

FCC SAR Test Report

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : 10874, 12665
FCC ID : IHDT56WK3
STANDARD : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2013

We, Sporton International (Kunshan) 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 (Kunshan) Inc., the test report shall not be reproduced except in full.



Approved by: Mark Qu / Manager



Sporton International (Kunshan) Inc.
No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China

Table of Contents

1. Statement of Compliance	4
2. Administration Data	5
3. Guidance Applied.....	5
4. Equipment Under Test (EUT) Information.....	6
4.1 General Information	6
4.2 Specification of Accessory	8
4.3 General LTE SAR Test and Reporting Considerations	9
5. Re-use of Measured Data	11
5.1 Introduction Section	11
5.2 Difference Section.....	11
5.3 Spot Check Verification Data Section.....	12
5.4 Reference detail Section	12
6. Conducted RF Output Power (Unit: dBm).....	13
7. Antenna Location	15
8. Simultaneous Transmission Analysis.....	16
8.1 Head Exposure Conditions	17
8.2 Hotspot Exposure Conditions.....	18
8.3 Body-Worn Accessory Exposure Conditions	20
8.4 SPLSR Evaluation and Analysis	21
9. Uncertainty Assessment	24
10. References	27
Appendix A. Reference Report	

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA761702-02	Rev. 01	Initial issue of report	Aug. 09, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Mobility LLC, Mobile Cellular Phone, 10874, 12665**, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary			Highest Simultaneous Transmission 1g SAR (W/kg)
			Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 10mm)	
			1g SAR (W/kg)			
Licensed	GSM	GSM850	0.35	0.90	0.90	1.59
		GSM1900	0.14	1.03	1.03	
	WCDMA	Band V	0.27	0.67	0.67	
		Band IV	0.13	1.16	1.16	
		Band II	0.14	1.13	1.13	
	LTE	Band 4	0.38	1.04	1.04	
		Band 5	0.45	0.75	0.75	
		Band 7	0.34	1.15	0.56	
		Band 38	0.19	1.01	0.53	
DTS	WLAN	2.4GHz WLAN	0.91	0.54	0.54	1.58
NII		5GHz WLAN	0.97	0.83	0.83	1.59
DSS	Bluetooth	2.4GHz Bluetooth				1.49
Date of Testing:			2017/7/31~2017/8/1			

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue) 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 (Kunshan) Inc.
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958

Applicant	
Company Name	Motorola Mobility LLC
Address	222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

Manufacturer	
Company Name	Motorola Mobility LLC
Address	222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

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	10874, 12665
FCC ID	IHDT56WK3
IMEI Code	SIM1: 356516080009885 SIM2: 356516080009843
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 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 ~ 5700 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 HSPA+ (16QAM uplink is not supported) LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0+EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE, Bluetooth v4.2 LE, Bluetooth v5.0 LE NFC
HW Version	DVT2
SW Version	NPW26.75
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: - WLAN operation in 5600 MHz ~ 5650 MHz is notched. - This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation. - This device 2.4GHz WLAN/5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.3GHz / 5.5GHz supports WiFi Direct (GC only). - This device does not support DTM operation and supports GRPS/EGRPS mode up to multi-slot class 12. - There are two different types of EUT. They are dual SIM card mobile (12665) and single SIM card mobile (10874). It is special to declare. The others are the same including circuit design, PCB board, structure and all components. After pre-scan two types of EUT, we found test result of the sample that dual SIM was the worst, so we chose dual SIM card mobile to perform all tests. - The dual SIM card mobile has 2 SIM slots and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active). After pre-scan two SIM cards power, we found test result of the SIM1 was the worse, so we chose dual SIM1 card to perform all tests. - The device employs proximity sensors that detect the presence of the user's body at the front or back faces of the device. When front or back body worn condition is detected, WCDMA band II/IV and LTE band 4/7/38 reduced power will be active. (P-sensor can't work at detecting presence of the user's body at the four edges of the device.)	

8. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of WCDMA band II/IV and LTE band 4/7/38.
9. This device hotspot reduced power and P-sensor reduced power level are the same. So only show one reduced power level for hotspot reduced power and P-sensor reduced power for this application.
10. When the phone is in talking mode and receiver worked, then power reduction will be implemented immediately at WLAN2.4GHz and WLAN5GHz.
11. This device has two antennas. WWAN antenna 1 is located on the left side of bottom edge of the device and WWAN antenna 2 is located on the right side of bottom edge of the device which can refer to antenna location chapter. WWAN antenna 1 frequency bands include GSM850/1900, WCDMA Band II/IV/V, LTE Band 4/5 and WWAN antenna 2 frequency bands only include LTE Band 7/38.
12. This device implements antenna tuning techniques for several WWAN (cellular) operating modes and frequencies for the purpose of improving antenna efficiency over a broad range of frequencies. Specifically, these techniques are employed in the WCDMA and LTE modes of WWAN antenna 1.

4.2 Specification of Accessory

Specification of Accessory				
AC Adapter 1 (US)	Brand Name	Motorola (Salom)	Model Name	SC-22
	Power Rating	I/P: 100 – 240 Vac, 500 mA, O/P: 5/9/12 Vdc, 3000/1600/1200 mA		
AC Adapter 2 (US)	Brand Name	Motorola (Chenyang)	Model Name	SC-22
	Power Rating	I/P: 100 – 240 Vac, 500 mA, O/P: 5/9/12 Vdc, 3000/1600/1200 mA		
AC Adapter 3 (US)	Brand Name	Motorola (LiteOn)	Model Name	SC-22
	Power Rating	I/P: 100 – 240 Vac, 500 mA, O/P: 5/9/12 Vdc, 3000/1600/1200 mA		
Battery	Brand Name	Motorola (Sunwoda)	Model Name	HX40
	Power Rating	3.8Vdc, 2810mAh	Type	Li-ion
Earphone	Brand Name	Motorola (Cosonic)	Model Name	SH38C16617
	Signal Line Type	1.10 meter, non-shielded cable, with w/o ferrite core		
USB Cable 1	Brand Name	Motorola (Saibao)	Model Name	SKN6473A
	Signal Line Type	1.10 meter, shielded cable, with w/o ferrite core		
USB Cable 2	Brand Name	Motorola (Foxlink)	Model Name	SKN6473A
	Signal Line Type	1.10 meter, shielded cable, with w/o ferrite core		
USB Cable 3	Brand Name	Motorola (Cabletech)	Model Name	SKN6473A
	Signal Line Type	1.10 meter, shielded cable, with w/o ferrite core		

4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05																																																																																											
FCC ID	IHDT56WK3																																																																																										
Equipment Name	Mobile Cellular Phone																																																																																										
Operating Frequency Range of each LTE transmission band	LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz																																																																																										
Channel Bandwidth	LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz																																																																																										
uplink modulations used	QPSK, 16QAM and 64QAM																																																																																										
LTE Voice / Data requirements	Voice and Data																																																																																										
LTE Release Version	R11, Cat 5																																																																																										
CA Support	Yes, Downlink Only																																																																																										
LTE MPR permanently built-in by design	<table><tr><th colspan="8">Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth configuration [RB]</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr></table> <table><tr><th colspan="8">Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth configuration [RB]</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr><tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr></table>							Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3								Modulation	Channel bandwidth / Transmission bandwidth configuration [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	Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3								Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3																																																																																											
Modulation	Channel bandwidth / Transmission bandwidth configuration [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																																																																																				
Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3																																																																																											
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)																																																																																				
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																																																																					
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2																																																																																				
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 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 1. The device employs proximity sensors that detect the presence of the user's body at the front or back faces of the device. When front or back body worn condition is detected, WCDMA band II/IV and LTE band 4/7/38 reduced power will be active. (P-sensor can't work at detecting presence of the user's body at the four edges of the device.) 2. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of WCDMA band II/IV and LTE band 4/7/38. 3. When the phone is in talking mode and receiver worked, then power reduction will be implemented immediately at WLAN2.4GHz and WLAN5GHz.																																																																																										
LTE Carrier Aggregation Combinations	Intra-Band possible combinations as below page and the detail power verification please referred to section 13.																																																																																										
LTE Carrier Aggregation Additional Information	This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink only. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.																																																																																										

Transmission (H, M, L) channel numbers and frequencies in each LTE band												
LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745
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)	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	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844				
LTE Band 7												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510				
M	21100	2535	21100	2535	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560				
LTE Band 38												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580				
M	38000	2595	38000	2595	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610				

5. Re-use of Measured Data

5.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: 10874, 12665, FCC ID: IHDT56WK3) is electrically identical to the reference device (Model: 10647, FCC ID: IHDT56WK1 for WWAN bands and Model: 10870, 10869, FCC ID: IHDT56WK4) for WLAN for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 178919 D01.

5.2 Difference Section

For details concerning the similarity with respect to component placement, mechanical/electrical design etc., please refer to the Product Equality Declaration "PED" file.

The re-used RF data includes the following bands provided in Appendix A

- a. Sporton SAR Report No. FA761702-01 for the reference device Model: 10647, FCC ID: IHDT56WK1 for WWAN.
 - GSM850/1900
 - WCDMA Band V/IV/II
 - LTE Band 4/5/7/38
- b. Sporton SAR Report No. FA761702-03 for the reference device Model: 10870, 10869, FCC ID: IHDT56WK4 for WLAN.
 - WLAN/BT

Spot check for WWAN and WLAN are performed for ensure that SAR measurement for both device are the same. So, the original SAR value can represent this application.



5.3 Spot Check Verification Data Section

Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Original model (FCC ID: IHDT56WK1, IHDT56WK4)				Spot check model (FCC ID: IHDT56WK3)				Deviation
											Average Power (dBm)	Tune-Up Limit (dBm)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)	Average Power (dBm)	Tune-Up Limit (dBm)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)	
GSM850	-	-	-	-	GPRS 2 Tx slots	Back	10	Full	251	848.8	30.69	31.0	0.835	0.897	30.69	31.0	0.698	0.750	-16.39%
GSM1900	-	-	-	-	GPRS 2 Tx slots	Front	10	Full	512	1850.2	26.75	27.5	0.863	1.026	26.75	27.5	0.721	0.857	-16.47%
WCDMA Band V	-	-	-	-	RMC12.2Kbps	Back	10	Full	4182	836.4	23.10	23.5	0.607	0.666	23.10	23.5	0.523	0.573	-13.96%
WCDMA Band IV	-	-	-	-	RMC12.2Kbps	Front	10	Reduced	1513	1752.6	21.58	22.0	1.050	1.157	21.58	22.0	0.999	1.100	-4.93%
WCDMA Band II	-	-	-	-	RMC12.2Kbps	Back	10	Reduced	9262	1852.4	21.49	22.0	1.000	1.125	21.49	22.0	0.990	1.113	-1.07%
LTE Band 4(66)	20M	QPSK	1	0	-	Front	10	Reduced	132572	1770	20.85	21.5	0.894	1.038					4.53%
LTE Band 4	20M	QPSK	1	0	-	Front	10	Reduced	20175	1732.5					21.04	21.5	0.976	1.085	
LTE Band 5(26)	15M	QPSK	1	0	-	Back	10	Full	26865	831.5	22.94	23.50	0.663	0.754					-11.80%
LTE Band 5	15M	QPSK	1	25	-	Back	10	Full	20525	831.5					23.07	23.5	0.602	0.665	
LTE Band 7	20M	QPSK	1	0	-	Bottom Side	10	Reduced	20850	2510	20.22	20.50	1.080	1.152	20.22	20.50	1.150	1.227	6.51%
LTE Band 38(41)	20M	QPSK	1	0	-	Bottom Side	10	Reduced	39750	2506	22.08	22.50	0.987	1.094					-5.03%
LTE Band 38	20M	QPSK	1	0	-	Bottom Side	10	Reduced	37850	2580					22.16	22.50	0.955	1.039	
WLAN2.4GHz	-	-	-	-	802.11b 1Mbps	Left Cheek	-	Reduced	1	2412	16.52	17	0.814	0.909	16.52	17	0.923	1.031	13.42%
WLAN5.2GHz	-	-	-	-	802.11a 6Mbps	Back	10	Full	36	5180	16.95	17.5	0.303	0.366	16.95	17.5	0.360	0.434	18.58%
WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Left Tilted	-	Reduced	60	5300	14.86	15	0.879	0.965	14.86	15	0.858	0.942	-2.38%
WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Left Cheek	-	Reduced	100	5500	14.68	15	0.826	0.945	14.68	15	0.866	0.991	4.87%
WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Back	10	Full	165	5825	17.29	17.5	0.746	0.832	17.29	17.5	0.732	0.817	-1.80%

Note: In the table above, all the deviation of SAR test results are compliant with uncertainty budget.

5.4 Reference detail Section

Reference FCC ID	Folder Test/RF Exposure	Report Title/Section
IHDT56WK1	RF Exposure(FA761702-01)	All sections applicable (Only WWAN)
IHDT56WK4	RF Exposure(FA761702-03)	All sections applicable (Only WLAN/BT)

6. Conducted RF Output Power (Unit: dBm)

<LTE Carrier Aggregation>

General Note:

This device supports Carrier Aggregation on downlink for intra band, uplink CA is not supported. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.

E-UTRA CA configuration / Bandwidth combination set							
E-UTRA CA configuration	Uplink CA configurations	Component carriers in order of increasing carrier frequency				Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]		
CA_7B	-	15	5			20	0
CA_7C	-	15	15	15		40	0
		20	20	20			
		10	20	10			
		15	15, 20	15		40	1
		20	10, 15, 20	20			
		15	10, 15	15		40	2
		20	15, 20	20			
CA_38C	-	15	15			40	0
		20	20				
CA_7A-7A	-	5	15			40	0
		10	10, 15				
		15	15, 20				
		20	20				
		5, 10, 15, 20	5, 10, 15, 20			40	1
		5, 10, 15, 20	5, 10			30	2
		10, 15, 20	10, 15, 20			40	3

LTE Carrier Aggregation Conducted Power (Downlink)
General Note:

- According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.
- Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.
- The device supports downlink carrier aggregation only. Uplink carrier aggregation is not supported. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
- Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.
- For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band. For SCC DL RB size and offset will base on the PCC corresponding RB allocation.
- For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3 \text{ [MHz]}$$

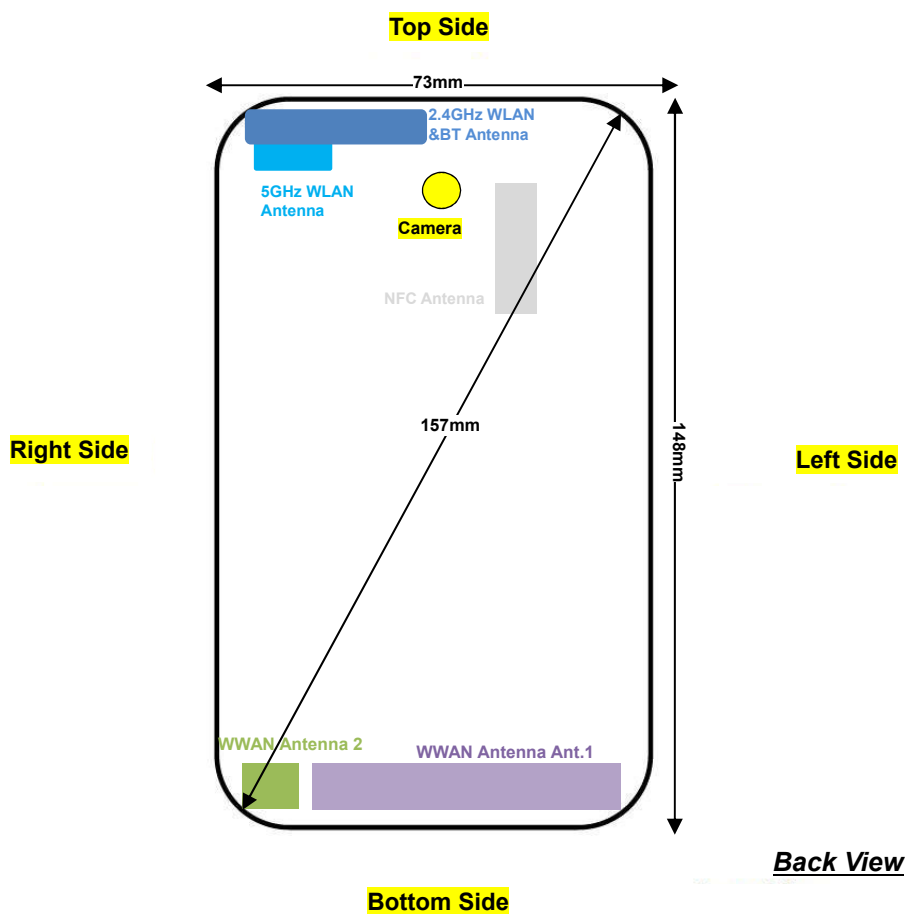
<Full Power Mode>

Configure		PCC							SCC				Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx. Power (dBm)	Without CA Tx. Power (dBm)
Intra-Band	Contiguous	Band 7	15M	2562.5	21375	QPSK	1	37	Band 7	5M	2691.8	3468	23.48	23.49
		Band 7	20M	2560	21350	QPSK	1	0	Band 7	20M	2660.2	3152	23.42	23.46
		Band 38	20M	2580	37850	QPSK	1	0	Band 38	20M	2599.8	38048	23.11	23.13
	Non-Contiguous	Band 7	20M	2560	21350	QPSK	1	0	Band 7	5M	2622.5	2775	23.41	23.46

<Reduced Power Mode for Hotspot On/P-Sensor On>

Configure		PCC							SCC				Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx. Power (dBm)	Without CA Tx. Power (dBm)
Intra-Band	Contiguous	Band 7	15M	2562.5	21375	QPSK	1	0	Band 7	5M	2691.8	3468	20.41	20.45
		Band 7	20M	2560	21350	QPSK	1	0	Band 7	20M	2660.2	3152	20.42	20.44
		Band 38	20M	2580	37850	QPSK	1	0	Band 38	20M	2599.8	38048	22.15	22.16
	Non-Contiguous	Band 7	20M	2560	21350	QPSK	1	0	Band 7	5M	2622.5	2775	20.41	20.44

7. Antenna Location



8. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Portable Handset			Note
		Head	Body-worn	Hotspot	
1.	GSM Voice + WLAN2.4GHz	Yes	Yes		
2.	GPRS/EDGE + WLAN2.4GHz	Yes	Yes	Yes	WLAN Hotspot
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes	WLAN Hotspot
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes	WLAN Hotspot
5.	GSM Voice + WLAN5.3/5.5GHz	Yes	Yes		
6.	GPRS/EDGE + WLAN5.3/5.5GHz	Yes	Yes		WLAN Direct (GC only)
7.	WCDMA + WLAN5.3/5.5GHz	Yes	Yes		WLAN Direct (GC only)
8.	LTE + WLAN5.3/5.5GHz	Yes	Yes		WLAN Direct (GC only)
9.	GSM Voice + WLAN5.2/5.8GHz	Yes	Yes		
10.	GPRS/EDGE + WLAN5.2/5.8GHz	Yes	Yes	Yes	WLAN Hotspot/Direct(GC/GO)
11.	WCDMA + WLAN5.2/5.8GHz	Yes	Yes	Yes	WLAN Hotspot/Direct(GC/GO)
12.	LTE + WLAN5.2/5.8GHz	Yes	Yes	Yes	WLAN Hotspot/Direct(GC/GO)
13.	GSM Voice + Bluetooth		Yes		
14.	GPRS/EDGE + Bluetooth		Yes	Yes	BT Tethering
15.	WCDMA + Bluetooth		Yes	Yes	BT Tethering
16.	LTE + Bluetooth		Yes	Yes	BT Tethering

General Note:

- This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
- EUT will choose each GSM, WCDMA, and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
- This device 2.4GHz WLAN/ 5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WLAN Direct (GC/GO), and 5.3GHz / 5.5GHz supports WLAN Direct (GC only).
- EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment though they have independent antenna.
- WLAN 2.4GHz and Bluetooth share the same antenna so can't transmit simultaneously.
- According to the EUT character, WLAN 5GHz and Bluetooth can't transmit simultaneously.
- Chose the worst zoom scan SAR of WLAN correspondingly for co-located with WWAN analysis.
- The reported SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - Scalar SAR summation < 1.6W/kg.
 - $SPLSR = (SAR1 + SAR2)^{1.5} / (\min. \text{ separation distance, mm})$, 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.
 - If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary.
 - Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
 - The SPLSR calculated results please refer to section 8.4.
- For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
 - (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm) · $[\sqrt{f(\text{GHz})}/x]$ W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
 - When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
 - 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 (dBm)	Exposure Position	Hotspot & Body worn
	Test separation	10 mm
12	Estimated SAR (W/kg)	0.336

8.1 Head Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN		
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM	GSM850	Right Cheek	0.233	0.570	0.673	0.80	0.91
		Right Tilted	0.195	0.909	0.965	1.10	1.16
		Left Cheek	0.354	0.909	0.945	1.26	1.30
		Left Tilted	0.166	0.824	0.965	0.99	1.13
	GSM1900	Right Cheek	0.136	0.570	0.673	0.71	0.81
		Right Tilted	0.030	0.909	0.965	0.94	1.00
		Left Cheek	0.075	0.909	0.945	0.98	1.02
		Left Tilted	0.026	0.824	0.965	0.85	0.99
WCDMA	Band V	Right Cheek	0.226	0.570	0.673	0.80	0.90
		Right Tilted	0.177	0.909	0.965	1.09	1.14
		Left Cheek	0.272	0.909	0.945	1.18	1.22
		Left Tilted	0.136	0.824	0.965	0.96	1.10
	Band IV	Right Cheek	0.127	0.570	0.673	0.70	0.80
		Right Tilted	0.046	0.909	0.965	0.96	1.01
		Left Cheek	0.107	0.909	0.945	1.02	1.05
		Left Tilted	0.030	0.824	0.965	0.85	1.00
	Band II	Right Cheek	0.138	0.570	0.673	0.71	0.81
		Right Tilted	0.052	0.909	0.965	0.96	1.02
		Left Cheek	0.072	0.909	0.945	0.98	1.02
		Left Tilted	0.072	0.824	0.965	0.90	1.04
LTE	Band 5	Right Cheek	0.204	0.570	0.673	0.77	0.88
		Right Tilted	0.160	0.909	0.965	1.07	1.13
		Left Cheek	0.454	0.909	0.945	1.36	1.40
		Left Tilted	0.265	0.824	0.965	1.09	1.23
	Band 4	Right Cheek	0.381	0.570	0.673	0.95	1.05
		Right Tilted	0.091	0.909	0.965	1.00	1.06
		Left Cheek	0.281	0.909	0.945	1.19	1.23
		Left Tilted	0.099	0.824	0.965	0.92	1.06
	Band 7	Right Cheek	0.335	0.570	0.673	0.91	1.01
		Right Tilted	0.112	0.909	0.965	1.02	1.08
		Left Cheek	0.276	0.909	0.945	1.19	1.22
		Left Tilted	0.160	0.824	0.965	0.98	1.13
	Band 38	Right Cheek	0.148	0.570	0.673	0.72	0.82
		Right Tilted	0.042	0.909	0.965	0.95	1.01
		Left Cheek	0.100	0.909	0.945	1.01	1.05
		Left Tilted	0.066	0.824	0.965	0.89	1.03



8.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	3	4	1+2			1+3			1+4		
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth	Summed 1g SAR (W/kg)	SPLSR	Case No	Summed 1g SAR (W/kg)	SPLSR	Case No	Summed 1g SAR (W/kg)	SPLSR	Case No
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)									
GSM	GSM850	Front	0.599	0.421	0.138	0.336	1.02			0.74			0.94		
		Back	0.897	0.540	0.832	0.336	1.44			1.73	0.02	#3	1.23		
		Left Side	0.613				0.61			0.61			0.61		
		Right Side	0.079	0.540	0.232	0.336	0.62			0.31			0.42		
		Top Side		0.540	0.832	0.336	0.54			0.83			0.34		
		Bottom Side	0.375				0.38			0.38			0.38		
	GSM1900	Front	1.026	0.421	0.138	0.336	1.45			1.16			1.36		
		Back	0.755	0.540	0.832	0.336	1.30			1.59			1.09		
		Left Side	0.166				0.17			0.17			0.17		
		Right Side	0.036	0.540	0.232	0.336	0.58			0.27			0.37		
		Top Side		0.540	0.832	0.336	0.54			0.83			0.34		
WCDMA	Band V	Front	0.431	0.421	0.138	0.336	0.85			0.57			0.77		
		Back	0.666	0.540	0.832	0.336	1.21			1.50			1.00		
		Left Side	0.531				0.53			0.53			0.53		
		Right Side	0.101	0.540	0.232	0.336	0.64			0.33			0.44		
		Top Side		0.540	0.832	0.336	0.54			0.83			0.34		
		Bottom Side	0.273				0.27			0.27			0.27		
	Band IV	Front	1.157	0.421	0.138	0.336	1.58			1.30			1.49		
		Back	1.080	0.540	0.832	0.336	1.62	0.02	#1	1.91	0.02	#4	1.42		
		Left Side	0.288				0.29			0.29			0.29		
		Right Side	0.033	0.540	0.232	0.336	0.57			0.27			0.37		
		Top Side		0.540	0.832	0.336	0.54			0.83			0.34		
		Bottom Side	1.073				1.07			1.07			1.07		
	Band II	Front	1.029	0.421	0.138	0.336	1.45			1.17			1.37		
		Back	1.125	0.540	0.832	0.336	1.67	0.02	#2	1.96	0.02	#5	1.46		
		Left Side	0.189				0.19			0.19			0.19		
		Right Side	0.049	0.540	0.232	0.336	0.59			0.28			0.39		
		Top Side		0.540	0.832	0.336	0.54			0.83			0.34		
		Bottom Side	1.023				1.02			1.02			1.02		



WWAN Band	Exposure Position	1	2	3	4	1+2			1+3			1+4		
		WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth									
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)	Summed 1g SAR (W/kg)	SPLSR	Case No	Summed 1g SAR (W/kg)	SPLSR	Case No	Summed 1g SAR (W/kg)	SPLSR	Case No
LTE	Band 5	Front	0.671	0.421	0.138	0.336	1.09		0.81			1.01		
		Back	0.754	0.540	0.832	0.336	1.29		1.59			1.09		
		Left Side	0.619				0.62		0.62			0.62		
		Right Side	0.162	0.540	0.232	0.336	0.70		0.39			0.50		
		Top Side		0.540	0.832	0.336	0.54		0.83			0.34		
		Bottom Side	0.383				0.38		0.38			0.38		
	Band 4	Front	1.038	0.421	0.138	0.336	1.46		1.18			1.37		
		Back	0.998	0.540	0.832	0.336	1.54		1.83	0.02	#6	1.33		
		Left Side	0.233				0.23		0.23			0.23		
		Right Side	0.035	0.540	0.232	0.336	0.58		0.27			0.37		
		Top Side		0.540	0.832	0.336	0.54		0.83			0.34		
		Bottom Side	1.017				1.02		1.02			1.02		
	Band 7	Front	0.563	0.421	0.138	0.336	0.98		0.70			0.90		
		Back	0.473	0.540	0.832	0.336	1.01		1.31			0.81		
		Right Side	0.230	0.540	0.232	0.336	0.77		0.46			0.57		
		Top Side		0.540	0.832	0.336	0.54		0.83			0.34		
		Bottom Side	1.152				1.15		1.15			1.15		
	Band 38	Front	0.361	0.421	0.138	0.336	0.78		0.50			0.70		
		Back	0.310	0.540	0.832	0.336	0.85		1.14			0.65		
		Right Side	0.182	0.540	0.232	0.336	0.72		0.41			0.52		
		Top Side		0.540	0.832	0.336	0.54		0.83			0.34		
		Bottom Side	1.094				1.09		1.09			1.09		

8.3 Body-Worn Accessory Exposure Conditions

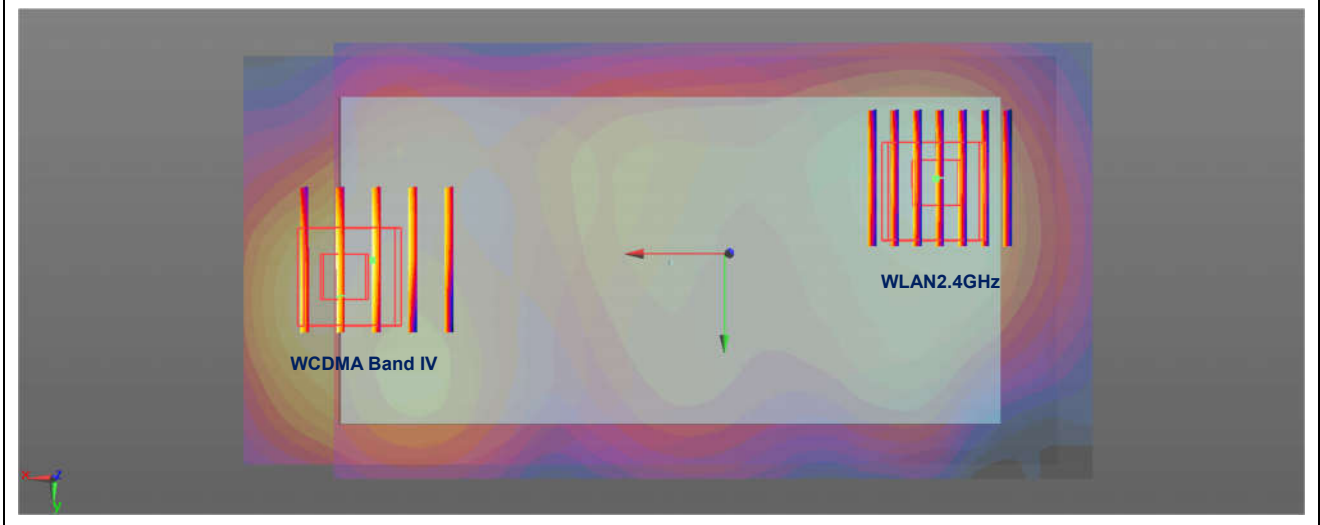
WWAN Band		Exposure Position	1	2	3	4	1+2			1+3			1+4		
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth	Summed 1g SAR (W/kg)	SPLSR	Case No	Summed 1g SAR (W/kg)	SPLSR	Case No	Summed 1g SAR (W/kg)	SPLSR	Case No
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)									
GSM	GSM850	Front	0.599	0.421	0.212	0.336	1.02			0.81			0.94		
		Back	0.897	0.540	0.832	0.336	1.44			1.73	0.02	#3	1.23		
	GSM1900	Front	1.026	0.421	0.212	0.336	1.45			1.24			1.36		
		Back	0.755	0.540	0.832	0.336	1.30			1.59			1.09		
WCDMA	Band V	Front	0.431	0.421	0.212	0.336	0.85			0.64			0.77		
		Back	0.666	0.540	0.832	0.336	1.21			1.50			1.00		
	Band IV	Front	1.157	0.421	0.212	0.336	1.58			1.37			1.49		
		Back	1.080	0.540	0.832	0.336	1.62	0.02	#1	1.91	0.02	#4	1.42		
	Band II	Front	1.029	0.421	0.212	0.336	1.45			1.24			1.37		
		Back	1.125	0.540	0.832	0.336	1.67	0.02	#2	1.96	0.02	#5	1.46		
LTE	Band 5	Front	0.671	0.421	0.212	0.336	1.09			0.88			1.01		
		Back	0.754	0.540	0.832	0.336	1.29			1.59			1.09		
	Band 4	Front	1.038	0.421	0.212	0.336	1.46			1.25			1.37		
		Back	0.998	0.540	0.832	0.336	1.54			1.83	0.02	#6	1.33		
	Band 7	Front	0.563	0.421	0.212	0.336	0.98			0.78			0.90		
		Back	0.473	0.540	0.832	0.336	1.01			1.31			0.81		
	Band 38	Front	0.361	0.421	0.212	0.336	0.78			0.57			0.70		
		Back	0.310	0.540	0.832	0.336	0.85			1.14			0.65		

8.4 SPLSR Evaluation and Analysis

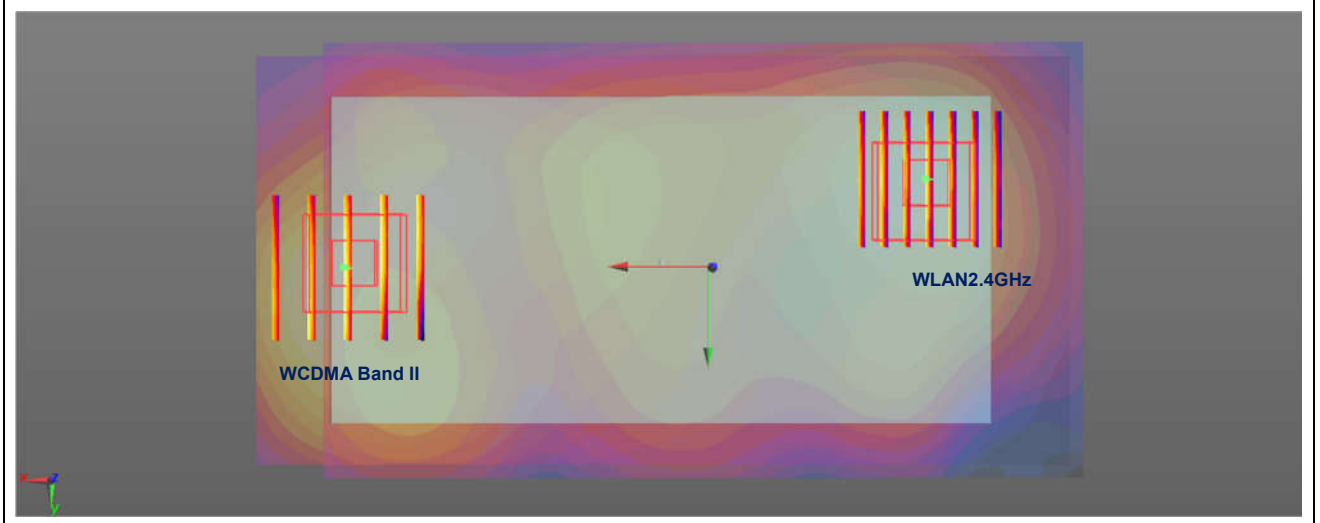
General Note:

- When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
- $SPLSR = (SAR_1 + SAR_2)1.5 / (\text{min. separation distance, mm})$. If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary.

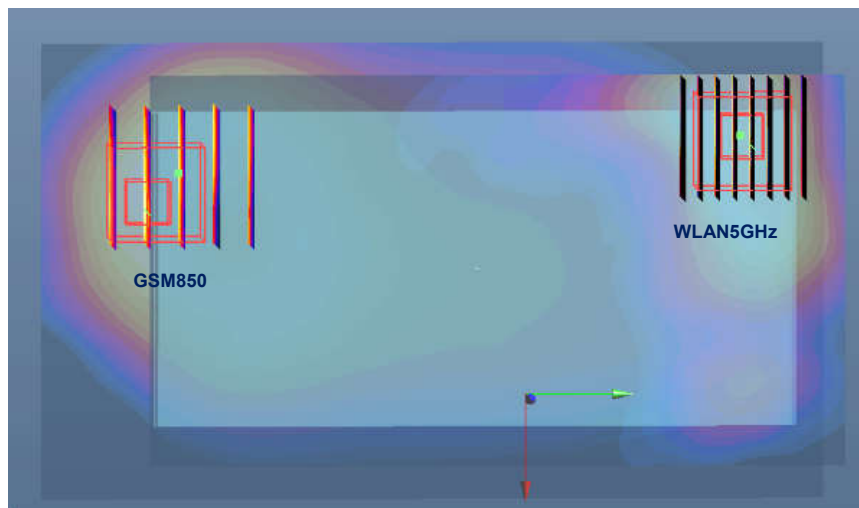
Case #1	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA Band IV	Back	1.080	10	0.0745	0.008	-0.176	135.23	1.62	0.02	Not required
	WLAN2.4GHz		0.540	10	-0.0582	-0.018	-0.177				



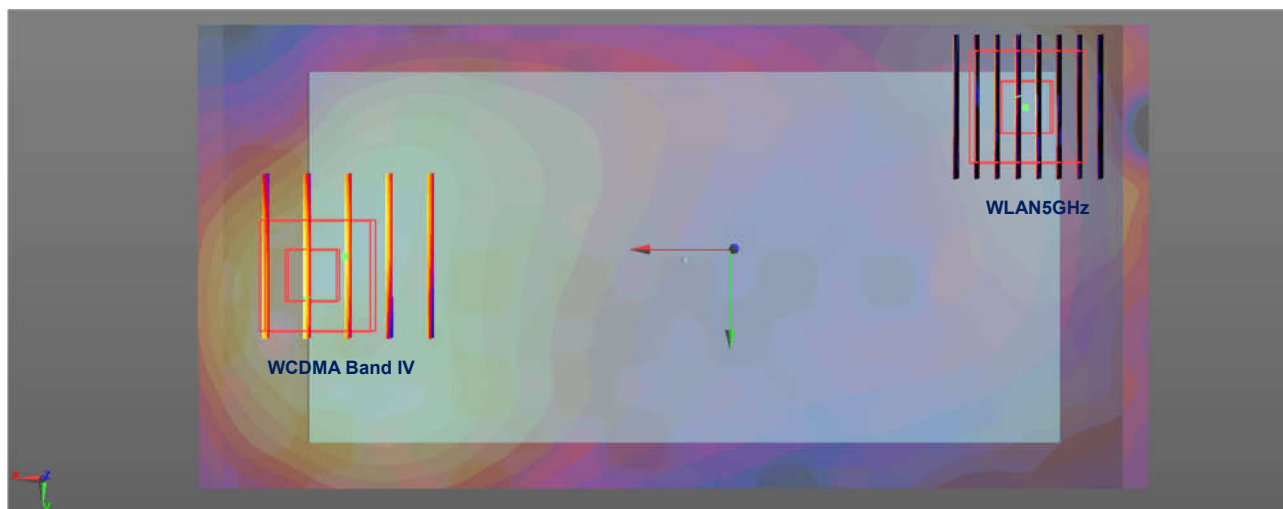
Case #2	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA Band II	Back	1.125	10	0.0705	0.0015	-0.177	130.17	1.67	0.02	Not required
	WLAN2.4GHz		0.540	10	-0.0582	-0.018	-0.177				



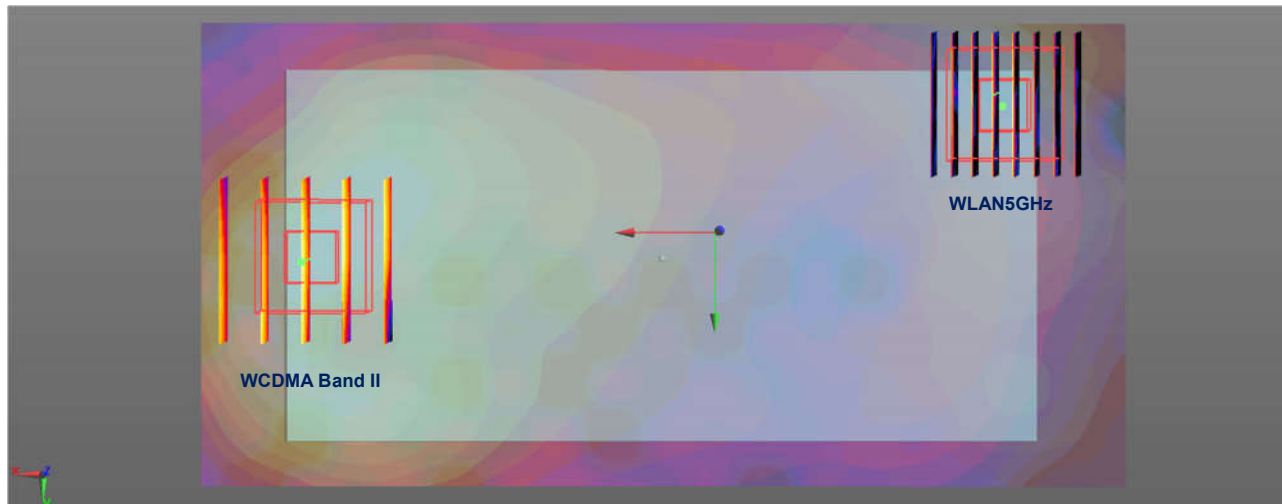
Case #3	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	GSM850				X	Y	Z				
	WLAN5GHz				-0.0315	-0.0765	-0.206				
		Back	0.897	10	-0.0315	-0.0765	-0.206	143.25	1.73	0.02	Not required
			0.832	10	-0.064	0.063	-0.204				



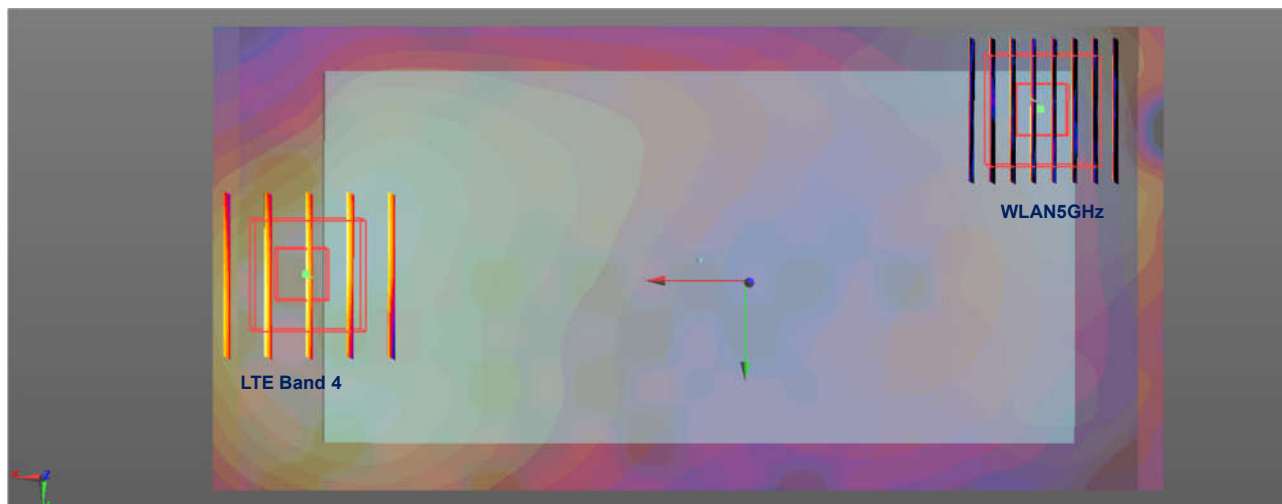
Case #4	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA Band IV				X	Y	Z				
	WLAN5GHz				-0.064	0.063	-0.204				
		Back	1.080	10	0.0745	0.008	-0.176	151.63	1.91	0.02	Not required
			0.832	10	-0.064	0.063	-0.204				



Case #5	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA Band II	Back	1.125	10	0.0705	0.0015	-0.177	150.34	1.96	0.02	Not required
	WLAN5GHz		0.832	10	-0.064	0.063	-0.204				



Case #6	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 4	Back	0.998	10	0.077	0.003	-0.177	155.60	1.83	0.02	Not required
	WLAN5GHz		0.832	10	-0.064	0.063	-0.204				



Test Engineer: Nick Hu

9. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A 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/ κ ^(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 9.1. 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	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 9.2. 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	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.6	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.5%	12.5%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.1%	25.0%

Table 9.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

10. 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
- [3] IEEE Std. 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", Sep 2013
- [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
- [10] FCC KDB 941225 D05A v01r02, "Rel. 10 LTE SAR Test Guidance and KDB Inquiries", Oct 2015
- [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.



Appendix A. Reference Report

Please refer to Sporton report number FA761702-01 and FA761702-03 which are issued separately.