FCC SAR Test Report

APPLICANT	:	Motorola Mobility, LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	10057
FCC ID	:	IHDT56WA2
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA720310-08	Rev. 01	Initial issue of report	Mar. 20, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Motorola Mobility, LLC, Mobile Cellular Phone, 10057 are as follows.

Equipment Class	Frequency Band	Highest SAR Summary				Highest Simultaneous Transmission 1g SAR (W/kg)
		Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)	Specific Product (Separation 0mm)	
		1g SAR (W/kg)			10g SAR (W/kg)	
Licensed	GSM850	0.18	0.83	0.83		1.56
	GSM1900	0.16	0.60	0.60		
	WCDMA V	0.36	1.19	1.19		
	LTE Band 5	0.23	0.96	0.96		
DTS	2.4GHz WLAN	1.29	0.40	0.40		1.51
NII	5GHz WLAN	1.30	0.54	0.47	2.76	1.56
DSS	Bluetooth		0.07			1.50

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body, 4.0 W/kg for Product Specific) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Motorola Mobility, LLC
Address	222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

Manufacturer	
Company Name	Motorola Mobility, LLC
Address	222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
Model Name	10057
FCC ID	IHDT56WA2
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM 802.11a/b/g/n HT20/HT40 Bluetooth BR/EDR/LE NFC:ASK
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. This report does not test any RF exposure results, for WLAN / BT SAR test results are referred to FCC ID: IHDT56WA1, Sporton Report No: FA720310 or Appendix B3~B7,and for GSM850/1900, UMTS B5 and LTE B5 SAR test results are referred to FCC ID: IHDT56WA3, Sporton Report No: FA720310-04 or Appendix B1~B7, and spot checks all Bands performed on FCC ID: IHDT56WA2 to ensure that the SAR measurements for IHDT56WA2 are the same with WLAN / BT of IHDT56WA1 and WWAN of IHDT56WA3, the spot checks detail information please refer to Appendix A.
2. This device 2.4GHz / 5.2GHz / 5.8GHz WLAN supports Hotspot operation.
3. When the device operating under different conditions of At-Head, body-worn, near-body, hotspot and free space will limit different maximum output powers in several cellular transmitters and the detail mechanisms description of the different output power levels are included in the operation description.
4. The device used different output power mechanisms for SAR compliance for WLAN transmitter for held-to-are exposure conditions and detail descriptions of the output power mechanism are included in the operational description.
5. This device implements antenna tuning techniques for several WWAN (cellular) operating modes for the purpose of improving antenna efficiency over a broad range of frequencies. Specifically, these techniques are employed in several frequency bands. The detail descriptions of the antenna tuner are included in the operational description and supplemental data for additional information please referred to FCC ID: IHDT56WA3, Sporton Report No: FA720310-04 or Appendix B1~B7.

4.2 General LTE SAR Test and Reporting Considerations

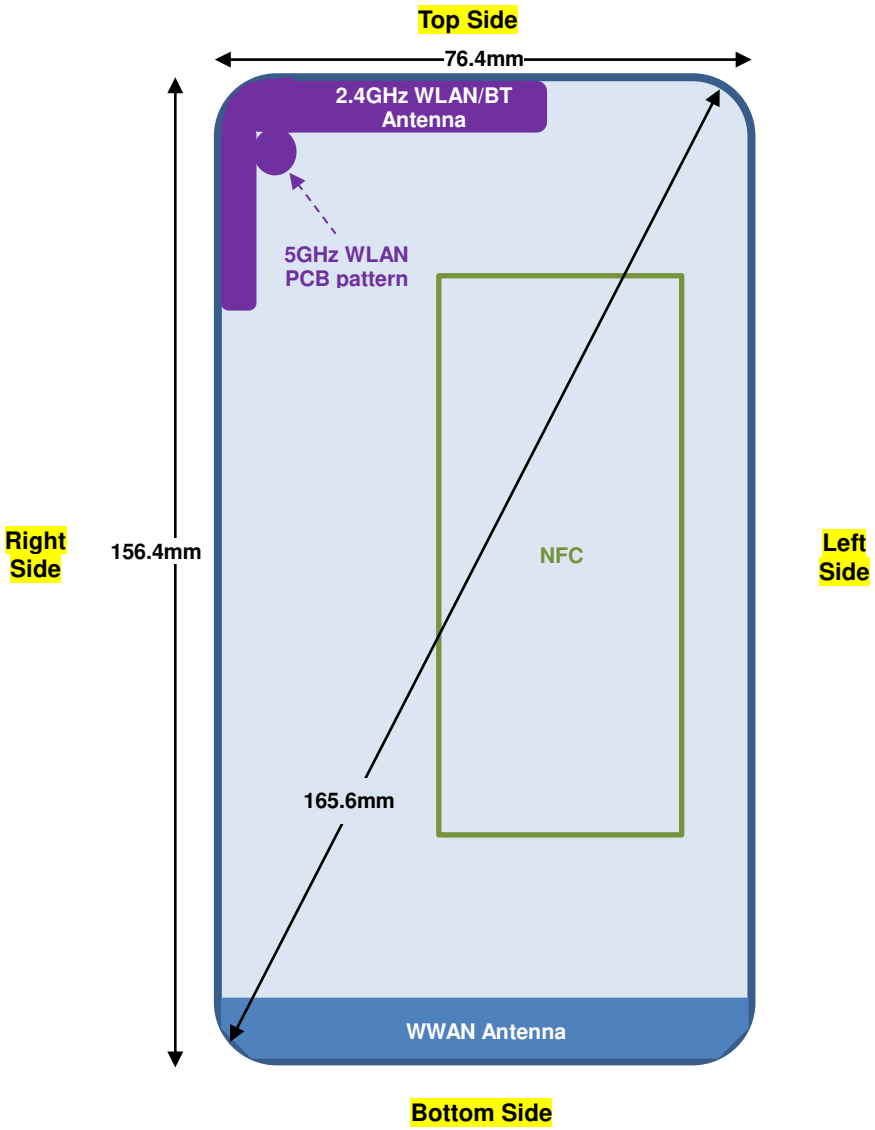
Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	IHDT56WA2
Equipment Name	Mobile Cellular Phone
Operating Frequency Range of each LTE transmission band	LTE Band 5: 824.7 MHz ~ 848.3 MHz
Channel Bandwidth	LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz
uplink modulations used	QPSK, and 16QAM
LTE Voice / Data requirements	1. Voice and data.
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, When the device operating under different conditions of At-Head, body-worn, near-body, hotspot and free space will limit different maximum output powers in several cellular transmitters and the detail mechanisms description of the different output power levels are included in the operation description.

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

Transmission (H, M, L) channel numbers and frequencies in each LTE band								
LTE Band 5								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

5. Antenna Location

<Mobile Phone>



Back View

Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	Yes	Yes

General Note:

1. Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

6. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product Specific
1.	GSM Voice + WLAN2.4GHz	Yes	Yes		Yes
2.	GPRS/EDGE + WLAN2.4GHz	Yes	Yes	Yes	Yes
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes	Yes
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes	Yes
5.	GSM Voice + Bluetooth		Yes		Yes
6.	GPRS/EDGE + Bluetooth		Yes		Yes
7.	WCDMA+ Bluetooth		Yes		Yes
8.	LTE + Bluetooth		Yes		Yes
9.	GSM Voice + WLAN5GHz	Yes	Yes	Yes	Yes
10.	GPRS/EDGE + WLAN5GHz	Yes	Yes	Yes	Yes
11.	WCDMA + WLAN5GHz	Yes	Yes	Yes	Yes
12.	LTE + WLAN5GHz	Yes	Yes	Yes	Yes
13.	GSM Voice + WLAN5GHz + Bluetooth		Yes		Yes
14.	GPRS/EDGE + WLAN5GHz + Bluetooth		Yes		Yes
15.	WCDMA + WLAN5GHz + Bluetooth		Yes		Yes
16.	LTE + WLAN5GHz + Bluetooth		Yes		Yes

General Note:

1. In this report, WLAN / BT SAR test results are referred to FCC ID: IHDT56WA1, Sporton Report No: FA720310 or Appendix B3~B7 and GSM850/1900, UMTS B5 and LTE B5 SAR test results are referred to FCC ID: IHDT56WA3, Sporton Report No: FA720310-04 or Appendix B1~B7 and these SAR results are also used to perform simultaneous transmission analysis.
2. This device 2.4GHz / 5.2GHz / 5.8GHz WLAN supports Hotspot operation.
3. The worst case WLAN reported SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
4. 2.4GHz WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
5. EUT will choose either 2.4GHz WLAN or 5GHz WLAN according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
6. The Scaled SAR summation is calculated based on the same configuration and test position.
7. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 6.5.
8. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power	Exposure Position	Product Specific
	Test separation	5 mm
12dBm	Estimated 10g SAR (W/kg)	0.269W/kg

6.1 Head Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+2 SPLSR	1+2 Case No
GSM	GSM850	Right Cheek	0.178	0.513	**0.69**		
		Right Tilted	0.088	0.455	**0.54**		
		Left Cheek	0.165	1.292	**1.46**		
		Left Tilted	0.086	0.792	**0.88**		
	GSM1900	Right Cheek	0.155	0.513	**0.67**		
		Right Tilted	0.075	0.455	**0.53**		
		Left Cheek	0.137	1.292	**1.43**		
		Left Tilted	0.062	0.792	**0.85**		
WCDMA	WCDMA V	Right Cheek	0.358	0.513	**0.87**		
		Right Tilted	0.178	0.455	**0.63**		
		Left Cheek	0.333	1.292	**1.63**	0.02	Case 1
		Left Tilted	0.178	0.792	**0.97**		
LTE	LTE Band 5	Right Cheek	0.227	0.513	**0.74**		
		Right Tilted	0.053	0.455	**0.51**		
		Left Cheek	0.119	1.292	**1.41**		
		Left Tilted	0.052	0.792	**0.84**		

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+3 SPLSR	1+3 Case No
GSM	GSM850	Right Cheek	0.178	0.669	**0.85**		
		Right Tilted	0.088	0.536	**0.62**		
		Left Cheek	0.165	1.301	**1.47**		
		Left Tilted	0.086	0.963	**1.05**		
	GSM1900	Right Cheek	0.155	0.669	**0.82**		
		Right Tilted	0.075	0.536	**0.61**		
		Left Cheek	0.137	1.301	**1.44**		
		Left Tilted	0.062	0.963	**1.03**		
WCDMA	WCDMA V	Right Cheek	0.358	0.669	**1.03**		
		Right Tilted	0.178	0.536	**0.71**		
		Left Cheek	0.333	1.301	**1.63**	0.02	Case 2
		Left Tilted	0.178	0.963	**1.14**		
LTE	LTE Band 5	Right Cheek	0.227	0.669	**0.90**		
		Right Tilted	0.053	0.536	**0.59**		
		Left Cheek	0.119	1.301	**1.42**		
		Left Tilted	0.052	0.963	**1.02**		

6.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
GSM	GSM850	Front	0.829	0.319	0.293	**1.15**	**1.12**
		Back	0.716	0.403	0.471	**1.12**	**1.19**
		Left side	0.436	0.029	0.036	**0.47**	**0.47**
		Right side	0.199	0.091	0.096	**0.29**	**0.30**
		Top side		0.149	0.109	**0.15**	**0.11**
		Bottom side	0.358			**0.36**	**0.36**
	GSM1900	Front	0.604	0.319	0.293	**0.92**	**0.90**
		Back	0.576	0.403	0.471	**0.98**	**1.05**
		Left side	0.110	0.029	0.036	**0.14**	**0.15**
		Right side	0.184	0.091	0.096	**0.28**	**0.28**
		Top side		0.149	0.109	**0.15**	**0.11**
		Bottom side	0.602			**0.60**	**0.60**
WCDMA	WCDMA V	Front	1.193	0.319	0.293	**1.51**	**1.49**
		Back	1.088	0.403	0.471	**1.49**	**1.56**
		Left side	0.647	0.029	0.036	**0.68**	**0.68**
		Right side	0.262	0.091	0.096	**0.35**	**0.36**
		Top side		0.149	0.109	**0.15**	**0.11**
		Bottom side	0.438			**0.44**	**0.44**
LTE	LTE Band 5	Front	0.964	0.319	0.293	**1.28**	**1.26**
		Back	0.898	0.403	0.471	**1.30**	**1.37**
		Left side	0.570	0.029	0.036	**0.60**	**0.61**
		Right side	0.275	0.091	0.096	**0.37**	**0.37**
		Top side		0.149	0.109	**0.15**	**0.11**
		Bottom side	0.390			**0.39**	**0.39**

6.3 Product Specific Exposure Conditions

General Note:

1. The worst case 5GHz WLAN results are taking from 5.3GHz (U-NII-2A) and 5.5GHz (U-NII-2C) perform product specific simultaneous transmission analysis.
2. According to KDB 648474 D04v01r03, for WWAN and 2.4GHz WLAN SAR ("-") was excluded, due to hotspot SAR was < 1.2W/kg.
3. According to KDB 941225 D06 v02r01, for Bluetooth and 5GHz WLAN SAR ("-") was excluded, due to transmitting antenna located larger 25mm from that surface or edge

Exposure Position	1 WWAN 10g SAR (W/kg)	2 2.4GHz WLAN 10g SAR (W/kg)	3 5GHz WLAN 10g SAR (W/kg)	4 Bluetooth Estimated 10g SAR (W/kg)	**1+3+4 Summed 10g SAR (W/kg)**
Front	-	-	2.764	0.269	**3.03**
Back	-	-	0.847	0.269	**1.12**
Left side	-	-	0.084	0.269	**0.35**
Right side	-	-	0.233	0.269	**0.50**
Top side	-	-	0.262	0.269	**0.53**
Bottom side	-	-	-	-	**0.00**

6.4 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	**1+2 Summed 1g SAR (W/kg)**	1+2 SPLSR	1+2 Case No
GSM	GSM850	Front	0.829	0.319	**1.15**		
		Back	0.716	0.403	**1.12**		
	GSM1900	Front	0.604	0.319	**0.92**		
		Back	0.576	0.403	**0.98**		
WCDMA	WCDMA V	Front	1.193	0.319	**1.51**		
		Back	1.088	0.403	**1.49**		
LTE	LTE Band 5	Front	0.964	0.319	**1.28**		
		Back	0.898	0.403	**1.30**		

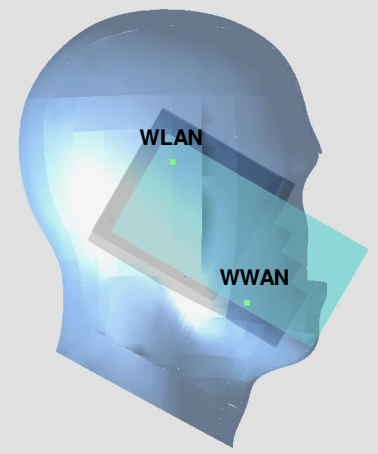
WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	4 Bluetooth 1g SAR (W/kg)	**1+3 Summed 1g SAR (W/kg)**	**1+3+4 Summed 1g SAR (W/kg)**	**1+4 Summed 1g SAR (W/kg)**	1+3+4 SPLSR	1+3+4 Case No
GSM	GSM850	Front	0.829	0.408	0.050	**1.24**	**1.29**	**0.88**		
		Back	0.716	0.539	0.066	**1.26**	**1.32**	**0.78**		
	GSM1900	Front	0.604	0.408	0.050	**1.01**	**1.06**	**0.65**		
		Back	0.576	0.539	0.066	**1.12**	**1.18**	**0.64**		
WCDMA	WCDMA V	Front	1.193	0.408	0.050	**1.60**	**1.65**	**1.24**	0.01	Case 3
		Back	1.088	0.539	0.066	**1.63**	**1.69**	**1.15**	0.02	Case 4
LTE	LTE Band 5	Front	0.964	0.408	0.050	**1.37**	**1.42**	**1.01**		
		Back	0.898	0.539	0.066	**1.44**	**1.50**	**0.96**		

6.5 SPLSR Evaluation and Analysis

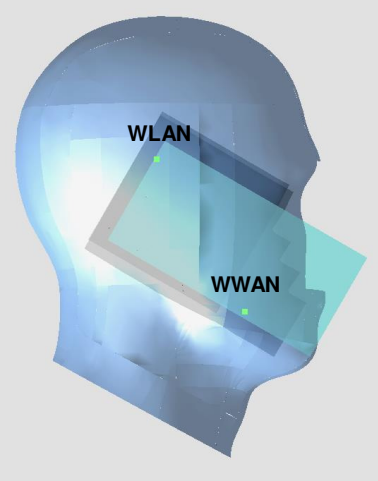
General Note:

1. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

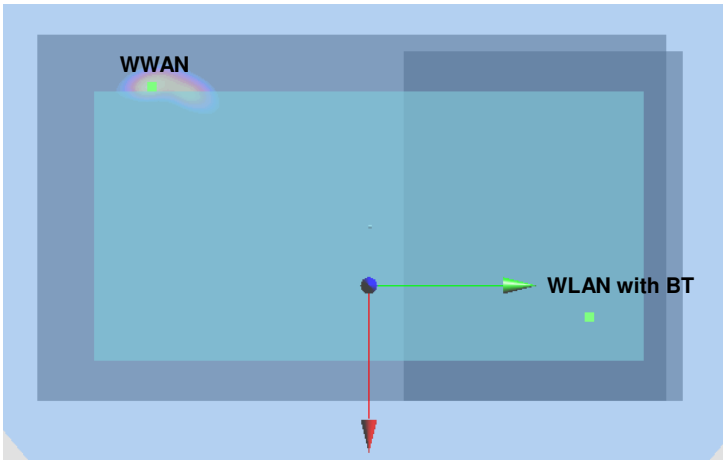
Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA V	Left Cheek	0.333	0mm	68.2	-79.92	9.39	115.7	1.63	0.02	Not required
	2.4GHz WLAN		1.292	0mm	11.62	20.32	-1.96				



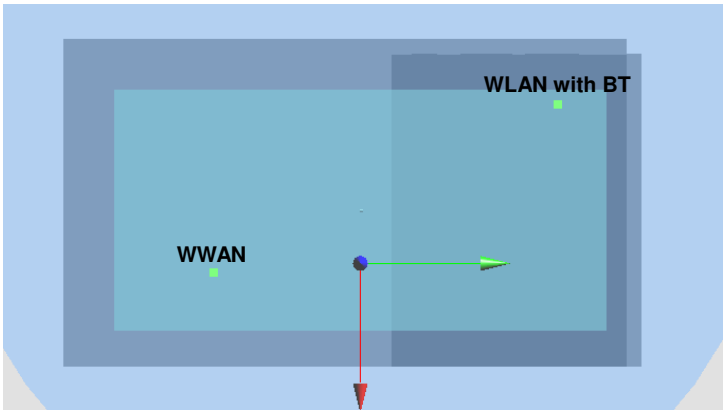
Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA V	Left Cheek	0.333	0mm	68.2	-79.92	9.39	121.3	1.63	0.02	Not required
	5GHz WLAN		1.301	0mm	7.65	24.66	-1.04				



	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
Case 3	WCDMA V	Front	1.193	10mm	-41.01	-60.59	-1.87	140.2	1.65	0.01	Not required
	5GHz WLAN with BT		0.458	10mm	23.37	64.01	-1.87				



	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
Case 4	WCDMA V	Back	1.088	10mm	14.38	-50.78	-1.68	123.3	1.69	0.02	Not required
	5GHz WLAN with BT		0.605	10mm	-32.6	63.21	-1.68				



7. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	$1/k^{(b)}$	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 7.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.00	N	1	1	1	6.0	6.0
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.00	R	1.732	1	1	0.6	0.6
Linearity	4.70	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	2.90	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.00	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.03	N	1	1	1	3.0	3.0
Device Holder	3.60	N	1	1	1	3.6	3.6
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.10	R	1.732	1	1	3.5	3.5
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.71	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.71	1.7	1.5
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.6%	11.6%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						23.2%	23.1%

Table 7.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	7.00	N	1	1	1	7.0	7.0
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.00	R	1.732	1	1	1.2	1.2
Linearity	4.70	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	6.70	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.00	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.03	N	1	1	1	3.0	3.0
Device Holder	3.60	N	1	1	1	3.6	3.6
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.60	R	1.732	1	1	3.8	3.8
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.71	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.71	1.7	1.5
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.9%	12.9%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.9%	25.8%

Table 7.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

8. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

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[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

[8] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[9] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

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[11] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

[12] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[13] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.