



Registration
No.788871

TEST REPORT FOR SAR TESTING

Report No.: SRTC2017-9004(F)-17083001(H)-3

Product Name: Joy Album

Product Model: K13

Applicant: Joy Home, Inc.

Manufacturer: Joy Home, Inc.

Specification: FCC Part 2.1093

IEEE Std 1528-2013

FCC RF Exposure KDB Procedures

FCC ID: 2AMPA-GC125542

IC ID: 23004-GC125542

The State Radio_monitoring_center Testing Center (SRTC)

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1. GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).

The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, P.R.China
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1.3 Applicant's details

Company:	Joy Home, Inc.
Address:	1788 Sutter St. #312, San Francisco, USA
City:	San Francisco
Country or Region:	USA
Grantee Code:	2AMPAGC125542
Contacted person:	Alan Chan
Tel:	646.784.1430
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Email:	Alan@joy.co

1.4 Manufacturer's details

Company:	Joy Home, Inc.
Address:	1788 Sutter St. #312, San Francisco, USA
City:	San Francisco
Country or Region:	USA
Contacted person:	Alan Chan
Tel:	646.784.1430
Fax:	---
Email:	Alan@joy.co

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2017.09.10
Testing Start Date:	2017.11.06
Testing End Date:	2017.11.07

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	22	43

Normal Supply Voltage (V d.c.):	3.8
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2. DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Wireless Technology and Frequency Bands	<input type="checkbox"/> GSM Band : <input type="checkbox"/> WCDMA Band: <input type="checkbox"/> LTE Band: <input type="checkbox"/> Bluetooth Band: <input type="checkbox"/> Wi-Fi Band:
Mode	GSM <input type="checkbox"/> Voice (GMSK) <input type="checkbox"/> GPRS (GMSK) <input type="checkbox"/> EGPRS (GMSK/8PSK) WCDMA <input type="checkbox"/> UMTS Rel. 99 (Voice & Data) <input type="checkbox"/> HSDPA (Rel. 5) <input type="checkbox"/> HSUPA (Rel. 6) <input type="checkbox"/> HSPA+ (Rel.) <input type="checkbox"/> DC-HSDPA (Rel.) Wi-Fi (802.11a/b/g/n) <input checked="" type="checkbox"/> 802.11a <input checked="" type="checkbox"/> 802.11b <input checked="" type="checkbox"/> 802.11g <input checked="" type="checkbox"/> 802.11n (20MHz) <input checked="" type="checkbox"/> 802.11n (40MHz) <input checked="" type="checkbox"/> 802.11ac (20MHz) <input checked="" type="checkbox"/> 802.11ac (40MHz) <input checked="" type="checkbox"/> 802.11ac (80MHz) Bluetooth <input checked="" type="checkbox"/> BR(GFSK) <input checked="" type="checkbox"/> EDR($\pi/4$ DQPSK , 8-DPSK) <input checked="" type="checkbox"/> BLE(GFSK) LTE <input type="checkbox"/> QPSK <input type="checkbox"/> 16QAM <input type="checkbox"/> 64QAM
Duty Cycle	GSM Voice: 12.5%; GPRS: 12.5% (1 Slot), 25% (2 Slots), 37.5% (3 Slots), 50% (4 Slots) WCDMA: 100% Wi-Fi 802.11b/g/n: 100% Bluetooth: 32.25% (DH1), 66.68% (DH3), 77.52% (DH5)
GPRS Multi-Slot Class	<input type="checkbox"/> Class 8 - One Up <input type="checkbox"/> Class 10 - Two Up <input type="checkbox"/> Class 12 - Four Up
Mobile Phone Capability	<input type="checkbox"/> Class A - Mobile phones can be connected to both GPRS and GSM services simultaneously. <input type="checkbox"/> Class B - Mobile phones can be attached to both GPRS and GSM services, using one service at a time. <input type="checkbox"/> Class C - Mobile phones are attached to either GPRS or GSM voice service. You need to switch manually between services
DTM (Dual Transfer Mode)	Not Supported

2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

State of sample	Production unit
Headset	NA
Batteries	K13/DONGGUAN YONGWEI TECHNOLOGY CO.,LTD
H/W Version	5A
S/W Version	V1.0
SN	1#
Notes	NA

3. REFERENCE SPECIFICATION

Specification	Version	Title
Part 2.1093	Nov. 14, 2016	Radiofrequency radiation exposure evaluation: portable devices.
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
IEEE Std 1528a	2005	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques Amendment 1: CAD File for Human Head Model (SAM Phantom)
KDB 248227 D01	v02r02	802 11 Wi-Fi SAR
KDB 865664 D01	v01r04	SAR Measurement 100 MHz to 6 GHz
KDB 865664 D02	v01r02	RF Exposure Reporting
KDB 447498 D01	V06	General RF Exposure Guidance
KDB 616217 D04	v01r02	SAR for laptop and tablets

4. TEST CONDITIONS

4.1 Picture to demonstrate the required liquid depth

The liquid depth in the used phantoms



Liquid depth for SAR Measurement

4.2 Test Signal, Frequencies and Output Power

The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

In all operating bands the measurements were performed on lowest, middle and highest channels.

4.3 SAR Measurement Set-up

The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than $\pm 0.02\text{mm}$. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit. A cell controller system contains the power supply, robot controller, teaches pendant (Joystick), and remote control, is used to drive the robot motors.

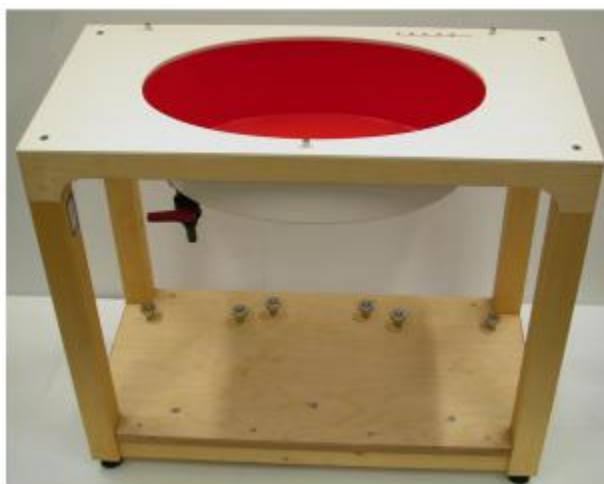
The PC consists of the Micron Pentium IV computer with Win7 system and SAR Measurement Software DASY5 Professional, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot.

A data acquisition electronic (DAE) circuit performs the signal amplification; signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the

conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines.

The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection The robot uses its own controller with a built in VME-bus computer.

4.4 Phantoms



The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEEE 1528-3013 and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into a SPEAG standard phantom table. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all prede_ned phantom positions and measurement grids, by teaching three points. The SPEAG device holder was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.5 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 - 2013 and FCC Supplement C to OET Bulletin 65. All tests were carried out using simulants whose dielectric parameters were within $\pm 5\%$ of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.

The depth of the tissue simulant was 15.0 ± 0.5 cm measured from the reference point during system checking and device measurements.

4.5.1 Tissue Simulant Recipes

The following recipe(s) were used for Head and Body tissue stimulant(s):

835MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Water	41.45	52.50
Sugar	56.00	45.0
Nacl	1.45	1.40
Cellulose	1.00	1.00
Preventol	0.10	0.10

1900MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Water	44.45	70.17
DGBE	55.24	29.44
Nacl	0.31	0.39

2450MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Water	55.00	68.64
DGBE	45.00	31.37
Nacl	0.00	0.00

5GHz band

Ingredient	Head (% by weight)	Body (% by weight)
Water	65.52	---
Triton X-100	17.24	---
Diethyenglycol monohexylether	17.24	---

4.6 DESCRIPTION OF THE TEST PROCEDURE

4.6.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.



Device holder supplied by SPEAG

4.6.2 Test positions

4.6.2.1 Against Phantom Head

N/A

4.6.2.2 Body Worn Configuration

The device was placed in the SPEAG holder below the flat section of the phantom. The distance between the device and the phantom was kept at the separation distance using a separate flat spacer that was removed before the start of the measurements. And the distance is 0mm. The device was oriented with its antenna facing the phantom since this orientation gives higher results.

4.6.3 Scan Procedure

First, area scans were used for determination of the field distribution and the approximate location of the local peak SAR values. The SAR distribution is scanned along the inside surface, at least for an area larger than the projection of the handset and antenna. The angle between the probe axis and the surface normal line is recommended but not required to be less than 30°. The SAR distribution is first measured on a 2-D coarse grid. The scan region should cover all areas that are exposed and encompassed by the projection of the handset. It is a 15 mm × 15 mm for 2GHz-3GHz and 10 mm × 10 mm for 4GHz-6GHz measurement grid used when two staggered one-dimensional cubic splines are used to estimate the maximum SAR location. Next, a zoom scan, a minimum of 7 x 7x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

4.6.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.




The interpolation, extrapolation and maximum search routines within DASYS5 are all based on the modified Quadratic Shepard's method (Robert J. Renka, "Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics. In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

5 RESULT SUMMAR

The maximum reported SAR values for Body Worn configuration are given as follows. The device conforms to the requirements of the standard(s) when the maximum reported SAR value is less than or equal to the limit.

Exposure Position	Frequency Band	1g-SAR Reported Result (W/kg)	Highest 1g-SAR Reported Result (W/kg)	Limit (W/kg)/1g	Result
Body (0mm Gap)	WLAN 2.4GHz Band	0.189	0.937	1.60	PASS
	WLAN 5GHz Band 5150-5250MHz	0.737			
	WLAN 5GHz Band 5250-5350MHz	0.937			
	WLAN 5GHz Band 5470-5725MHz	0.637			
	WLAN 5GHz Band 5725-5850MHz	0.358			

This Test Report Is Issued by: Mr. Peng Zhen 	Checked by: Ms. Liu Jia 
Tested by: Mr. Chang Taosha 	Issued date: 2017.11.11

6 TEST RESULT

6.1 Manufacturing Tolerance

Bluetooth

GFSK			
Channel	0	39	78
Tolerance (dBm)	-1.0~3.0	-1.0~3.0	-1.0~3.0
π/4DQPSK			
Channel	0	39	78
Tolerance (dBm)	-2.0~1.0	-2.0~1.0	-2.0~1.0
8DPSK			
Channel	0	39	78
Tolerance (dBm)	-2.0~1.0	-2.0~1.0	-2.0~1.0

Bluetooth (BLE)

GFSK			
Channel	0	39	78
Tolerance (dBm)	-3.0~1.0	-3.0~1.0	-3.0~1.0

Wi-Fi

802.11b			
Channel	1	6	11
Tolerance (dBm)	10.0~15.0	10.0~15.0	10.0~14.0
802.11g			
Channel	1	6	11
Tolerance (dBm)	10.0~13.5	10.0~13.5	10.0~13.5
802.11n HT20 (MCS0~MCS3)			
Channel	1	6	11
Tolerance (dBm)	8.0~13.5	8.0~13.5	8.0~13.5
802.11n HT40 (MCS4~MCS7)			
Channel	3	6	9
Tolerance (dBm)	8.0~13.5	8.0~13.5	8.0~13.5

5GHz Wi-Fi 5150-5250MHz

802.11a			
Channel	5180 MHz	5200 MHz	5240MHz
Tolerance (dBm)	8.0~15.0	8.0~15.0	8.0~14.0
802.11n HT20			
Channel	5180 MHz	5200 MHz	5240MHz
Tolerance (dBm)	7.0~11.5	7.0~11.5	7.0~11.5
802.11n HT40			
Channel	5190 MHz	5230 MHz	
Tolerance (dBm)	7.0~12.5	7.0~12.5	
802.11ac HT20			
Channel	5180 MHz	5200 MHz	5240MHz
Tolerance (dBm)	6.0~11.0	6.0~11.0	6.0~11.0
802.11ac HT40			
Channel	5190 MHz	5230 MHz	
Tolerance (dBm)	7.0~12.5	7.0~12.5	
802.11ac HT80			
Channel	5210MHz		
Tolerance (dBm)	5.0~10.5		

5GHz Wi-Fi 5250-5350MHz

802.11a			
Channel	5260 MHz	5280 MHz	5320MHz
Tolerance (dBm)	8.0~14.0	8.0~14.0	8.0~14.0
802.11n HT20			
Channel	5260 MHz	5280 MHz	5320MHz
Tolerance (dBm)	7.0~11.5	7.0~11.5	7.0~11.5
802.11n HT40			
Channel	5270 MHz	5310 MHz	
Tolerance (dBm)	7.0~12.5	7.0~12.5	
802.11ac HT20			
Channel	5260 MHz	5280 MHz	5320MHz
Tolerance (dBm)	6.0~11.0	6.0~11.0	6.0~11.0
802.11ac HT40			
Channel	5270 MHz	5310 MHz	
Tolerance (dBm)	7.0~12.5	7.0~12.5	
802.11ac HT80			
Channel	5290MHz		
Tolerance (dBm)	5.0~10.5		

5GHz Wi-Fi 5470-5725MHz

802.11a			
Channel	5500 MHz	5580 MHz	5720MHz
Tolerance (dBm)	8.0~14.0	8.0~14.0	8.0~14.0
802.11n HT20			
Channel	5500 MHz	5580 MHz	5720MHz
Tolerance (dBm)	7.0~11.5	7.0~11.5	7.0~11.5
802.11n HT40			
Channel	5510 MHz	5550MHz	5710 MHz
Tolerance (dBm)	7.0~12.5	7.0~12.5	7.0~12.5
802.11ac HT20			
Channel	5500 MHz	5580 MHz	5720MHz
Tolerance (dBm)	6.0~11.0	6.0~11.0	6.0~11.0
802.11ac HT40			
Channel	5510 MHz	5550MHz	5710 MHz
Tolerance (dBm)	7.0~12.5	7.0~12.5	7.0~12.5
802.11ac HT80			
Channel	5530 MHz	5690MHz	
Tolerance (dBm)	5.0~11.0	5.0~11.0	

5GHz Wi-Fi 5725-5850MHz

802.11a			
Channel	5745 MHz	5785 MHz	5825MHz
Tolerance (dBm)	8.0~14.0	8.0~14.0	8.0~14.0
802.11n HT20			
Channel	5745 MHz	5785 MHz	5825MHz
Tolerance (dBm)	7.0~12.0	7.0~12.0	7.0~12.0
802.11n HT40			
Channel	5755 MHz	5795 MHz	
Tolerance (dBm)	7.0~11.5	7.0~11.5	
802.11ac HT20			
Channel	5745 MHz	5785 MHz	5825MHz
Tolerance (dBm)	7.0~11.5	7.0~11.5	6.0~11.0
802.11ac HT40			
Channel	5755 MHz	5795 MHz	
Tolerance (dBm)	7.0~11.5	7.0~11.5	
802.11ac HT80			
Channel	5755MHz		
Tolerance (dBm)	7.0~11.5		

6.2 Bluetooth Measurement result

BT output power

Modulation type	Power Output (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	-0.98	0.14	-0.11
$\pi/4$ DQPSK	-1.17	0.17	-0.48
8DPSK	-0.67	0.14	-0.40

BT BLE output power

Modulation type	Power Output (dBm)		
	2402MHz (Ch0)	2440MHz (Ch19)	2480MHz (Ch39)
GFSK (LE)	-1.28	-0.25	-0.39

BT output power

Modulation type	Power Output (mW)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	0.80	1.03	0.97
$\pi/4$ DQPSK	0.76	1.04	0.90
8DPSK	0.86	1.03	0.91

BT BLE output power

Modulation type	Power Output (mW)		
	2402MHz (Ch0)	2440MHz (Ch19)	2480MHz (Ch39)
GFSK (LE)	0.74	0.94	0.91

6.3 Wi-Fi Measurement result

2.4GHz maximum conducted output power test result

Modulation type		Power Output (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
11b	1 Mbps	14.28	14.38	12.78
	2 Mbps	14.12	14.11	12.34
	5.5 Mbps	13.45	13.56	11.89
	11 Mbps	13.14	13.12	11.75
11g	6 Mbps	11.72	11.85	11.79
	9 Mbps	11.53	11.23	11.41
	12 Mbps	11.23	10.68	10.87
	18 Mbps	10.76	10.12	10.24
	24 Mbps	10.23	9.69	9.68
	36 Mbps	9.78	9.23	9.45
	48 Mbps	9.24	8.84	8.89
	54 Mbps	8.46	8.58	8.69
11n HT20	6.5 Mbps	9.98	10.12	9.94
	13 Mbps	9.23	9.78	9.32
	19.5 Mbps	8.57	9.14	8.45
	26 Mbps	8.21	8.52	8.13
	39 Mbps	7.81	8.41	7.78
	52 Mbps	7.36	7.88	7.26
	58.5 Mbps	6.91	7.21	6.47
	65 Mbps	6.53	6.47	6.37

Modulation type		Power Output (dBm)		
		2422MHz (Ch3)	2437MHz (Ch6)	2452MHz (Ch9)
11n HT40	13.5 Mbps	7.46	7.52	7.67
	27 Mbps	6.99	7.12	6.61
	40.5 Mbps	6.45	6.48	6.22
	54 Mbps	6.12	6.11	5.52
	81 Mbps	5.64	5.36	5.35
	108 Mbps	5.12	4.89	4.28
	121.5 Mbps	4.78	4.42	4.16
	135 Mbps	3.49	3.64	3.83

2.4GHz maximum conducted output power test result

Modulation type		Power Output (mW)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
11b	1 Mbps	26.79	27.42	18.97
	2 Mbps	25.82	25.76	17.14
	5.5 Mbps	22.13	22.70	15.45
	11 Mbps	20.61	20.51	14.96
11g	6 Mbps	14.86	15.31	15.10
	9 Mbps	14.22	13.27	13.84
	12 Mbps	13.27	11.69	12.22
	18 Mbps	11.91	10.28	10.57
	24 Mbps	10.54	9.31	9.29
	36 Mbps	9.51	8.38	8.81
	48 Mbps	8.39	7.66	7.74
11n HT20	54 Mbps	7.01	7.21	7.40
	6.5 Mbps	9.95	10.28	9.86
	13 Mbps	8.38	9.51	8.55
	19.5 Mbps	7.19	8.20	7.00
	26 Mbps	6.62	7.11	6.50
	39 Mbps	6.04	6.93	6.00
	52 Mbps	5.45	6.14	5.32
	58.5 Mbps	4.91	5.26	4.44
65 Mbps	4.50	4.44	4.34	

Modulation type		Power Output (mW)		
		2422MHz (Ch3)	2437MHz (Ch6)	2452MHz (Ch9)
11n HT40	13.5 Mbps	5.57	5.65	5.85
	27 Mbps	5.00	5.15	4.58
	40.5 Mbps	4.42	4.45	4.19
	54 Mbps	4.09	4.08	3.56
	81 Mbps	3.66	3.44	3.43
	108 Mbps	3.25	3.08	2.68
	121.5 Mbps	3.01	2.77	2.61
	135 Mbps	2.23	2.31	2.42

5GHz maximum conducted output power test result
5150MHz~5250MHz

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5180 MHz	5200 MHz	5240MHz
802.11a	6	12.19	12.23	12.14
	9	11.78	11.56	11.63
	12	11.23	11.12	11.12
	18	10.65	10.82	10.72
	24	10.21	10.32	10.31
	36	9.56	9.72	9.78
	48	9.23	9.45	9.41
	54	8.93	9.02	9.11
802.11n (HT20)	6.5	10.37	10.42	10.36
	13	9.78	10.12	10.12
	19.5	9.45	9.67	9.45
	26	8.67	9.32	9.12
	39	8.34	9.12	8.78
	52	8.12	8.76	8.23
	58.5	7.65	8.23	7.45
	65	7.13	7.65	7.24
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5190 MHz	5230 MHz	
802.11n (HT40)	13.5	11.13	11.05	
	27	10.87	10.82	
	40.5	10.56	10.45	
	54	9.45	9.37	
	81	9.23	9.12	
	108	8.45	8.48	
	121.5	8.21	8.13	
	135	7.38	7.41	

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5180 MHz	5200 MHz	5240MHz
802.11ac (HT20)	6.5	10.35	10.54	10.37
	13	9.48	10.12	9.89
	19.5	9.21	9.56	9.64
	26	8.67	9.21	8.72
	39	8.52	8.72	8.36
	52	7.45	8.24	7.35
	58.5	7.21	7.48	7.21
	65	7.11	7.13	6.99
	78	6.74	6.82	6.81
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5190 MHz	5230 MHz	
802.11ac (HT40)	13.5	11.12	11.04	
	27	10.78	10.88	
	40.5	10.52	10.34	
	54	10.41	9.73	
	81	9.89	9.42	
	108	9.52	8.65	
	121.5	8.72	8.27	
	135	8.34	8.12	
	162	7.53	7.53	
	180	7.23	7.34	
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5210 MHz		
802.11ac (HT80)	29.3	9.85		
	58.5	9.45		
	87.8	9.12		
	117	8.34		
	175.5	8.12		
	234	7.76		
	263.3	7.52		
	292.5	6.43		
	351	6.11		
	390	5.68		

5150MHz~5250MHz

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5180 MHz	5200 MHz	5240MHz
802.11a	6	16.56	16.71	16.37
	9	15.07	14.32	14.55
	12	13.27	12.94	12.94
	18	11.61	12.08	11.80
	24	10.50	10.76	10.74
	36	9.04	9.38	9.51
	48	8.38	8.81	8.73
	54	7.82	7.98	8.15
802.11n (HT20)	6.5	10.89	11.02	10.86
	13	9.51	10.28	10.28
	19.5	8.81	9.27	8.81
	26	7.36	8.55	8.17
	39	6.82	8.17	7.55
	52	6.49	7.52	6.65
	58.5	5.82	6.65	5.56
	65	5.16	5.82	5.30
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5190 MHz	5230 MHz	
802.11n (HT40)	13.5	12.97	12.74	
	27	12.22	12.08	
	40.5	11.38	11.09	
	54	8.81	8.65	
	81	8.38	8.17	
	108	7.00	7.05	
	121.5	6.62	6.50	
	135	5.47	5.51	

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5180 MHz	5200 MHz	5240MHz
802.11ac (HT20)	6.5	10.84	11.32	10.89
	13	8.87	10.28	9.75
	19.5	8.34	9.04	9.20
	26	7.36	8.34	7.45
	39	7.11	7.45	6.85
	52	5.56	6.67	5.43
	58.5	5.26	5.60	5.26
	65	5.14	5.16	5.00
	78	4.72	4.81	4.80
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5190 MHz	5230 MHz	
802.11ac (HT40)	13.5	12.94	12.71	
	27	11.97	12.25	
	40.5	11.27	10.81	
	54	10.99	9.40	
	81	9.75	8.75	
	108	8.95	7.33	
	121.5	7.45	6.71	
	135	6.82	6.49	
	162	5.66	5.66	
	180	5.28	5.42	
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5210 MHz		
802.11ac (HT80)	29.3	9.66		
	58.5	8.81		
	87.8	8.17		
	117	6.82		
	175.5	6.49		
	234	5.97		
	263.3	5.65		
	292.5	4.40		
	351	4.08		
	390	3.70		

5250MHz~5350MHz

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5260 MHz	5280 MHz	5320MHz
802.11a	6	12.36	12.42	12.37
	9	11.90	11.96	11.90
	12	11.36	11.50	11.43
	18	10.82	11.04	10.96
	24	10.28	10.58	10.49
	36	9.74	10.12	10.02
	48	9.20	9.66	9.55
	54	9.12	9.23	9.11
802.11n (HT20)	6.5	10.78	10.64	10.76
	13	10.34	10.23	10.36
	19.5	9.89	9.82	9.97
	26	9.45	9.40	9.57
	39	9.01	8.99	9.17
	52	8.56	8.58	8.77
	58.5	8.12	8.17	8.38
	65	7.23	7.34	7.58
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5270 MHz	5310 MHz	
802.11n (HT40)	13.5	11.02	11.11	
	27	10.66	10.75	
	40.5	10.30	10.40	
	54	9.93	10.04	
	81	9.57	9.68	
	108	9.21	9.32	
	121.5	8.85	8.97	
	135	8.12	8.25	

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5260 MHz	5280 MHz	5320MHz
802.11ac (HT20)	6.5	10.68	10.71	10.59
	13	10.28	10.32	10.22
	19.5	9.89	9.93	9.84
	26	9.49	9.54	9.47
	39	9.10	9.15	9.10
	52	8.70	8.77	8.72
	58.5	8.31	8.38	8.35
	78	7.91	7.99	7.98
802.11ac (HT40)	13.5	10.45	10.23	
	27	10.14	9.97	
	40.5	9.83	9.71	
	54	9.52	9.46	
	81	9.21	9.20	
	108	8.90	8.94	
	121.5	8.58	8.68	
	135	8.27	8.42	
	162	7.96	8.17	
	180	7.34	7.65	
802.11ac (HT80)	29.3	10.12		
	58.5	9.72		
	87.8	9.32		
	117	8.92		
	175.5	8.52		
	234	8.12		
	263.3	7.72		
	292.5	7.32		
	351	6.92		
	390	6.12		

5250MHz~5350MHz

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5260 MHz	5280 MHz	5320MHz
802.11a	6	17.22	17.46	17.26
	9	15.49	15.70	15.49
	12	13.68	14.13	13.90
	18	12.08	12.71	12.47
	24	10.67	11.43	11.19
	36	9.42	10.28	10.05
	48	8.32	9.25	9.02
	54	8.17	8.38	8.15
802.11n (HT20)	6.5	11.97	11.59	11.91
	13	10.81	10.54	10.86
	19.5	9.75	9.59	9.93
	26	8.81	8.71	9.06
	39	7.96	7.93	8.26
	52	7.18	7.21	7.53
	58.5	6.49	6.56	6.89
	65	5.28	5.42	5.73
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5270 MHz	5310 MHz	
802.11n (HT40)	13.5	12.65	12.91	
	27	11.64	11.89	
	40.5	10.72	10.96	
	54	9.84	10.09	
	81	9.06	9.29	
	108	8.34	8.55	
	121.5	7.67	7.89	
	135	6.49	6.68	

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5260 MHz	5280 MHz	5320MHz
802.11ac (HT20)	6.5	11.69	11.78	11.46
	13	10.67	10.76	10.52
	19.5	9.75	9.84	9.64
	26	8.89	8.99	8.85
	39	8.13	8.22	8.13
	52	7.41	7.53	7.45
	58.5	6.78	6.89	6.84
	65	6.18	6.30	6.28
	78	5.15	5.26	5.28
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5270 MHz	5310 MHz	
802.11ac (HT40)	13.5	11.09	10.54	
	27	10.33	9.93	
	40.5	9.62	9.35	
	54	8.95	8.83	
	81	8.34	8.32	
	108	7.76	7.83	
	121.5	7.21	7.38	
	135	6.71	6.95	
	162	6.25	6.56	
	180	5.42	5.82	
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5290 MHz		
802.11ac (HT80)	29.3	10.28		
	58.5	9.38		
	87.8	8.55		
	117	7.80		
	175.5	7.11		
	234	6.49		
	263.3	5.92		
	292.5	5.40		
	351	4.92		
	390	4.09		

5470MHz~5725MHz

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5500 MHz	5580 MHz	5700MHz
802.11a	6	12.45	12.53	12.57
	9	12.43	12.34	12.41
	12	12.21	12.16	12.15
	18	11.99	11.97	11.89
	24	11.78	11.79	11.83
	36	11.56	11.60	11.67
	48	11.34	11.42	11.41
	54	11.12	11.23	11.25
802.11n (HT20)	6.5	10.88	10.76	10.62
	13	10.39	10.27	10.07
	19.5	9.90	9.79	9.67
	26	9.41	9.30	9.47
	39	8.92	8.81	8.71
	52	8.43	8.32	8.46
	58.5	7.94	7.84	7.81
	65	7.45	7.35	7.66
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5510 MHz	5550MHz	5670 MHz
802.11n (HT40)	13.5	11.12	11.23	11.16
	27	10.71	10.81	10.77
	40.5	10.30	10.40	10.28
	54	9.89	9.98	9.99
	81	9.48	9.56	9.49
	108	9.07	9.14	9.20
	121.5	8.66	8.73	8.91
	135	8.25	8.31	8.62

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5500 MHz	5580 MHz	5720MHz
802.11ac (HT20)	6.5	10.34	10.42	10.38
	13	9.90	9.97	9.89
	19.5	9.45	9.52	9.40
	26	9.01	9.07	8.91
	39	8.56	8.62	8.42
	52	8.12	8.16	7.93
	58.5	7.67	7.71	7.44
	65	7.23	7.26	6.95
78	6.78	6.81	6.46	
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5510 MHz	5550MHz	5710 MHz
802.11ac (HT40)	13.5	11.02	11.12	11.13
	27	10.65	10.75	10.73
	40.5	10.28	10.39	10.32
	54	9.91	10.02	9.92
	81	9.54	9.65	9.51
	108	9.16	9.29	9.11
	121.5	8.79	8.92	8.70
	135	8.42	8.55	8.30
	162	8.05	8.19	7.89
180	7.68	7.82	7.49	
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5530 MHz	5690MHz	
802.11ac (HT80)	29.3	10.67	10.73	
	58.5	10.25	10.31	
	87.8	9.83	9.90	
	117	9.41	9.48	
	175.5	8.99	9.06	
	234	8.57	8.65	
	263.3	8.15	8.23	
	292.5	7.73	7.81	
	351	7.31	7.40	
390	6.89	6.98		

5470MHz~5725MHz

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5500 MHz	5580 MHz	5700MHz
802.11a	6	17.58	17.91	18.07
	9	17.50	17.14	17.42
	12	16.63	16.44	16.41
	18	15.81	15.74	15.45
	24	15.07	15.10	15.24
	36	14.32	14.45	14.69
	48	13.61	13.87	13.84
	54	12.94	13.27	13.34
802.11n (HT20)	6.5	12.25	11.91	11.53
	13	10.94	10.64	10.16
	19.5	9.77	9.53	9.27
	26	8.73	8.51	8.85
	39	7.80	7.60	7.43
	52	6.97	6.79	7.01
	58.5	6.22	6.08	6.04
	65	5.56	5.43	5.83
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5510 MHz	5550MHz	5670 MHz
802.11n (HT40)	13.5	12.94	13.27	13.06
	27	11.78	12.05	11.94
	40.5	10.72	10.96	10.67
	54	9.75	9.95	9.98
	81	8.87	9.04	8.89
	108	8.07	8.20	8.32
	121.5	7.35	7.46	7.78
	135	6.68	6.78	7.28

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5500 MHz	5580 MHz	5720MHz
802.11ac (HT20)	6.5	10.81	11.02	10.91
	13	9.77	9.93	9.75
	19.5	8.81	8.95	8.71
	26	7.96	8.07	7.78
	39	7.18	7.28	6.95
	52	6.49	6.55	6.21
	58.5	5.85	5.90	5.55
	65	5.28	5.32	4.95
	78	4.76	4.80	4.43
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5510 MHz	5550MHz	5710 MHz
802.11ac (HT40)	13.5	12.65	12.94	12.97
	27	11.61	11.89	11.83
	40.5	10.67	10.94	10.76
	54	9.79	10.05	9.82
	81	8.99	9.23	8.93
	108	8.24	8.49	8.15
	121.5	7.57	7.80	7.41
	135	6.95	7.16	6.76
	162	6.38	6.59	6.15
180	5.86	6.05	5.61	
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5530 MHz	5690MHz	
802.11ac (HT80)	29.3	11.67	11.83	
	58.5	10.59	10.74	
	87.8	9.62	9.77	
	117	8.73	8.87	
	175.5	7.93	8.05	
	234	7.19	7.33	
	263.3	6.53	6.65	
	292.5	5.93	6.04	
	351	5.38	5.50	
	390	4.89	4.99	

5725MHz~5850MHz

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745 MHz	5785 MHz	5825MHz
802.11a	6	12.18	12.24	12.12
	9	12.04	12.00	11.98
	12	11.91	11.86	11.85
	18	11.77	11.72	11.71
	24	11.64	11.57	11.57
	36	11.50	11.43	11.43
	48	11.37	11.29	11.30
	54	11.23	11.15	11.16
802.11n (HT20)	6.5	11.08	10.85	10.67
	13	10.59	10.40	10.22
	19.5	10.11	9.96	9.76
	26	9.62	9.51	9.31
	39	9.13	9.07	8.85
	52	8.64	8.62	8.40
	58.5	8.16	8.18	7.94
	65	7.67	7.73	7.49
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5755 MHz	5795 MHz	
802.11n (HT40)	13.5	10.76	10.89	
	27	10.42	10.53	
	40.5	10.08	10.18	
	54	9.75	9.82	
	81	9.41	9.47	
	108	9.07	9.11	
	121.5	8.73	8.76	
	135	7.72	7.69	

Power Output (dBm)				
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745 MHz	5785 MHz	5825MHz
802.11ac (HT20)	6.5	10.78	10.82	10.65
	13	10.32	10.37	10.21
	19.5	9.87	9.92	9.78
	26	9.41	9.47	9.34
	39	8.95	9.03	8.90
	52	8.49	8.58	8.46
	58.5	8.04	8.13	8.03
	78	7.12	7.23	7.15
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5755 MHz	5795 MHz	
802.11ac (HT40)	13.5	10.89	10.45	
	27	10.47	10.13	
	40.5	10.05	9.81	
	54	9.64	9.49	
	81	9.22	9.17	
	108	8.80	8.84	
	121.5	8.38	8.52	
	135	7.97	8.20	
	162	7.55	7.88	
	180	7.13	7.56	
Test Mode	Data Rate (Mbps)	Test Result (dBm)		
		5775 MHz		
802.11ac (HT80)	29.3	10.64		
	58.5	10.26		
	87.8	9.88		
	117	9.50		
	175.5	9.12		
	234	8.75		
	263.3	8.37		
	292.5	7.99		
	351	7.61		
	390	7.23		

5725MHz~5850MHz

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5745 MHz	5785 MHz	5825MHz
802.11a	6	16.52	16.75	16.29
	9	16.00	15.85	15.78
	12	15.52	15.35	15.31
	18	15.03	14.86	14.83
	24	14.59	14.35	14.35
	36	14.13	13.90	13.90
	48	13.71	13.46	13.49
	54	13.27	13.03	13.06
802.11n (HT20)	6.5	12.82	12.16	11.67
	13	11.46	10.96	10.52
	19.5	10.26	9.91	9.46
	26	9.16	8.93	8.53
	39	8.18	8.07	7.67
	52	7.31	7.28	6.92
	58.5	6.55	6.58	6.22
	65	5.85	5.93	5.61
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5755 MHz	5795 MHz	
802.11n (HT40)	13.5	11.91	12.27	
	27	11.02	11.30	
	40.5	10.19	10.42	
	54	9.44	9.59	
	81	8.73	8.85	
	108	8.07	8.15	
	121.5	7.46	7.52	
	135	5.92	5.87	

Power Output (mW)				
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5745 MHz	5785 MHz	5825MHz
802.11ac (HT20)	6.5	11.97	12.08	11.61
	13	10.76	10.89	10.50
	19.5	9.71	9.82	9.51
	26	8.73	8.85	8.59
	39	7.85	8.00	7.76
	52	7.06	7.21	7.01
	58.5	6.37	6.50	6.35
	65	5.73	5.86	5.74
	78	5.15	5.28	5.19
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5755 MHz	5795 MHz	
802.11ac (HT40)	13.5	12.27	11.09	
	27	11.14	10.30	
	40.5	10.12	9.57	
	54	9.20	8.89	
	81	8.36	8.26	
	108	7.59	7.66	
	121.5	6.89	7.11	
	135	6.27	6.61	
	162	5.69	6.14	
	180	5.16	5.70	
Test Mode	Data Rate (Mbps)	Test Result (mW)		
		5775 MHz		
802.11ac (HT80)	29.3	11.59		
	58.5	10.62		
	87.8	9.73		
	117	8.91		
	175.5	8.17		
	234	7.50		
	263.3	6.87		
	292.5	6.30		
	351	5.77		
	390	5.28		

6.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

According to the KDB447498 4.3.1 (1)

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f} (\text{GHz})] \leq 3.0$ for 1-g SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

This is equivalent to $[(\text{max. power of channel, including tune-up tolerance, mW}) / (60 / \sqrt{f} (\text{GHz}) \text{ mW})] \cdot [20 \text{ mm} / (\text{min. test separation distance, mm})] \leq 1.0$ for 1-g SAR; also see Appendix A for approximate exclusion threshold values at selected frequencies and distances.

According to the KDB447498 appendix A

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	<i>SAR Test Exclusion Threshold (mW)</i>
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

Summary of Transmitters

Band/Mode	Max.RF output power (mW)	SAR test exclusion Threshold (mW)	SAR Required
(2.4~2.4835)GHz Bluetooth	2.00	10	No
(2.4~2.4835)GHz WLAN	27.42	10	Yes
(5.15~5.25)GHz WLAN	16.71	7	Yes
(5.25~5.35)GHz WLAN	17.46	7	Yes
(5.47~5.725)GHz WLAN	17.91	6	Yes
(5.725~5.85)GHz WLAN	16.75	6	Yes

6.5 RF exposure conditions

Refer to the follow picture“Antenna Locations & Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.



Antenna Locations & Separation Distances

**6.5.1 Body-worn Accessory Exposure conditions
 For Wi-Fi**

Test Configurations	Antenna-to-edge/surface	SAR Required
Rear	<25 mm	Yes
Front	<25 mm	Yes
Edge 1	115 mm	No
Edge 2	211 mm	No
Edge 3	5 mm	Yes
Edge 4	195 mm	No

6.6 System Checking

The manufacturer calibrates the probes annully. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW(for 2.45GHz)/10mW(for 5GHz) was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system checking results (dielectric parameters and SAR values) are given in the table below.

Date Tested	System dipole	T.S. Liquid	SAR measured (normalized to 1W)		Target (Ref.Value)	Delta (%)	Tolerance (%)
2017.11.06	D5GHzV2 5200MHz	Body	1g	77.80	75.40	3.18	±10
2017.11.07	D5GHzV2 5300MHz	Body	1g	78.50	76.90	2.08	±10
2017.11.07	D5GHzV2 5500MHz	Body	1g	79.40	82.40	-3.64	±10
2017.11.07	D5GHzV2 5800MHz	Body	1g	76.80	77.50	-0.90	±10
2017.11.07	D2450V2	Body	1g	50.38	52.30	-3.67	±10

Plots of the system checking scans are given in Appendix A.

Tissue Simulants used in the Measurements

For the measurement of the following parameters the SPEAG DAKS-3.5 dielectric parameter probe is used, representing the open-ended coaxial probe measurement procedure.

Date Tested	Freq.(MHz)	Liquid parameters	measured	Target	Delta(%)	Tolerance(%)
2017.11.06	Body 5200	ϵ_r	49.035	49.00	0.07	±5
		σ [S/m]	5.355	5.30	1.04	±5
2017.11.07	Body 5300	ϵ_r	47.35	48.90	-3.17	±5
		σ [S/m]	5.581	5.42	2.97	±5
2017.11.07	Body 5500	ϵ_r	49.78	48.60	2.43	±5
		σ [S/m]	5.526	5.65	-2.19	±5
2017.11.07	Body 5800	ϵ_r	49.65	48.20	3.01	±5
		σ [S/m]	5.882	6.00	-1.97	±5
2017.11.07	Body 2450	ϵ_r	51.24	52.70	-2.77	±5
		σ [S/m]	1.99	1.95	2.05	±5

Liquid check details

Date Tested	Freq.(MHz)	Liquid parameters	
		ϵ_r	σ [S/m]
2017.11.07	2400	52.746	1.902
2017.11.07	2410	52.749	1.901
2017.11.07	2420	52.745	1.908
2017.11.07	2430	52.716	1.931
2017.11.07	2440	52.717	1.933
2017.11.07	2450	51.24	1.99
2017.11.07	2460	52.685	1.966
2017.11.07	2470	52.679	1.968
2017.11.07	2480	52.431	1.972
2017.11.07	2490	52.428	1.977
2017.11.07	2500	52.337	1.996
2017.11.06	5160	49.102	5.343
2017.11.06	5180	49.085	5.351
2017.11.06	5200	49.035	5.355
2017.11.06	5220	49.017	5.359
2017.11.06	5240	48.982	5.386
2017.11.07	5260	48.952	5.421
2017.11.07	5280	48.924	5.443
2017.11.07	5300	47.350	5.581
2017.11.07	5320	48.869	5.487
2017.11.07	5340	49.223	5.520
2017.11.07	5500	49.780	5.526
2017.11.07	5520	49.312	5.586
2017.11.07	5540	48.923	5.614
2017.11.07	5560	48.901	5.698
2017.11.07	5580	48.507	5.768
2017.11.07	5600	48.435	5.782
2017.11.07	5620	48.414	5.815
2017.11.07	5640	48.356	5.821
2017.11.07	5660	48.324	5.834
2017.11.07	5680	48.295	5.865
2017.11.07	5700	48.271	5.854
2017.11.07	5720	48.254	5.867
2017.11.07	5740	48.238	5.872
2017.11.07	5760	48.211	5.876
2017.11.07	5780	47.745	6.014
2017.11.07	5800	49.650	5.882

6.7 SAR TEST RESULT

In order to determine the largest value of the peak spatial-average SAR of a handset, all device positions, configurations, and operational modes should be tested for each frequency band according to Steps 1 to 3 below.

Step 1: The tests should be performed at the channel that is closest to the center of the transmit frequency band.

a) All device positions (cheek and tilt, for both left and right sides of the SAM phantom),
b) All configurations for each device position in a), e.g., antenna extended and retracted, and
c) All operational modes for each device position in item a) and configuration in item b) in each frequency band, e.g., analog and digital, If more than three frequencies need to be tested (i.e., $N_c > 3$), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing the highest peak spatial-average SAR determined in Step 1 for each frequency, perform all tests at all other test frequency channels, e.g., lowest and highest frequencies. In addition, for all other conditions (device position, configuration, and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies should be tested as well.

Step 3: Examine all data to determine the largest value of the peak.

Note:

1. Per KDB 447498 D01v05, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.

Reported SAR (W/kg) = Measured SAR (W/kg) * Scaling Factor

2. Per KDB 447498 D01v05, for each exposure position, if the highest output channel reported SAR ≤ 0.8 W/kg, other channels SAR testing are not necessary.

3. In the report the test position "Mobile phone screen Towards Ground" abbreviated as "TG", and "Mobile phone screen Towards Phantom" abbreviated as "TP".

The measured and reported Head/body SAR values for the test device are tabulated below:

Mode: Wi-Fi 2.4GHz

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

SAR Values (Wi-Fi 802.11b - body)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Result (W/kg)	Reported Result (W/kg)
Position	mode					1 g Average	1g Average
TG	1Mbps	1	14.28	15.00	---	---	---
		6	14.38	15.00	1.15	0.147	0.170
		11	12.78	14.00	---	---	---
TP	1Mbps	1	14.28	15.00	1.18	0.148	0.175
		6	14.38	15.00	1.15	0.161	0.186
		11	12.78	14.00	1.32	0.143	0.189
EDGE3	1Mbps	1	14.28	15.00	---	---	---
		6	14.38	15.00	1.15	0.135	0.156
		11	12.78	14.00	---	---	---

Note: The distance between the EUT and the phantom bottom is 0mm.

TG: The abbreviation of “To Ground”, the device’s screen towards ground (Rear).

TP: The abbreviation of “To Phantom”, the device’s screen towards phantom (Front).

As the information below described in the KDB , (5mm, 5mm, 5mm) zoom scan resolution is applied in our test.

When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

Mode: Wi-Fi 5.15-5.25GHz

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

SAR Values (Wi-Fi 802.11a - body)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Result (W/kg)	Reported Result (W/kg)
Position	mode					1 g Average	1g Average
TG	1Mbps	36	12.36	14.00	---	---	---
		40	12.42	14.00	1.44	0.301	0.433
		48	12.37	14.00	---	---	---
TP	1Mbps	36	12.36	14.00	---	---	---
		40	12.42	14.00	1.44	0.195	0.281
		48	12.37	14.00	---	---	---
EDGE3	1Mbps	36	12.36	14.00	---	---	---
		40	12.42	14.00	1.44	0.512	0.737
		48	12.37	14.00	---	---	---

Note: The distance between the EUT and the phantom bottom is 0mm.

TG: The abbreviation of "To Ground", the device's screen towards ground (Rear).

TP: The abbreviation of "To Phantom", the device's screen towards phantom (Front).

As the information below described in the KDB , (5mm, 5mm, 5mm) zoom scan resolution is applied in our test.

When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

Mode: Wi-Fi 5.25-5.35GHz

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

SAR Values (Wi-Fi 802.11a - body)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Result (W/kg)	Reported Result (W/kg)
Position	mode					1 g Average	1g Average
TG	1Mbps	52	12.36	14.00	---	---	---
		56	12.42	14.00	1.44	0.245	0.353
		64	12.37	14.00	---	---	---
TP	1Mbps	52	12.36	14.00	---	---	---
		56	12.42	14.00	1.44	0.232	0.334
		64	12.37	14.00	---	---	---
EDGE3	1Mbps	52	12.36	14.00	1.46	0.533	0.778
		56	12.42	14.00	1.44	0.651	0.937
		64	12.37	14.00	1.46	0.532	0.774

Note: The distance between the EUT and the phantom bottom is 0mm.

TG: The abbreviation of “To Ground”, the device’s screen towards ground (Rear).

TP: The abbreviation of “To Phantom”, the device’s screen towards phantom (Front).

As the information below described in the KDB , (5mm, 5mm, 5mm) zoom scan resolution is applied in our test.

When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

Mode: Wi-Fi 5.47-5.725GHz

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

SAR Values (Wi-Fi 802.11a - body)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Result (W/kg)	Reported Result (W/kg)
Position	mode					1 g Average	1g Average
TG	1Mbps	100	12.45	14.00	---	---	---
		116	12.53	14.00	1.40	0.211	0.296
		144	12.47	14.00	---	---	---
TP	1Mbps	100	12.45	14.00	---	---	---
		116	12.53	14.00	1.40	0.066	0.093
		144	12.47	14.00	---	---	---
EDGE3	1Mbps	100	12.45	14.00	---	---	---
		116	12.53	14.00	1.40	0.454	0.637
		144	12.47	14.00	---	---	---

Note: The distance between the EUT and the phantom bottom is 0mm.

TG: The abbreviation of “To Ground”, the device’s screen towards ground (Rear).

TP: The abbreviation of “To Phantom”, the device’s screen towards phantom (Front).

As the information below described in the KDB , (5mm, 5mm, 5mm) zoom scan resolution is applied in our test.

When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

Mode: Wi-Fi 5.725-5.85GHz

Limit of SAR (W/kg) : <1.6W/kg (1g Average)

SAR Values (Wi-Fi 802.11a - body)

Test Case		CH	Measure Conducted Power (dBm)	Tune-up limit (dBm)	Scaling Factor	Measure Result (W/kg)	Reported Result (W/kg)
Position	mode					1 g Average	1g Average
TG	1Mbps	149	12.18	14.00	---	---	---
		157	12.24	14.00	1.50	0.146	0.219
		165	12.12	14.00	---	---	---
TP	1Mbps	149	12.18	14.00	---	---	---
		157	12.24	14.00	1.50	0.239	0.358
		165	12.12	14.00	---	---	---
EDGE3	1Mbps	149	12.18	14.00	---	---	---
		157	12.24	14.00	1.50	0.184	0.276
		165	12.12	14.00	---	---	---

Note: The distance between the EUT and the phantom bottom is 0mm.

TG: The abbreviation of "To Ground", the device's screen towards ground (Rear).

TP: The abbreviation of "To Phantom", the device's screen towards phantom (Front).

As the information below described in the KDB , (5mm, 5mm, 5mm) zoom scan resolution is applied in our test.

When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

6.8 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

6.8.1 The Highest Measured SAR configuration in Each Frequency Band

Frequency band(MHz)	Air interface	Body(w/kg)
2450	WLan	<0.8
5200	WLan	<0.8
5400	WLan	<0.8
5600	WLan	<0.8
5800	WLan	<0.8

7 MEASUREMENT UNCERTAINTY

DASY5 Uncertainty Budget								
Error description	Uncertainty value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std.Un c (1g).	Std.Unc (10g)	(vi) Veff
Measurement system								
Probe calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System detection limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF ambient noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF ambient reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max.SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Power drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid conductivity (target.)	±5.0%	R	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
Liquid conductivity (mea.)	±2.5%	R	$\sqrt{3}$	0.64	0.43	±0.9%	±0.6%	∞
Liquid Permittivity (target.)	±5.0%	R	$\sqrt{3}$	0.60	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (mea.)	±2.5%	R	$\sqrt{3}$	0.60	0.49	±0.9%	±0.7%	∞
Combined std. Uncertainty						±10.9%	±10.7%	387
Expanded STD Uncertainty						±21.7%	±21.4%	

8 TEST EQUIPMENTS

The measurements were performed using an automated near-field scanning system, DASY5, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the 'advanced extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
DAE	DAE4	546	2017.09.15	2018.09.14
Dosimetric E-field Probe	EX3DV4	3708	2016.11.10	2017.11.09
Dipole Validation Kit	D5GHZV2	1079	2017.09.25	2018.09.24
Dipole Validation Kit	D2450V2	738	2017.09.18	2018.09.17

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration Due data
Signal Generator	E4428C	MY45280865	2017.08.20	2018.08.19
Signal Generator	SML 03	103514	2017.08.20	2018.08.19
Power meter	E4417A	MY45101182	2017.08.20	2018.08.19
Power Sensor	E4412A	MY41502214	2017.08.20	2018.08.19
Power Sensor	E4412A	MY41502130	2017.08.20	2018.08.19
Power meter	E4417A	MY45101004	2017.08.20	2018.08.19
Power Sensor	E9300B	MY41496001	2017.08.20	2018.08.19
Power Sensor	E9300B	MY41496003	2017.08.20	2018.08.19
Communication Tester	8960	GB43194054	2017.08.20	2018.08.19
Communication Tester	CMU200	114666	2017.08.20	2018.08.19
Vector Network Analyzer	VNA R140	0011213	2017.08.20	2018.08.19
Dielectric Parameter Probe	DAKS-3.5	1042	2017.08.20	2018.08.19

Detailed information of Isotropic E-field Probe Type ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Dynamic Range	5 μ W/g to > 100 W/kg; Linearity: ± 0.2 dB
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

Detailed information of Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Optical Surface Detection	± 0.3 mm repeatability in air and clear liquids over diffuse reflecting surfaces
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
Dynamic Range	10 μ W/g to > 100 W/kg Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

ANNEX A – TEST PLOTS

Please refer to the attachment.

ANNEX B – RELEVANT PAGES FROM CALIBRATION REPORTS

Please refer to the attachment.

ANNEX C – PHOTOGRAPH

Please refer to the attachment.