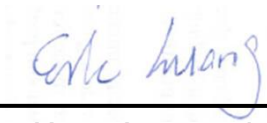
FCC SAR Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
FCC ID	:	IHDT56XE1
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
FA811821-09	Rev. 01	Initial issue of report	Apr. 13, 2018

1. Statement of Compliance

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

Equipment Class	Frequency Band	Highest SAR Summary			
		Head (Separation 0mm)	Body-worn (Separation 5mm)	Hotspot (Separation 5mm)	Product Specific (Separation 0mm)
		1g SAR (W/kg)			10g SAR (W/kg)
Licensed	GSM850	0.16	0.39	0.39	
	GSM1900	0.11	0.53	1.13	1.31
	WCDMA II	0.25	1.17	1.05	2.96
	WCDMA IV	0.26	0.97	1.03	2.92
	WCDMA V	0.34	0.58	0.58	
	CDMA BC0	0.29	0.23	0.66	
	CDMA BC1	0.29	0.77	0.99	2.77
	CDMA BC10	0.30	0.58	0.61	
	LTE Band 7	0.78	0.78	0.78	3.12
	LTE Band 12 / 17	0.30	0.66	0.66	
	LTE Band 13	0.23	0.76	0.76	
	LTE Band 14	0.35	0.57	0.57	
	LTE Band 2 / 25	0.22	1.07	1.15	2.58
	LTE Band 5 / 26	0.30	0.55	0.55	
	LTE Band 30	0.32	0.81	0.81	2.94
	LTE Band 38 / 41	0.43	0.46	0.46	3.04
	LTE Band 4 / 66	0.20	0.69	1.05	3.06
	LTE Band 71	0.20	0.62	0.62	
DTS	2.4GHz WLAN	1.13	0.47	1.18	1.41
NII	5GHz WLAN	1.04	0.45	0.60	2.22
DSS	Bluetooth	0.13	0.03	0.07	
Date of Testing:		2018/3/13 ~ 2018/3/26			

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) 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

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

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, 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 D03 Wireless Chargers Battery Cover v01r04
- 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
FCC ID	IHDT56XE1
IMEI Code	351886090018877
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 CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz CDMA 2000 BC10: 817.9 MHz ~ 823.1 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 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 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 14: 790.5 MHz ~ 795.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz LTE Band 26: 814.7 MHz ~ 848.3 MHz LTE Band 30: 2307.5 MHz ~ 2312.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz LTE Band 71: 665.5 MHz ~ 695.5 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 ~ 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 CDMA2000 : 1xRTT/1xEv-Do(Rev.0)/1xEv-Do(Rev.A) LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz : 802.11b/g/n HT20 WLAN 5GHz : 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
HW Version	DVT2
SW Version	OPW28.22
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. Add WPC accessory to include verification worst case found in the original report FCC ID: IHDT56XE1 (Sporton Report No. FA811821) as appendix D performed testing.	

4.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>IHDT56XE1</td></tr>
<tr><td>Equipment Name</td><td>Mobile Cellular Phone</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850.7 MHz ~ 1909.3 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 12: 699.7 MHz ~ 715.3 MHz
LTE Band 13: 779.5 MHz ~ 784.5 MHz
LTE Band 14: 790.5 MHz ~ 795.5 MHz
LTE Band 17: 706.5 MHz ~ 713.5 MHz
LTE Band 25: 1850.7 MHz ~ 1914.3 MHz
LTE Band 26: 814.7 MHz ~ 848.3 MHz
LTE Band 30: 2307.5 MHz ~ 2312.5 MHz
LTE Band 38: 2572.5 MHz ~ 2617.5 MHz
LTE Band 41: 2498.5 MHz ~ 2687.5 MHz
LTE Band 66: 1710.7 MHz ~ 1779.3 MHz
LTE Band 71: 665.5 MHz ~ 695.5 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 02:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 04:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 13: 5MHz, 10MHz
LTE Band 14: 5MHz, 10MHz
LTE Band 17: 5MHz, 10MHz
LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz
LTE Band 30: 5MHz, 10MHz
LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 66: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM / 64QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Voice and Data</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{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>
<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>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table></td></tr>
<tr><td>LTE A-MPR</td><td>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)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>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.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, when operating in hotspot mode or Near-body or Product Specific that LTE B2 / B4 / B5 / B7 / B14 / B25 / B26 / B30 / B66 / B38 / B41 power reduction applied to satisfy SAR compliance.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>Inter-Band and Intra-Band possible combinations as below page and the detail power verification please referred to appendix D original report section 12.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>(1) This device supports LTE Carrier Aggregation (CA) in the uplink for LTE Band 41 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance.
(2) This device supports maximum of 3 carriers in the downlink and 2 carriers in the uplink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.</td></tr>
</table>

Transmission (H, M, L) channel numbers and frequencies in each LTE band												
LTE Band 2												
	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	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900
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)
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
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)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560
LTE Band 12								
	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	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711
LTE Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		
LTE Band 14				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Channel #	Channel #	Freq.(MHz)
L	23305	790.5	23330	793
M	23330	793		
H	23355	795.5		
LTE Band 17				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 25												
	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	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

LTE Band 26										
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

LTE Band 30				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	27685	2307.5	27710	2310
M	27710	2310		
H	27735	2312.5		

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)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
L M	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
H M	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

LTE Band 66												
	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	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

LTE Band 71								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133147	665.5	133172	668	133197	670.5	133222	673
M	133247	675.5	133272	678	133297	680.5	133322	683
H	133447	695.5	133422	693	133397	690.5	133372	688

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

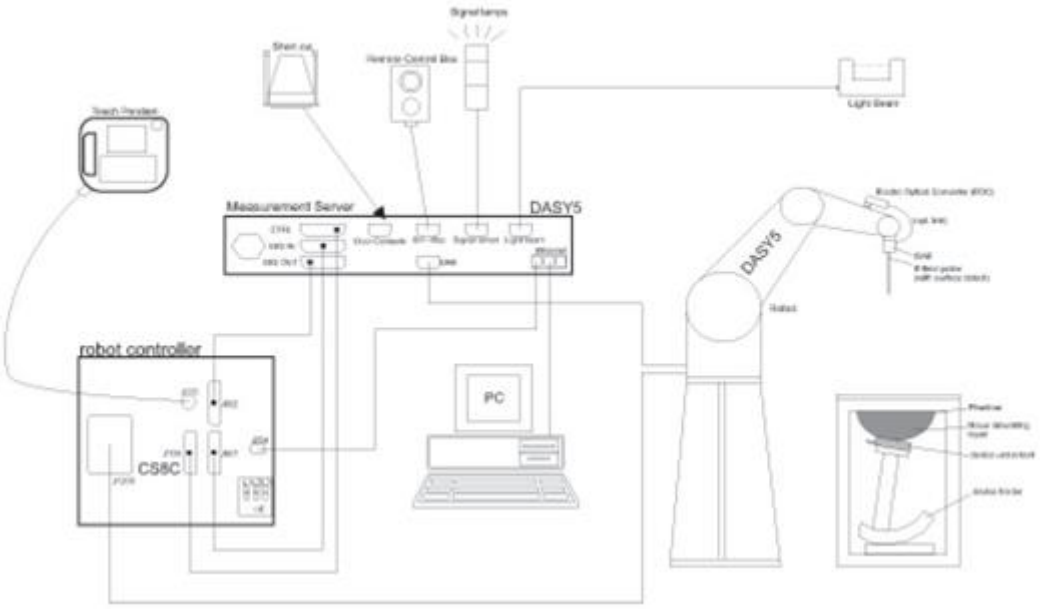
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^{\mathbf{2}}}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- 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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- 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.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.2 Data Acquisition Electronics (DAE)

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

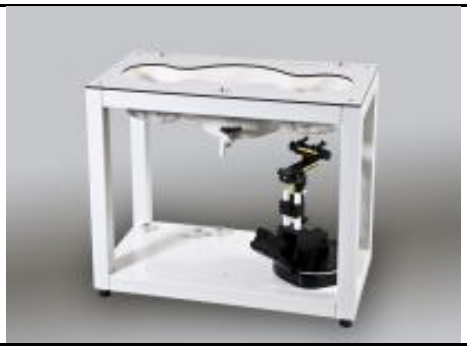
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

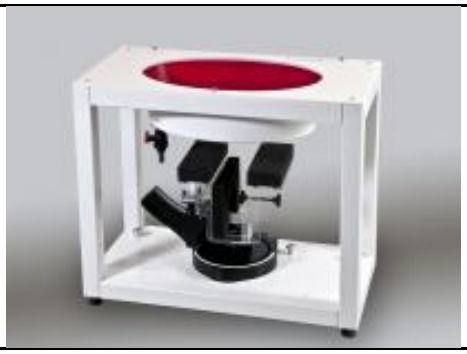
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm



The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1012	May. 22, 2017	May. 21, 2018
SPEAG	835MHz System Validation Kit	D835V2	4d167	Feb. 27, 2018	Feb. 26, 2019
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Nov. 15, 2017	Nov. 14, 2018
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Sep. 28, 2017	Sep. 27, 2018
SPEAG	2300MHz System Validation Kit	D2300V2	1006	Jan. 17, 2018	Jan. 16, 2019
SPEAG	2450MHz System Validation Kit	D2450V2	736	Sep. 18, 2017	Sep. 17, 2018
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Sep. 18, 2017	Sep. 17, 2018
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Sep. 26, 2017	Sep. 25, 2018
SPEAG	Data Acquisition Electronics	DAE3	495	May. 22, 2017	May. 21, 2018
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 16, 2017	Nov. 15, 2018
SPEAG	Data Acquisition Electronics	DAE4	853	Jul. 19, 2017	Jul. 18, 2018
SPEAG	Dosimetric E-Field Probe	EX3DV4	3976	Jan. 23, 2018	Jan. 22, 2019
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 29, 2017	Sep. 28, 2018
SPEAG	Dosimetric E-Field Probe	ES3DV3	3169	May. 11, 2017	May. 10, 2018
WonDer	Thermometer	WD-5016	TM281-1	Apr. 17, 2017	Apr. 16, 2018
WonDer	Thermometer	WD-5016	TM281-2	Apr. 17, 2017	Apr. 16, 2018
WonDer	Thermometer	WD-5016	TM560-1	Apr. 17, 2017	Apr. 16, 2018
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Apr. 20, 2017	Apr. 19, 2018
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 30, 2017	May. 29, 2018
R&S	BT Base Station	CBT	100815	Feb. 05, 2018	Feb. 04, 2019
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Dec. 07, 2017	Dec. 06, 2018
Agilent	ENA Network Analyzer	E5071C	MY46316648	Jan. 17, 2018	Jan. 16, 2019
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 26, 2017	Sep. 25, 2018
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL	Sep. 06, 2017	Sep. 05, 2018
Anritsu	Power Meter	ML2495A	1419002	May. 15, 2017	May. 14, 2018
Anritsu	Power Sensor	MA2411B	1339124	May. 15, 2017	May. 14, 2018
Anritsu	Power Meter	ML2495A	1218006	Oct. 06, 2017	Oct. 05, 2018
Anritsu	Power Sensor	MA2411B	1207363	Oct. 06, 2017	Oct. 05, 2018
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 23, 2017	Aug. 22, 2018
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 26, 2017	Jun. 25, 2018
Mini-Circuits	Power Amplifier	ZVE-8G+	D120604	Mar. 12, 2018	Mar. 11, 2019
Mini-Circuits	Power Amplifier	ZHL-42W+	QA1344002	Mar. 12, 2018	Mar. 11, 2019
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

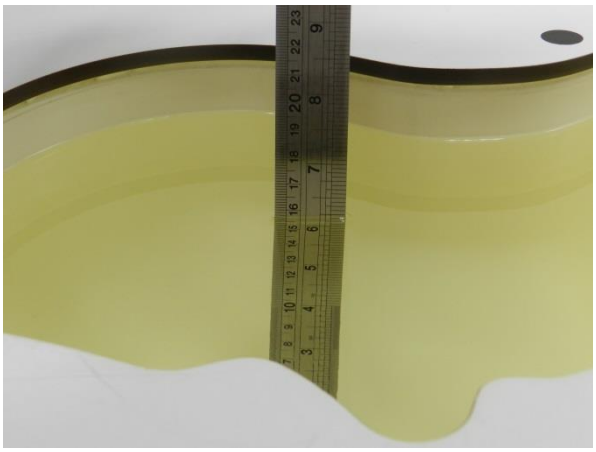


Fig 10.1Photo of Liquid Height for Head SAR

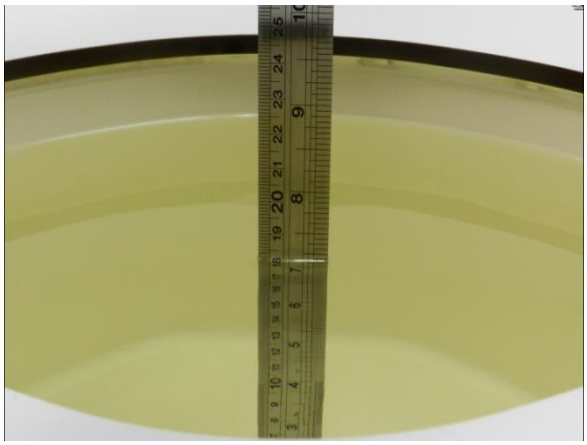


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	HSL	22.2	0.917	40.092	0.89	41.90	3.03	-4.32	±5	2018/3/22
750	MSL	22.2	0.962	55.124	0.96	55.50	0.21	-0.68	±5	2018/3/23
835	HSL	22.4	0.871	42.117	0.90	41.50	-3.22	1.49	±5	2018/3/21
835	MSL	22.2	0.956	56.284	0.97	55.20	-1.44	1.96	±5	2018/3/22
1750	HSL	22.4	1.405	40.768	1.37	40.10	2.55	1.67	±5	2018/3/21
1750	MSL	22.2	1.509	53.539	1.49	53.40	1.28	0.26	±5	2018/3/23
1900	HSL	22.4	1.416	40.241	1.40	40.00	1.14	0.60	±5	2018/3/21
1900	MSL	22.2	1.539	53.611	1.52	53.30	1.25	0.58	±5	2018/3/23
2300	HSL	22.3	1.615	41.140	1.67	39.50	-3.29	4.15	±5	2018/3/26
2300	MSL	22.3	1.781	51.789	1.81	52.90	-1.60	-2.10	±5	2018/3/26
2450	HSL	22.6	1.796	39.877	1.80	39.20	-0.22	1.73	±5	2018/3/13
2450	MSL	22.6	1.992	53.233	1.95	52.70	2.15	1.01	±5	2018/3/24
2600	HSL	22.6	1.962	39.345	1.96	39.00	0.10	0.88	±5	2018/3/13
2600	MSL	22.2	2.154	52.740	2.16	52.50	-0.28	0.46	±5	2018/3/22
2600	MSL	22.6	2.195	52.690	2.16	52.50	1.62	0.36	±5	2018/3/24
5250	HSL	22.5	4.552	35.889	4.71	35.95	-3.35	-0.17	±5	2018/3/14
5250	MSL	22.3	5.349	47.692	5.36	48.95	-0.21	-2.57	±5	2018/3/21
5600	HSL	22.5	4.884	35.439	5.07	35.50	-3.67	-0.17	±5	2018/3/14
5600	MSL	22.3	5.793	47.101	5.77	48.50	0.40	-2.88	±5	2018/3/21
5750	HSL	22.5	5.034	35.223	5.22	35.35	-3.56	-0.36	±5	2018/3/14
5750	MSL	22.3	5.995	46.834	5.94	48.28	0.93	-3.00	±5	2018/3/21

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2018/3/22	750	HSL	250	D750V3-1012	ES3DV3 - SN3169	DAE4 Sn853	2.10	8.22	8.4	2.19
2018/3/23	750	MSL	250	D750V3-1012	ES3DV3 - SN3169	DAE4 Sn853	2.17	8.71	8.68	-0.34
2018/3/21	835	HSL	250	D835V2-4d167	ES3DV3 - SN3169	DAE4 Sn853	2.44	9.26	9.76	5.40
2018/3/22	835	MSL	250	D835V2-4d167	ES3DV3 - SN3169	DAE4 Sn853	2.38	9.62	9.52	-1.04
2018/3/21	1750	HSL	250	D1750V2-1068	ES3DV3 - SN3169	DAE4 Sn853	9.25	36.70	37	0.82
2018/3/23	1750	MSL	250	D1750V2-1068	ES3DV3 - SN3169	DAE4 Sn853	8.72	37.20	34.88	-6.24
2018/3/21	1900	HSL	250	D1900V2-5d041	ES3DV3 - SN3169	DAE4 Sn853	9.79	40.50	39.16	-3.31
2018/3/23	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3169	DAE4 Sn853	9.93	40.70	39.72	-2.41
2018/3/26	2300	HSL	250	D2300V2-1006	EX3DV4 - SN3931	DAE4 Sn1399	12.00	48.70	48	-1.44
2018/3/26	2300	MSL	250	D2300V2-1006	EX3DV4 - SN3931	DAE4 Sn1399	12.00	47.30	48	1.48
2018/3/13	2450	HSL	250	D2450V2-736	ES3DV3 - SN3169	DAE4 Sn853	13.20	52.40	52.8	0.76
2018/3/24	2450	MSL	250	D2450V2-736	EX3DV4 - SN3976	DAE3 Sn495	12.70	50.80	50.8	0.00
2018/3/13	2600	HSL	250	D2600V2-1008	ES3DV3 - SN3169	DAE4 Sn853	13.60	56.80	54.4	-4.23
2018/3/22	2600	MSL	250	D2600V2-1008	ES3DV3 - SN3169	DAE4 Sn853	13.60	55.00	54.4	-1.09
2018/3/24	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3976	DAE3 Sn495	14.40	55.00	57.6	4.73
2018/3/14	5250	HSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	8.56	78.30	85.6	9.32
2018/3/21	5250	MSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	7.40	77.00	74	-3.90
2018/3/14	5600	HSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	8.63	85.00	86.3	1.53
2018/3/21	5600	MSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	7.77	80.10	77.7	-3.00
2018/3/14	5750	HSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	7.82	78.50	78.2	-0.38
2018/3/21	5750	MSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	7.32	75.10	73.2	-2.53

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2018/3/23	1750	MSL	250	D1750V2-1068	ES3DV3 - SN3169	DAE4 Sn853	4.77	19.70	19.08	-3.15
2018/3/23	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3169	DAE4 Sn853	5.25	21.40	21	-1.87
2018/3/26	2300	MSL	250	D2300V2-1006	EX3DV4 - SN3931	DAE4 Sn1399	5.81	22.80	23.24	1.93
2018/3/24	2450	MSL	250	D2450V2-736	EX3DV4 - SN3976	DAE3 Sn495	5.82	23.60	23.28	-1.36
2018/3/22	2600	MSL	250	D2600V2-1008	ES3DV3 - SN3169	DAE4 Sn853	6.10	24.50	24.4	-0.41
2018/3/21	5250	MSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	2.01	21.30	20.1	-5.63
2018/3/21	5600	MSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	2.09	22.40	20.9	-6.70
2018/3/21	5750	MSL	100	D5GHzV2-1006	EX3DV4 - SN3976	DAE3 Sn495	1.97	20.80	19.7	-5.29

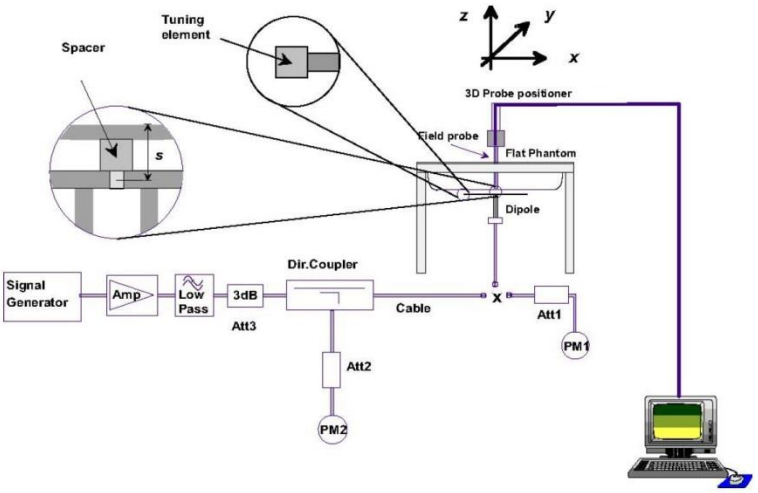
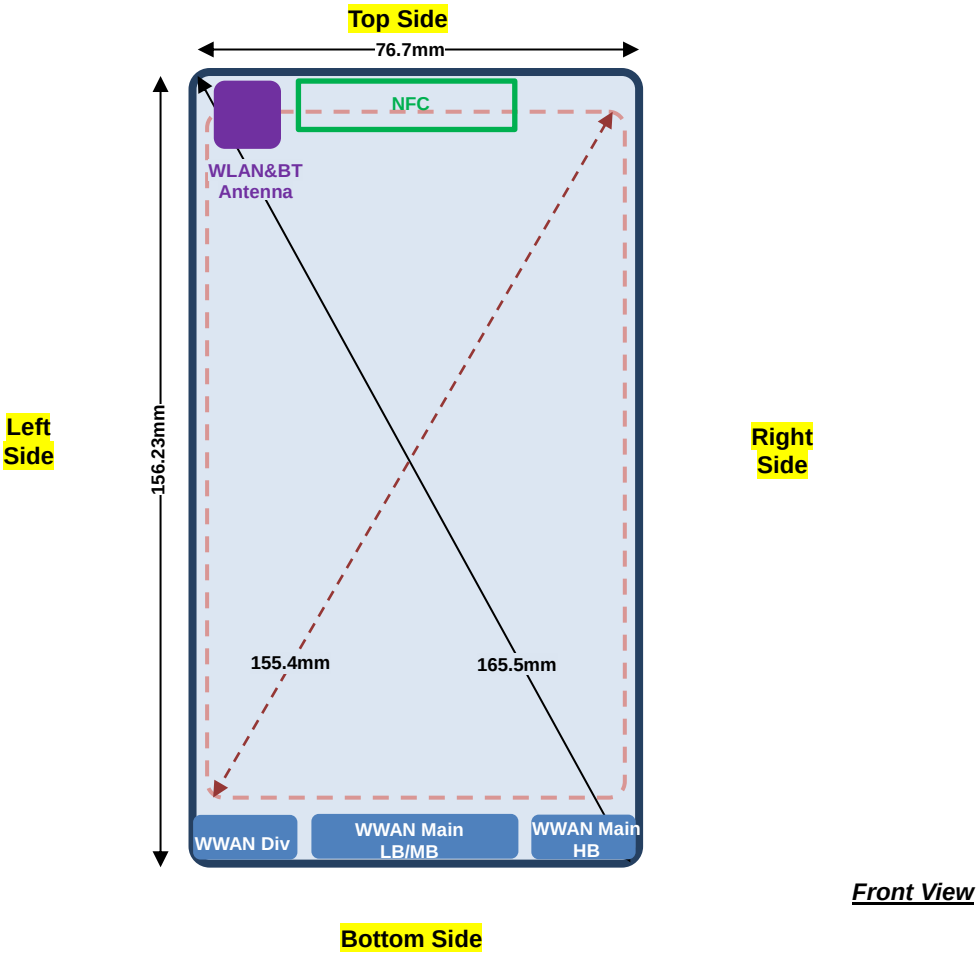


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. Antenna Location

<Mobile Phone>



General Note:

1. The WWAN Div antenna only supports LTE B7/B30/B38/B41.
2. LB: Low Band as 1GHz below, MB: middle band as 2GHz below, HB: high band as 2GHz above.

12. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   e. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. Initially, the handset must be tested according to all applicable SAR test procedures using the normal battery cover (without the wireless charging hardware). The highest SAR reported for each wireless technology (1xRTT, EVDO, WCDMA, GSM, Wi-Fi etc.), frequency band, operating mode (different modes/configurations within each wireless technology) and exposure condition (head, body-worn accessory, hotspot mode, etc.) must be repeated using the wireless charging battery cover.
5. In this report all the conducted power, tune-up, power reduction mechanism is referring to original report as appendix D to be used for the testing.

12.1 Head SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	GSM850	GPRS (2 Tx slots)	Left Cheek	0mm	OFF	128	824.2	30.31	32.00	1.476	0.11	0.105	0.155
02	GSM1900	GPRS (3 Tx slots)	Right Cheek	0mm	OFF	810	1909.8	26.87	28.00	1.297	-0.04	0.082	0.106

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
03	WCDMA II	RMC 12.2Kbps	Right Cheek	0mm	OFF	9538	1907.6	22.73	23.50	1.194	-0.12	0.209	0.250
04	WCDMA IV	RMC 12.2Kbps	Right Cheek	0mm	OFF	1312	1712.4	22.62	23.50	1.225	0.11	0.208	0.255
05	WCDMA V	RMC 12.2Kbps	Left Cheek	0mm	OFF	4132	826.4	22.64	24.00	1.368	0.06	0.247	0.338

<CDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
06	CDMA BC0	1xRTT RC3 SO55	Right Cheek	0mm	OFF	1013	824.7	23.86	25.00	1.300	0.02	0.225	0.293
07	CDMA BC1	1xRTT RC3 SO55	Right Cheek	0mm	OFF	1175	1908.75	23.52	25.00	1.406	-0.06	0.206	0.290
08	CDMA BC10	1xRTT RC3 SO55	Right Cheek	0mm	OFF	580	820.5	23.83	25.00	1.309	0.02	0.232	0.304

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
09	LTE Band 7_Main	20M	QPSK	1	99	Right Cheek	0mm	OFF	21350	2560	22.83	24.00	1.309	-0.12	0.598	0.783
	LTE Band 7_Aux	20M	QPSK	1	99	Left Cheek	0mm	OFF	21350	2560	22.83	24.00	1.309	-0.16	0.461	0.604
10	LTE Band 12	10M	QPSK	1	49	Left Cheek	0mm	OFF	23095	707.5	22.77	24.00	1.327	0	0.223	0.296
11	LTE Band 13	10M	QPSK	1	0	Left Cheek	0mm	OFF	23230	782	22.72	24.00	1.343	0	0.170	0.228
12	LTE Band 14	10M	QPSK	1	0	Left Cheek	0mm	OFF	23330	793	22.71	24.00	1.346	0.04	0.257	0.346
13	LTE Band 25	20M	QPSK	1	0	Right Cheek	0mm	OFF	26140	1860	23.26	23.50	1.057	-0.19	0.205	0.217
14	LTE Band 26	15M	QPSK	1	37	Left Cheek	0mm	OFF	26865	831.5	22.73	24.00	1.340	0.01	0.222	0.297
15	LTE Band 30_Main	10M	QPSK	1	0	Right Cheek	0mm	OFF	27710	2310	22.71	24.00	1.346	-0.05	0.238	0.320
	LTE Band 30_Aux	10M	QPSK	1	0	Left Cheek	0mm	OFF	27710	2310	22.71	24.00	1.346	-0.19	0.147	0.198
16	LTE Band 66	20M	QPSK	1	0	Left Cheek	0mm	OFF	132072	1720	22.83	23.50	1.167	0.1	0.174	0.203
17	LTE Band 71	20M	QPSK	1	0	Left Cheek	0mm	OFF	133322	683	23.18	24.00	1.208	0	0.162	0.196

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
18	LTE Band 41_Main	20M	QPSK	1	99	Right Cheek	0mm	OFF	40620	2593	26.18	27.00	1.208	42.90	1.009	-0.16	0.352	0.429
	LTE Band 41_Aux	20M	QPSK	1	99	Left Cheek	0mm	OFF	40620	2593	26.18	27.00	1.208	42.90	1.009	0.05	0.252	0.307

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
19	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	ON	6	2437	16.49	18.00	1.416	99.42	1.006	0.13	0.790	1.125
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	ON	1	2412	16.48	18.00	1.419	99.42	1.006	0.18	0.771	1.101
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	ON	11	2462	16.49	18.00	1.416	99.42	1.006	0.18	0.774	1.102
20	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	58	5290	15.70	16.00	1.071	87.06	1.149	-0.16	0.842	1.036
	WLAN5GHz	802.11n-HT40 MCS0	Right Cheek	0mm	ON	62	5310	15.91	16.00	1.021	93.90	1.065	-0.13	0.779	0.847
21	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	138	5690	15.81	16.00	1.044	87.06	1.149	0.11	0.867	1.040
	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	106	5530	15.60	16.00	1.096	87.06	1.149	0.11	0.821	1.034
22	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	155	5775	15.95	16.00	1.011	87.06	1.149	0.13	0.855	0.993
	WLAN5GHz	802.11n-HT40 MCS0	Right Cheek	0mm	ON	151	5755	15.73	16.00	1.063	93.90	1.065	-0.11	0.841	0.952

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
23	Bluetooth	1Mbps	Right Cheek	0mm	39	2441	8.86	10.00	1.300	0.01	0.100	0.130

12.2 Hotspot SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
24	GSM850	GPRS (2 Tx slots)	Back	5mm	OFF	128	824.2	30.31	32.00	1.476	-0.12	0.262	0.387
25	GSM1900	GPRS (3 Tx slots)	Bottom Side	5mm	ON	810	1909.8	19.68	20.50	1.208	0.08	0.934	1.128
	GSM1900	GPRS (3 Tx slots)	Bottom Side	5mm	ON	512	1850.2	19.58	20.50	1.236	0.12	0.862	1.065
	GSM1900	GPRS (3 Tx slots)	Bottom Side	5mm	ON	661	1880	19.60	20.50	1.230	-0.01	0.912	1.122

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
26	WCDMA II	RMC 12.2Kbps	Bottom Side	5mm	ON	9262	1852.4	13.95	15.50	1.429	-0.14	0.733	1.047
	WCDMA II	RMC 12.2Kbps	Bottom Side	5mm	ON	9400	1880	13.83	15.50	1.469	0.12	0.705	1.036
	WCDMA II	RMC 12.2Kbps	Bottom Side	5mm	ON	9538	1907.6	13.79	15.50	1.483	-0.05	0.700	1.038
27	WCDMA IV	RMC 12.2Kbps	Bottom Side	5mm	ON	1513	1752.6	15.53	16.50	1.250	0.11	0.825	1.031
	WCDMA IV	RMC 12.2Kbps	Bottom Side	5mm	ON	1312	1712.4	15.45	16.50	1.274	-0.03	0.803	1.023
	WCDMA IV	RMC 12.2Kbps	Bottom Side	5mm	ON	1413	1732.6	15.44	16.50	1.276	0.05	0.804	1.026
28	WCDMA V	RMC 12.2Kbps	Back	5mm	ON	4233	846.6	22.15	23.50	1.365	-0.12	0.423	0.577

<CDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
29	CDMA BC0	RTAP 153.6Kbps	Back	5mm	ON	777	848.31	22.78	23.50	1.180	0.14	0.556	0.656
	CDMA BC0	RTAP 153.6Kbps	Back	5mm	ON	1013	824.7	22.71	23.50	1.199	0.07	0.488	0.585
	CDMA BC0	RTAP 153.6Kbps	Back	5mm	ON	384	836.52	22.77	23.50	1.183	0.16	0.444	0.525
30	CDMA BC1	RTAP 153.6Kbps	Bottom Side	5mm	ON	1175	1908.75	14.63	15.50	1.222	-0.06	0.812	0.992
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	5mm	ON	25	1851.25	14.61	15.50	1.227	-0.02	0.798	0.979
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	5mm	ON	600	1880	14.49	15.50	1.262	-0.1	0.776	0.979
31	CDMA BC10	RTAP 153.6Kbps	Back	5mm	ON	580	820.5	22.62	23.50	1.225	0.15	0.500	0.612
	CDMA BC10	RTAP 153.6Kbps	Back	5mm	ON	476	817.9	22.55	23.50	1.245	0.12	0.484	0.602
	CDMA BC10	RTAP 153.6Kbps	Back	5mm	ON	684	823.1	22.57	23.50	1.239	0.16	0.489	0.606

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
32	LTE Band 7	20M	QPSK	50	50	Back	5mm	ON	20850	2510	16.66	18.00	1.361	0.09	0.572	0.779
	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	21350	2560	16.85	18.00	1.303	-0.13	0.438	0.571
33	LTE Band 12	10M	QPSK	1	49	Back	5mm	OFF	23095	707.5	22.77	24.00	1.327	-0.02	0.500	0.664
34	LTE Band 13	10M	QPSK	1	0	Back	5mm	OFF	23230	782	22.72	24.00	1.343	-0.04	0.563	0.756
35	LTE Band 14	10M	QPSK	50	0	Back	5mm	ON	23330	793	21.66	23.50	1.528	0.01	0.370	0.565
36	LTE Band 25	20M	QPSK	50	0	Bottom Side	5mm	ON	26590	1905	15.60	16.50	1.230	0.11	0.932	1.147
	LTE Band 25	20M	QPSK	50	0	Bottom Side	5mm	ON	26140	1860	15.75	16.50	1.189	0	0.889	1.057
	LTE Band 25	20M	QPSK	50	0	Bottom Side	5mm	ON	26340	1880	15.58	16.50	1.236	0.13	0.876	1.083
37	LTE Band 26	15M	QPSK	36	0	Back	5mm	ON	26865	831.5	21.98	23.50	1.419	-0.17	0.388	0.551
38	LTE Band 30_Main	10M	QPSK	25	0	Back	5mm	ON	27710	2310	20.11	21.00	1.227	-0.01	0.661	0.811
	LTE Band 30_Aux	10M	QPSK	50	0	Back	5mm	ON	27710	2310	20.03	21.00	1.250	-0.01	0.518	0.648
39	LTE Band 66	20M	QPSK	100	0	Bottom Side	5mm	ON	132572	1770	15.37	16.50	1.297	0.12	0.812	1.053
40	LTE Band 71	20M	QPSK	1	0	Back	5mm	OFF	133322	683	23.18	24.00	1.208	0.1	0.510	0.616

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
41	LTE Band 41	20M	QPSK	1	0	Back	5mm	ON	41490	2680	19.92	20.00	1.019	62.90	1.006	0.12	0.449	0.460
	LTE Band 41	20M	QPSK	1	0	Back	5mm	ON	40620	2593	19.26	20.00	1.186	62.90	1.006	-0.16	0.320	0.382

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
42	WLAN2.4GHz	802.11b 1Mbps	Left Side	5mm	ON	6	2437	18.87	20.50	1.455	99.42	1.006	0.04	0.807	1.182
	WLAN2.4GHz	802.11b 1Mbps	Left Side	5mm	ON	1	2412	18.85	20.50	1.462	99.42	1.006	-0.02	0.713	1.049
	WLAN2.4GHz	802.11b 1Mbps	Left Side	5mm	ON	11	2462	18.96	20.50	1.426	99.42	1.006	-0.1	0.790	1.133
43	WLAN5GHz	802.11ac-VHT80 MCS0	Left Side	5mm	ON	42	5210	14.99	15.00	1.002	87.06	1.149	-0.13	0.519	0.597
44	WLAN5GHz	802.11ac-VHT80 MCS0	Left Side	5mm	ON	155	5775	14.88	15.00	1.028	87.06	1.149	-0.1	0.508	0.600

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
45	Bluetooth	1Mbps	Left Side	5mm	ON	39	2441	8.86	10.00	1.300	-0.1	0.053	0.069

12.3 Product Specific SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
46	GSM1900	GPRS (3 Tx slots)	Bottom Side	0mm	OFF	810	1909.8	26.87	28.00	1.297	0.11	1.010	1.310

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
47	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9262	1852.4	22.23	23.00	1.194	0.13	2.480	2.961
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9400	1880	22.66	23.00	1.081	-0.19	2.410	2.606
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9538	1907.6	22.71	23.00	1.069	-0.12	2.350	2.512
48	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1312	1712.4	21.87	22.00	1.030	-0.18	2.830	2.916
	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1413	1732.6	21.82	22.00	1.042	-0.19	2.780	2.898
	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1513	1752.6	22.00	22.00	1.000	-0.16	2.220	2.220

<CDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
49	CDMA BC1	RTAP 153.6Kbps	Bottom Side	0mm	ON	600	1880	21.17	23.00	1.524	-0.01	1.820	2.774
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	0mm	ON	25	1851.25	21.22	23.00	1.507	-0.03	1.740	2.621
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	0mm	ON	1175	1908.75	21.16	23.00	1.528	-0.1	1.730	2.643

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
50	LTE Band 7_Main	20M	QPSK	1	49	Right Side	0mm	ON	21100	2535	20.84	21.50	1.164	-0.17	2.680	3.120
	LTE Band 7_Main	20M	QPSK	1	49	Right Side	0mm	ON	20850	2510	20.88	21.50	1.153	-0.11	2.570	2.964
	LTE Band 7_Main	20M	QPSK	1	49	Right Side	0mm	ON	21350	2560	20.99	21.50	1.125	-0.03	2.520	2.834
	LTE Band 7_Aux	20M	QPSK	1	49	Left Side	0mm	ON	21350	2560	20.99	21.50	1.125	0.04	2.390	2.688
	LTE Band 7_Aux	20M	QPSK	1	49	Left Side	0mm	ON	20850	2510	20.88	21.50	1.153	0.15	2.310	2.664
	LTE Band 7_Aux	20M	QPSK	1	49	Left Side	0mm	ON	21100	2535	20.84	21.50	1.164	0.11	2.280	2.654
51	LTE Band 25	20M	QPSK	50	0	Bottom Side	0mm	ON	26340	1880	20.66	22.50	1.528	0.15	1.690	2.582
	LTE Band 25	20M	QPSK	50	0	Bottom Side	0mm	ON	26140	1860	20.71	22.50	1.510	0.16	1.650	2.492
	LTE Band 25	20M	QPSK	50	0	Bottom Side	0mm	ON	26590	1905	20.62	22.50	1.542	0.14	1.580	2.436
52	LTE Band 30_Main	10M	QPSK	1	0	Right Side	0mm	ON	27710	2310	22.66	23.50	1.213	0.13	2.420	2.936
53	LTE Band 66	20M	QPSK	1	0	Bottom Side	0mm	ON	132572	1770	22.28	23.00	1.180	0.18	2.590	3.057
	LTE Band 66	20M	QPSK	1	0	Bottom Side	0mm	ON	132072	1720	22.09	23.00	1.233	0.14	2.440	3.009
	LTE Band 66	20M	QPSK	1	0	Bottom Side	0mm	ON	132322	1745	22.20	23.00	1.202	-0.07	2.480	2.982

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
54	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	ON	41055	2636.5	22.89	24.00	1.291	62.90	1.006	0.11	2.340	3.040
	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	ON	39750	2506	22.95	24.00	1.274	62.90	1.006	-0.1	1.950	2.498
	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	ON	40185	2549.5	22.95	24.00	1.274	62.90	1.006	0.03	2.020	2.588
	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	ON	40620	2593	22.96	24.00	1.271	62.90	1.006	-0.07	2.020	2.582
	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	ON	41490	2680	23.92	24.00	1.019	62.90	1.006	-0.08	2.360	2.418
	LTE Band 41	20M	QPSK	1	0	Left Side	0mm	ON	41055	2636.5	22.89	24.00	1.291	62.90	1.006	0.14	2.050	2.663
	LTE Band 41	20M	QPSK	1	0	Left Side	0mm	ON	39750	2506	22.95	24.00	1.274	62.90	1.006	-0.09	1.690	2.165
	LTE Band 41	20M	QPSK	1	0	Left Side	0mm	ON	40185	2549.5	22.95	24.00	1.274	62.90	1.006	-0.1	1.810	2.319
	LTE Band 41	20M	QPSK	1	0	Left Side	0mm	ON	40620	2593	22.96	24.00	1.271	62.90	1.006	-0.13	1.870	2.390
	LTE Band 41	20M	QPSK	1	0	Left Side	0mm	ON	41490	2680	23.92	24.00	1.019	62.90	1.006	-0.15	1.920	1.967

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
55	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	OFF	6	2437	19.74	21.00	1.337	99.42	1.006	-0.16	1.050	1.412
56	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	OFF	64	5320	19.98	20.00	1.005	93.64	1.068	-0.11	2.070	2.221
	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	OFF	60	5300	19.97	20.00	1.007	93.64	1.068	-0.02	1.990	2.140
57	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	OFF	144	5720	19.95	20.00	1.012	93.64	1.068	-0.17	1.500	1.621
58	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	OFF	165	5825	19.98	20.00	1.005	93.64	1.068	-0.09	1.860	1.996

12.4 Body Worn Accessory SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
59	GSM850	GPRS (2 Tx slots)	Back	5mm	OFF	128	824.2	30.31	32.00	1.476	-0.12	0.262	0.387
60	GSM1900	GPRK (3 Tx slots)	Back	5mm	ON	810	1909.8	21.05	21.50	1.109	-0.16	0.475	0.527

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
61	WCDMA II	RMC 12.2Kbps	Front	5mm	ON	9400	1880	16.33	17.50	1.309	0.03	0.894	1.170
	WCDMA II	RMC 12.2Kbps	Front	5mm	ON	9262	1852.4	16.46	17.50	1.271	-0.01	0.886	1.126
	WCDMA II	RMC 12.2Kbps	Front	5mm	ON	9538	1907.6	16.30	17.50	1.318	0.01	0.785	1.035
62	WCDMA IV	RMC 12.2Kbps	Front	5mm	ON	1513	1752.6	15.53	17.00	1.403	-0.02	0.693	0.972
	WCDMA IV	RMC 12.2Kbps	Front	5mm	ON	1312	1712.4	15.45	17.00	1.429	-0.01	0.659	0.942
	WCDMA IV	RMC 12.2Kbps	Front	5mm	ON	1413	1732.6	15.44	17.00	1.432	-0.17	0.663	0.950
63	WCDMA V	RMC 12.2Kbps	Back	5mm	ON	4233	846.6	22.15	23.50	1.365	-0.12	0.423	0.577

<CDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
64	CDMA BC0	1xRTT RC3 SO32	Back	5mm	ON	777	848.31	22.87	23.50	1.156	0.06	0.195	0.225
65	CDMA BC1	1xRTT RC3 SO32	Back	5mm	ON	25	1851.25	16.67	18.00	1.358	-0.07	0.567	0.770
66	CDMA BC10	1xRTT RC3 SO32	Back	5mm	ON	476	817.9	22.60	23.50	1.230	0.09	0.469	0.577

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
67	LTE Band 7_Main	20M	QPSK	50	50	Back	5mm	ON	20850	2510	16.66	18.00	1.361	0.09	0.572	0.779
	LTE Band 7_Aux	20M	QPSK	1	49	Back	5mm	ON	21350	2560	16.85	18.00	1.303	-0.13	0.438	0.571
68	LTE Band 12	10M	QPSK	1	49	Back	5mm	OFF	23095	707.5	22.77	24.00	1.327	-0.02	0.500	0.664
69	LTE Band 13	10M	QPSK	1	0	Back	5mm	OFF	23230	782	22.72	24.00	1.343	-0.04	0.563	0.756
70	LTE Band 14	10M	QPSK	50	0	Back	5mm	ON	23330	793	21.66	23.50	1.528	0.01	0.370	0.565
71	LTE Band 25	20M	QPSK	50	0	Front	5mm	ON	26590	1905	15.60	16.50	1.230	-0.08	0.870	1.070
	LTE Band 25	20M	QPSK	50	0	Front	5mm	ON	26140	1860	15.75	16.50	1.189	-0.12	0.860	1.022
	LTE Band 25	20M	QPSK	50	0	Front	5mm	ON	26340	1880	15.58	16.50	1.236	-0.19	0.851	1.052
72	LTE Band 26	15M	QPSK	36	0	Back	5mm	ON	26865	831.5	21.98	23.50	1.419	-0.17	0.388	0.551
73	LTE Band 30_Main	10M	QPSK	25	0	Back	5mm	ON	27710	2310	20.11	21.00	1.227	-0.01	0.661	0.811
	LTE Band 30_Aux	10M	QPSK	50	0	Back	5mm	ON	27710	2310	20.03	21.00	1.250	-0.01	0.518	0.648
74	LTE Band 66	20M	QPSK	1	0	Front	5mm	ON	132572	1770	15.70	17.00	1.349	-0.02	0.513	0.692
75	LTE Band 71	20M	QPSK	1	0	Back	5mm	OFF	133322	683	23.18	24.00	1.208	0.1	0.510	0.616

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
76	LTE Band 41	20M	QPSK	1	0	Back	5mm	ON	41490	2680	19.92	20.00	1.019	62.90	1.006	0.12	0.449	0.460
	LTE Band 41	20M	QPSK	1	0	Back	5mm	ON	40620	2593	19.26	20.00	1.186	62.90	1.006	-0.16	0.320	0.382

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
77	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	ON	6	2437	18.87	20.50	1.455	99.42	1.006	-0.11	0.321	0.470
78	WLAN5GHz	802.11ac-VHT80 MCS0	Back	5mm	ON	58	5290	17.32	17.50	1.042	87.06	1.149	-0.1	0.374	0.448
79	WLAN5GHz	802.11ac-VHT80 MCS0	Back	5mm	ON	138	5690	17.44	17.50	1.013	87.06	1.149	-0.02	0.299	0.348
80	WLAN5GHz	802.11ac-VHT80 MCS0	Back	5mm	ON	155	5775	17.49	17.50	1.00	87.06	1.149	-0.12	0.313	0.360

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
81	Bluetooth	1Mbps	Back	5mm	39	2441	8.86	10.00	1.300	-0.08	0.022	0.029

12.5 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	58	5290	15.70	16.00	1.071	87.06	1.149	-0.16	0.842		1.036
2nd	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	58	5290	15.70	16.00	1.071	87.06	1.149	-0.12	0.822	1.02	1.012
1st	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	138	5690	15.81	16.00	1.044	87.06	1.149	0.11	0.867		1.040
2nd	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	138	5690	15.81	16.00	1.044	87.06	1.149	-0.12	0.851	1.02	1.021
1st	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	155	5775	15.95	16.00	1.011	87.06	1.149	0.13	0.855		0.993
2nd	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	ON	155	5775	15.95	16.00	1.011	87.06	1.149	-0.11	0.832	1.03	0.967
1st	GSM1900	GPRS (3 Tx slots)	Bottom Side	5mm	ON	810	1909.8	19.68	20.50	1.208	-	-	0.08	0.934		1.128
2nd	GSM1900	GPRS (3 Tx slots)	Bottom Side	5mm	ON	810	1909.8	19.68	20.50	1.208	-	-	0.01	0.902	1.04	1.089
1st	WCDMA IV	RMC 12.2Kbps	Bottom Side	5mm	ON	1513	1752.6	15.53	16.50	1.250	-	-	0.11	0.825		1.031
2nd	WCDMA IV	RMC 12.2Kbps	Bottom Side	5mm	ON	1513	1752.6	15.53	16.50	1.250	-	-	0.16	0.804	1.03	1.005
1st	WLAN2.4GHz	802.11b 1Mbps	Left Side	5mm	ON	6	2437	18.87	20.50	1.455	99.42	1.006	0.04	0.807		1.182
2nd	WLAN2.4GHz	802.11b 1Mbps	Left Side	5mm	ON	6	2437	18.87	20.50	1.455	99.42	1.006	0.02	0.792	1.02	1.160

No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Ratio	Reported 10g SAR (W/kg)
1st	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9262	1852.4	22.23	23.00	1.194	-	-	0.13	2.480		2.961
2nd	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	ON	9262	1852.4	22.23	23.00	1.194	-	-	0.02	2.410	1.03	2.878
1st	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1312	1712.4	21.87	22.00	1.030	-	-	-0.18	2.830		2.916
2nd	WCDMA IV	RMC 12.2Kbps	Bottom Side	0mm	ON	1312	1712.4	21.87	22.00	1.030	-	-	-0.03	2.710	1.04	2.792
1st	LTE Band 7_Main	20M_QPSK_1_49	Right Side	0mm	ON	21100	2535	20.84	21.50	1.164	-	-	-0.17	2.680		3.120
2nd	LTE Band 7_Main	20M_QPSK_1_49	Right Side	0mm	ON	21100	2535	20.84	21.50	1.164	-	-	-0.02	2.580	1.04	3.003
1st	LTE Band 30_Main	10M_QPSK_1_0	Right Side	0mm	ON	27710	2310	22.66	23.50	1.213	-	-	0.13	2.420		2.936
2nd	LTE Band 30_Main	10M_QPSK_1_0	Right Side	0mm	ON	27710	2310	22.66	23.50	1.213	-	-	0.11	2.330	1.04	2.827
1st	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	OFF	64	5320	19.98	20.00	1.005	93.64	1.068	-0.11	2.070		2.221
2nd	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	OFF	64	5320	19.98	20.00	1.005	93.64	1.068	0.04	2.010	1.03	2.157

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. The ratio is the difference in percentage between original and repeated *measured SAR*.
5. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

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13. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

14. 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 D03 v01r04, “Evaluation and Approval Considerations for Handsets with Specific Wireless Charging Battery Covers” Dec 2015.

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

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

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

[11] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

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

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

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