tested, the EUT 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.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Electronic & Communication Laboratory or testing done by SGS Taiwan Electronic & Communication Laboratory in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Electronic & Communication Laboratory in writing.

Signed on behalf of SGS

Sr. Engineer	**Supervisor**
Afu Chen	**John Yeh**
Date: Feb. 16, 2017	**Date: Feb. 16, 2017**

Revision History

Report Number	Revision	Description	Issue Date
EN/2016/B0010	Rev.00	Initial creation of document	Feb. 16, 2017

Contents

1. General Information

1.1 Testing Laboratory

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1.2 Details of Applicant

Company Name	HP Inc.
Company Address	3390 East Harmony Road Fort Collins, Colorado 80528 United States

1.3 Description of EUT

Equipment Under Test	Tablet			
Brand Name	HP			
Model No.	HSN-I07C			
Integrated Module	WWAN	Brand Name : FIBOCOM Model Name : H380-GL		
	WLAN/BT	Brand Name : Intel Model Name : 8265NGW		
Antenna type	PIFA			
Antenna Gain	-4.06dBi (for GPRS850/EDGE850/WCDMA B5) 1.36dBi (for GPRS1900/EDGE1900/WCDMA B2)			
FCC ID	B94HNI07CWR2			
Mode of Operation	☒GPRS ☒EDGE ☒WCDMA ☒HSDPA ☒HSUPA ☒HSPA+☒GPS			
Duty Cycle	GPRS	1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)		
	EDGE	1/2 (1Dn4UP) 1/2.76 (1Dn3UP) 1/4.1 (1Dn2UP) 1/8.3 (1Dn1UP)		
	WCDMA	1		
TX Frequency Range (MHz)	GPRS850	824	–	849
	GPRS1900	1850	–	1910
	WCDMA Band II	1850	–	1910
	WCDMA Band V	824	–	849
Channel Number (ARFCN)	GPRS850	128	–	251
	GPRS1900	512	–	810
	WCDMA Band II	9262	–	9538
	WCDMA Band V	4132	–	4233

Max. SAR (1 g) (Unit: W/Kg)				
Band	Measured	Reported	Channel	Position
GPRS 850	0.938	1.173	251	Back side
GRPS 1900	0.988	1.282	810	Back side
WCDMA Band II	1.290	1.401	9538	Back side
WCDMA Band V	1.080	1.155	4132	Back side

GPRS/EDGE conducted power table (Full power):

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			33.5	31.2	29.9	28.3
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 850	824.2	128	31.85	29.79	28.47	26.88
	836.6	190	31.65	29.57	28.26	26.67
	848.8	251	31.83	29.78	28.45	26.86
Source-based time average power						
GPRS 850	824.2	128	22.82	23.77	24.21	23.87
	836.6	190	22.62	23.55	24.00	23.66
	848.8	251	22.80	23.76	24.19	23.85
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			28	25.7	24.4	22.8
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 850 (MCS5)	824.2	128	26.09	24.08	22.82	21.32
	836.6	190	26.06	23.97	22.62	21.19
	848.8	251	26.03	24.03	22.74	21.31
Source-based time average power						
EDGE 850 (MCS5)	824.2	128	17.06	18.06	18.56	18.31
	836.6	190	17.03	17.95	18.36	18.18
	848.8	251	17.00	18.01	18.48	18.30
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

GPRS/EDGE conducted power table (Full power):

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			30.5	28.2	26.9	25.3
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 1900	1850.2	512	29.23	27.03	25.81	24.28
	1880	661	29.17	27.04	25.79	24.30
	1909.8	810	29.11	26.99	25.75	24.26
Source-based time average power						
GPRS 1900	1850.2	512	20.20	21.01	21.55	21.27
	1880	661	20.14	21.02	21.53	21.29
	1909.8	810	20.08	20.97	21.49	21.25
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			27	24.2	23.4	21.8
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
EDGE 1900 (MCS5)	1850.2	512	25.14	22.84	21.98	20.38
	1880	661	25.29	22.91	22.22	20.65
	1909.8	810	25.35	22.92	22.13	20.59
Source-based time average power						
EDGE 1900 (MCS5)	1850.2	512	16.11	16.82	17.72	17.37
	1880	661	16.26	16.89	17.96	17.64
	1909.8	810	16.32	16.90	17.87	17.58
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

GPRS conducted power table (Reduced power):

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			29	26.7	25.4	23.8
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 850	824.2	128	28.02	25.75	24.44	22.83
	836.6	190	27.80	25.54	24.25	22.62
	848.8	251	28.00	25.73	24.43	22.80
Source-based time average power						
GPRS 850	824.2	128	18.99	19.73	20.18	19.82
	836.6	190	18.77	19.52	19.99	19.61
	848.8	251	18.97	19.71	20.17	19.79
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

Burst average power						
Max. Rated Avg. Power + Max. Tolerance (dBm)			27.5	25.2	23.9	22.3
			1Dn1UP	1Dn2UP	1Dn3UP	1Dn4UP
EUT mode	Frequency (MHz)	CH	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)	Avg. (dBm)
GPRS 1900	1850.2	512	26.20	24.03	22.78	21.18
	1880	661	26.22	24.07	22.76	21.15
	1909.8	810	26.23	24.07	22.77	21.28
Source-based time average power						
GPRS 1900	1850.2	512	17.17	18.01	18.52	18.17
	1880	661	17.19	18.05	18.50	18.14
	1909.8	810	17.20	18.05	18.51	18.27
The division factor compared to the number of TX time slot						
Division factor			1 TX time slot	2 TX time slot	3 TX time slot	4 TX time slot
			-9.03	-6.02	-4.26	-3.01

WCDMA Band II / Band V - HSDPA / HSUPA / HSPA+ conducted power table (Full power)

Band		WCDMA II		
TX Channel		9262	9400	9538
Frequency (MHz)		1852.4	1880	1907.6
Max. Rated Avg. Power+Max. Tolerance (dBm)		24.50		
3GPP Rel 99	RMC 12.2Kbps	23.67	23.39	23.04
Max. Rated Avg. Power+Max. Tolerance (dBm)		23.50		
3GPP Rel 5	HSDPA Subtest-1	23.08	22.86	22.72
	HSDPA Subtest-2	22.36	22.10	21.86
	HSDPA Subtest-3	22.17	21.92	21.62
	HSDPA Subtest-4	21.89	21.65	21.52
3GPP Rel 6	HSUPA Subtest-1	22.59	22.34	22.10
	HSUPA Subtest-2	23.08	22.81	22.57
	HSUPA Subtest-3	22.11	21.86	21.63
	HSUPA Subtest-4	23.34	23.07	22.79
	HSUPA Subtest-5	22.35	22.11	21.87
3GPP Rel 7	HSPA+ Subtest-1	23.23	22.97	22.64

Band		WCDMA V		
TX Channel		4132	4183	4233
Frequency (MHz)		826.4	836.6	846.6
Max. Rated Avg. Power+Max. Tolerance (dBm)		24.50		
3GPP Rel 99	RMC 12.2Kbps	23.05	23.10	23.00
Max. Rated Avg. Power+Max. Tolerance (dBm)		23.50		
3GPP Rel 5	HSDPA Subtest-1	22.80	22.86	22.72
	HSDPA Subtest-2	21.85	21.87	21.78
	HSDPA Subtest-3	21.61	21.63	21.53
	HSDPA Subtest-4	21.55	21.56	21.51
3GPP Rel 6	HSUPA Subtest-1	22.07	22.11	22.01
	HSUPA Subtest-2	22.53	22.57	22.46
	HSUPA Subtest-3	21.58	21.61	21.51
	HSUPA Subtest-4	22.78	22.83	22.76
	HSUPA Subtest-5	21.85	21.87	21.77
3GPP Rel 7	HSPA+	22.74	22.75	22.71

WCDMA Band II / Band V - HSDPA / HSUPA / HSPA+ conducted power table (Reduced power)

Band		WCDMA II		
TX Channel		9262	9400	9538
Frequency (MHz)		1852.4	1880	1907.6
Max. Rated Avg. Power+Max. Tolerance (dBm)		19.00		
3GPP Rel 99	RMC 12.2Kbps	18.98	18.78	18.64
Max. Rated Avg. Power+Max. Tolerance (dBm)		19.00		
3GPP Rel 5	HSDPA Subtest-1	18.82	18.56	18.58
	HSDPA Subtest-2	18.92	18.57	18.56
	HSDPA Subtest-3	18.93	18.63	18.64
	HSDPA Subtest-4	18.91	18.65	18.63
3GPP Rel 6	HSUPA Subtest-1	17.79	17.84	18.06
	HSUPA Subtest-2	18.42	18.45	18.54
	HSUPA Subtest-3	18.16	18.00	18.14
	HSUPA Subtest-4	18.24	17.84	18.00
	HSUPA Subtest-5	18.90	18.60	18.60
3GPP Rel 7	HSPA+	18.76	18.51	18.54

Band		WCDMA V		
TX Channel		4132	4183	4233
Frequency (MHz)		826.4	836.6	846.6
Max. Rated Avg. Power+Max. Tolerance (dBm)		20.00		
3GPP Rel 99	RMC 12.2Kbps	19.71	19.74	19.60
Max. Rated Avg. Power+Max. Tolerance (dBm)		20.00		
3GPP Rel 5	HSDPA Subtest-1	19.62	19.65	19.59
	HSDPA Subtest-2	19.63	19.59	19.52
	HSDPA Subtest-3	19.63	19.57	19.52
	HSDPA Subtest-4	19.60	19.58	19.53
3GPP Rel 6	HSUPA Subtest-1	19.07	19.03	19.00
	HSUPA Subtest-2	19.56	19.46	19.50
	HSUPA Subtest-3	19.06	19.07	19.00
	HSUPA Subtest-4	19.02	19.05	18.95
	HSUPA Subtest-5	19.60	19.60	19.50
3GPP Rel 7	HSPA+	19.58	19.61	19.54

1.4 Test Environment

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

1.5 Operation Description

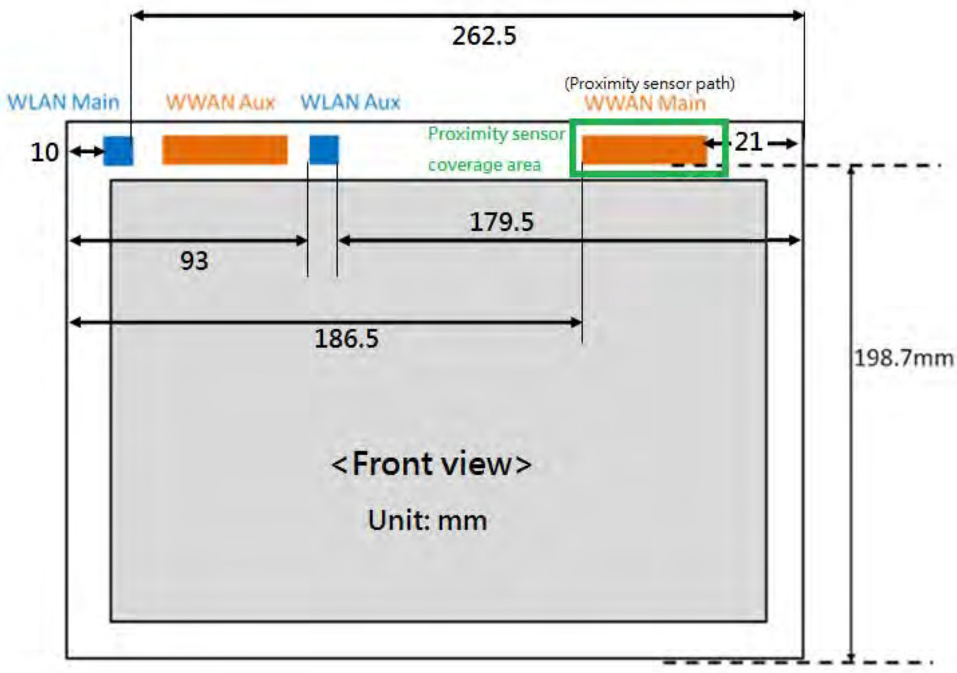
1. WWAN:

SAR is measured in the following configurations:

Configuration 1: back/top side_0mm with power reduction

Configuration 2: back/top side_10mm without power reduction

Configuration 3: right/left sides_0mm without power reduction



Antenna location

(The p-sensor is colocated with WWAN antenna)

2. WLAN

For WLAN, since the RF hardware/software of FCC ID: B94HNI07CWR2 is the same with that of FCC ID: PD98265NG, so the WLAN is refer to the WLAN SAR report of FCC ID: PD98265NG after verifying the worst cases of the WLAN SAR report.

Note:

1. The EUT is controlled by using a Radio Communication Tester (Anritsu MT8820C), and the communication between the EUT and the tester is established by air link.

2. 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.

3. During the SAR testing, the DASY 5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.

4. SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power. The data mode with highest specified time-averaged output power should be tested for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode. Since the maximum output power in a secondary mode (8-PSK EDGE) is ≤ ¼ dB higher than the primary mode (GMSK GPRS/EDGE), SAR measurement is not required for the secondary mode (8-PSK EDGE).

5. The 3G SAR test reduction procedure is applied to HSDPA with 12.2 kbps RMC as the primary mode. Since the maximum output power in a secondary mode (HSDPA) is ≤ ¼ dB higher than the primary mode (WCDMA), SAR measurement is not required for the secondary mode (HSDPA).

6. The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) with 12.2 kbps RMC as the primary mode. Since the maximum output power in a secondary mode (HSPA) is ≤ ¼ dB higher than the primary mode (WCDMA), SAR measurement is not required for the secondary mode (HSPA).

7. The 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction. Since the maximum output power in a secondary mode (HSPA+) is ≤ ¼ dB higher than the primary mode (WCDMA), SAR measurement is not required for the secondary mode (HSPA+).

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

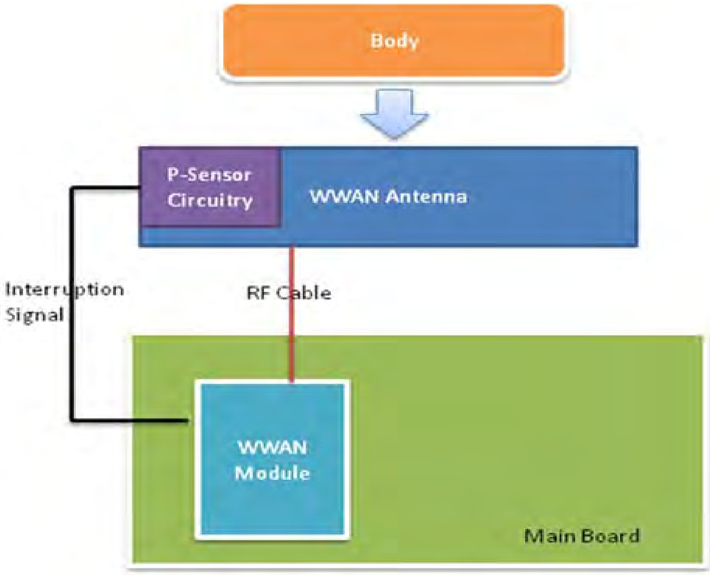
Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

8. According to **KDB447498D01v06**, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.

9. According to **KDB865664D01v01r04**, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 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 ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)

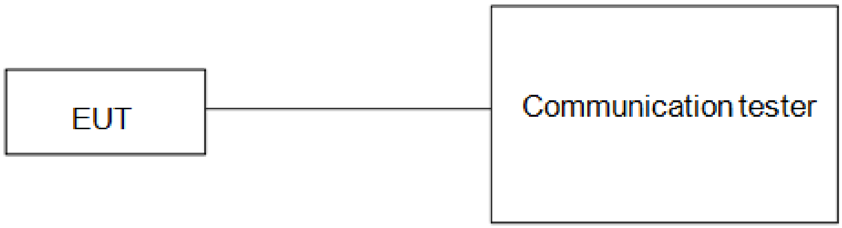
1.6 Proximity sensor operation description

The P-sensor being used to reduce output power is capacitive in which when the object such as human body, metal or plastic is being approached, the sensing capacitance would be increased with the antenna pad. Once the capacitance is accumulated, and reached over the threshold as set in MCU of the microchip, the interruption signal is pulled low (High state without trigger) and further inform modem module of the transmitter to make power reduction.



1.6.1 Proximity sensor measurement procedure

1. The proximity sensor is collocated with WWAN antenna.
2. Output power is measured, and monitored by using the communication tester. A RF cables with sufficient length was being attached from the antenna port of the module, and used for the measurement. The appropriate loss attenuated from cable is compensated in the communication tester.



1.6.2 Trigger distances for back/top side

Test procedure:

1. The entire back surface or edge of the tablet is positioned below a flat phantom filled with the required tissue equivalent medium and positioned at least 20 mm further than the distance that triggers power reduction.

2. The back surface or edge is moved toward the phantom in 3 mm steps until the sensor triggers.

3. The back surface or edge is then moved back (further away) from the phantom until maximum output power is returned to the normal maximum level.

4. The back surface or edge is again moved toward the phantom, but in 1 mm steps, until it is at least 5 mm past the triggering point or touching the phantom

5. If the tablet is not touching the phantom, it is moved in 3 mm steps until it touches the phantom to confirm that the sensor remains triggered and the maximum power stays reduced.

6. The process is then reversed by moving the tablet away from the phantom to determine triggering release, until it is at least 10 mm beyond the point that triggers the return of normal maximum power.

7. The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom should be tabulated.

8. To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for

movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

9. For back side, the trigger distance of proximity sensor is 11mm.

10. For top side, the trigger distance of proximity sensor is 12mm, and we perform the 1.6.3 tilt angle testing in next step.

1.6.3 Tilt angle testing

Test procedure:

1. The influence of table tilt angles to proximity sensor triggering is determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance determined in sections 1.6.2 by rotating the tablet around the edge next to the phantom in ≤ 10 deg increments until the tablet is +/- 45deg or more from the vertical position at 0 deg.

2. If sensor triggering is released and normal maximum output power is restored within the +/- 45deg range, the procedures in step 1) should be repeated by reducing the tablet to phantom separation distance by 1 mm until the proximity sensor no longer releases triggering, and maximum output power remains in the reduced mode.

3. The smallest separation distance determined in steps 1) and 2), minus 1 mm, is the sensor triggering distance for tablet tilt coverage. The smallest separation distance determined in sections 1.6.2, 1.6.3 minus 1 mm should be used in the SAR measurements.

4. The influence of tablet tilt angles to proximity sensor triggering is determined by positioning top and right sides, please refer to table 1.6.5 and 1.6.6.

5. After the tilt angle testing for top side, the sensor is not released during +/- 45deg, so 12-1=11mm, is the sensor triggering distance for tablet tilt coverage. The smallest separation distance minus 1 mm(11-1=10mm) should be used in the SAR measurements.

1.6.4 Proximity sensor coverage

The following procedures do not apply and are not required for configurations where the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

Test procedure:

1. The back surface or edges of the tablet is positioned at a test separation distance less than or equal to the distance required for back surface or edge triggering, with both the antenna and sensor pad located at least 20 mm laterally outside the edge (boundary) of the phantom, along the direction of maximum antenna and sensor offset.

2. The similar sequence of steps applied to determine sensor triggering distance in section 1.6.2 are used to verify back surface and edge sensor coverage by moving the tablet (sensor and antenna) horizontally toward the phantom while maintaining the same vertical separation between the back surface or edge and the phantom.

3. After the exact location where triggering of power reduction is determined, with respect to the sensor and antenna, the tablet movement should be continued, in 3 mm increments, until both the sensor and antenna(s) are fully under the phantom and at least 20 mm inside the phantom edge.

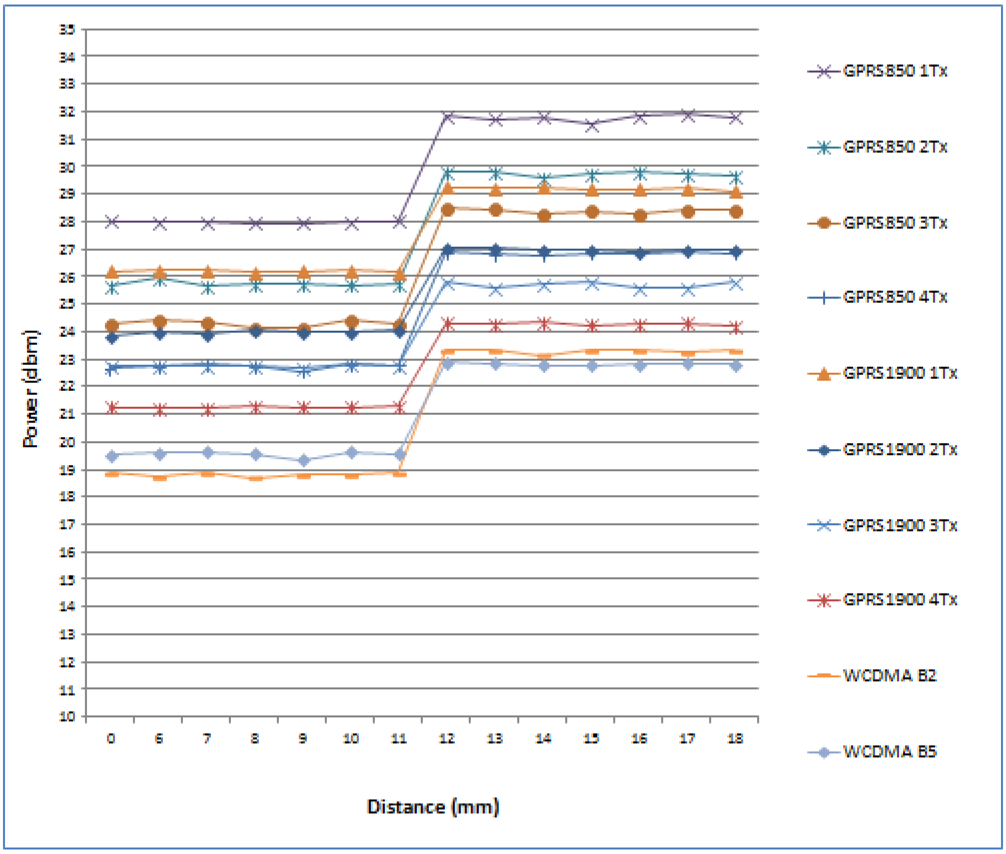
4. The process is then repeated from the other direction, at the opposite end of maximum antenna and sensor offset, by rotating the tablet 180 degrees.

1.6.5 Results

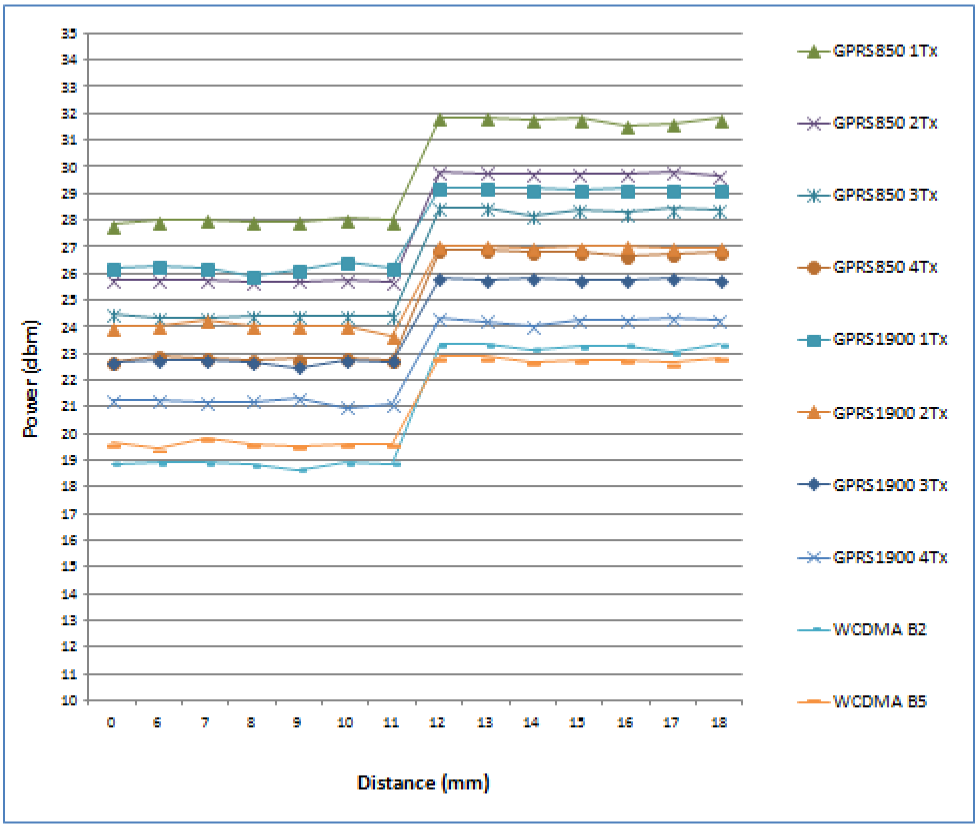
The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom is tabulated in the following.

Back side

Moving device toward the phantom

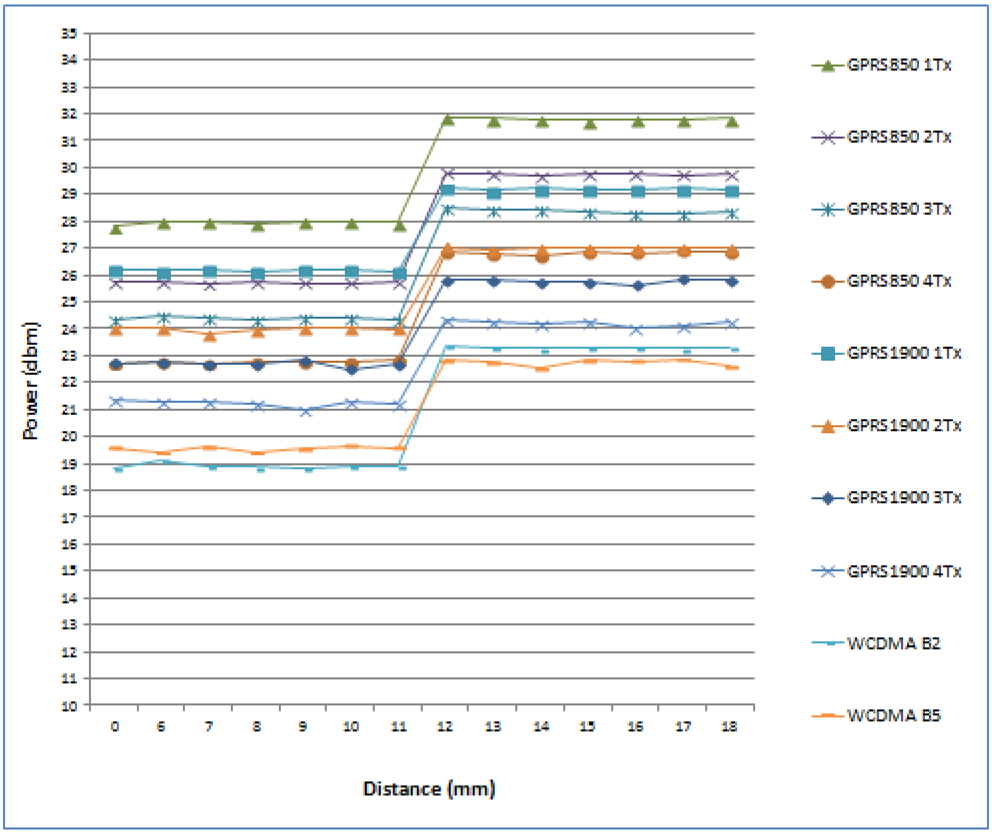


Moving device away from the phantom

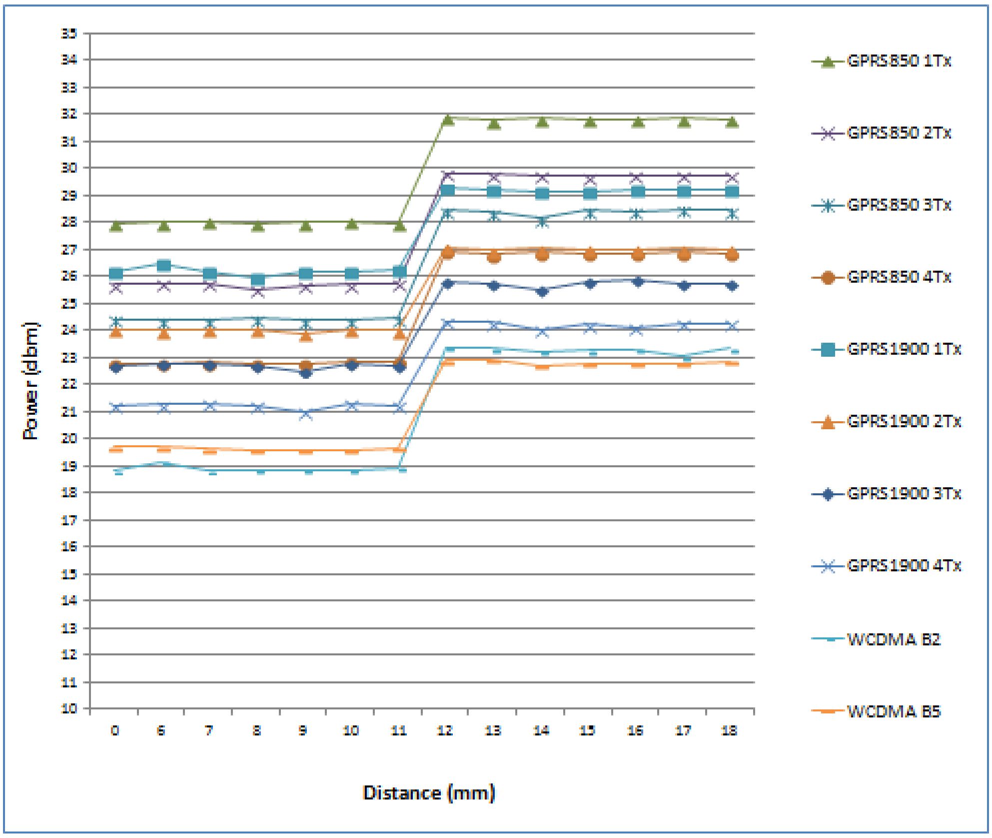


Top side

Moving device toward the phantom



Moving device away from the phantom



For back side, the worst trigger distance of proximity sensor is 11mm, thus we test back side SAR in 10mm without power reduction and 0mm with power reduction.

Table 1.6.5 Tilt angle test results for top side

P-sensor ON/OFF	-50 deg	-45 deg	-40 deg	-30 deg	-20 deg	-10 deg	0 deg	10 deg	20 deg	30 deg	40 deg	45 deg	50 deg
12mm	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

During the tilt angle testing for top side, the sensor is not released in 12mm, so 12-1=11mm, is the sensor triggering distance for tablet tilt coverage. The smallest separation distance minus 1 mm(11-1=10mm) should be used in the SAR measurements for top side.

Note:

1. The triggering variations and hysteresis effect has been evaluated separately according to the tissue-equivalent medium required for each frequency band, and sensor triggering does not change with different tissue-equivalent media.

2. The default power level for sensor failure and malfunctioning, including all compliance concerns, has been addressed in the client's operation description (1.6.6) for the proximity sensor implementation to be acceptable.

3. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing.

1.6.6 Operation description for P-sensor

Power Reduction Design Specification (for P-sensor)

The mechanism of power reduction is used only for WWAN. The reduced power for each technology/band is defined in Table1-1. With P-sensor mechanism, the GPRS/WCDMA default power when P-sensor failure or malfunction are show in Table1-2 as below.

Table1-1：The power reduction scenario table

Band	Power Reduction
GPRS850	YES
GPRS1900	YES
WCDMA B2	YES
WCDMA B5	YES

Table1-2：The default maximum power when p-sensor failure or malfunction

Technology / Band	Mode	Default Maximum Power (dBm)
GPRS 850	Class 8	29
	Class 10	26.7
	Class 11	25.4
	Class 12	23.8
GPRS 1900	Class 8	27.5
	Class 10	25.2
	Class 11	23.9
	Class 12	22.3

Technology / Band	Mode	Default Maximum Power (dBm)
UMTS B2	RMC 12.2K data	19
	HSDPA case 1	19
	HSDPA case 2	19
	HSDPA case 3	19
	HSDPA case 4	19
	HSUPA case 1	19
	HSUPA case 2	19
	HSUPA case 3	19
	HSUPA case 4	19
	HSUPA case 5	19
	HSPA+	19
UMTS B5	RMC 12.2K data	20
	HSDPA case 1	20
	HSDPA case 2	20
	HSDPA case 3	20
	HSDPA case 4	20
	HSUPA case 1	20
	HSUPA case 2	20
	HSUPA case 3	20
	HSUPA case 4	20
	HSUPA case 5	20
	HSPA+	20

1.7 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= σ (|Ei|^2)/ ρ where σ and ρ 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.

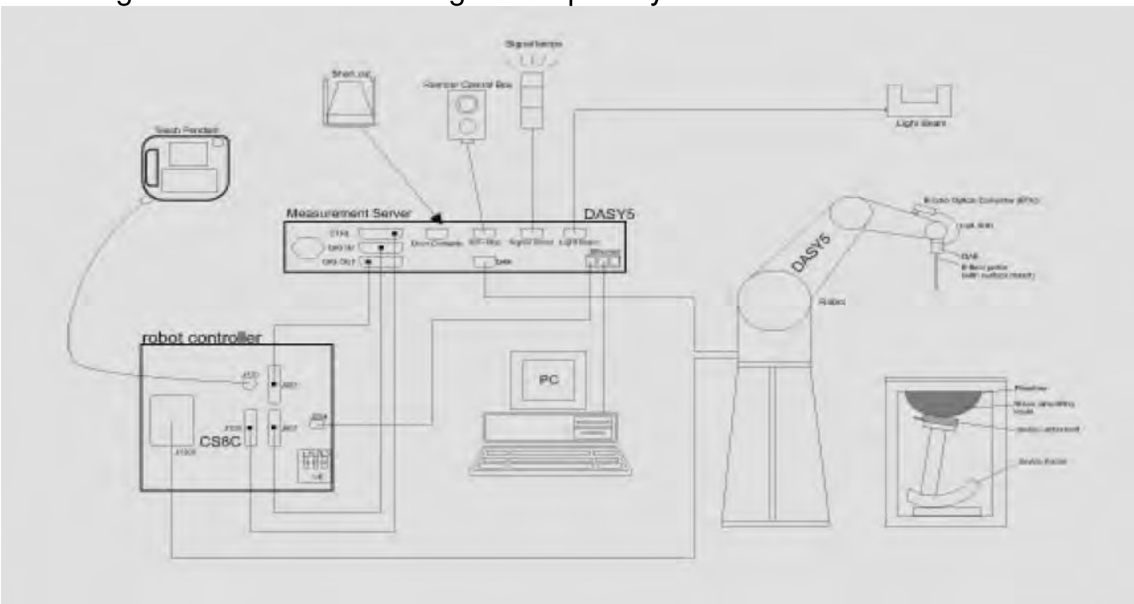


Fig. a The block diagram of SAR system

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.
9. Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
10. The SAM twin phantom enabling testing left-hand and right-hand usage.
11. The device holder for handheld mobile phones.
12. Tissue simulating liquid mixed according to the given recipes.
13. Validation dipole kits allowing to validate the proper functioning of the system.

1.8 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 835/1900/2450/5300/5600 MHz Additional CF for other liquids and frequencies upon request	
Frequency	10 MHz to > 6 GHz	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/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%.	

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 Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 30 liters	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	

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.	 Device Holder

1.9 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 835/1900/2450/ 5300/ 5600 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 ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 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.

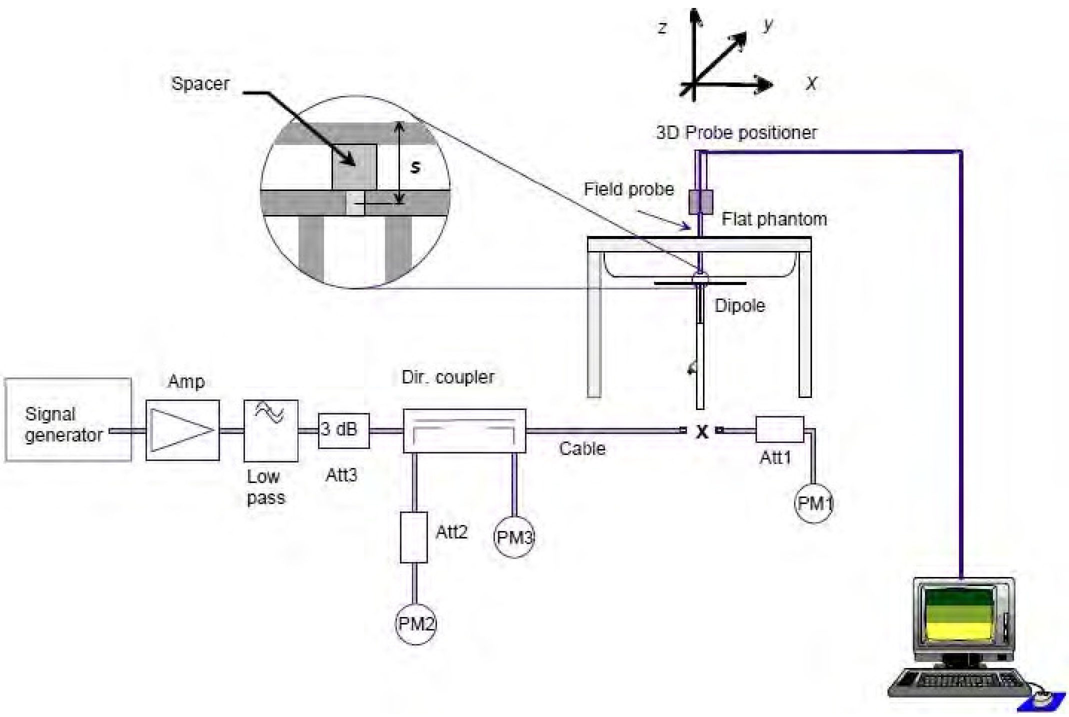


Fig. b The block diagram of system verification

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W	Deviation (%)	Measured Date
D835V2	4d063	835	Body	9.57	2.4	9.6	0.31%	Dec. 09, 2016
D1900V2	5d027	1900	Body	39.7	10.1	40.4	1.76%	Dec. 06, 2016
D2450V2	727	2450	Body	49.6	13	52	4.84%	Feb. 08, 2016
D5GHzV2	1040	5300	Body	76.4	7.89	78.9	3.27%	Feb. 08, 2017
		5600	Body	78.4	8.14	81.4	3.83%	Feb. 08, 2017

Table 1. Results of system validation

1.10 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the Schmid & Partner Engineering AG Model DAKS-3.5 Dielectric Probe Kit in conjunction with Network Analyzer (30 KHz-6000 MHz).

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.

Tissue Type	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ	Measurement Date
Body	824.2	55.242	0.969	57.585	0.988	-4.24%	-1.94%	Dec. 09, 2016
	826.4	55.234	0.969	57.485	0.991	-4.08%	-2.24%	
	835	55.200	0.970	57.392	1.000	-3.97%	-3.09%	
	836.6	55.195	0.972	57.367	1.002	-3.93%	-3.09%	
	846.6	55.164	0.984	57.301	1.012	-3.87%	-2.82%	
	848.8	55.158	0.987	57.254	1.011	-3.80%	-2.43%	
	1850.2	53.300	1.520	53.309	1.536	-0.02%	-1.05%	Dec. 06, 2016
	1852.4	53.300	1.520	53.305	1.542	-0.01%	-1.45%	
	1880	53.300	1.520	53.212	1.566	0.17%	-3.03%	
	1900	53.300	1.520	53.166	1.584	0.25%	-4.21%	
	1907.6	53.300	1.520	53.140	1.594	0.30%	-4.87%	
	1909.8	53.300	1.520	53.135	1.593	0.31%	-4.80%	
	2437	52.717	1.938	51.637	1.988	2.05%	-2.60%	Feb .08, 2017
	2450	52.700	1.950	51.614	2.003	2.06%	-2.72%	
	2480	52.662	1.993	51.545	2.040	2.12%	-2.36%	
	5270	48.919	5.381	47.592	5.585	2.71%	-3.79%	
	5300	48.879	5.416	47.577	5.607	2.66%	-3.53%	
	5600	48.471	5.766	46.582	6.002	3.90%	-4.09%	
	5610	48.458	5.778	46.572	6.010	3.89%	-4.01%	

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the body tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
850	Body	—	631.68 g	11.72 g	1.2 g	—	600 g	1.0L(Kg)
1900	Body	300.67 g	716.56 g	4.0 g	—	—	—	1.0L(Kg)
2450	Body	301.7ml	698.3ml	—	—	—	—	1.0L(Kg)

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

1.11 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 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.

1.12 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:

1.12.1 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.

$$SAR = \frac{\sigma}{\rho}\left|E\right|^2 = c\,\frac{\delta T}{\delta t}$$

whereby σ is the conductivity, ρ 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:

1. 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.
2. 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.
3. 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 ρ) , there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
4. 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 ±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].

1.12.2 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:

1. The setup must enable accurate determination of the incident power.
2. The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.

3. Due to the small wavelength in liquids with high permittivity, even small 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.

References

1. N. Kuster, Q. Balzano, and J.C. Lin, Eds., *Mobile Communications Safety*, Chapman & Hall, London, 1997.
2. K. Meier, M. Burkhardt, T. Schmid, and N. Kuster, \Broadband calibration of E-field probes in lossy media", *IEEE Transactions on Microwave Theory and Techniques*, vol. 44, no. 10, pp. 1954{1962, Oct. 1996.
3. K. Jokela, P. Hyysalo, and L. Puranen, \Calibration of specific absorption rate (SAR) probes in waveguide at 900 MHz", *IEEE Transactions on Instrumentation and Measurements*, vol. 47, no. 2, pp. 432{438, Apr. 1998.

1.13 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.

1. Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the 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).
2. Occupational/Controlled limits apply when persons are exposed as a 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.
3. Limits for General Population/Uncontrolled exposure: 0.08 W/kg as 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 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.

2. Summary of Results

GPRS 850 (without power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
GPRS 850 (1D3UP)	Back side	10	128	824.2	29.9	28.47	39.00%	0.647	0.899	-
	Back side	10	190	836.6	29.9	28.26	45.88%	0.634	0.925	-
	Back side	10	251	848.8	29.9	28.45	39.64%	0.623	0.870	-
	Top side	10	128	824.2	29.9	28.47	39.00%	0.256	0.356	-
	Right side	0	128	824.2	29.9	28.47	39.00%	0.282	0.392	-
	Left side	0	128	824.2	29.9	28.47	39.00%	0.043	0.060	-

GPRS 850 (with power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
GPRS 850 (1D3UP)	Back side	0	128	824.2	25.4	24.44	24.74%	0.668	0.833	-
	Back side	0	190	836.6	25.4	24.25	30.32%	0.795	1.036	-
	Back side	0	251	848.8	25.4	24.43	25.03%	0.938	1.173	65
	Back side*	0	251	848.8	25.4	24.43	25.03%	0.923	1.154	-
	Top side	0	128	824.2	25.4	24.44	24.74%	0.284	0.354	-

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

GPRS 1900 (without power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
GPRS 1900 (1D3UP)	Back side	10	512	1850.2	26.9	25.81	28.53%	0.414	0.532	-
	Top side	10	512	1850.2	26.9	25.81	28.53%	0.369	0.474	-
	Right side	0	512	1850.2	26.9	25.81	28.53%	0.044	0.057	-
	Left side	0	512	1850.2	26.9	25.81	28.53%	0.003	0.004	-

GPRS 1900 (with power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
GPRS 1900 (1D3UP)	Back side	0	512	1850.2	23.9	22.78	29.42%	0.667	0.863	-
	Back side	0	661	1880	23.9	22.76	30.02%	0.715	0.930	-
	Back side	0	810	1909.8	23.9	22.77	29.72%	0.988	1.282	66
	Back side*	0	810	1909.8	23.9	22.77	29.72%	0.982	1.274	-
	Top side	0	512	1850.2	23.9	22.78	29.42%	0.698	0.903	-
	Top side	0	661	1880	23.9	22.76	30.02%	0.712	0.926	-
	Top side	0	810	1909.8	23.9	22.77	29.72%	0.734	0.952	-

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

WCDMA Band II (without power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
WCDMA Band II	Back side	10	9262	1852.4	24.5	23.67	21.06%	0.642	0.777	-
	Top side	10	9262	1852.4	24.5	23.67	21.06%	0.677	0.820	-
	Right side	0	9262	1852.4	24.5	23.67	21.06%	0.061	0.074	-
	Left side	0	9262	1852.4	24.5	23.67	21.06%	0.004	0.005	-

WCDMA Band II (with power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
WCDMA Band II	Back side	0	9262	1852.4	19	18.98	0.46%	1.160	1.165	-
	Back side	0	9400	1880.0	19	18.78	5.20%	1.180	1.241	-
	Back side	0	9538	1907.6	19	18.64	8.64%	1.290	1.401	67
	Back side*	0	9538	1907.6	19	18.64	8.64%	1.250	1.358	-
	Top side	0	9262	1852.4	19	18.98	0.46%	0.849	0.853	-
	Top side	0	9400	1880.0	19	18.78	5.20%	0.951	1.000	-
	Top side	0	9538	1907.6	19	18.64	8.64%	1.050	1.141	-

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

WCDMA Band V (without power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
WCDMA Band V	Back side	10	4183	836.6	24.5	23.10	38.04%	0.423	0.584	-
	Top side	10	4183	836.6	24.5	23.10	38.04%	0.160	0.221	-
	Right side	0	4183	836.6	24.5	23.10	38.04%	0.231	0.319	-
	Left side	0	4183	836.6	24.5	23.10	38.04%	0.043	0.060	-

WCDMA Band V (with power reduction)

Mode	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
								Measured	Reported	
WCDMA Band V	Back side	0	4132	826.4	20	19.71	6.91%	1.140	1.219	68
	Back side*	0	4132	826.4	20	19.71	6.91%	1.080	1.155	-
	Back side	0	4183	836.6	20	19.74	6.17%	0.853	0.906	-
	Back side	0	4233	846.6	20	19.60	9.65%	0.952	1.044	-
	Top side	0	4183	836.6	20	19.74	6.17%	0.253	0.269	-

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

In order to evaluate the simultaneous transmission SAR analysis based on the SAR data from both SAR reports(FCC ID: B94HNI07CWR2 & FCC ID: PD98265NG), we check the worst cases of WLAN SAR report in 2.4G and 5G respectively, such as the following shown.

WLAN SISO

Mode	Antenna	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg. Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
									Measured	Reported	
WLAN802.11b	Main	Back side	0	6	2437	17.50	17.48	0.46%	0.229	0.230	69
		Top side	0	6	2437	17.50	17.48	0.46%	0.108	0.108	70
		Left side	0	6	2437	17.50	17.48	0.46%	0.047	0.047	71
	Aux	Back side	0	6	2437	15.00	14.99	0.23%	0.599	0.600	-
		Top side	0	6	2437	15.00	14.99	0.23%	0.221	0.222	72
Bluetooth (GFSK)	Aux	Back side	0	78	2480	11.50	10.50	25.89%	0.185	0.233	-
		Top side	0	39	2480	11.50	10.50	25.89%	0.033	0.041	-
WLAN802.11n(40M) 5.3G	Main	Back side	0	54	5270	13.50	13.48	0.46%	0.676	0.679	-
WLAN802.11ac(80M) 5.6G		Top side	0	122	5610	13.50	13.47	0.69%	1.150	1.158	-
WLAN802.11n(40M) 5.3G		Left side	0	54	5270	13.50	13.48	0.46%	0.030	0.030	-
WLAN802.11ac(80M) 5.6G	Aux	Back side	0	122	5610	14.50	14.47	0.69%	0.556	0.560	-
WLAN802.11ac(80M) 5.6G		Top side	0	124	5620	14.50	14.47	0.69%	0.783	0.788	-

3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

NO.	Simultaneous Transmit Configurations	Body
1	GPRS/EDGE + 2.4GHz WLAN Main / 2.4GHz WLAN Aux / 2.4GHz MIMO	YES
2	GPRS/EDGE + 5GHz WLAN Main / 5GHz WLAN Aux / 5GHz MIMO	YES
3	GPRS/EDGE + BT	YES
4	GPRS/EDGE + 2.4/5GHz WLAN Main + BT	YES
5	GPRS/EDGE + 5GHz MIMO + BT	YES
6	UMTS + 2.4GHz WLAN Main / 2.4GHz WLAN Aux / 2.4GHz MIMO	YES
7	UMTS + 5GHz WLAN Main / 5GHz WLAN Aux / 5GHz MIMO	YES
8	UMTS + BT	YES
9	UMTS + 2.4/5GHz WLAN Main + BT	YES
10	UMTS + 5GHz MIMO + BT	YES

Note :
1) WWAN and WLAN may transmit simultaneously.
2) Bluetooth and WLAN Aux share the same antenna path.
3) Bluetooth can transmit with WLAN Main simultaneously.
4) Bluetooth can transmit with 5GHz WLAN Main and 5GHz WLAN Aux simultaneously.

3.1 Estimated SAR calculation

According to KDB447498 D01 – 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:

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

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.

Mode / Band	Test position	test separation distance(mm)	Estimated SAR(W/kg)
WLAN Aux 2.4 / 5G	right / left	> 50mm	0.4
WLAN Main 2.4 / 5G	right	> 50mm	0.4
BT	right / left	> 50mm	0.4

Max highest reported 1-g SAR (0mm) and estimated SAR for WWAN & WLAN

Antenna	Band	Highest Reported 1-g SAR (0mm) [W/kg]			
		Back	Top	Right	Left
WLAN Main	2.4GHz	0.230	0.108	0.400	0.047
	5GHz	0.690	1.200	0.400	0.080
WLAN Aux	2.4GHz	0.600	0.222	0.400	0.400
	5GHz	1.160	0.940	0.400	0.400
	BT	0.290	0.060	0.400	0.400
WWAN	GPRS 850	1.173	0.354	0.392	0.060
	GPRS 1900	1.282	0.952	0.057	0.004
	WCDMA Band II	1.290	1.050	0.074	0.005
	WCDMA Band V	1.219	0.269	0.319	0.060

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 ≤ 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

Sum of the SAR for GPRS 850 + WLAN + Bluetooth

No.	Test Position	Simultaneous Transmission Scenario						Σ SAR 1g (W/kg)	SPLSR (Yes/No)	Figure
		GPRS 850	2.4GHz		5GHz		Bluetooth			
			Main	Aux	Main	Aux				
1~5	Back side	1.173	0.230	0.730	-	-	-	2.133	Yes	1
		1.173	0.230	-	-	-	0.290	1.693	Yes	2
		1.173	-	-	0.690	-	0.290	2.153	Yes	3
		1.173	-	-	0.690	1.160	0.290	3.313	Yes	4
	Top side	0.354	0.108	0.222	-	-	-	0.684	No	-
		0.354	0.108	-	-	-	0.060	0.522	No	-
		0.354	-	-	1.200	-	0.060	1.614	Yes	5
		0.354	-	-	1.200	0.940	0.060	2.554	Yes	6
	Right side	0.392	0.400	0.400	-	-	-	1.192	No	-
		0.392	0.400	-	-	-	0.400	1.192	No	-
		0.392	-	-	0.400	-	0.400	1.192	No	-
		0.392	-	-	0.400	0.400	0.400	1.592	No	-
	Left side	0.060	0.047	0.400	-	-	-	0.507	No	-
		0.060	0.047	-	-	-	0.400	0.507	No	-
		0.060	-	-	0.080	-	0.400	0.540	No	-
		0.060	-	-	0.400	0.400	0.400	1.260	No	-

Sum of the SAR for GPRS 1900 + WLAN + Bluetooth

No.	Test Position	Simultaneous Transmission Scenario						Σ SAR 1g (W/kg)	SPLSR (Yes/No)	Figure
		GPRS 1900	2.4GHz		5GHz		Bluetooth			
			Main	Aux	Main	Aux				
1~5	Back side	1.282	0.230	0.730	-	-	-	2.242	Yes	7
		1.282	0.230	-	-	-	0.290	1.802	Yes	8
		1.282	-	-	0.690	-	0.290	2.262	Yes	9
		1.282	-	-	0.690	1.160	0.290	3.422	Yes	10
	Top side	0.952	0.108	0.222	-	-	-	1.282	No	-
		0.952	0.108	-	-	-	0.060	1.120	No	-
		0.952	-	-	1.200	-	0.060	2.212	Yes	11
		0.952	-	-	1.200	0.940	0.060	3.152	Yes	12
	Right side	0.057	0.400	0.400	-	-	-	0.857	No	-
		0.057	0.400	-	-	-	0.400	0.857	No	-
		0.057	-	-	0.400	-	0.400	0.857	No	-
		0.057	-	-	0.400	0.400	0.400	1.257	No	-
	Left side	0.004	0.047	0.400	-	-	-	0.451	No	-
		0.004	0.047	-	-	-	0.400	0.451	No	-
		0.004	-	-	0.080	-	0.400	0.484	No	-
		0.004	-	-	0.400	0.400	0.400	1.204	No	-

Sum of the SAR for WCDMA Band II + WLAN + Bluetooth

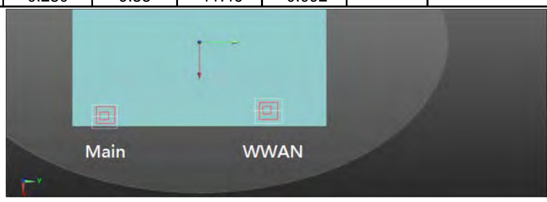
No.	Test Position	Simultaneous Transmission Scenario						Σ SAR 1g (W/kg)	SPLSR (Yes/No)	Figure
		WCDMA Band II	2.4GHz		5GHz		Bluetooth			
			Main	Aux	Main	Aux				
6~10	Back side	1.290	0.230	0.730	-	-	-	2.250	Yes	13
		1.290	0.230	-	-	-	0.290	1.810	Yes	14
		1.290	-	-	0.690	-	0.290	2.270	Yes	15
		1.290	-	-	0.690	1.160	0.290	3.430	Yes	16
	Top side	1.050	0.108	0.222	-	-	-	1.380	No	-
		1.050	0.108	-	-	-	0.060	1.218	No	-
		1.050	-	-	1.200	-	0.060	2.310	Yes	17
		1.050	-	-	1.200	0.940	0.060	3.250	Yes	18
	Right side	0.074	0.400	0.400	-	-	-	0.874	No	-
		0.074	0.400	-	-	-	0.400	0.874	No	-
		0.074	-	-	0.400	-	0.400	0.874	No	-
		0.074	-	-	0.400	0.400	0.400	1.274	No	-
	Left side	0.005	0.047	0.400	-	-	-	0.452	No	-
		0.005	0.047	-	-	-	0.400	0.452	No	-
		0.005	-	-	0.080	-	0.400	0.485	No	-
		0.005	-	-	0.400	0.400	0.400	1.205	No	-

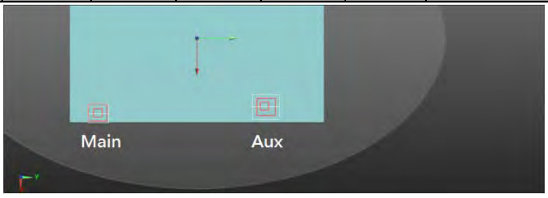
Sum of the SAR for WCDMA Band V + WLAN + Bluetooth

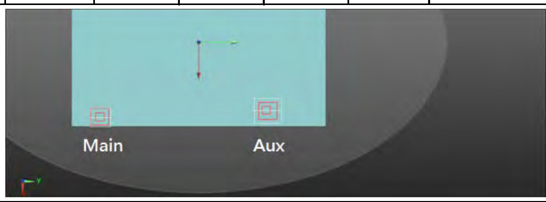
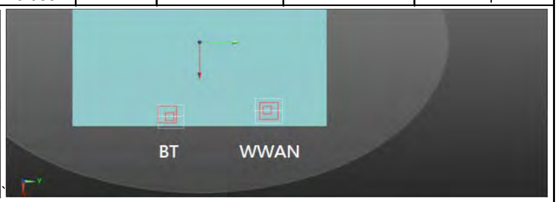
No.	Test Position	Simultaneous Transmission Scenario						Σ SAR 1g (W/kg)	SPLSR (Yes/No)	Figure
		WCDMA Band V	2.4GHz		5GHz		Bluetooth			
			Main	Aux	Main	Aux				
6~10	Back side	1.219	0.230	0.730	-	-	-	2.179	No	19
		1.219	0.230	-	-	-	0.290	1.739	No	20
		1.219	-	-	0.690	-	0.290	2.199	No	21
		1.219	-	-	0.690	1.160	0.290	3.359	Yes	22
	Top side	0.269	0.108	0.222	-	-	-	0.599	No	-
		0.269	0.108	-	-	-	0.060	0.437	No	-
		0.269	-	-	1.200	-	0.060	1.529	No	-
		0.269	-	-	1.200	0.940	0.060	2.469	Yes	23
	Right side	0.319	0.400	0.400	-	-	-	1.119	No	-
		0.319	0.400	-	-	-	0.400	1.119	No	-
		0.319	-	-	0.400	-	0.400	1.119	No	-
		0.319	-	-	0.400	0.400	0.400	1.519	No	-
	Left side	0.060	0.047	0.400	-	-	-	0.507	No	-
		0.060	0.047	-	-	-	0.400	0.507	No	-
		0.060	-	-	0.080	-	0.400	0.540	No	-
		0.060	-	-	0.400	0.400	0.400	1.260	No	-

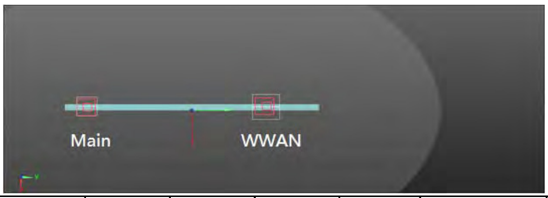
Figures

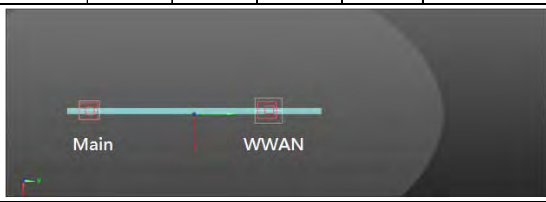
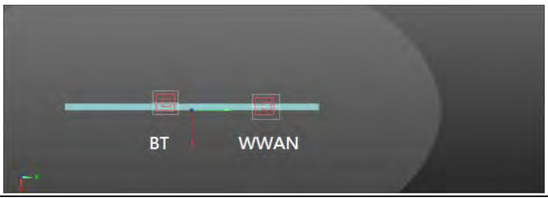
Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
1	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.403	19.31	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				
										
	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.903	11.45	0.023	SPLSR<0.04, Not required
	2.4GHz Aux		0.730	9.24	-3.6	-0.11				
										

Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
2	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.403	19.31	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				
										
	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.463	11.33	0.016	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				
										

Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
3	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.863	19.70	0.013	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				
										
	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.463	11.33	0.016	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				
										

Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
4	GPRS 850	Back side	1.173	8.59	7.83	-0.201	1.863	19.70	0.013	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				
										
	GPRS 850	Back side	1.173	8.59	7.83	-0.201	2.623	11.33	0.038	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.450	9.48	-3.46	-0.085				
	 									

Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
5	GPRS 850	Top side	0.354	-0.45	9.23	-0.371	1.554	21.71	0.009	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				
										
	GPRS 850	Top side	0.354	-0.45	9.23	-0.371	0.414	12.36	0.002	SPLSR<0.04, Not required
	Bluetooth		0.060	-0.98	-3.12	-0.242				
										

Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
6	GPRS 850	Top side	0.354	-0.45	9.23	-0.371	1.554	21.71	0.009	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				
										
	GPRS 850	Top side	0.354	-0.45	9.23	-0.371	1.354	12.36	0.013	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.000	-0.98	-3.12	-0.242				
										

Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
7	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	1.512	20.04	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				

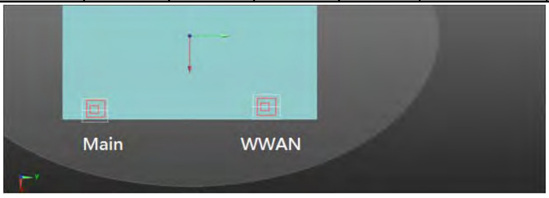
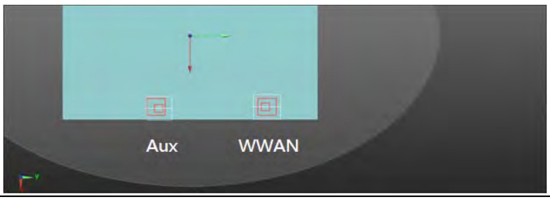


Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
7	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	2.012	12.18	0.023	SPLSR<0.04, Not required
	2.4GHz Aux		0.730	9.24	-3.6	-0.11				



Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
8	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	1.512	20.04	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				

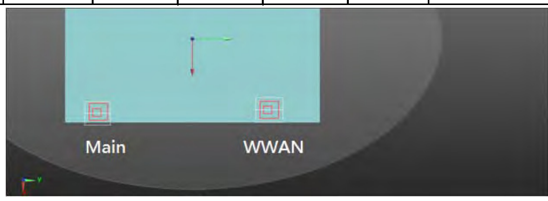
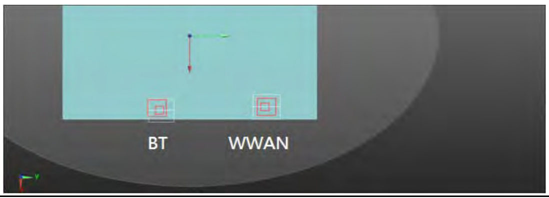


Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
8	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	1.572	12.04	0.016	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				



Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
9	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	1.972	20.42	0.014	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				

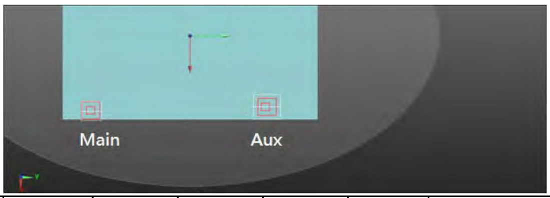


Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
9	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	1.572	12.04	0.016	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				

Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
10	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	1.972	20.42	0.014	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				

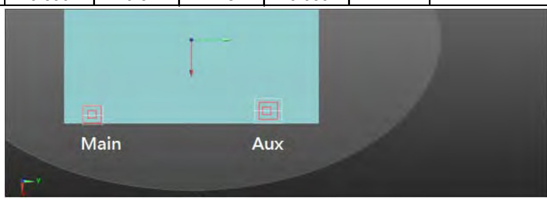
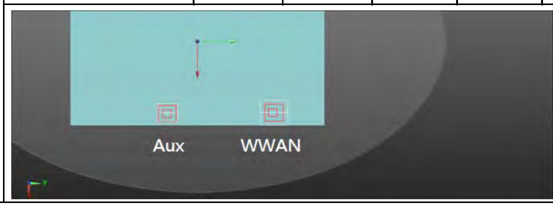
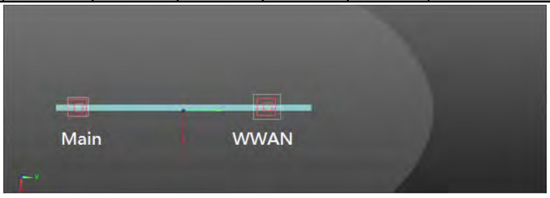


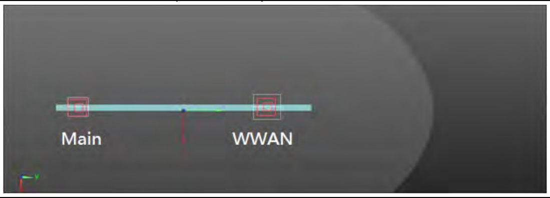
Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
10	GPRS 1900	Back side	1.282	8.89	8.57	-0.058	2.732	12.04	0.037	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.450	9.48	-3.46	-0.085				

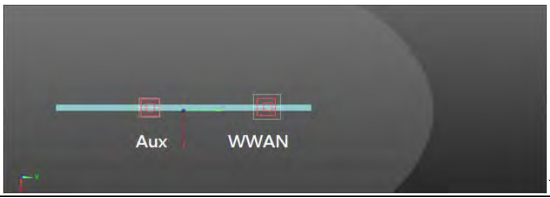


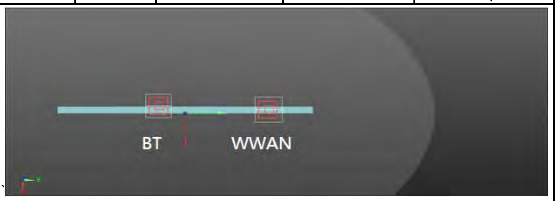
Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
11	GPRS 1900	Top side	0.952	-0.5	9.8	-0.253	2.152	22.28	0.014	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				
	GPRS 1900	Top side	0.952	-0.5	9.8	-0.253	1.012	12.93	0.008	SPLSR<0.04, Not required
	Bluetooth		0.060	-0.98	-3.12	-0.242				



Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
12	GPRS 1900	Top side	0.952	-0.5	9.8	-0.253	2.152	22.28	0.014	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				
	GPRS 1900	Top side	0.952	-0.5	9.8	-0.253	1.952	12.93	0.021	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.000	-0.98	-3.12	-0.242				

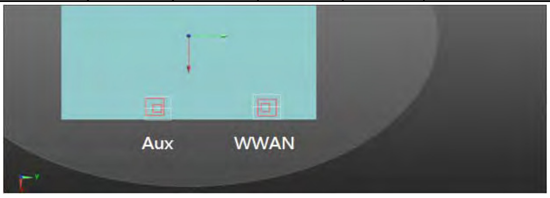






Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
13	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	1.520	20.18	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				

Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
13	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	2.020	12.32	0.023	SPLSR<0.04, Not required
	2.4GHz Aux		0.730	9.24	-3.6	-0.11				



Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
14	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	1.520	20.18	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				

Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
14	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	1.580	12.19	0.016	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				

Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
15	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	1.980	20.57	0.014	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				

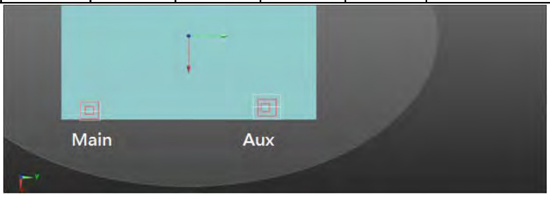
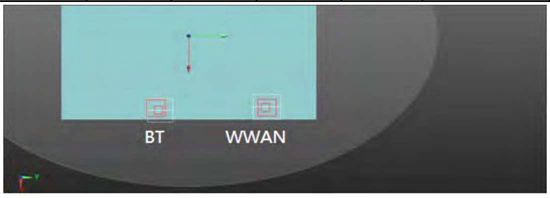


Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
15	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	1.580	12.19	0.016	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				



Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
16	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	1.980	20.57	0.014	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				

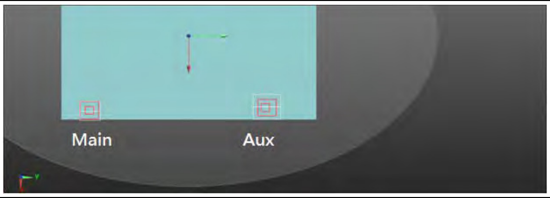


Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
16	WCDMA Band II	Back side	1.290	9.05	8.72	-0.121	2.740	12.19	0.037	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.450	9.48	-3.46	-0.085				

Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
17	WCDMA Band II	Top side	1.050	-0.4	9.58	-0.277	2.250	22.06	0.015	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				

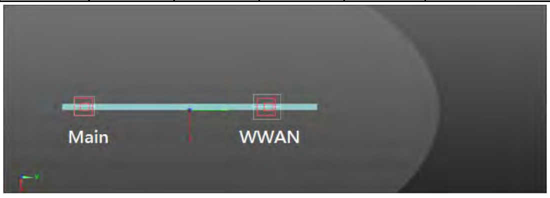
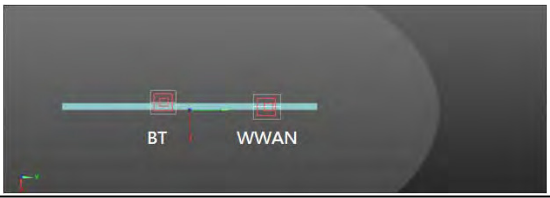


Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
17	WCDMA Band II	Top side	1.050	-0.4	9.58	-0.277	1.110	12.71	0.009	SPLSR<0.04, Not required
	Bluetooth		0.060	-0.98	-3.12	-0.242				



Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
18	WCDMA Band II	Top side	1.050	-0.4	9.58	-0.277	2.250	22.06	0.015	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				

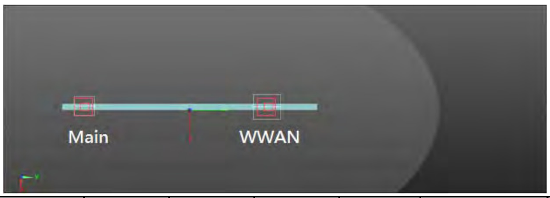
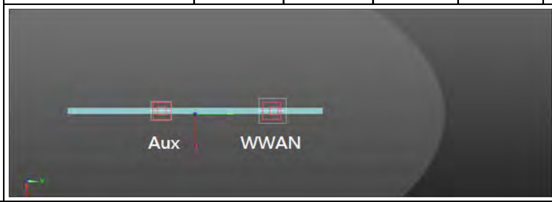
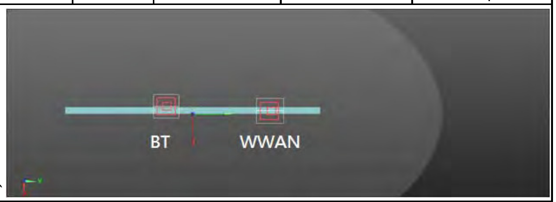
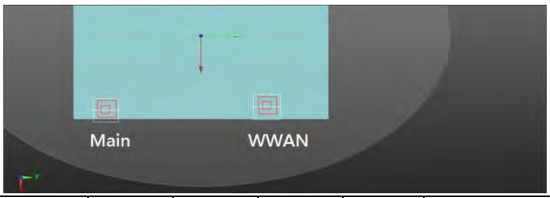
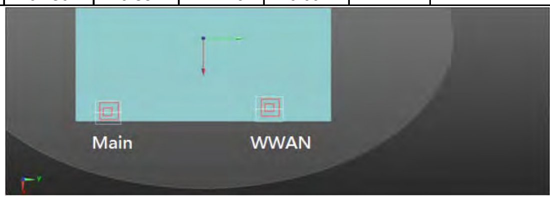
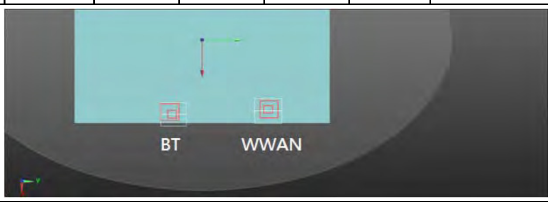


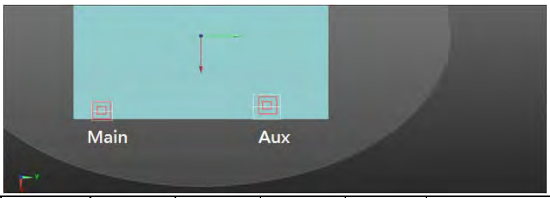
Figure	Conditions	Position	SAR Value (W/kg)	x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
18	WCDMA Band II	Top side	1.050	-0.4	9.58	-0.277	2.050	12.71	0.023	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.000	-0.98	-3.12	-0.242				

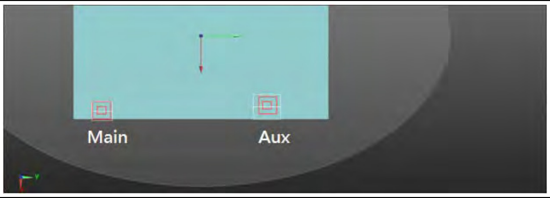
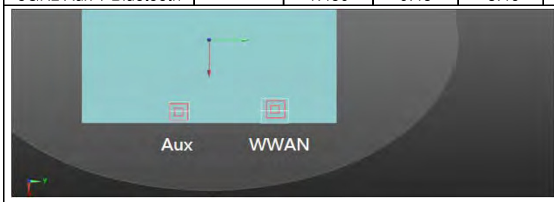
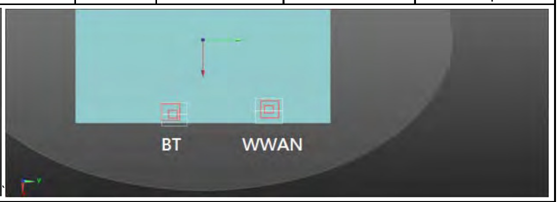


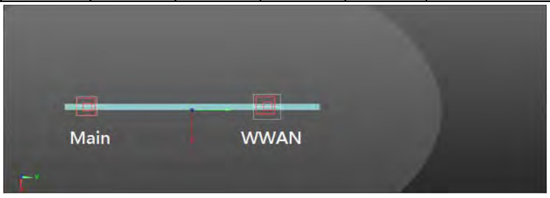
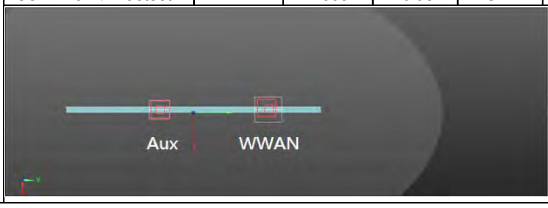


Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
19	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.449	19.22	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				
										
	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.949	11.36	0.024	SPLSR<0.04, Not required
	2.4GHz Aux		0.730	9.24	-3.6	-0.11				
										

Simultaneous Transmission Scenario				WWAN+Main+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
20	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.449	19.22	0.009	SPLSR<0.04, Not required
	2.4GHz Main		0.230	9.38	-11.46	-0.092				
										
	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.509	11.23	0.017	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				
										

Simultaneous Transmission Scenario				WWAN+Main+Aux						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
21	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.909	19.60	0.013	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				
										
	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.509	11.23	0.017	SPLSR<0.04, Not required
	Bluetooth		0.290	9.48	-3.46	-0.085				
										

Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
22	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	1.909	19.60	0.013	SPLSR<0.04, Not required
	5GHz Main		0.690	9.6	-11.84	-0.069				
										
	WCDMA Band V	Back side	1.219	8.89	7.75	-0.086	2.669	11.23	0.039	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.450	9.48	-3.46	-0.085				
	 									

Simultaneous Transmission Scenario				WWAN+Main+Aux+BT						
Figure	Conditions	Position	SAR Value (W/kg)	Coordinates (cm) x	y	z	ΣSAR (W/kg)	Peak Location Separation Distance (cm)	SPLSR	Result
23	WCDMA Band V	Top side	0.269	-0.56	8.96	-0.375	1.469	21.44	0.008	SPLSR<0.04, Not required
	5GHz Main		1.200	-0.26	-12.48	-0.244				
										
	WCDMA Band V	Top side	0.269	-0.56	8.96	-0.375	1.269	12.09	0.012	SPLSR<0.04, Not required
	5GHz Aux + Bluetooth		1.000	-0.98	-3.12	-0.242				
										

4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3770	Apr.27,2016	Apr.26,2017
Schmid & Partner Engineering AG	System Validation Dipole	D835V2	4d063	Aug.25,2016	Aug.24,2017
		D1900V2	5d027	Apr.25,2016	Apr.24,2017
		D2450V2	727	Apr.19,2016	Apr.18,2017
		D5GHzV2	1040	Jun.17,2016	Jun.16,2017
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	856	Apr.21,2016	Apr.20,2017
Schmid & Partner Engineering AG	Software	DASY 52 V52.8.8	N/A	Calibration not required	Calibration not required
Schmid & Partner Engineering AG	Phantom	ELI	N/A	Calibration not required	Calibration not required
Schmid & Partner Engineering AG	Vector Network Analyzer and Vector Reflect meter	DAKS VNA R140	0170813	Mar.23,2016	Mar.22,2017
Schmid & Partner Engineering AG	Dielectric Probe Kit	DAKS-3.5	0004	Mar.23,2016	Mar.22,2017
Agilent	Dual-directional coupler	772D	MY46151242	Jul.11,2016	Jul.10,2017
		778D	MY48220468	Jul.06,2016	Jul.05,2017
Agilent	RF Signal Generator	N5181A	MY50145142	Feb.19,2016	Feb.18,2017
Agilent	Power Meter	E4417A	MY52240003	Oct.17,2016	Oct.16,2017

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
Agilent	Power Sensor	E9301H	MY52200003	Oct.17,2016	Oct.16,2017
			MY52200004	Oct.17,2016	Oct.16,2017
TECPEL	Digital thermometer	DTM-303A	TP130073	Feb.26,2016	Feb.25,2017
Anritsu	Radio Communication Test	MT8820C	6201061049	Apr.08,2016	Apr.07,2017

5. Measurements

Date: 2016/12/9

GPRS 850_Body_Back side_CH 251_0mm

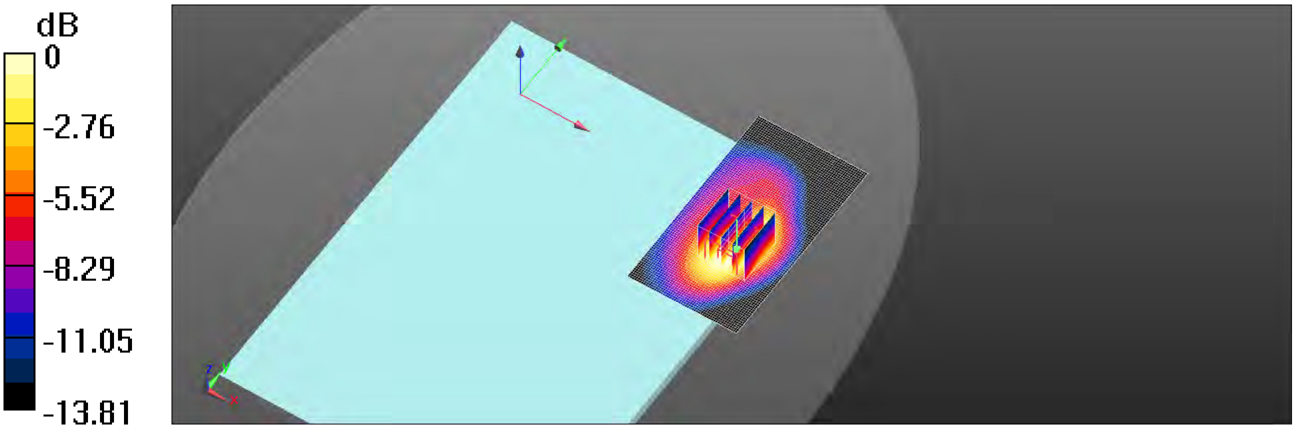
Communication System: GPRS (1Dn3Up); Frequency: 848.8 MHz; Duty Cycle: 1:2.76
Medium parameters used: f = 849 MHz; σ = 1.011 S/m; ε_r = 57.254; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.2°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.3, 9.3, 9.3); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x91x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.28 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.657 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.938 W/kg; SAR(10 g) = 0.551 W/kg
Maximum value of SAR (measured) = 1.23 W/kg



0 dB = 1.23 W/kg = 0.90 dBW/kg

Date: 2016/12/6

GPRS 1900_Body_Back side_CH 810_0mm

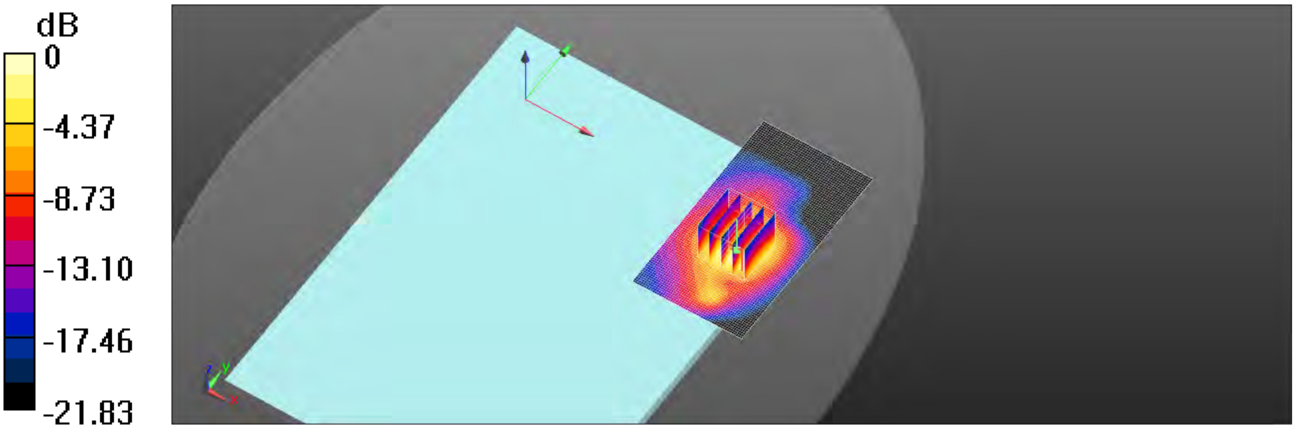
Communication System: GPRS (1Dn3Up); Frequency: 1909.8 MHz; Duty Cycle: 1:2.76
Medium parameters used: f = 1910 MHz; σ = 1.593 S/m; ε_r = 53.135; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.71, 7.71, 7.71); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x91x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.30 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.476 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.94 W/kg
SAR(1 g) = 0.988 W/kg; SAR(10 g) = 0.480 W/kg
Maximum value of SAR (measured) = 1.52 W/kg



0 dB = 1.52 W/kg = 1.82 dBW/kg

Date: 2016/12/6

WCDMA Band II_Body_Back side_CH 9538_0mm

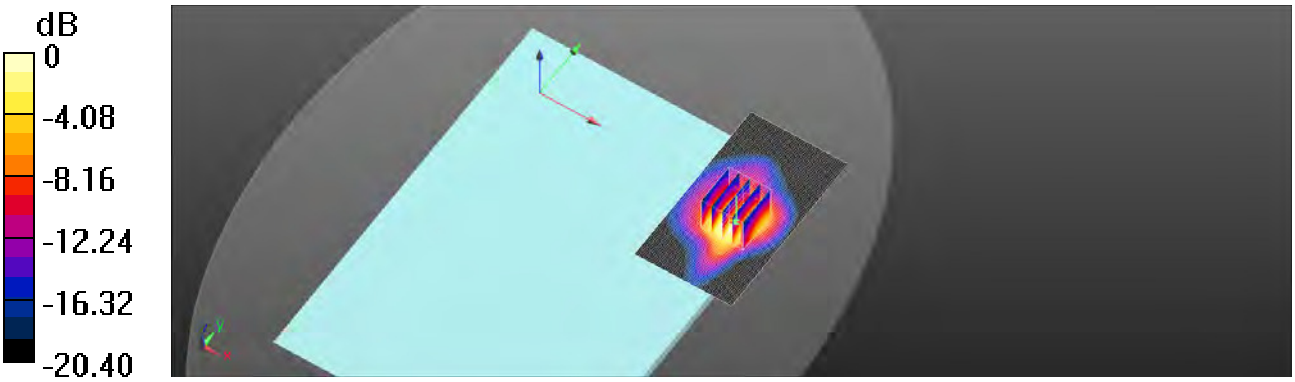
Communication System: WCDMA; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1908 MHz; σ = 1.594 S/m; ε_r = 53.14; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.71, 7.71, 7.71); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x91x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 2.31 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.562 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.65 W/kg
SAR(1 g) = 1.29 W/kg; SAR(10 g) = 0.633 W/kg
Maximum value of SAR (measured) = 1.79 W/kg



0 dB = 1.79 W/kg = 2.53 dBW/kg

Date: 2016/12/9

WCDMA Band V_Body_Back side_CH 4132_0mm

Communication System: WCDMA; Frequency: 826.4 MHz; Duty Cycle: 1:1
Medium parameters used: f = 826.4 MHz; σ = 0.991 S/m; ε_r = 57.485; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.2°C; Liquid temperature: 21.9°C

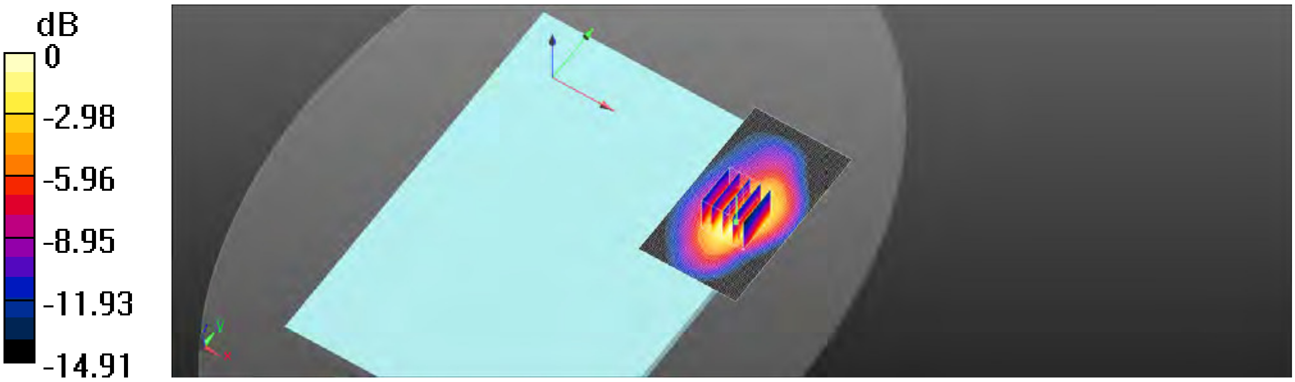
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.3, 9.3, 9.3); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x91x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.42 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.161 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.92 W/kg
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.655 W/kg
Maximum value of SAR (measured) = 1.53 W/kg



0 dB = 1.53 W/kg = 1.85 dBW/kg

Date: 2017/2/8

WLAN 802.11b_Body_Back side_CH 6_Main_0mm

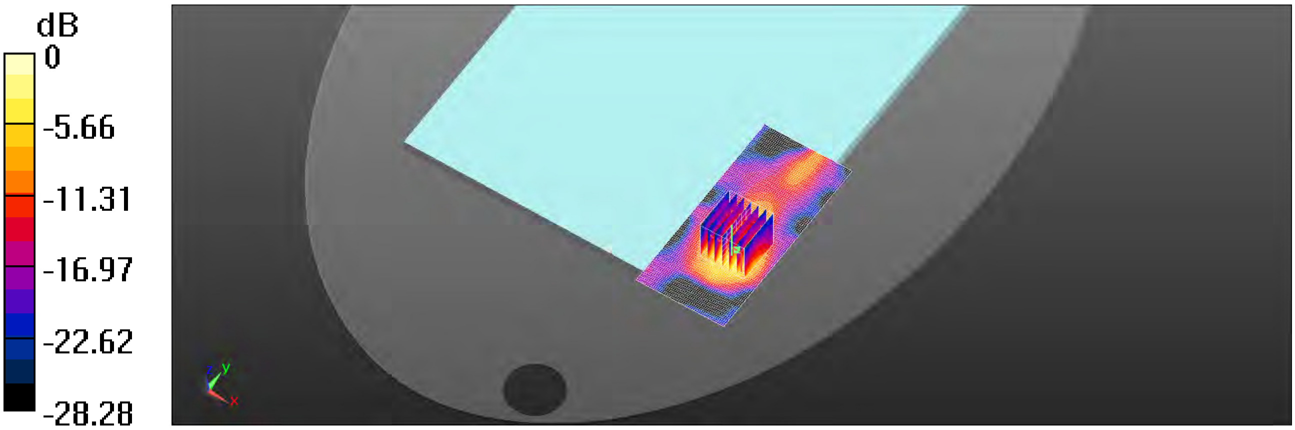
Communication System: WLAN 2.4G; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.988 S/m; εr = 51.637; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.37, 7.37, 7.37); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x111x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.387 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.895 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.595 W/kg
SAR(1 g) = 0.229 W/kg; SAR(10 g) = 0.088 W/kg
Maximum value of SAR (measured) = 0.364 W/kg



0 dB = 0.364 W/kg = -4.39 dBW/kg

Date: 2017/2/8

WLAN 802.11b_Body_Top side_CH 6_Main_0mm

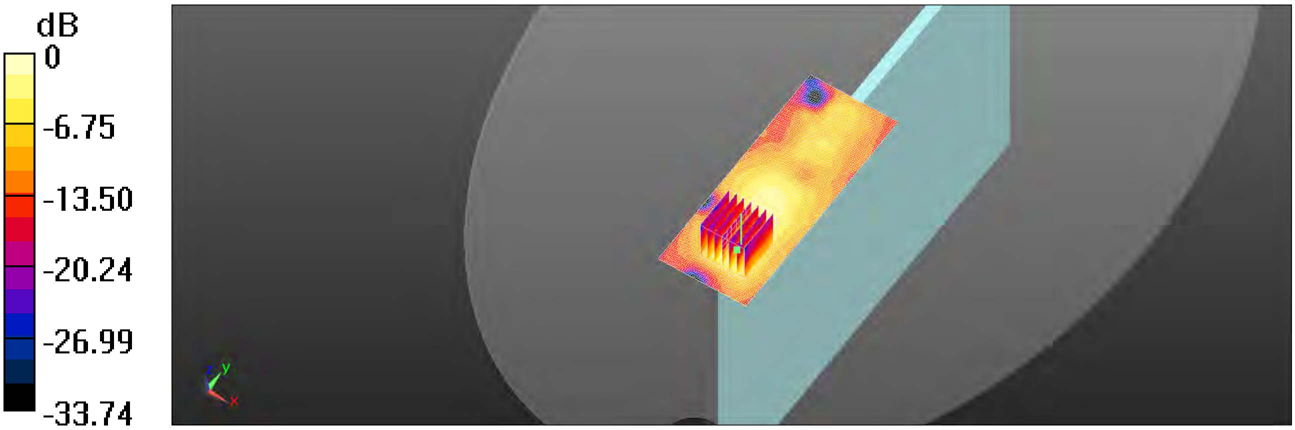
Communication System: WLAN 2.4G; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.988 S/m; εr = 51.637; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.37, 7.37, 7.37); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x131x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.187 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.225 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.240 W/kg
SAR(1 g) = 0.108 W/kg; SAR(10 g) = 0.047 W/kg
Maximum value of SAR (measured) = 0.179 W/kg



0 dB = 0.179 W/kg = -7.47 dBW/kg

Date: 2017/2/8

WLAN 802.11b_Body_Left side_CH 6_Main_0mm

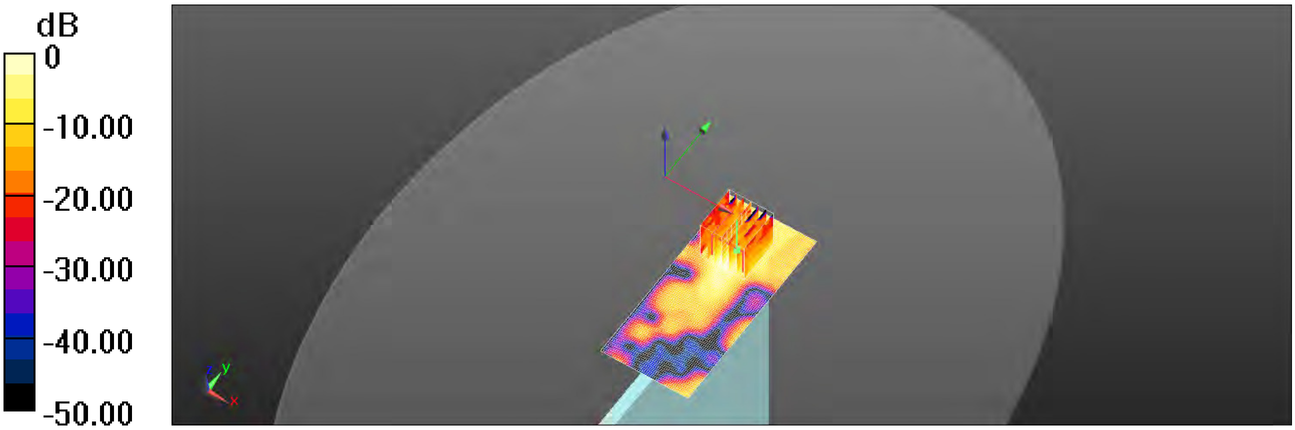
Communication System: WLAN 2.4G; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.988 S/m; εr = 51.637; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.37, 7.37, 7.37); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x111x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.0745 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.824 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.124 W/kg
SAR(1 g) = 0.047 W/kg; SAR(10 g) = 0.017 W/kg
Maximum value of SAR (measured) = 0.0797 W/kg



0 dB = 0.0797 W/kg = -10.99 dBW/kg

Date: 2017/2/8

WLAN 802.11b_Body_Top side_CH 6_Aux_0mm

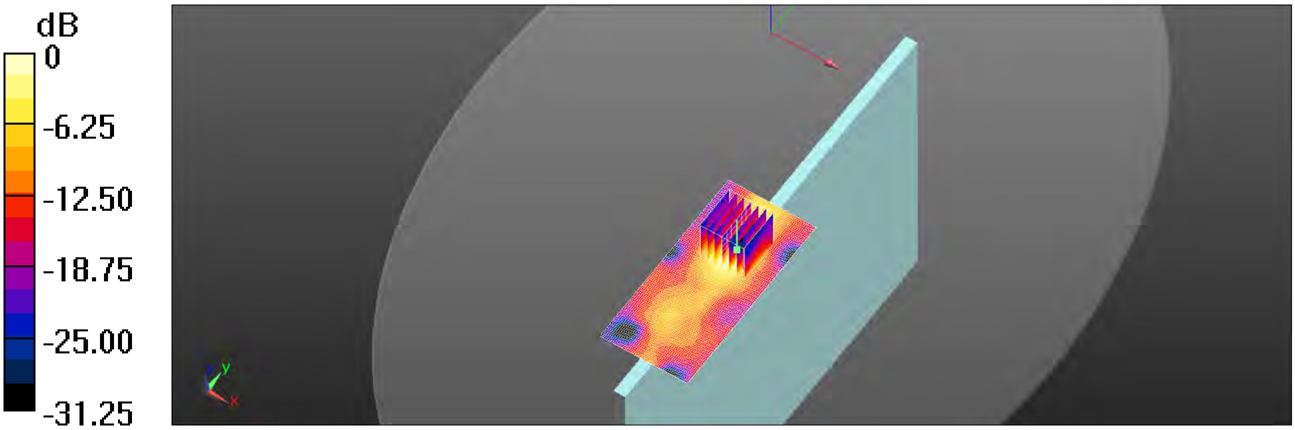
Communication System: WLAN 2.45G; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.988 S/m; εr = 51.637; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.37, 7.37, 7.37); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Body/Area Scan (51x111x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.380 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.362 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.586 W/kg
SAR(1 g) = 0.221 W/kg; SAR(10 g) = 0.082 W/kg
Maximum value of SAR (measured) = 0.402 W/kg



0 dB = 0.402 W/kg = -3.96 dBW/kg

6. SAR System Performance Verification

Date: 2016/12/9

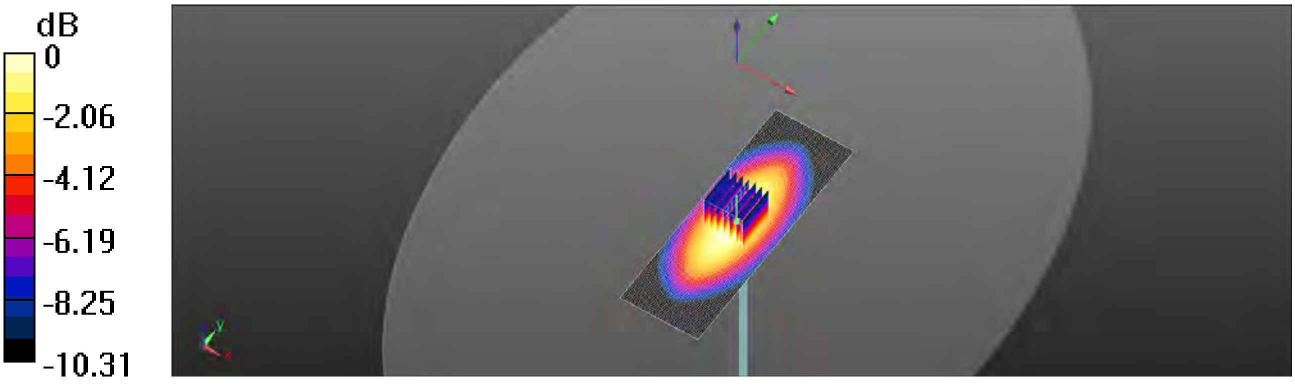
Dipole 835 MHz_SN:4d063
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 1 S/m; ε_r = 57.392; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.2°C; Liquid temperature: 21.9°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.3, 9.3, 9.3); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=250mW/Area Scan (41x121x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.02 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.06 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.55 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.02 W/kg



0 dB = 3.02 W/kg = 4.80 dBW/kg

Date: 2016/12/6

Dipole 1900 MHz_SN:5d027

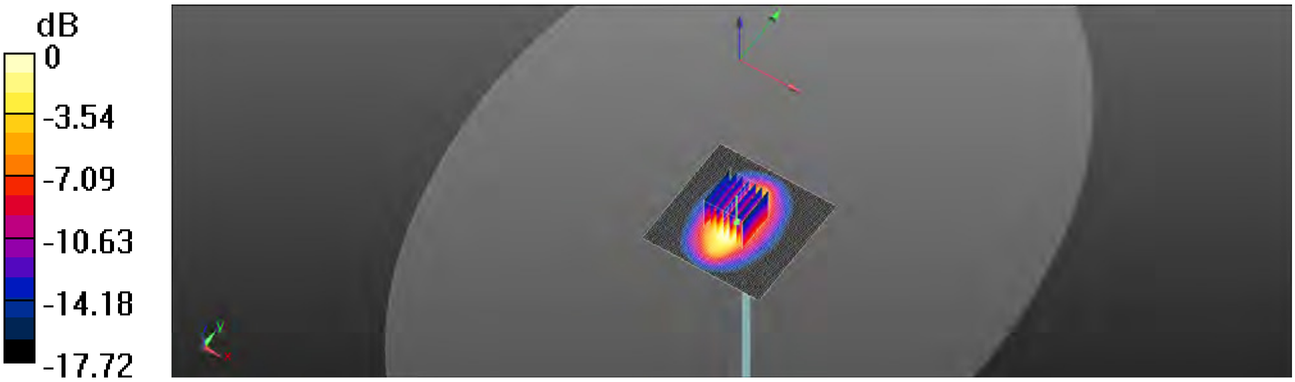
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.584 S/m; ε_r = 53.166; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 21.8°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.71, 7.71, 7.71); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.09 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 18.6 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.21 W/kg
Maximum value of SAR (measured) = 14.6 W/kg



0 dB = 14.6 W/kg = 11.64 dBW/kg

Date: 2017/2/8

Dipole 2450 MHz_SN:727

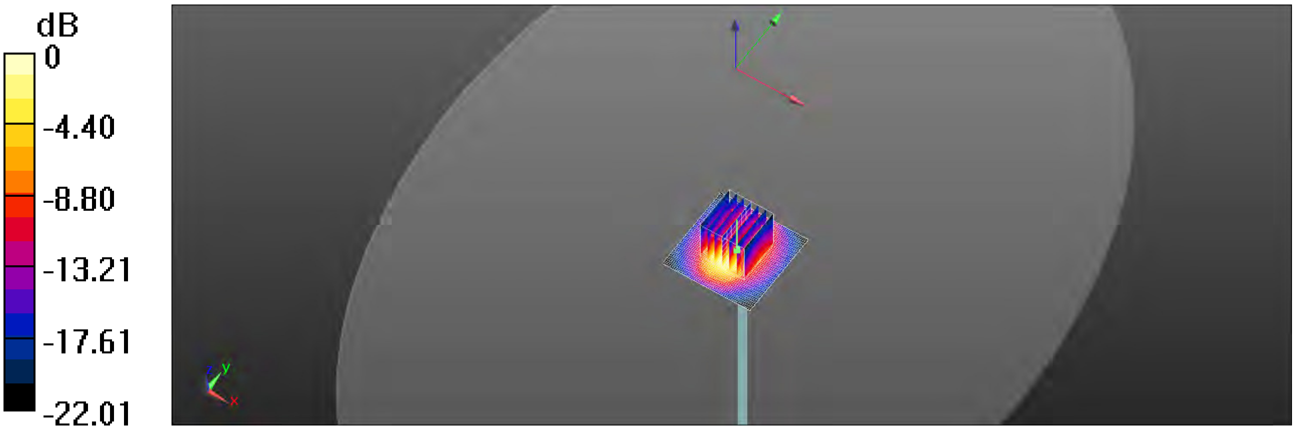
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.003 S/m; ε_r = 51.614; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 21.9°C; Liquid temperature: 22.2°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.37, 7.37, 7.37); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=250mW/Area Scan (51x51x1): Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 21.6 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.3 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 5.93 W/kg
Maximum value of SAR (measured) = 20.1 W/kg



0 dB = 20.1 W/kg = 13.03 dBW/kg

Date: 2017/2/8

Dipole 5300 MHz_SN:1040

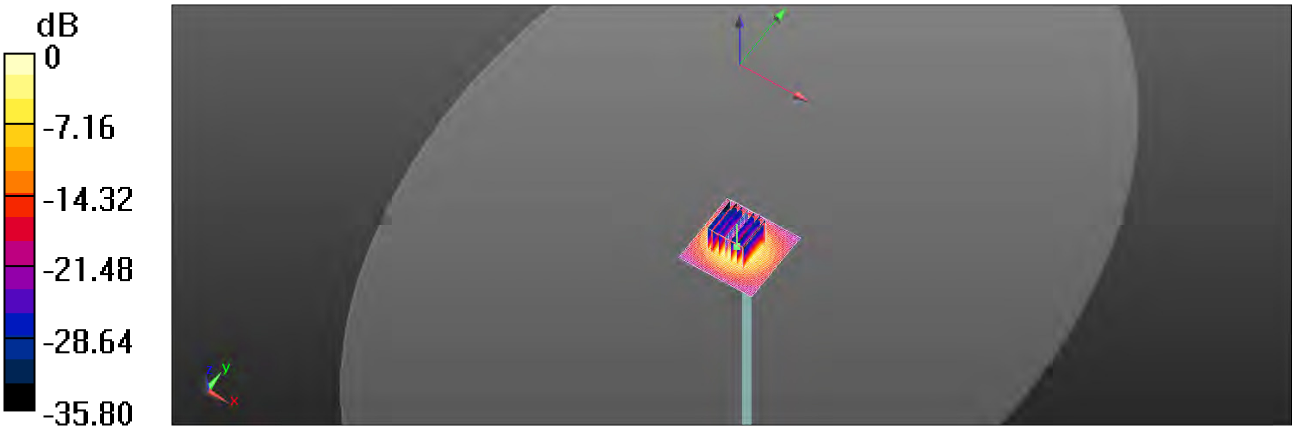
Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 5.607 S/m; ε_r = 47.577; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(4.34, 4.34, 4.34); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 17.0 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 59.64 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 35.1 W/kg
SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



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

Date: 2017/2/8

Dipole 5600 MHz_SN:1040

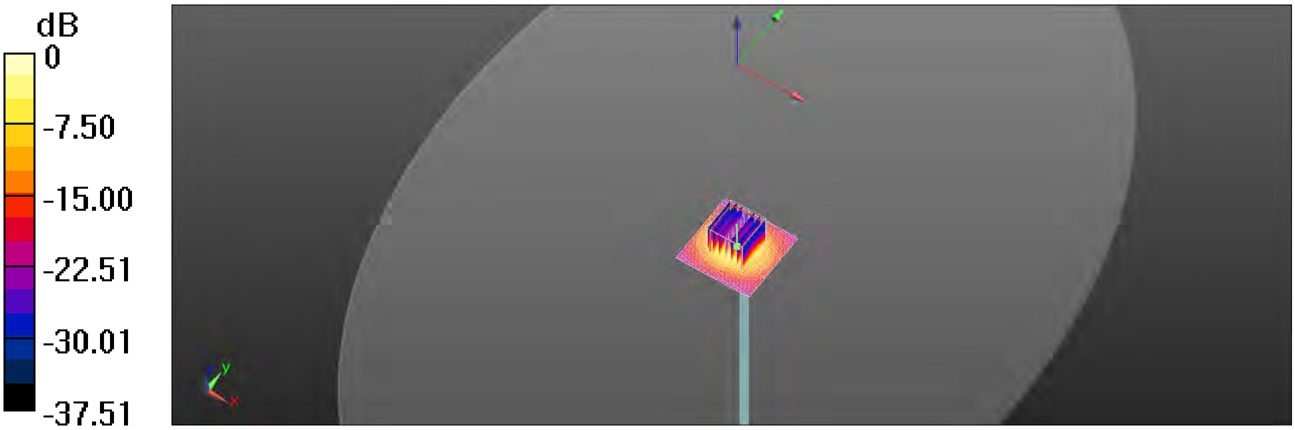
Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 6.002 S/m; ε_r = 46.582; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient temperature: 22.1°C; Liquid temperature: 22.3°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(3.7, 3.7, 3.7); Calibrated: 2016/4/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 2016/4/21
- Phantom: Body
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

Configuration/Pin=100mW/Area Scan (51x51x1): Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.1 W/kg

Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.52 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 36.5 W/kg
SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.6 W/kg = 12.70 dBW/kg

7. DAE & Probe Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 0108

Client SGS-TW (Auden)

Certificate No: DAE4-856_Apr16

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BM - SN: 856

Calibration procedure(s): QA CAL-06.v29
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: April 21, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	09-Sep-15 (No:17153)	Sep-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	05-Jan-16 (in house check)	In house check: Jan-17
Calibrator Box V2.1	SE UMS 006 AA 1002	05-Jan-16 (in house check)	In house check: Jan-17

	Name	Function	Signature
Calibrated by:	R Mayoraz	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: April 21, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-856_Apr16 Page 1 of 5

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Schmid & Partner
Engineering AG
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Accreditation No.: **SCS 0108**

Glossary

DAE	data acquisition electronics
Connector angle	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.
- *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 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.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1µV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	403.450 ± 0.02% (k=2)	404.571 ± 0.02% (k=2)	403.888 ± 0.02% (k=2)
Low Range	3.97641 ± 1.50% (k=2)	3.97912 ± 1.50% (k=2)	3.97796 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	52.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199996.11	0.91	0.00
Channel X	+ Input	19999.18	-2.34	-0.01
Channel X	- Input	-19999.41	1.06	-0.01
Channel Y	+ Input	199997.66	2.51	0.00
Channel Y	+ Input	19996.64	-2.84	-0.01
Channel Y	- Input	-20002.21	-1.65	0.01
Channel Z	+ Input	199995.99	0.62	0.00
Channel Z	+ Input	19999.35	-2.13	-0.01
Channel Z	- Input	-20002.57	-1.88	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.59	0.10	0.01
Channel X	+ Input	202.26	0.40	0.20
Channel X	- Input	-197.29	0.76	-0.38
Channel Y	+ Input	2001.59	0.10	0.00
Channel Y	+ Input	200.68	-1.06	-0.52
Channel Y	- Input	-199.46	-1.39	0.70
Channel Z	+ Input	2001.75	0.26	0.01
Channel Z	+ Input	201.40	-0.39	-0.19
Channel Z	- Input	-198.94	-0.69	0.35

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	-14.19	-16.06
	- 200	18.03	16.49
Channel Y	200	-2.43	-2.73
	- 200	0.85	0.06
Channel Z	200	10.84	10.76
	- 200	-12.44	-12.80

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.98	-2.81
Channel Y	200	7.60	-	4.11
Channel Z	200	9.54	4.60	-

Certificate No: DAE4-856_Apr16 Page 4 of 5

B.

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	16223	16358
Channel Y	15947	17393
Channel Z	15877	17066

5. Input Offset Measurement

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

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.86	0.04	1.50	0.29
Channel Y	-0.51	-2.36	0.33	0.41
Channel Z	-0.75	-2.04	0.01	0.30

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

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Swiss Calibration Service

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Accreditation No.: **SCS 0108**

Client **SGS-TW (Auden)**

Certificate No: **EX3-3770_Apr16**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3770

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: April 27, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (No. 217-02285/02284)	In house check: Jun-16
Power sensor E4412A	SN: MY41498087	06-Apr-16 (No. 217-02285)	In house check: Jun-16
Power sensor E4412A	SN: 000110210	06-Apr-16 (No. 217-02284)	In house check: Jun-16
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Apr-13)	In house check: Jun-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 27, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3770_Apr16 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z:* *A, B, C, D* are numerical linearization parameters assessed based on the 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 voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in 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 ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3770

Manufactured: July 6, 2010
Calibrated: April 27, 2016

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.31	0.61	0.40	± 10.1 %
DCP (mV)[B]	100.4	97.4	102.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	145.0	±2.2 %
		Y	0.0	0.0	1.0		148.7	
		Z	0.0	0.0	1.0		135.3	

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%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	43.5	0.87	11.36	11.36	11.36	0.18	1.20	± 13.3 %
750	41.9	0.89	9.83	9.83	9.83	0.41	0.88	± 12.0 %
835	41.5	0.90	9.47	9.47	9.47	0.14	1.48	± 12.0 %
900	41.5	0.97	9.17	9.17	9.17	0.15	1.78	± 12.0 %
1750	40.1	1.37	8.19	8.19	8.19	0.12	1.68	± 12.0 %
1900	40.0	1.40	7.88	7.88	7.88	0.12	1.77	± 12.0 %
2000	40.0	1.40	7.91	7.91	7.91	0.14	1.61	± 12.0 %
2300	39.5	1.67	7.47	7.47	7.47	0.13	2.08	± 12.0 %
2450	39.2	1.80	7.12	7.12	7.12	0.14	2.00	± 12.0 %
2600	39.0	1.96	6.95	6.95	6.95	0.21	1.26	± 12.0 %
5250	35.9	4.71	5.03	5.03	5.03	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.42	4.42	4.42	0.50	1.80	± 13.1 %
5750	35.4	5.22	4.83	4.83	4.83	0.50	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it 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 assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth 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 diameter from the boundary.

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

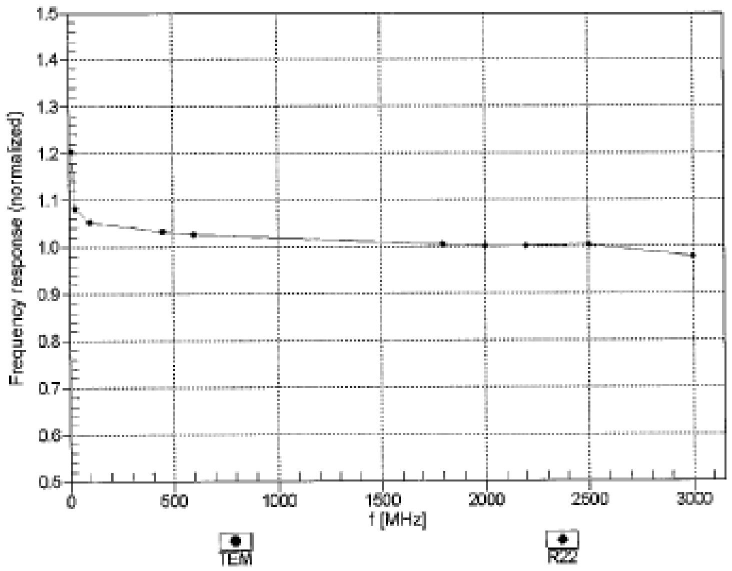
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	56.7	0.94	10.49	10.49	10.49	0.09	1.20	± 13.3 %
750	55.5	0.96	9.43	9.43	9.43	0.19	1.26	± 12.0 %
835	55.2	0.97	9.30	9.30	9.30	0.17	1.43	± 12.0 %
900	55.0	1.05	9.15	9.15	9.15	0.28	1.06	± 12.0 %
1750	53.4	1.49	7.88	7.88	7.88	0.10	2.60	± 12.0 %
1900	53.3	1.52	7.71	7.71	7.71	0.11	2.44	± 12.0 %
2000	53.3	1.52	7.82	7.82	7.82	0.18	1.42	± 12.0 %
2300	52.9	1.81	7.53	7.53	7.53	0.54	0.69	± 12.0 %
2450	52.7	1.95	7.37	7.37	7.37	0.80	0.56	± 12.0 %
2600	52.5	2.16	7.12	7.12	7.12	0.80	0.56	± 12.0 %
5250	48.9	5.36	4.34	4.34	4.34	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.70	3.70	3.70	0.60	1.90	± 13.1 %
5750	48.3	5.94	4.07	4.07	4.07	0.60	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it 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 assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth 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 diameter from the boundary.

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

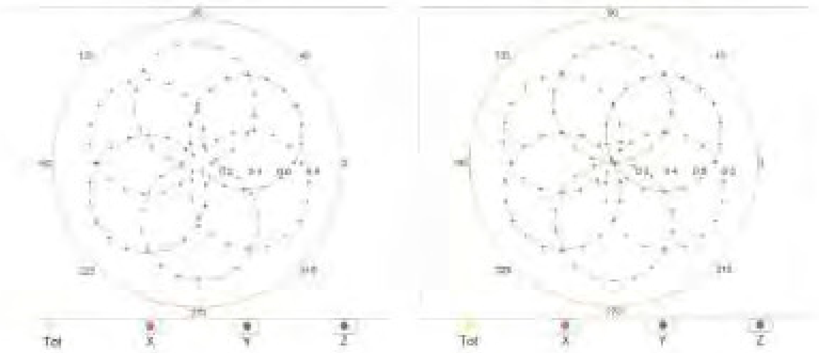


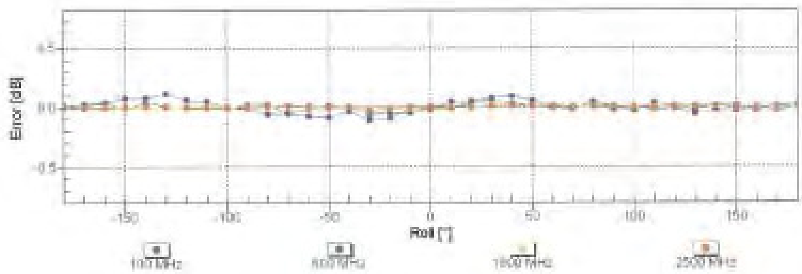
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM

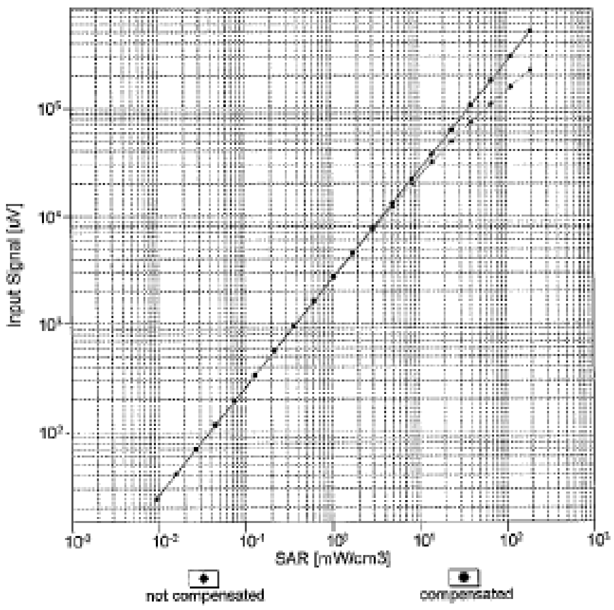
f=1800 MHz,R22

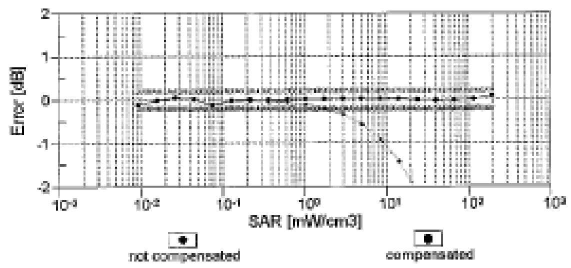




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

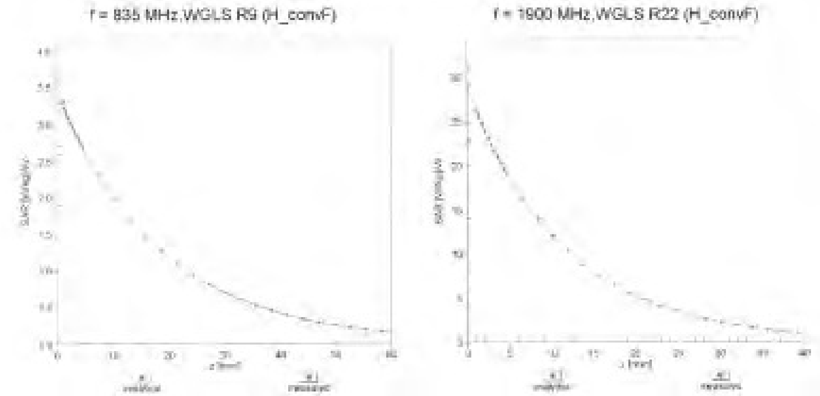
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)





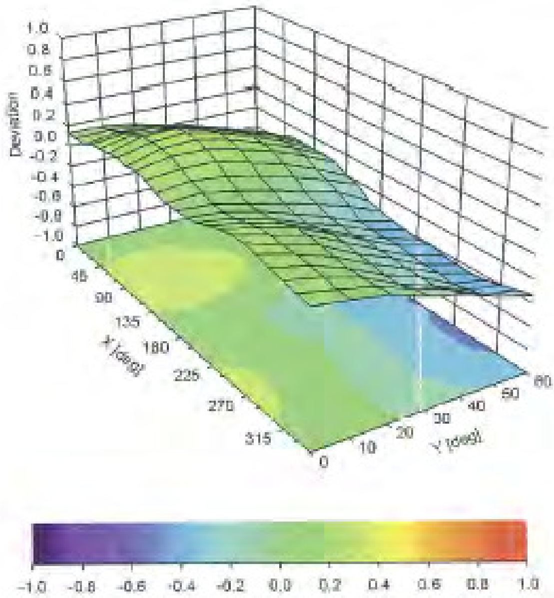
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-29.9
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

8. Uncertainty Budget

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

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.55%	N	1	1	1	1	6.55%	6.55%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, 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%	∞
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%	∞
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	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
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%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	3.90%	N	1	1	0.64	0.43	2.50%	1.68%	M
Liquid Conductivity (mea.)	4.09%	N	1	1	0.6	0.49	2.45%	2.00%	M
Combined standard uncertainty		RSS					12.23%	11.99%	
Expant uncertainty (95% confidence							24.46%	23.99%	

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

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability	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%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, 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%	∞
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%	∞
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	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
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%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	4.24%	N	1	1	0.64	0.43	2.71%	1.82%	M
Liquid Conductivity (mea.)	4.87%	N	1	1	0.6	0.49	2.92%	2.39%	M
Combined standard uncertainty		RSS					12.09%	11.80%	
Expant uncertainty (95% confidence							24.19%	23.59%	

9. System Validation from Original Equipment Supplier

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

Client **SGS-TW (Auden)**

Certificate No: **D835V2-4d063_Aug16**

CALIBRATION CERTIFICATE

Object: D835V2 - SN:4d063

Calibration procedure(s): QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 25, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 29, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-4d063_Aug16 Page 1 of 8

Calibration Laboratory of
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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

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.1 ± 6 %	0.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.40 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.05 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.57 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.28 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 2.8 jΩ
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω - 5.5 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.392 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	November 27, 2006

DASY5 Validation Report for Head TSL

Date: 25.08.2016

Test Laboratory: SPEAG, Zurich, Switzerland

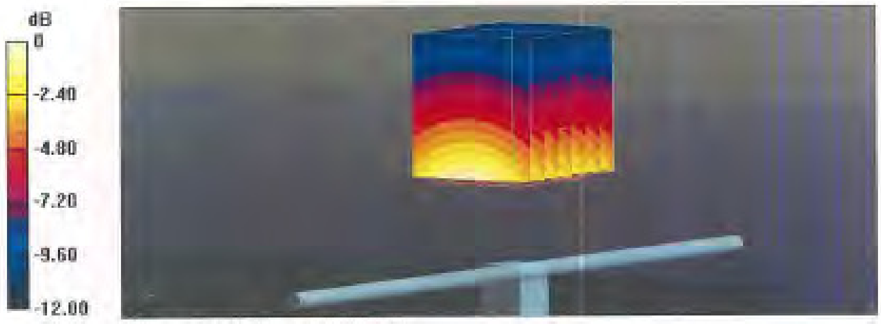
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d063

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 42.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

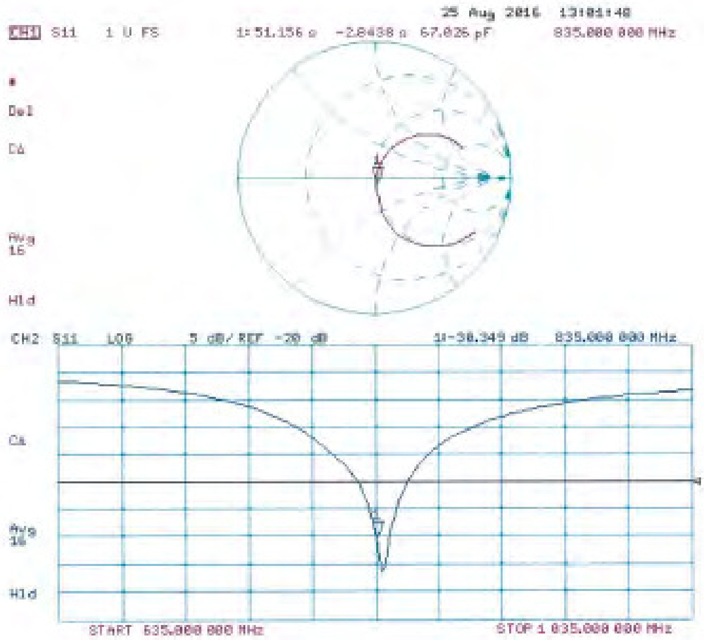
- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.75 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.65 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.08.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d063

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 54.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

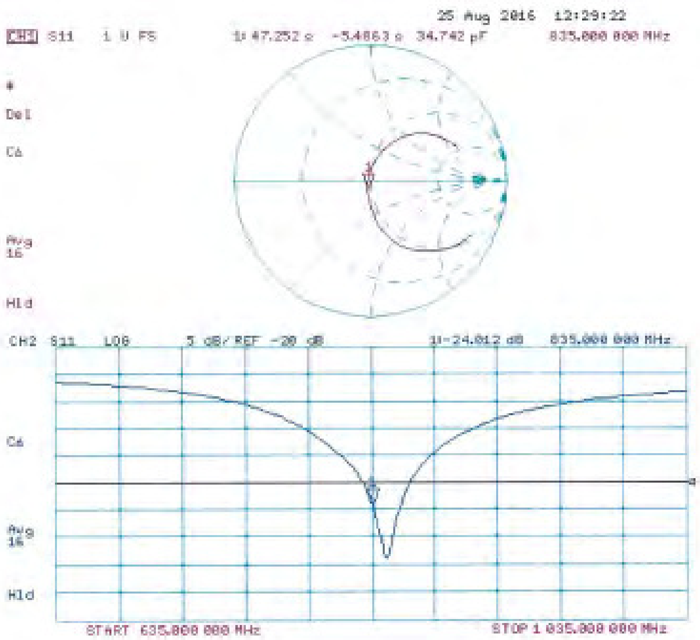
DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.73, 9.73, 9.73); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.83 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.63 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.61 W/kg
Maximum value of SAR (measured) = 3.25 W/kg

0 dB = 3.25 W/kg = 5.12 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client SGS-TW (Auden)

Certificate No: D1900V2-5d027_Apr16

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d027
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 25, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 26, 2016

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.0 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**38.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.83 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.8 Ω + 4.4 jΩ
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.5 Ω + 5.6 jΩ
Return Loss	- 23.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 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	December 17, 2002

DASY5 Validation Report for Head TSL

Date: 25.04.2016

Test Laboratory: SPEAG, Zurich, Switzerland

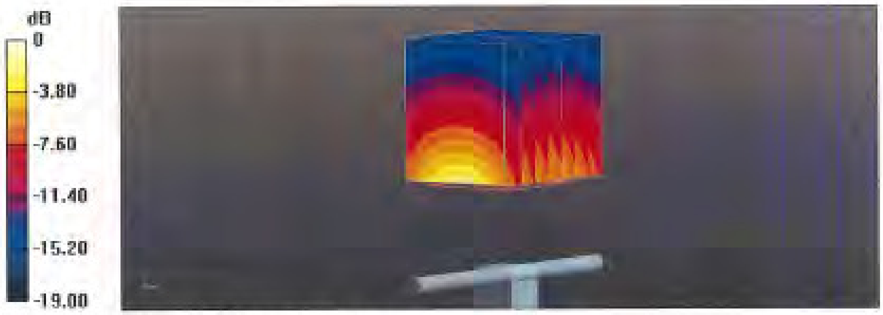
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d027

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.37$ S/m; $\varepsilon_r = 40$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

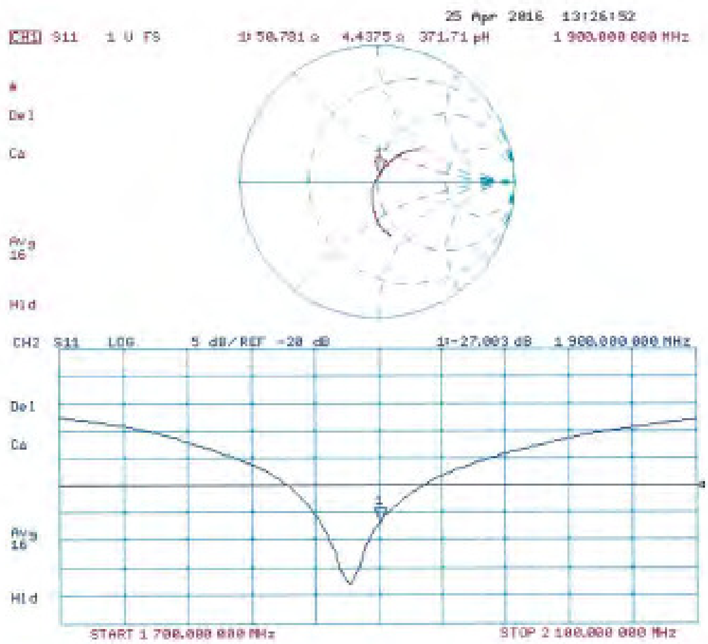
- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 106.9 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.55 W/kg; SAR(10 g) = 5.03 W/kg
Maximum value of SAR (measured) = 14.3 W/kg



0 dB = 14.3 W/kg = 11.55 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.04.2016

Test Laboratory: SPEAG, Zurich, Switzerland

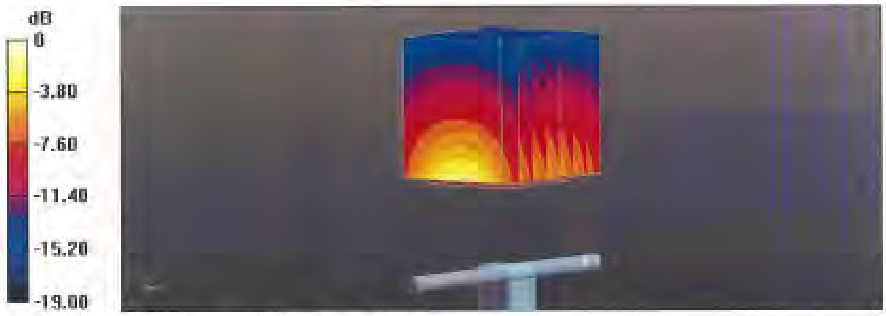
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d027

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.49 S/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

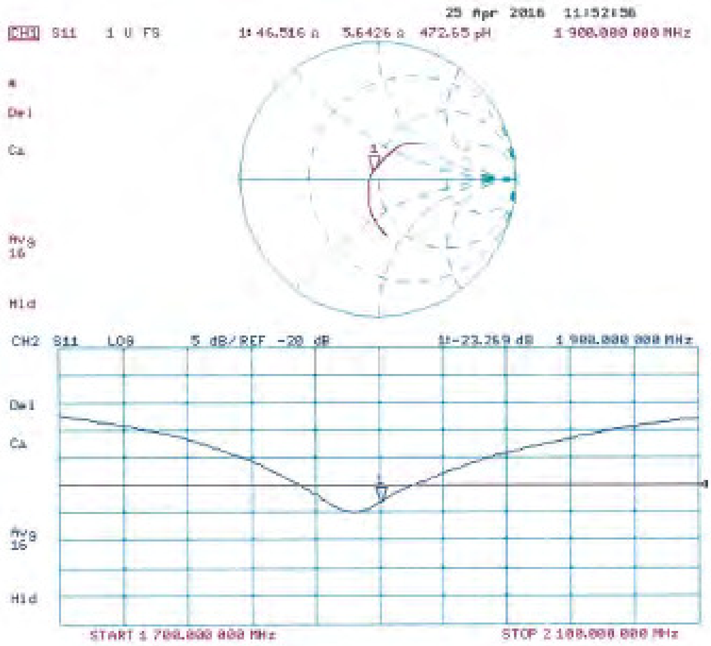
- Probe: EX3DV4 - SN7349; ConvF(8.03, 8.03, 8.03); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 104.2 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.83 W/kg; SAR(10 g) = 5.21 W/kg
Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 0108**

Client **SGS-TW (Auden)** Certificate No: **D2450V2-727_Apr16**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:727
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 19, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 20, 2016

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Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, 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	40.0 ± 6 %	1.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.7 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.5 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.3 Ω + 2.0 jΩ
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.1 Ω + 4.8 jΩ
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.148 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	January 09, 2003

DASY5 Validation Report for Head TSL

Date: 19.04.2016

Test Laboratory: SPEAG, Zurich, Switzerland

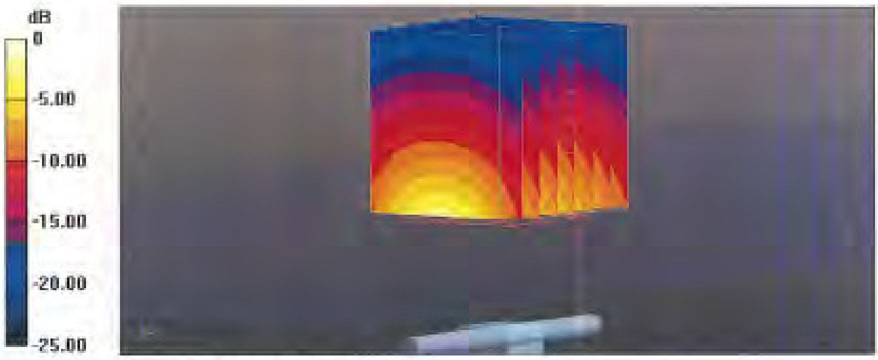
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.83 S/m; ε_r = 40; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

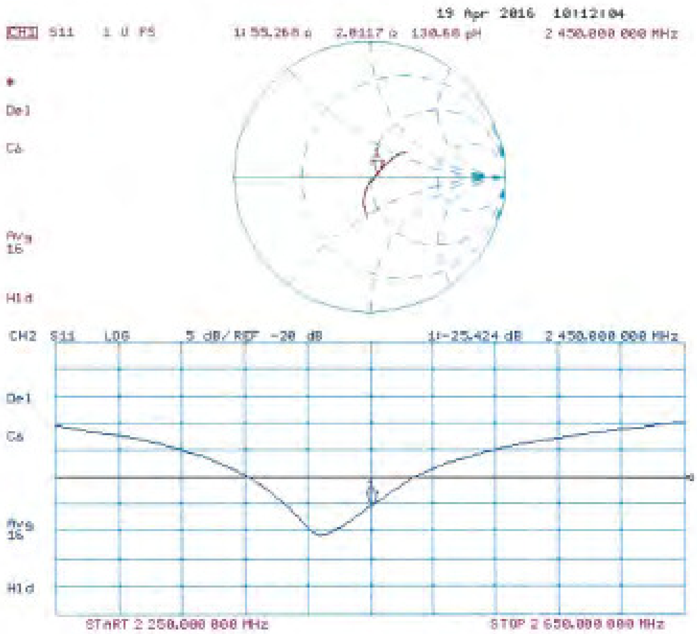
- Probe: EX3DV4 - SN7349; ConvF(7.76, 7.76, 7.76); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 112.1 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 25.7 W/kg
SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.93 W/kg
Maximum value of SAR (measured) = 20.8 W/kg



0 dB = 20.8 W/kg = 13.18 dBW/kg

Impedance Measurement Plot for Head TSL



Calibration Laboratory of
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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Auden**

Certificate No: **D5GHzV2-1040_Jun16**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN:1040
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	June 17, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 3503	31-Dec-15 (No. EX3-3503_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 20, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D5GHzV2-1040_Jun16 Page 1 of 16

Calibration Laboratory of
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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
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 62209-2, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
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 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 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	34.8 ± 6 %	4.54 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.68 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**76.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	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	34.6 ± 6 %	4.64 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.7 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.3 ± 6 %	4.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.4 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	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	34.2 ± 6 %	4.93 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	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	33.9 ± 6 %	5.14 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**75.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	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	47.1 ± 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^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.35 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**72.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.5 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	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	46.9 ± 6 %	5.53 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^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.70 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.4 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (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 5600 MHz

The following parameters and calculations were applied.

	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	46.3 ± 6 %	5.95 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^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.90 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.9 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	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	46.0 ± 6 %	6.23 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.2 Ω - 8.5 jΩ
Return Loss	- 21.4 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	47.8 Ω - 3.3 jΩ
Return Loss	- 27.8 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	50.0 Ω - 5.9 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	56.4 Ω - 3.3 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	54.3 Ω - 2.3 jΩ
Return Loss	- 26.6 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	50.7 Ω - 7.0 jΩ
Return Loss	- 23.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	48.6 Ω - 1.6 jΩ
Return Loss	- 33.4 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.3 Ω - 4.4 jΩ
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	57.9 Ω - 2.3 jΩ
Return Loss	- 22.4 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	54.6 Ω - 0.7 jΩ
Return Loss	- 27.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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	December 30, 2005

DASY5 Validation Report for Head TSL

Date: 17.06.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1040

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.54 S/m; ε_r = 34.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.64 S/m; ε_r = 34.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.83 S/m; ε_r = 34.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.93 S/m; ε_r = 34.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.14 S/m; ε_r = 33.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.59, 5.59, 5.59); Calibrated: 31.12.2015, ConvF(5.25, 5.25, 5.25); Calibrated: 31.12.2015, ConvF(5.18, 5.18, 5.18); Calibrated: 31.12.2015, ConvF(4.99, 4.99, 4.99); Calibrated: 31.12.2015, ConvF(4.95, 4.95, 4.95); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

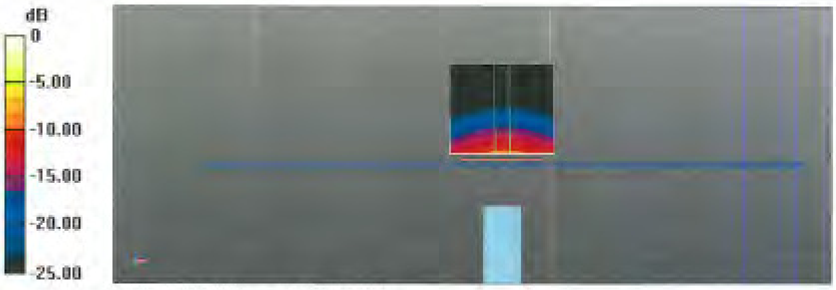
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.41 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 17.3 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 = 72.35 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.02 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 30.8 W/kg
SAR(1 g) = 7.93 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

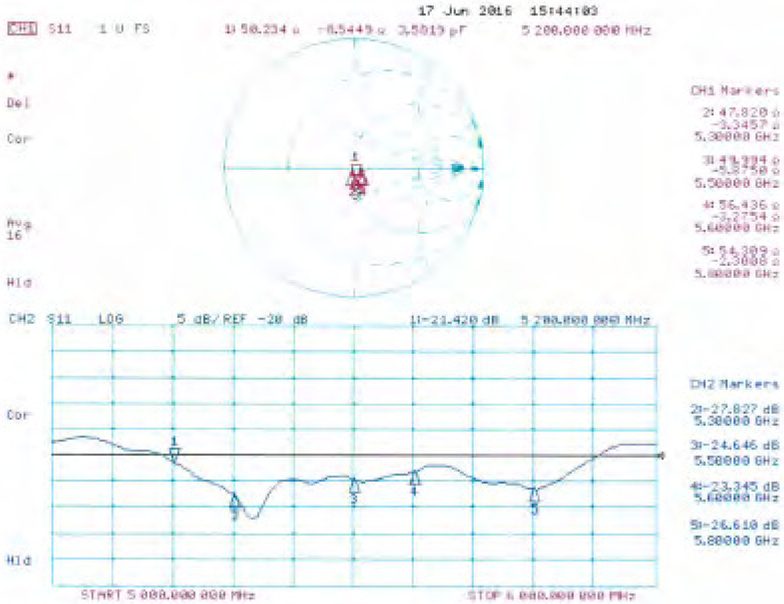
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.08 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 19.0 W/kg

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 = 67.92 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.66 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.06.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1040

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.41 S/m; ε_r = 47.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.53 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.8 S/m; ε_r = 46.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.95 S/m; ε_r = 46.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.23 S/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.99, 4.99, 4.99); Calibrated: 31.12.2015, ConvF(4.75, 4.75, 4.75); Calibrated: 31.12.2015, ConvF(4.4, 4.4, 4.4); Calibrated: 31.12.2015, ConvF(4.35, 4.35, 4.35); Calibrated: 31.12.2015, ConvF(4.27, 4.27, 4.27); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

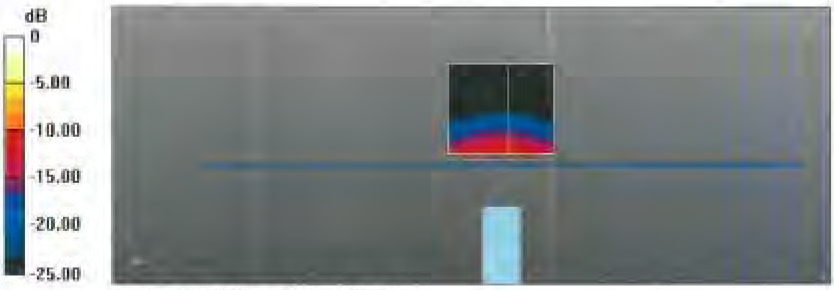
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.34 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 7.35 W/kg; SAR(10 g) = 2.07 W/kg
Maximum value of SAR (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 = 68.02 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 29.2 W/kg
SAR(1 g) = 7.7 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.81 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 31.7 W/kg
SAR(1 g) = 7.92 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 18.6 W/kg

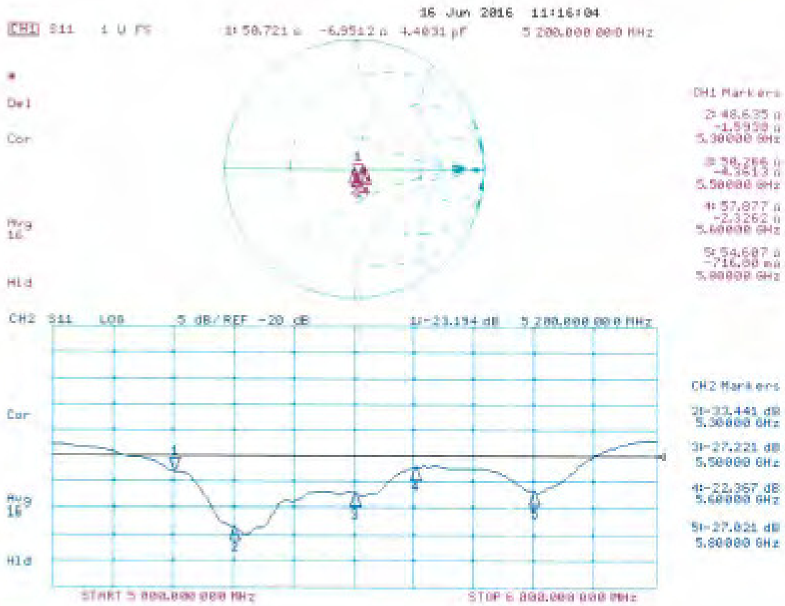
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.28 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 7.9 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 18.6 W/kg

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 = 65.14 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Impedance Measurement Plot for Body TSL



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- End of 1st part of report -