SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013
(Class II Permissive Change)

For
RFID Mini PCI-E Card Module
(Tested inside of Panasonic Tablet PC FZ-G1)

Model: RU-865
FCC ID: MAD-RU-865

Report Number: 12482970H-A
Issue Date: October 12, 2018

Prepared for
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NVLAP LAB CODE: 200572-0

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/12/2018	Initial Issue	T. Shimada

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1. Attestation of Test Results

Applicant	Microelectronics Technology Inc.
DUT description	RFID Mini PCI-E Card Module (Tested inside of Panasonic Tablet PC FZ-G1)
Model	RU-865
Test device is	An identical prototype
Device category Portabl	Portable
Exposure category	General Population/Uncontrolled Exposure
Date tested	September 6 to 28, 2018

Applicable Standards	Test Results
FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013	Pass

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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1.1. Summary of Highest 1-g SAR Results

Worst Case SAR data for each Frequency Band

RF Exposure Rule	Freq. Range	Highest Reported SAR	Limit
FCC 47 CFR § 2.1093	902.75-927.25 MHz	Body: 0.856 W/kg (Edge 3 tilt)	1.6 W/kg
Simultaneous Transmission Condition		1.588 W/kg (refer to Section 15) (The highest across exposure conditions)	

LEGEND:

- Rear 1(Bottom) = Back side(UHF-RFID area is removed, but the 4.7mm height corner guards are added.)
- Rear 2 = Back side
- Edge 1 = Top
- Edge 2 = Right
- Edge 3 = Bottom
- Edge 4 = Left
- Edge 1 tilt = Top tilt
- Edge 2 tilt = Right tilt
- Edge 3 tilt = Bottom tilt

Notes:

1. Refer to 18. Antenna Dimensions & Separation distances

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2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528- 2013, the following FCC Published RF exposure KDB procedures:

- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- 865664 D02 SAR Reporting v01r02
- 447498 D01 General RF Exposure Guidance v06
- 941225 D01 SAR test for 3G devices v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
- 616217 D04 SAR for laptop and tablets v01r02
- 248227 D01 802.11 Wi-Fi SAR v02r02

Additional Guidance: TCB workshop

- TCB workshop

3. Facilities and Accreditation

*Shielded room for SAR testings
The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0
FCC Test Firm Registration Number: 199967 / ISED SAR Lab Company Number: 2973C
The full scope of accreditation can be viewed at
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MNA-03	Vector Reflectometer	Copper Mountain Technologies	PLANAR R140	0030913	SAR	2018/04/11 * 12
MDPK-03	Dielectric assessment kit	Schmid&Partner Engineering AG	DAK-3.5	0008	SAR	2018/04/10 * 12
MOS-37	Digital thermometer	LKM electronic	DTM3000	-	SAR	2018/07/30 * 12
COTS-MSAR-04	Dielectric assessment software	Schmid&Partner Engineering AG	DAK	-	SAR	-

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System check

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
COTS-MSAR-03	Dasy5	Schmid&Partner Engineering AG	DASY5	-	SAR	-
MDAE-02	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	1369	SAR	2018/05/23 * 12
MPB-08	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3917	SAR	2018/05/23 * 12
MPF-03	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1203	SAR	2018/05/08 * 12
MDH-04	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-35	Digital thermometer	HANNA	Checktemp 4	-	SAR	2018/07/30 * 12
MRBT-03	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F13/5PPLD1/A/01	SAR	2018/04/06 * 12
MDAE-03	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	1372	SAR	2018/06/19 * 12
MPB-09	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3922	SAR	2017/11/15 * 12
MPF-04	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1207	SAR	2018/05/08 * 12
MDH-03	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-31	Thermo-Hygrometer	CUSTOM	CTH-201	3101	SAR	2018/07/30 * 12
MRBT-04	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F13/5PPLA1/A/01	SAR	2018/04/03 * 12
MDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	509	SAR	2018/07/11 * 12
MPB-07	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3825	SAR	2017/12/11 * 12
MPF-02	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1045	SAR	2018/05/08 * 12
MDH-01	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-33	Thermo-Hygrometer	CUSTOM	CTH-201	3301	SAR	2018/07/30 * 12
MRBT-02	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F10/5E3LA1/A/01	SAR	2018/09/04 * 12
MPM-11	Dual Power Meter	Agilent	E4419B	MY45102060	SAR	2018/08/07 * 12
MPSE-15	Power sensor	Agilent	E9301A	MY41498311	SAR	2018/08/07 * 12
MPSE-16	Power sensor	Agilent	E9301A	MY41498313	SAR	2018/08/07 * 12
MRFA-24	Pre Amplifier	R&K	R&K CGA020M602-2633R	B30550	SAR	2018/06/20 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2017/11/29 * 12
MAT-78	Attenuator	Telegrartner	J01156A0011	0042294119	SAR	Pre Check
MPSE-24	Power sensor	ANRITSU	MA24106A	1026164	SAR	2018/08/07 * 12
MAT-81	Attenuator	Weinshel Associates	WA1-20-33	100131	SAR	2018/04/05 * 12

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MHDC-21	Dual Directional Coupler	Agilent	778D	MY52180243	SAR(0.1-2GHz)	Pre Check
MHDC-12	Dual Directional Coupler	Hewlett Packard	772D	2839A0016	SAR(2-18GHz)	Pre Check
MDA-20	Dipole Antenna	Schmid&Partner Engineering AG	D750V3	1058	SAR(D750)	2018/05/18 * 12
MMSL0750	Tissue simulation liquid (Body)	Schmid&Partner Engineering AG	MSL750V2	SL AAM 075 AA	SAR*Daily Check Target Value ±5%	Pre Check
SSDA-04	Dipole Antenna	Schmid&Partner Engineering AG	D835V2	4d149	SAR(D835)	2016/03/08 * 36
MMSL0900	Tissue simulation liquid (Body)	Schmid&Partner Engineering AG	MSL900V2	SL AAM 090 CA	SAR*Daily Check Target Value ±5%	Pre Check
SSLM175-01	Tissue simulation liqud (1750MHz,body)	Schmid&Partner Engineering AG	SL AAM 175 AA	-	SAR*Daily Check Target Value ±5%	Pre Check
SSDA-08	Dipole Antenna	Schmid&Partner Engineering AG	D1900V2	5d169	SAR(D1900)	2016/03/09 * 36
MMSL1900	Tissue simulation liquid (Body)	Schmid&Partner Engineering AG	SL AAM 190 AA	-	SAR*Daily Check Target Value ±5%	Pre Check
MDA-07	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	SAR(D2450)	2016/09/13 * 24
MMSL2450	Tissue simulation liquid (Body)	Schmid&Partner Engineering AG	MSL2450V2	SL AA 245 BA	SAR*Daily Check Target Value ±5%	Pre Check
MDA-08	Dipole Antenna	Schmid&Partner Engineering AG	D5GHzV2	1020	SAR(D5G)	2018/01/11 * 12
MMBBL3.5-5.8	Tissue simulation liquid (Body)	Schmid&Partner Engineering AG	MBBL3500-5800V5	SL AAM 501 DA	SAR*Daily Check Target Value ±5%	Pre Check
MDA-19	Dipole Antenna	Schmid&Partner Engineering AG	D2600V2	1030	SAR	2016/03/09 * 36
SSDA-06	Dipole Antenna	Schmid&Partner Engineering AG	D1750V2	1089	SAR(D1750)	2016/03/11 * 36

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Other

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MURC-10	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	165750	SAR	2018/07/13 * 12
MPM-08	Power Meter	ANRITSU	ML2495A	6K00003338	Power	2017/10/13 * 12
MPSE-18	Power sensor	ANRITSU	MA2411B	738174	Power	2017/11/16 * 12
MAT-86	Attenuator	Weinshel Associates	WA56-20	56200213	Power	2018/05/29 * 12

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4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

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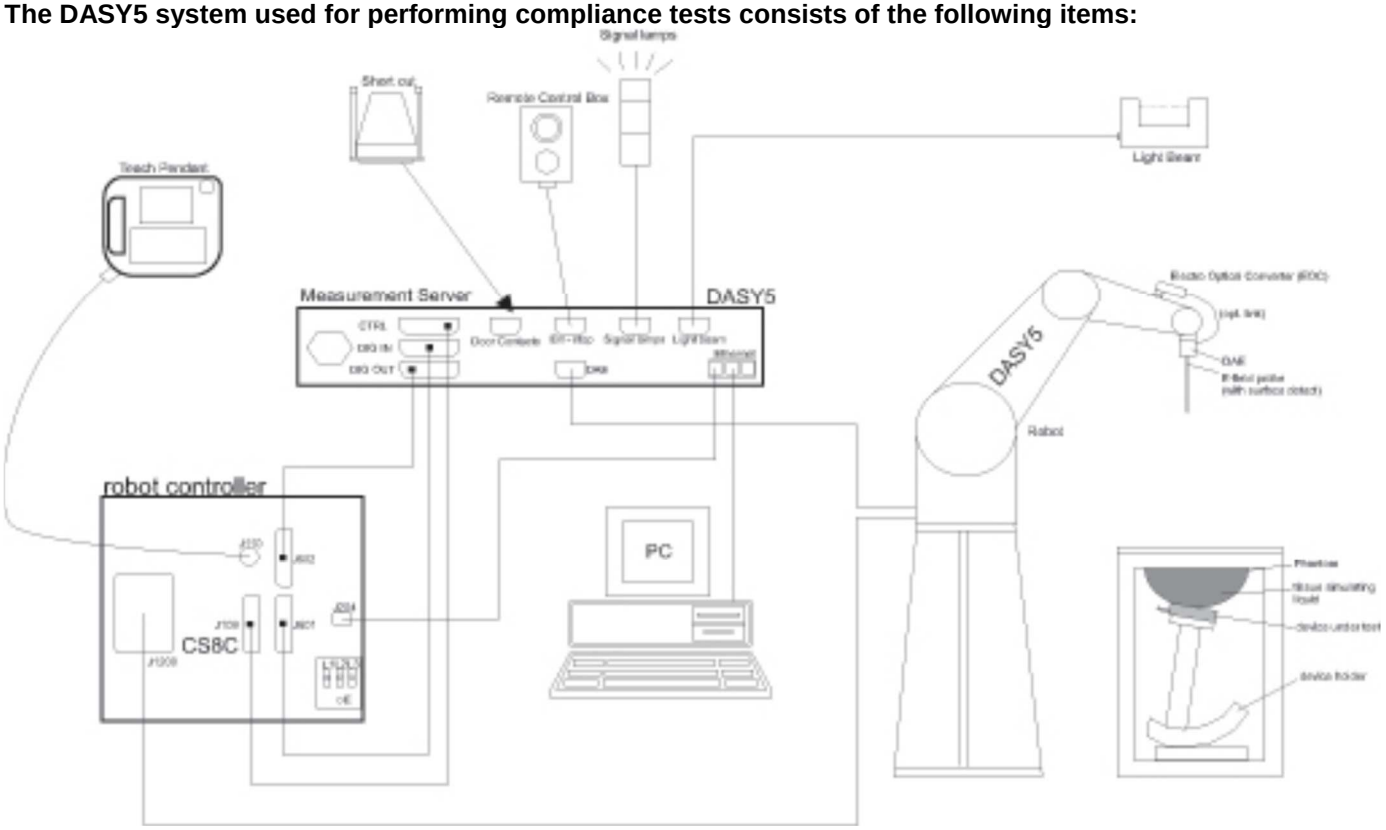
5. Measurement System Description and Setup

The DASY5 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.

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6. SAR Measurement Procedure

6.1. Normal SAR Measurement Procedure

Step 1: 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. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: 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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) 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 KDB 865664 D01 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.	

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Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose 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 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 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.	

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

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6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan
Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 3: Power drift measurement
The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

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7. Device Under Test

RFID Mini PCI-E Card Module (Tested inside of Panasonic Tablet PC FZ-G1) Model: RU-865	
Operating Configuration(s)	• Tablet Mode
Exposure Condition(s)	• The device is used in close proximity to the body. Specific details of the required test positions are provided in Section 8 “Exposure Conditions”
Accessory	• None

7.1. Band and Air Interfaces

Tx Frequency Bands	• 902.75MHz – 927.25MHz Simultaneous transmission with RU-865 Radio Module(Tested inside of Panasonic Tablet PC FZ-G1) Model: WW16D • W-CDMA Band V: 824 - 849 MHz • W-CDMA Band IV: 1710 - 1755 MHz • W-CDMA Band II: 1850 - 1910 MHz • LTE Band 2: 1850 - 1910 MHz • LTE Band 4: 1710 - 1755 MHz • LTE Band 5: 824 - 849 MHz • LTE Band 7: 2500 – 2570 MHz • LTE Band 12: 699 – 716 MHz • LTE Band 13: 777 - 787 MHz • LTE Band 25: 1850 - 1915 MHz • LTE Band 26: 814 – 849 MHz • LTE Band 41: 2496 – 2690 MHz Wireless Module(Tested inside of Panasonic Tablet PC FZ-G1) Model: WL16A • 802.11a/b/g/n/ac: 2412 - 2472 MHz, b / g / HT20 / HT40 5180 - 5240 MHz, a/HT20/HT40/VHT20/VHT40/VHT80 5260 - 5320 MHz, a/HT20/HT40/VHT20/VHT40/VHT80 5500 - 5720 MHz, a/HT20/HT40/VHT20/VHT40/VHT80 5745 - 5825 MHz, a/HT20/HT40/VHT20/VHT40/VHT80 • Bluetooth: 2402 - 2480 MHz
Modulation	• ASK
Duty Cycle	• 38%

7.2. Hotspot (Wireless Router) Exposure Condition

N/A

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7.3. Simultaneous Transmission with UHF-RFID

WWAN + WLAN 2.4 GHz SISO (1 Tx) + UHF-RFID

Usage Scenario	Modes	Mode of Operation	BAND	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	WLAN 2.4GHz Main	WLAN 2.4GHz Aux	WLAN 5 GHz Bands Main	WLAN 5 GHz Bands Aux	BT 2.4 GHz	UHF-RFID
Body SAR	WWAN + 2.4 GHz Bands WLAN	W-CDMA	2	YES	No	No	No	No	No	YES	No	No	No	No	YES
		W-CDMA	4	YES	No	No	No	No	No	YES	No	No	No	No	YES
		W-CDMA	5	YES	No	No	No	No	No	YES	No	No	No	No	YES
		HSDPA	2	No	YES	No	No	No	No	YES	No	No	No	No	YES
		HSDPA	4	No	YES	No	No	No	No	YES	No	No	No	No	YES
		HSDPA	5	No	YES	No	No	No	No	YES	No	No	No	No	YES
		HSUPA	2	No	No	YES	No	No	No	YES	No	No	No	No	YES
		HSUPA	4	No	No	YES	No	No	No	YES	No	No	No	No	YES
		HSUPA	5	No	No	YES	No	No	No	YES	No	No	No	No	YES
		HSPA+	2	No	No	No	YES	No	No	YES	No	No	No	No	YES
		HSPA+	4	No	No	No	YES	No	No	YES	No	No	No	No	YES
		HSPA+	5	No	No	No	YES	No	No	YES	No	No	No	No	YES
		DC-HSDPA	2	No	No	No	No	YES	No	YES	No	No	No	No	YES
		DC-HSDPA	4	No	No	No	No	YES	No	YES	No	No	No	No	YES
		DC-HSDPA	5	No	No	No	No	YES	No	YES	No	No	No	No	YES
		LTE	2	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	4	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	5	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	7	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	12	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	13	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	25	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	26	No	No	No	No	No	YES	YES	No	No	No	No	YES
		LTE	41	No	No	No	No	No	YES	YES	No	No	No	No	YES
		W-CDMA	2	YES	No	No	No	No	No	No	YES	No	No	No	YES
		W-CDMA	4	YES	No	No	No	No	No	No	YES	No	No	No	YES
		W-CDMA	5	YES	No	No	No	No	No	No	YES	No	No	No	YES
		HSDPA	2	No	YES	No	No	No	No	No	YES	No	No	No	YES
		HSDPA	4	No	YES	No	No	No	No	No	YES	No	No	No	YES
		HSDPA	5	No	YES	No	No	No	No	No	YES	No	No	No	YES
		HSUPA	2	No	No	YES	No	No	No	No	YES	No	No	No	YES
		HSUPA	4	No	No	YES	No	No	No	No	YES	No	No	No	YES
		HSUPA	5	No	No	YES	No	No	No	No	YES	No	No	No	YES
		HSPA+	2	No	No	No	YES	No	No	No	YES	No	No	No	YES
		HSPA+	4	No	No	No	YES	No	No	No	YES	No	No	No	YES
		HSPA+	5	No	No	No	YES	No	No	No	YES	No	No	No	YES
		DC-HSDPA	2	No	No	No	No	YES	No	No	YES	No	No	No	YES
		DC-HSDPA	4	No	No	No	No	YES	No	No	YES	No	No	No	YES
		DC-HSDPA	5	No	No	No	No	YES	No	No	YES	No	No	No	YES
		LTE	2	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	4	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	5	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	7	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	12	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	13	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	25	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	26	No	No	No	No	No	YES	No	YES	No	No	No	YES
		LTE	41	No	No	No	No	No	YES	No	YES	No	No	No	YES

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WWAN + WLAN 5 GHz Bands SISO (1 Tx) + UHF-RFID

Usage Scenario	Modes	Mode of Operation	BAND	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	WLAN 2.4GHz Main	WLAN 2.4GHz Aux	WLAN 5 GHz Bands Main	WLAN 5 GHz Bands Aux	BT 2.4 GHz	UHF-RFID
Body SAR	WWAN + 5 GHz Bands WLAN	W-CDMA	2	YES	No	No	No	No	No	No	No	YES	No	No	YES
		W-CDMA	4	YES	No	No	No	No	No	No	No	YES	No	No	YES
		W-CDMA	5	YES	No	No	No	No	No	No	No	YES	No	No	YES
		HSDPA	2	No	YES	No	No	No	No	No	No	YES	No	No	YES
		HSDPA	4	No	YES	No	No	No	No	No	No	YES	No	No	YES
		HSDPA	5	No	YES	No	No	No	No	No	No	YES	No	No	YES
		HSUPA	2	No	No	YES	No	No	No	No	No	YES	No	No	YES
		HSUPA	4	No	No	YES	No	No	No	No	No	YES	No	No	YES
		HSUPA	5	No	No	YES	No	No	No	No	No	YES	No	No	YES
		HSPA+	2	No	No	No	YES	No	No	No	No	YES	No	No	YES
		HSPA+	4	No	No	No	YES	No	No	No	No	YES	No	No	YES
		HSPA+	5	No	No	No	YES	No	No	No	No	YES	No	No	YES
		DC-HSDPA	2	No	No	No	No	YES	No	No	No	YES	No	No	YES
		DC-HSDPA	4	No	No	No	No	YES	No	No	No	YES	No	No	YES
		DC-HSDPA	5	No	No	No	No	YES	No	No	No	YES	No	No	YES
		LTE	2	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	4	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	5	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	7	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	12	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	13	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	25	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	26	No	No	No	No	No	YES	No	No	YES	No	No	YES
		LTE	41	No	No	No	No	No	YES	No	No	YES	No	No	YES
		W-CDMA	2	YES	No	No	No	No	No	No	No	No	YES	No	YES
		W-CDMA	4	YES	No	No	No	No	No	No	No	No	YES	No	YES
		W-CDMA	5	YES	No	No	No	No	No	No	No	No	YES	No	YES
		HSDPA	2	No	YES	No	No	No	No	No	No	No	YES	No	YES
		HSDPA	4	No	YES	No	No	No	No	No	No	No	YES	No	YES
		HSDPA	5	No	YES	No	No	No	No	No	No	No	YES	No	YES
		HSUPA	2	No	No	YES	No	No	No	No	No	No	YES	No	YES
		HSUPA	4	No	No	YES	No	No	No	No	No	No	YES	No	YES
		HSUPA	5	No	No	YES	No	No	No	No	No	No	YES	No	YES
		HSPA+	2	No	No	No	YES	No	No	No	No	No	YES	No	YES
		HSPA+	4	No	No	No	YES	No	No	No	No	No	YES	No	YES
		HSPA+	5	No	No	No	YES	No	No	No	No	No	YES	No	YES
		DC-HSDPA	2	No	No	No	No	YES	No	No	No	No	YES	No	YES
		DC-HSDPA	4	No	No	No	No	YES	No	No	No	No	YES	No	YES
		DC-HSDPA	5	No	No	No	No	YES	No	No	No	No	YES	No	YES
		LTE	2	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	4	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	5	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	7	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	12	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	13	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	25	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	26	No	No	No	No	No	YES	No	No	No	YES	No	YES
		LTE	41	No	No	No	No	No	YES	No	No	No	YES	No	YES

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WWAN + Bluetooth + UHF-RFID

Usage Scenario	Modes	Mode of Operation	BAND	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	WLAN 2.4GHz Main	WLAN 2.4GHz Aux	WLAN 5 GHz Bands Main	WLAN 5 GHz Bands Aux	BT 2.4 GHz	UHF-RFID
Body SAR	WWAN + Bluetooth	W-CDMA	2	YES	No	No	No	No	No	No	No	No	No	YES	YES
		W-CDMA	4	YES	No	No	No	No	No	No	No	No	No	YES	YES
		W-CDMA	5	YES	No	No	No	No	No	No	No	No	No	YES	YES
		HSDPA	2	No	YES	No	No	No	No	No	No	No	No	YES	YES
		HSDPA	4	No	YES	No	No	No	No	No	No	No	No	YES	YES
		HSDPA	5	No	YES	No	No	No	No	No	No	No	No	YES	YES
		HSUPA	2	No	No	YES	No	No	No	No	No	No	No	YES	YES
		HSUPA	4	No	No	YES	No	No	No	No	No	No	No	YES	YES
		HSUPA	5	No	No	YES	No	No	No	No	No	No	No	YES	YES
		HSPA+	2	No	No	No	YES	No	No	No	No	No	No	YES	YES
		HSPA+	4	No	No	No	YES	No	No	No	No	No	No	YES	YES
		HSPA+	5	No	No	No	YES	No	No	No	No	No	No	YES	YES
		DC-HSDPA	2	No	No	No	No	YES	No	No	No	No	No	YES	YES
		DC-HSDPA	4	No	No	No	No	YES	No	No	No	No	No	YES	YES
		DC-HSDPA	5	No	No	No	No	YES	No	No	No	No	No	YES	YES
		LTE	2	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	4	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	5	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	7	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	12	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	13	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	25	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	26	No	No	No	No	No	YES	No	No	No	No	YES	YES
		LTE	41	No	No	No	No	No	YES	No	No	No	No	YES	YES

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WWAN + WLAN SISO (1 Tx) + Bluetooth + UHF-RFID

Usage Scenario	Modes	Mode of Operation	BAND	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	WLAN 2.4GHz Main	WLAN 2.4GHz Aux	WLAN 5 GHz Bands Main	WLAN 5 GHz Bands Aux	BT 2.4 GHz	UHF-RFID
Body SAR	WWAN + 2.4 GHz Bands WLAN + Bluetooth	W-CDMA	2	YES	No	No	No	No	No	YES	No	No	No	YES	YES
		W-CDMA	4	YES	No	No	No	No	No	YES	No	No	No	YES	YES
		W-CDMA	5	YES	No	No	No	No	No	YES	No	No	No	YES	YES
		HSDPA	2	No	YES	No	No	No	No	YES	No	No	No	YES	YES
		HSDPA	4	No	YES	No	No	No	No	YES	No	No	No	YES	YES
		HSDPA	5	No	YES	No	No	No	No	YES	No	No	No	YES	YES
		HSUPA	2	No	No	YES	No	No	No	YES	No	No	No	YES	YES
		HSUPA	4	No	No	YES	No	No	No	YES	No	No	No	YES	YES
		HSUPA	5	No	No	YES	No	No	No	YES	No	No	No	YES	YES
		HSPA+	2	No	No	No	YES	No	No	YES	No	No	No	YES	YES
		HSPA+	4	No	No	No	YES	No	No	YES	No	No	No	YES	YES
		HSPA+	5	No	No	No	YES	No	No	YES	No	No	No	YES	YES
		DC-HSDPA	2	No	No	No	No	YES	No	YES	No	No	No	YES	YES
		DC-HSDPA	4	No	No	No	No	YES	No	YES	No	No	No	YES	YES
		DC-HSDPA	5	No	No	No	No	YES	No	YES	No	No	No	YES	YES
		LTE	2	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	4	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	5	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	7	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	12	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	13	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	25	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	26	No	No	No	No	No	YES	YES	No	No	No	YES	YES
		LTE	41	No	No	No	No	No	YES	YES	No	No	No	YES	YES
	WWAN + 5 GHz Bands WLAN + Bluetooth	W-CDMA	2	YES	No	No	No	No	No	No	No	YES	No	YES	YES
		W-CDMA	4	YES	No	No	No	No	No	No	No	YES	No	YES	YES
		W-CDMA	5	YES	No	No	No	No	No	No	No	YES	No	YES	YES
		HSDPA	2	No	YES	No	No	No	No	No	No	YES	No	YES	YES
		HSDPA	4	No	YES	No	No	No	No	No	No	YES	No	YES	YES
		HSDPA	5	No	YES	No	No	No	No	No	No	YES	No	YES	YES
		HSUPA	2	No	No	YES	No	No	No	No	No	YES	No	YES	YES
		HSUPA	4	No	No	YES	No	No	No	No	No	YES	No	YES	YES
		HSUPA	5	No	No	YES	No	No	No	No	No	YES	No	YES	YES
		HSPA+	2	No	No	No	YES	No	No	No	No	YES	No	YES	YES
		HSPA+	4	No	No	No	YES	No	No	No	No	YES	No	YES	YES
		HSPA+	5	No	No	No	YES	No	No	No	No	YES	No	YES	YES
		DC-HSDPA	2	No	No	No	No	YES	No	No	No	YES	No	YES	YES
		DC-HSDPA	4	No	No	No	No	YES	No	No	No	YES	No	YES	YES
		DC-HSDPA	5	No	No	No	No	YES	No	No	No	YES	No	YES	YES
		LTE	2	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	4	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	5	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	7	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	12	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	13	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	25	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	26	No	No	No	No	No	YES	No	No	YES	No	YES	YES
		LTE	41	No	No	No	No	No	YES	No	No	YES	No	YES	YES

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WWAN + WLAN MIMO (2 Tx) + UHF-RFID

Usage Scenario	Modes	Mode of Operation	BAND	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	WLAN 2.4GHz Main	WLAN 2.4GHz Aux	WLAN 5 GHz Bands Main	WLAN 5 GHz Bands Aux	BT 2.4 GHz	UHF-RFID
Body SAR	WWAN + 2.4GHz Bands WLAN MIMO (2 Tx on WLAN)	W-CDMA	2	YES	No	No	No	No	No	YES	YES	No	No	No	YES
		W-CDMA	4	YES	No	No	No	No	No	YES	YES	No	No	No	YES
		W-CDMA	5	YES	No	No	No	No	No	YES	YES	No	No	No	YES
		HSDPA	2	No	YES	No	No	No	No	YES	YES	No	No	No	YES
		HSDPA	4	No	YES	No	No	No	No	YES	YES	No	No	No	YES
		HSDPA	5	No	YES	No	No	No	No	YES	YES	No	No	No	YES
		HSUPA	2	No	No	YES	No	No	No	YES	YES	No	No	No	YES
		HSUPA	4	No	No	YES	No	No	No	YES	YES	No	No	No	YES
		HSUPA	5	No	No	YES	No	No	No	YES	YES	No	No	No	YES
		HSPA+	2	No	No	No	YES	No	No	YES	YES	No	No	No	YES
		HSPA+	4	No	No	No	YES	No	No	YES	YES	No	No	No	YES
		HSPA+	5	No	No	No	YES	No	No	YES	YES	No	No	No	YES
		DC-HSDPA	2	No	No	No	No	YES	No	YES	YES	No	No	No	YES
		DC-HSDPA	4	No	No	No	No	YES	No	YES	YES	No	No	No	YES
		DC-HSDPA	5	No	No	No	No	YES	No	YES	YES	No	No	No	YES
		LTE	2	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	4	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	5	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	7	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	12	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	13	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	25	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	26	No	No	No	No	No	YES	YES	YES	No	No	No	YES
		LTE	41	No	No	No	No	No	YES	YES	YES	No	No	No	YES
	WWAN + 5 GHz Bands WLAN MIMO (2 Tx on WLAN)	W-CDMA	2	YES	No	No	No	No	No	No	No	YES	YES	No	YES
		W-CDMA	4	YES	No	No	No	No	No	No	No	YES	YES	No	YES
		W-CDMA	5	YES	No	No	No	No	No	No	No	YES	YES	No	YES
		HSDPA	2	No	YES	No	No	No	No	No	No	YES	YES	No	YES
		HSDPA	4	No	YES	No	No	No	No	No	No	YES	YES	No	YES
		HSDPA	5	No	YES	No	No	No	No	No	No	YES	YES	No	YES
		HSUPA	2	No	No	YES	No	No	No	No	No	YES	YES	No	YES
		HSUPA	4	No	No	YES	No	No	No	No	No	YES	YES	No	YES
		HSUPA	5	No	No	YES	No	No	No	No	No	YES	YES	No	YES
		HSPA+	2	No	No	No	YES	No	No	No	No	YES	YES	No	YES
		HSPA+	4	No	No	No	YES	No	No	No	No	YES	YES	No	YES
		HSPA+	5	No	No	No	YES	No	No	No	No	YES	YES	No	YES
		DC-HSDPA	2	No	No	No	No	YES	No	No	No	YES	YES	No	YES
		DC-HSDPA	4	No	No	No	No	YES	No	No	No	YES	YES	No	YES
		DC-HSDPA	5	No	No	No	No	YES	No	No	No	YES	YES	No	YES
		LTE	2	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	4	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	5	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	7	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	12	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	13	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	25	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	26	No	No	No	No	No	YES	No	No	YES	YES	No	YES
		LTE	41	No	No	No	No	No	YES	No	No	YES	YES	No	YES

Notes:

1. Bluetooth transmits using the WLAN Aux Antenna
2. Bluetooth can transmit simultaneously with the WLAN Main Antenna, in either of the WLAN bands.
3. Bluetooth cannot transmit simultaneously with the WLAN Aux Antenna, in either of the WLAN bands; this also precludes the transmission of Bluetooth when WLAN is in MIMO mode.

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8. Exposure Conditions

Refer to Section 18 “Antenna Dimensions & Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

8.1. Test Configurations for the UHF-RFID antenna

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear 2	3.95mm	Yes	
Front	-	No	SAR is not required as this is not a typical use scenario and also the front side SAR test is not required because of overall diagonal dimension >20cm based on KDB 616217D04.
Edge 1	83.4mm	Yes	Though SAR was not required for standalone, the test was performed for simultaneous transmitting evaluation. Refer to section 12.2.1 Notes 3
Edge 2	28.1mm	Yes	
Edge 3	39.9mm	Yes	
Edge 4	223.3mm	Yes	Though SAR was not required for standalone. Refer to section 12.1.
Edge 1 tilt *1	9.0mm	Yes	Please check the theory of operation.
Edge 2 tilt *1	10.5mm	Yes	Please check the theory of operation.
Edge 3 tilt *1	8.0mm	Yes	Please check the theory of operation.

*1 Special test considerations
Testing base against the flat phantom with the rear has upheaval did not represent the most conservative usage scenarios. Therefore, measurement of Edge 1 tilt, Edge 2 tilt and Edge 3 tilt was added. Please refer to the theory of operation.

LEGEND:

- Rear 1(Bottom)= Back side (UHF-RFID area is removed, but the 4.7mm height corner guards are added.)
- Rear 2 = Back side
- Edge 1 = Top
- Edge 2 = Right
- Edge 3 = Bottom
- Edge 4 = Left
- Edge 1 tilt = Top tilt
- Edge 2 tilt = Right tilt
- Edge 3 tilt = Bottom tilt

Note(s):

1. Refer to 18. Antenna Dimensions & Separation distances

8.2. Test Configurations for WWAN (Additional testing)

All WWAN 1-g SAR test configurations(frequency, RB allocation, RB start, modulation and BW) were taken from results recorded in SAR report 12108961H-A-R1, submitted under FCC ID: ACJ9TGWW16D

8.3. Test Configurations for WLAN (Additional testing)

All WLAN 1-g SAR test configurations(frequency, modulation and BW) were taken from results recorded in SAR report 12108956H-A, submitted under FCC ID ACJ9TGWL16A

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9. RF Output Power Measurement

Measured power level has its own set of target power and tune-up limit, and the scaling of SAR values is applied according to the corresponding target for the given operating power level

9.1. UHF-RFID

The target power is the absolute maximum.
Tune-up Tolerance
The upper power is the upper limit of tune-up tolerance.

Mode	Band	Channel	Frequency (MHz)	Upper Power (dBm)	Measured Power (dBm)
UHF-RFID	902.75-927.25 MHz	0	902.75	25.00	24.80
		24	914.75	25.00	24.76
		49	927.25	25.00	24.30

9.2. W-CDMA Band 2

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
WCDMA	BAND2	9262	1852.4	23.00	17.30	+/-1
		9400	1880			
		9538	1907.6			

Release 99 RMC Output Power Measurement Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm) Reduced Power
W-CDMA (UMTS) Band 2	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	17.05

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm) Full Power
W-CDMA (UMTS) Band 2	Rel 99 (RMC, 12.2 kbps)	9538	1907.6	22.85

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9.3. W-CDMA Band 4

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
WCDMA	BAND4	1312	1712.4	23.00	17.00	+/-1
		1413	1732.6			
		1513	1752.6			

Release 99 RMC Output Power Measurement Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm) Reduced Power
W-CDMA (UMTS) Band 4	Rel 99 (RMC, 12.2 kbps)	1312	1712.4	17.91

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm) Full Power
W-CDMA (UMTS) Band 4	Rel 99 (RMC, 12.2 kbps)	1513	1752.6	22.83

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9.4. W-CDMA Band 5

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
WCDMA	BAND5	4132	826.4	23.00	18.40	+/-1
		4182	836.4			
		4233	846.6			

Release 99 RMC Output Power Measurement Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm) Reduced Power
W-CDMA (UMTS) Band 5	Rel 99 (RMC, 12.2 kbps)	4183	836.6	18.47

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm) Full Power
W-CDMA (UMTS) Band 5	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.04

9.5. LTE Band 2

Target Power for LTE Band 2, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND2	18700	1860	23.00	17.20	+/-1
		18900	1880			
		19100	1900			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	19100	1900	QPSK	50	24	16.81

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	19100	1900	QPSK	1	49	22.57

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9.6. LTE Band 4

Target Power for LTE Band 4, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND4	20050	1720	23.00	16.80	+/-1
		20175	1732.5			
		20300	1745			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	20050	1720	QPSK	50	24	16.63

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	20300	1745	QPSK	1	49	22.56

9.7. LTE Band 5

Target Power for LTE Band 5, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND5	20450	829	23.00	18.20	+/-1
		20525	836.5			
		20600	844			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
10	20600	844	QPSK	25	0	18.38

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
10	20600	844	QPSK	1	0	22.71

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9.8. LTE Band 7

Target Power for LTE Band 7, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND7	20850	2510	21.00	14.60	+/-1
		21100	2535			
		21350	2560			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	21350	2560	QPSK	50	24	13.94

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	21100	2535	QPSK	1	49	21.16

9.9. LTE Band 12

Target Power for LTE Band 12, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND12	23060	704	23.00	21.40	+/-1
		23095	707.5			
		23130	711			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
10	23130	711	QPSK	25	0	21.29

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
10	23095	707.5	QPSK	1	0	23.00

9.10. LTE Band 13

Target Power for LTE Band 13, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND13	23205	779.5	23.00	19.80	+/-1
		23230	782			
		23225	784.5			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
10	23230	782	QPSK	50	0	19.99

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
10	23230	782	QPSK	25	12	21.48

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9.11. LTE Band 25

Target Power for LTE Band 25, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND25	26140	1860	23.00	16.90	+/-1
		26365	1882.5			
		26590	1905			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	26690	1905	QPSK	1	49	16.80

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	26365	1882.5	QPSK	1	0	22.48

9.12. LTE Band 26

Target Power for LTE Band 26, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND26	26765	821.5	23.00	18.00	+/-1
		26865	831.5			
		26965	841.5			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
15	26965	841.5	QPSK	36	0	17.82

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
15	26965	841.5	QPSK	1	74	22.58

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9.13. LTE Band 41

Target Power for LTE Band 41, QPSK and 16QAM modulations in all bandwidth

Tech	BAND	CH.	Freq. [MHz]	Target Power		Tolerance [dB]
				w/o Power Reduction	w/ Power Reduction	
LTE	BAND41	39750	2506	22.00	15.80	+/-1
		40620	2593			
		41490	2680			

Reduced Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	41490	2680	QPSK	1	49	16.21

Full Power

BW (MHz)	UL Ch #	Freq. (MHz)	Modu-lation	UL RB Allocation	UL RB Start	Meas. Pwr Avg (dBm)
20	41490	2680	QPSK	1	49	21.38

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9.14. Wi-Fi 2.4GHz (DTS Band)

SISO

Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		Initial SAR Test (Yes/No)	Note(s)
				Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
802.11b	1 Mbps	6	2437	14.99	-	15.0	15.0	Yes	
		11	2462	-	14.84				

Note(s):
1. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.

9.15. Wi-Fi 5GHz (U-NII-1 and U-NII-2A Bands)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		Initial SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.3 (U-NII-2A)	802.11n (HT40)	13.5 Mbps	62	5310	13.49	13.46	13.5	13.5	Yes	

Note(s):
1. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.

9.16. Wi-Fi 5GHz (U-NII-2C Band)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		Initial SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.5 (U-NII-2C)	802.11ac (VHT80)	29.3 Mbps	138	5690	13.42	13.44	13.5	13.5	Yes	

Note(s):
1. Initial SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

9.17. Wi-Fi 5GHz (U-NII-3 Band)

SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		Initial SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.8 (U-NII-3)	802.11n (HT40)	13.5 Mbps	159	5795	13.48	13.45	13.5	13.5	Yes	

Note(s):
1. Initial SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

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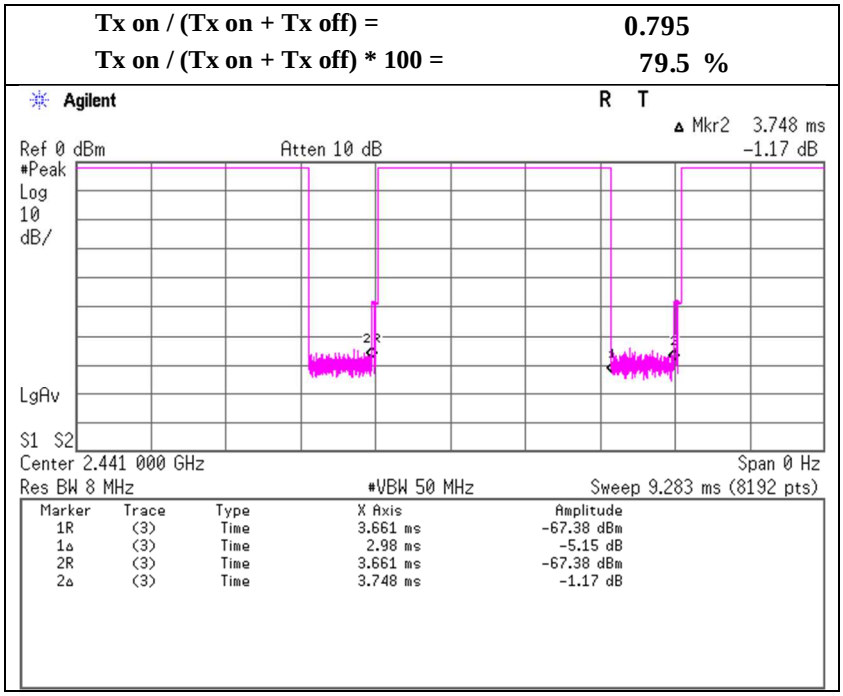
9.18. Bluetooth

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
2.4	BDR	DH5	39	2441	-	10.32	-	10.50	Yes	

BT DH5 duty cycle



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10. Tissue Dielectric Properties

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

10.1. Tissue Dielectric Parameter Check Results

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameter Check Results

Tissue Dielectric Parameter Check for UHF-RFID SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/6	Body 835	Relative Permittivity (ϵ_r):	55.66	55.20	0.83	5
		Conductivity (σ):	0.98	0.97	1.02	5
	Body 900	Relative Permittivity (ϵ_r):	55.04	55.00	0.06	5
		Conductivity (σ):	1.05	1.05	0.12	5
	Body 930	Relative Permittivity (ϵ_r):	54.74	54.97	-0.41	5
		Conductivity (σ):	1.08	1.07	1.23	5
2018/9/7	Body 835	Relative Permittivity (ϵ_r):	55.48	55.20	0.50	5
		Conductivity (σ):	0.96	0.97	-1.34	5
	Body 900	Relative Permittivity (ϵ_r):	54.99	55.00	-0.02	5
		Conductivity (σ):	1.02	1.05	-2.53	5
	Body 930	Relative Permittivity (ϵ_r):	54.75	54.97	-0.39	5
		Conductivity (σ):	1.06	1.07	-1.31	5
2018/9/10	Body 835	Relative Permittivity (ϵ_r):	55.90	55.20	1.27	5
		Conductivity (σ):	0.96	0.97	-1.03	5
	Body 900	Relative Permittivity (ϵ_r):	55.27	55.00	0.48	5
		Conductivity (σ):	1.03	1.05	-1.74	5
	Body 930	Relative Permittivity (ϵ_r):	55.02	54.97	0.09	5
		Conductivity (σ):	1.06	1.07	-0.66	5
2018/9/11	Body 835	Relative Permittivity (ϵ_r):	56.01	55.20	1.46	5
		Conductivity (σ):	0.96	0.97	-0.73	5
	Body 900	Relative Permittivity (ϵ_r):	55.35	55.00	0.63	5
		Conductivity (σ):	1.04	1.05	-0.88	5
	Body 930	Relative Permittivity (ϵ_r):	54.98	54.97	0.03	5
		Conductivity (σ):	1.07	1.07	-0.24	5
2018/9/12	Body 835	Relative Permittivity (ϵ_r):	55.43	55.20	0.41	5
		Conductivity (σ):	0.95	0.97	-1.80	5
	Body 900	Relative Permittivity (ϵ_r):	54.83	55.00	-0.31	5
		Conductivity (σ):	1.03	1.05	-2.16	5
	Body 930	Relative Permittivity (ϵ_r):	54.49	54.97	-0.87	5
		Conductivity (σ):	1.06	1.07	-0.50	5
2018/9/13	Body 835	Relative Permittivity (ϵ_r):	55.67	55.20	0.85	5
		Conductivity (σ):	0.95	0.97	-2.05	5
	Body 900	Relative Permittivity (ϵ_r):	55.11	55.00	0.20	5
		Conductivity (σ):	1.02	1.05	-3.18	5
	Body 930	Relative Permittivity (ϵ_r):	54.83	54.97	-0.25	5
		Conductivity (σ):	1.05	1.07	-1.90	5

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Tissue Dielectric Parameter Check for WWAN 835MHz band SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/14	Body 820	Relative Permittivity (ϵ_r):	55.87	55.28	1.08	5
		Conductivity (σ):	0.94	0.97	-2.45	5
	Body 835	Relative Permittivity (ϵ_r):	55.71	55.20	0.92	5
		Conductivity (σ):	0.96	0.97	-1.01	5
	Body 850	Relative Permittivity (ϵ_r):	55.55	55.16	0.72	5
		Conductivity (σ):	0.98	0.99	-1.11	5
2018/9/16	Body 820	Relative Permittivity (ϵ_r):	56.05	55.28	1.40	5
		Conductivity (σ):	0.95	0.97	-1.59	5
	Body 835	Relative Permittivity (ϵ_r):	55.94	55.20	1.34	5
		Conductivity (σ):	0.97	0.97	-0.29	5
	Body 850	Relative Permittivity (ϵ_r):	55.82	55.16	1.20	5
		Conductivity (σ):	0.98	0.99	-0.51	5
2018/9/28	Body 820	Relative Permittivity (ϵ_r):	55.34	55.28	0.12	5
		Conductivity (σ):	0.95	0.97	-1.49	5
	Body 835	Relative Permittivity (ϵ_r):	55.17	55.20	-0.06	5
		Conductivity (σ):	0.97	0.97	0.20	5
	Body 850	Relative Permittivity (ϵ_r):	54.98	55.16	-0.32	5
		Conductivity (σ):	0.99	0.99	0.26	5

Tissue Dielectric Parameter Check for WWAN 750MHz band SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/19	Body 750	Relative Permittivity (ϵ_r):	56.35	55.55	1.45	5
		Conductivity (σ):	0.93	0.96	-3.36	5
	Body 775	Relative Permittivity (ϵ_r):	56.26	55.45	1.45	5
		Conductivity (σ):	0.96	0.97	-0.85	5
	Body 790	Relative Permittivity (ϵ_r):	56.19	55.39	1.45	5
		Conductivity (σ):	0.97	0.97	0.80	5
2018/9/20	Body 750	Relative Permittivity (ϵ_r):	55.37	55.55	-0.31	5
		Conductivity (σ):	0.99	0.96	2.72	5
	Body 700	Relative Permittivity (ϵ_r):	55.82	55.74	0.15	5
		Conductivity (σ):	0.95	0.96	-1.42	5
	Body 720	Relative Permittivity (ϵ_r):	55.63	55.66	-0.06	5
		Conductivity (σ):	0.96	0.96	0.27	5

Tissue Dielectric Parameter Check for WWAN 1750MHz band SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/27	Body 1700	Relative Permittivity (ϵ_r):	51.89	53.57	-3.13	5
		Conductivity (σ):	1.39	1.46	-4.77	5
	Body 1750	Relative Permittivity (ϵ_r):	51.75	53.44	-3.16	5
		Conductivity (σ):	1.43	1.49	-3.51	5
	Body 1800	Relative Permittivity (ϵ_r):	51.66	53.30	-3.08	5
		Conductivity (σ):	1.49	1.52	-1.91	5

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Tissue Dielectric Parameter Check for WWAN 1900MHz band SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/25	Body 1900	Relative Permittivity (ϵ_r):	51.30	53.30	-3.75	5
		Conductivity (σ):	1.54	1.52	1.05	5
	Body 1850	Relative Permittivity (ϵ_r):	51.48	53.30	-3.41	5
		Conductivity (σ):	1.47	1.52	-2.98	5
	Body 1910	Relative Permittivity (ϵ_r):	51.27	53.30	-3.80	5
		Conductivity (σ):	1.55	1.52	1.81	5

Tissue Dielectric Parameter Check for WWAN 2600MHz band SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/27	Body 2500	Relative Permittivity (ϵ_r):	50.83	52.64	-3.43	5
		Conductivity (σ):	2.06	2.02	1.87	5
	Body 2600	Relative Permittivity (ϵ_r):	50.32	52.51	-4.17	5
		Conductivity (σ):	2.20	2.16	1.58	5
	Body 2700	Relative Permittivity (ϵ_r):	49.94	52.38	-4.68	5
		Conductivity (σ):	2.34	2.30	1.62	5

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Tissue Dielectric Parameter Check for WLAN SAR test

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2018/9/14	Body 2400	Relative Permittivity (ϵ_r):	51.91	52.77	-1.63	5
		Conductivity (σ):	1.96	1.90	3.27	5
	Body 2450	Relative Permittivity (ϵ_r):	51.72	52.70	-1.86	5
		Conductivity (σ):	2.02	1.95	3.69	5
	Body 2480	Relative Permittivity (ϵ_r):	51.60	52.66	-2.02	5
		Conductivity (σ):	2.06	1.99	3.36	5
2018/9/19	Body 2400	Relative Permittivity (ϵ_r):	51.94	52.77	-1.58	5
		Conductivity (σ):	1.94	1.90	2.16	5
	Body 2450	Relative Permittivity (ϵ_r):	51.81	52.70	-1.69	5
		Conductivity (σ):	2.01	1.95	3.03	5
	Body 2480	Relative Permittivity (ϵ_r):	51.72	52.66	-1.79	5
		Conductivity (σ):	2.05	1.99	2.95	5
2018/9/20	Body 5100	Relative Permittivity (ϵ_r):	47.19	49.16	-4.00	10
		Conductivity (σ):	5.29	5.18	2.18	5
	Body 5250	Relative Permittivity (ϵ_r):	46.62	48.95	-4.76	10
		Conductivity (σ):	5.51	5.35	2.86	5
	Body 5400	Relative Permittivity (ϵ_r):	46.62	48.75	-4.37	10
		Conductivity (σ):	5.79	5.53	4.79	5
2018/9/21	Body 5500	Relative Permittivity (ϵ_r):	46.44	48.61	-4.47	10
		Conductivity (σ):	5.84	5.64	3.51	5
	Body 5600	Relative Permittivity (ϵ_r):	46.21	48.48	-4.69	10
		Conductivity (σ):	5.90	5.76	2.49	5
	Body 5720	Relative Permittivity (ϵ_r):	45.94	48.32	-4.91	10
		Conductivity (σ):	6.17	5.90	4.54	5
2018/9/26	Body 5720	Relative Permittivity (ϵ_r):	46.61	48.32	-3.53	10
		Conductivity (σ):	6.16	5.90	4.47	5
	Body 5750	Relative Permittivity (ϵ_r):	46.56	48.27	-3.56	10
		Conductivity (σ):	6.21	5.94	4.60	5
	Body 5800	Relative Permittivity (ϵ_r):	46.72	48.20	-3.07	10
		Conductivity (σ):	6.24	6.00	4.02	5
2018/9/27	Body 2400	Relative Permittivity (ϵ_r):	51.01	52.77	-3.34	5
		Conductivity (σ):	1.97	1.90	3.63	5
	Body 2450	Relative Permittivity (ϵ_r):	50.86	52.70	-3.49	5
		Conductivity (σ):	2.04	1.95	4.72	5
	Body 2480	Relative Permittivity (ϵ_r):	50.72	52.66	-3.69	5
		Conductivity (σ):	2.09	1.99	4.76	5

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11. System Performance Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm ± 0.5 cm for SAR measurements.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 12 mm (2GHz to 4GHz) and15 mm (below 2GHz) was aligned with the dipole. For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 2 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW(For 5GHz band) or 250 mW(For 2.4GHz band).
- The results are normalized to 1 W input power.

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11.2. Reference SAR Values for System Performance Check

The target(reference) SAR values can be obtained from the calibration certificate of system validation dipoles (Section 16). The target SAR values are SAR measured value in the calibration certificate scaled to 1W.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D750V3	1058	05/18/2018	750	1g	8.24	8.60
				10g	5.40	5.72
D835V2	4d149	03/08/2016	835	1g	9.56	9.84
				10g	6.20	6.44
D1750V2	1089	03/11/2016	1750	1g	35.88	35.80
				10g	19.04	19.08
D1900V2	5d169	03/09/2016	1900	1g	38.72	39.96
				10g	20.32	21.12
D2450V2	713	9/13/2016	2450	1g	53.60	52.00
				10g	24.92	24.44
D2600V2	1030	03/09/2016	2600	1g	57.60	54.40
				10g	25.56	24.16
D5GHzV2	1020	01/11/2018	5250	1g	77.80	76.50
				10g	22.50	21.40
D5GHzV2	1020	01/11/2018	5600	1g	82.90	80.30
				10g	23.70	22.40
D5GHzV2	1020	01/11/2018	5750	1g	79.50	76.80
				10g	22.70	21.30

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System Performance Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

System Performance Check for UHF-RFID SAR test

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %
	Type	Serial #			Zoom Scan	Normalize to 1 W		
2018/9/6	D835V2	4d149	Body	1g	2.42	9.68	9.84	-1.63
				10g	1.60	6.40	6.44	-0.62
2018/9/7	D835V2	4d149	Body	1g	2.44	9.76	9.84	-0.81
				10g	1.61	6.44	6.44	0.00
2018/9/10	D835V2	4d149	Body	1g	2.46	9.84	9.84	0.00
				10g	1.62	6.48	6.44	0.62
2018/9/11	D835V2	4d149	Body	1g	2.44	9.76	9.84	-0.81
				10g	1.61	6.44	6.44	0.00
2018/9/12	D835V2	4d149	Body	1g	2.42	9.68	9.84	-1.63
				10g	1.60	6.40	6.44	-0.62
2018/9/13	D835V2	4d149	Body	1g	2.47	9.88	9.84	0.41
				10g	1.64	6.56	6.44	1.86

System Performance Check for WWAN SAR test

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %
	Type	Serial #			Zoom Scan	Normalize to 1 W		
2018/9/14	D835V2	4d149	Body	1g	2.43	9.72	9.84	-1.22
				10g	1.60	6.40	6.44	-0.62
2018/9/16	D835V2	4d149	Body	1g	2.47	9.88	9.84	0.41
				10g	1.63	6.52	6.44	1.24
2018/9/28	D835V2	4d149	Body	1g	2.54	10.16	9.84	3.25
				10g	1.68	6.72	6.44	4.35
2018/9/19	D750V3	1058	Body	1g	2.22	8.88	8.60	3.26
				10g	1.48	5.92	5.72	3.50
2018/9/20	D750V3	1058	Body	1g	2.31	9.24	8.60	7.44
				10g	1.52	6.08	5.72	6.29
2018/9/27	D1750V2	1089	Body	1g	9.84	39.36	35.80	9.94
				10g	5.24	20.96	19.08	9.85
2018/9/25	D1900V2	5d169	Body	1g	10.30	41.20	39.96	3.10
				10g	5.31	21.24	21.12	0.57
2018/9/27	D2600V2	1030	Body	1g	13.90	55.60	54.40	2.21
				10g	6.14	24.56	24.16	1.66

System Performance Check for WLAN SAR test

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %
	Type	Serial #			Zoom Scan	Normalize to 1 W		
2018/9/14	D2450V2	713	Body	1g	12.50	50.00	52.00	-3.85
				10g	5.75	23.00	24.44	-5.89
2018/9/19	D2450V2	713	Body	1g	12.30	49.20	52.00	-5.38
				10g	5.63	22.52	24.44	-7.86
2018/9/20	D5GHzV2 5250MHz	1020	Body	1g	7.03	70.30	76.50	-8.10
				10g	1.96	19.60	21.40	-8.41
2018/9/21	D5GHzV2 5600MHz	1020	Body	1g	7.38	73.80	80.30	-8.09
				10g	2.05	20.50	22.40	-8.48
2018/9/26	D5GHzV2 5750MHz	1020	Body	1g	7.79	77.90	76.80	1.43
				10g	2.22	22.20	21.30	4.23
2018/9/27	D2450V2	713	Body	1g	12.50	50.00	52.00	-3.85
				10g	5.65	22.60	24.44	-7.53

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12. RF Exposure Conditions (Test Configurations)

Refer to Section 18 “Antenna Dimensions & Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

12.1. Standalone SAR Test Exclusion Considerations

Standalone SAR test exclusion was based upon the following criteria:

1. According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the back side or edge the separation distance used for the SAR exclusion calculations is 5 mm.
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
3. If the antenna to DUT adjacent back side or edge separation distance is >50mm the actual antenna to user separation distance is used to determine SAR exclusion and estimated SAR value

12.1.1. SAR exclusion calculations for UHF-RFID for antenna <50mm from the user

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear2	Edge1	Edge2	Edge3	Edge4	Edge1 tilt	Rear2	Edge1	Edge2	Edge3	Edge4	Edge1 tilt
UHF-RFID	UHF-RFID	927.25	25.00	316	3.95	83.40	28.10	39.90	223.30	9.00	60.9 -MEASURE-	> 50 mm -EXEMPT-	60.9 -MEASURE-	60.9 -MEASURE-	> 50 mm -EXEMPT-	60.9 -MEASURE-

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)			Calculated Threshold Value		
			dBm	mW	Edge2 tilt	Edge3 tilt	Front	Edge2 tilt	Edge3 tilt	Front
UHF-RFID	UHF-RFID	927.25	25.00	316	10.50	8.00	N/A	60.9 -MEASURE-	60.9 -MEASURE-	N/A

Note(s):

1. According to KDB 447498D01, if the calculated threshold value is >3 then SAR testing is required.
2. The separation distances from antennas to the back side or the edge were input. For antennas <50 mm from the back side or edge the separation distance used for the SAR exclusion calculations is 5 mm.
3. For antennas <50 mm from the back side or edge the separation distance when SAR testing are mentioned above table.

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12.1.2. SAR exclusion calculations for UHF-RFID for antenna for antenna >50mm from the user

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear2	Edge1	Edge2	Edge3	Edge4	Edge1 tilt	Rear2	Edge1	Edge2	Edge3	Edge4	Edge1 tilt
UHF-RFID	UHF-RFID	927.25	25.00	316	3.95	83.40	28.10	39.90	223.30	9.00	< 50 mm	362.2 mW -EXEMPT-	< 50 mm	< 50 mm	1227.1 mW -EXEMPT-	< 50 mm

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)			Calculated Threshold Value		
			dBm	mW	Edge2 tilt	Edge3 tilt	Front	Edge2 tilt	Edge3 tilt	Front
UHF-RFID	UHF-RFID	927.25	25.00	316	10.50	8.00	N/A	< 50 mm	< 50 mm	N/A

Note(s):

1. According to KDB 447498D01, if the calculated Power threshold is less than the output power then SAR testing is required.
2. The separation distances from antennas to the back side or the edge were input. For antennas <50 mm from the back side or edge the separation distance used for the SAR exclusion calculations is 5 mm.
3. For antennas <50 mm from the back side or edge the separation distance when SAR testing are mentioned above table.

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12.2. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for using estimated SAR values:

1. According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the back side or edge the separation distance used for the estimated SAR calculations is 5 mm.
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
3. Output power is the maximum rated power (including tune-up or manufacturing tolerances) and includes source-based averaging.
4. If the antenna separation distance is > 50mm then the estimated SAR value is 0.4 W/Kg.
5. Formulas round separation distance to nearest mm and power to nearest mW before calculating estimated SAR

12.2.1. Estimated SAR for UHF-RFID

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear2	Edge1	Edge2	Edge3	Edge4	Edge1 tilt	Rear2	Edge1	Edge2	Edge3	Edge4	Edge1 tilt
UHF-RFID	UHF-RFID	927.25	25.00	316	3.95	83.40	28.10	39.90	223.30	9.00	-MEASURE-	-MEASURE-	-MEASURE-	-MEASURE-	0.400 -EXEMPT-	-MEASURE-

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)			Estimated 1-g SAR Value (W/kg)		
			dBm	mW	Edge2 tilt	Edge3 tilt	Front	Edge2 tilt	Edge3 tilt	Front
UHF-RFID	UHF-RFID	927.25	25.00	316	10.50	8.00	N/A	-MEASURE-	-MEASURE-	N/A

Notes:

1. The separation distances from antennas to the back side or the edge were input. For antennas <50 mm from the back side or edge the separation distance used for the SAR exclusion calculations is 5 mm.
2. For antennas <50 mm from the back side or edge the separation distance when SAR testing are mentioned above table.
3. Though SAR for UHF-RFID antenna in Edge 1 was not required for standalone, test was performed. The reason is as follows.
   - This model in which UHF-RFID module, WLAN module and WWAN module were installed. When considering simultaneous transmitting exclusion of Edge1 of UHF-RFID, 0.4W/kg had very large estimated SAR. And there is a possibility that sum of SAR value is exceeds 1.6W/kg. Since Edge 1 of UHF-RFID was measured standalone SAR for simultaneous transmitting evaluation in this report.

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13. Measured and Reported (Scaled) SAR Results

13.1. UHF-RFID SAR Results

About maximum duty cycle of UHF-RFID Tx
Maximum transmission burst duration: 608 ms
Shortest cycle: 1600 ms
Maximum duty cycle: 38%

Maximum duty cycle of UHF-RFID Tx is 38% for user.
When SAR was measured, Duty cycle of UHF-RFID Tx is 100%. Therefore, SAR result was scaled 38%.

Note: Measured value is rounded round off to three decimal places

UHF-RFID Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg) Duty 100%		1-g SAR (W/kg) Duty 38%	Plot No.	Note
					Tune-up limit	Meas.	Meas.	Power scaled	Duty scaled		
Rear2	UHF-RFID	0	0	902.75	25.00	24.80	1.230	1.288	0.489		
	UHF-RFID	0	24	914.75	25.00	24.76	1.750	1.849	0.703	1	
	UHF-RFID	0	49	927.25	25.00	24.30	1.570	1.845	0.701	2	
Edge1	UHF-RFID	0	0	902.75	25.00	24.80	0.030	0.031	0.012		
	UHF-RFID	0	24	914.75	25.00	24.76					
	UHF-RFID	0	49	927.25	25.00	24.30					
Edge2	UHF-RFID	0	0	902.75	25.00	24.80	0.331	0.347	0.132		
	UHF-RFID	0	24	914.75	25.00	24.76					
	UHF-RFID	0	49	927.25	25.00	24.30					
Edge3	UHF-RFID	0	0	902.75	25.00	24.80	0.174	0.182	0.069		
	UHF-RFID	0	24	914.75	25.00	24.76					
	UHF-RFID	0	49	927.25	25.00	24.30					
Edge 1 tilt	UHF-RFID	0	0	902.75	25.00	24.80	0.951	0.996	0.378		
	UHF-RFID	0	24	914.75	25.00	24.76	1.020	1.078	0.410		
	UHF-RFID	0	49	927.25	25.00	24.30	0.788	0.926	0.352		
Edge 2 tilt	UHF-RFID	0	0	902.75	25.00	24.80	1.620	1.696	0.645	3	
	UHF-RFID	0	24	914.75	25.00	24.76	1.410	1.490	0.566		
	UHF-RFID	0	49	927.25	25.00	24.30	0.998	1.173	0.446		
Edge 3 tilt	UHF-RFID	0	0	902.75	25.00	24.80	2.150	2.251	0.856	4	
	UHF-RFID	0	24	914.75	25.00	24.76	1.970	2.082	0.791	5	
	UHF-RFID	0	49	927.25	25.00	24.30	1.530	1.798	0.683	6	

Note(s):

According to KDB 447498 D01 General RF Exposure Guidance v06, 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

1. ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
2. ≤ 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
3. ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

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13.2. Summary of Highest SAR Values

Results for the highest scaled SAR values in each frequency band and mode

Technology/ Band	Test configuration			Mode	Dist. (mm)	Freq. (Mhz)	Power (dBm)	1g SAR (W/kg)
	Transmit Antenna	Exposure	Position					
UHF-RFID	UHF-RFID	Body	Edge 3 tilt	UHF-RFID	0	902.75	24.80	0.856

13.3. SAR Measurement Variability and Uncertainty for UHF-RFID

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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.

Wireless Technologies	Test Configuration		Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Plot No.
	Exposure	Position					Original	Repeated		
UHF-RFID	Body	Edge 3 tilt	UHF-RFID	0	0	902.75	2.150	2.010	1.07	1
UHF-RFID	Body	Edge 3 tilt	UHF-RFID	0	0	902.75	2.150	1.910	1.13	2
UHF-RFID	Body	Edge 3 tilt	UHF-RFID	0	0	902.75	2.150	1.930	1.11	3

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13.4. SAR Plots (from Summary of Highest Measured SAR Values)

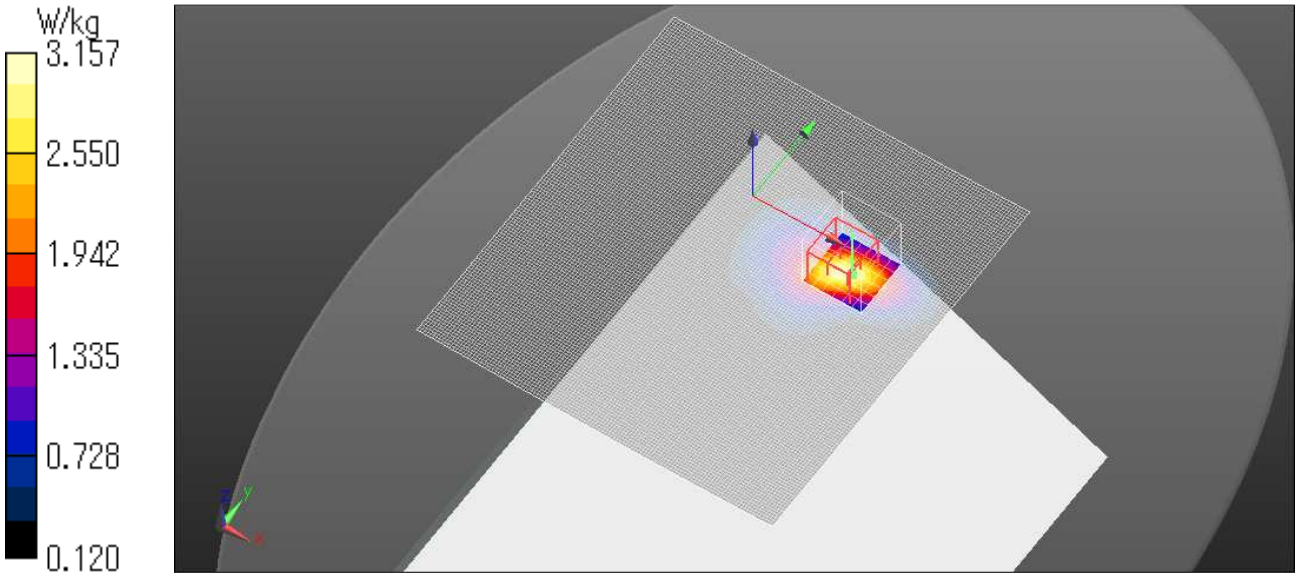
UHF-RFID Edge3 tilt 902.75MHz

Communication System: UID 0, UHF-RFID (0); Communication System Band: UHF; Frequency: 902.75 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 902.75 MHz; σ = 1.035 S/m; ε_r = 55.236; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: EX3DV4 - SN3917; ConvF(9.95, 9.95, 9.95); Calibrated: 2018/05/23;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1369; Calibrated: 2018/05/23
Phantom: ELI v5.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1203
Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

UHF-RFID/Edge3 tilt/Area Scan (121x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.01 W/kg

UHF-RFID/Edge3 tilt/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.06 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.87 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.25 W/kg
Maximum value of SAR (measured) = 3.16 W/kg

Date: 2018/09/10
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



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14. Additional SAR Test Results

The SAR result of WWAN and WLAN/Bluetooth in the former report is used for simultaneous transmission SAR analysis of UHF-RFID+WWAN+WLAN. Please refer to section 15 for simultaneous transmission SAR analysis.

The UHF-RFID area whose height is 13.5mm is connected to the back side of this host device. Therefore, additional test positions (Edge 1 tilt, Edge 2 tilt, Edge 3 tilt) are performed as additional measurement including WWAN and WLAN/Bluetooth.

About the definition of test setup position

- Rear 1(Bottom)= Back side (UHF-RFID area is removed, but the 4.7mm height corner guards are added.):

  Rear 1 means the back side of EUT when UHF-RFID area is removed and the 4.7mm height corner guards are added. The SAR measurement of WWAN and WLAN/Bluetooth was performed in the original reports (WWAN report 12108961H-A-R1, submitted under FCC ID ACJ9TGWW16D and WLAN report 12108956H-A, submitted under FCC ID ACJ9TGWL16A).

- Rear 2 = Back side:

  Rear 2 means the back side of EUT when UHF-RFID area is attached to Rear 1.

  The SAR value of the following composition is used.

  The SAR value of WWAN(Full power) Rear 2 0mm comes from the SAR value of Rear 1 separation 10.0mm in the WWAN original report

  The SAR value of WWAN(Reduced power) Rear 2 separation 0mm comes from the SAR value of Rear 1 separation 0mm in the original report.

  The WLAN(Main/Aux)/Bluetooth Rear 2 separation 0mm is measured in this report.

- Edge 1 = Top:

  The SAR value of the following composition is used.

  The SAR value of WWAN (Reduce power) Edge 1 separation 0mm comes from the WWAN original report.

  The SAR value of WWAN (Full power) Edge 1 separation 21.0mm comes from the WWAN original report

  The SAR value of WLAN Main/Aux antenna Edge 1 separation 0mm comes from the WLAN original report.

  The SAR value of WLAN(Main/Aux)/Bluetooth Edge 1 separation 21.0mm comes from the SAR value of Edge 1 separation 0mm in the WLAN original report.

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- Edge 2 = Right:

  The SAR value of the following composition is used.

  The SAR value of WWAN (Full power) Edge 2 separation 0mm comes from the WWAN original report.

  The SAR value of WLAN/ Bluetooth Edge 2 separation 0mm comes from the WLAN original report.

- Edge 3 = Bottom:

  The SAR value of the following composition is used.

  The SAR value of WWAN (Full power) Edge 2 separation 0mm comes from the WWAN original report.

  The SAR value of WLAN/ Bluetooth Edge 2 separation 0mm comes from the WLAN original report.

- Edge 4 = Left:

  UHF-RFID antenna is more than 20 cm away from Edge4. Stand-alone SAR test of Edge4 for UHF-RFID is excluded. Therefore, the Simultaneous Transmission SAR Analysis wasn't considered.

- Edge 1 tilt = Top tilt:

  The SAR value of the following composition is used.

  Additional measurement is performed in order to consider simultaneous transmission SAR analysis in this report.

- Edge 2 tilt = Right tilt:

  The SAR value of the following composition is used.

  Additional measurement is performed in order to consider simultaneous transmission SAR analysis in this report (It does not include WLAN Aux and Bluetooth).

  The SAR value of WLAN Aux and Bluetooth are estimated in this report.

- Edge 3 tilt = Bottom tilt:

  The SAR value of the following composition is used.

  Additional measurement is performed in order to consider simultaneous transmission SAR analysis in this report.

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14.1. WWAN SAR Results

Additional WWAN SAR tests were measured with the highest SAR channel reported by the SAR report 12108961H-A-R1 for WWAN (submitted under FCC ID ACJ9TGWW16D).

14.1.1. W-CDMA Band 2

Reduced Power Operation

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1 tilt	0	Rel 99 RMC 12.2 kbps	9262	1852.4	18.3	17.05	0.872	1.163	7	

Full Power Operation

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2 tilt	0	Rel 99 RMC 12.2 kbps	9538	1907.6	24.0	22.85	0.097	0.126	8	
Edge 3 tilt	0	Rel 99 RMC 12.2 kbps	9538	1907.6	24.0	22.85	0.018	0.023		

14.1.2. W-CDMA Band 4

Reduced Power Operation

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1 tilt	0	Rel 99 RMC 12.2 kbps	1312	1712.4	18.0	17.91	0.364	0.372	9	

Full Power Operation

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2 tilt	0	Rel 99 RMC 12.2 kbps	1513	1752.6	24.0	22.83	0.108	0.141	10	
Edge 3 tilt	0	Rel 99 RMC 12.2 kbps	1513	1752.6	24.0	22.83	0.020	0.026		

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14.1.3. W-CDMA Band 5

Reduced Power Operation

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1 tilt	0	Rel 99 RMC 12.2 kbps	4183	836.6	19.4	18.47	0.621	0.769	11	

Full Power Operation

Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2 tilt	0	Rel 99 RMC 12.2 kbps	4132	826.4	24.0	23.04	0.064	0.080	12	
Edge 3 tilt	0	Rel 99 RMC 12.2 kbps	4132	826.4	24.0	23.04	0.015	0.019		

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14.1.4. LTE Band 2

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	19100	1900	50	24	18.2	16.81	0.787	1.084	13	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tit	0	QPSK	19100	1900	1	49	24.0	22.57	0.090	0.125	14	
Edge3 tilt	0	QPSK	19100	1900	1	49	24.0	22.57	0.017	0.024		

14.1.5. LTE Band 4

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	20050	1720	50	24	17.8	16.63	0.345	0.452	15	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up	Meas.	Meas.	Scaled		
Edge2 tilt	0	QPSK	20300	1745	1	49	24.0	22.56	0.133	0.185	16	
Edge3 tilt	0	QPSK	20300	1745	1	49	24.0	22.56	0.020	0.028		

14.1.6. LTE Band 5

Reduced Power Operation

Test Position a	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge 1 tilt	0	QPSK	20600	844	25	0	19.2	18.38	0.861	1.040	17	

Full Power Operation

Test Position a	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	20600	844	1	0	24.0	22.71	0.028	0.038	18	
Edge3 tilt	0	QPSK	20600	844	1	0	24.0	22.71	0.019	0.026		

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14.1.7. LTE Band 7

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	21350	2560	50	24	15.6	13.94	0.483	0.708	19	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	21100	2535	1	49	22.0	21.16	0.076	0.092	20	
Edge3 tilt	0	QPSK	21100	2535	1	49	22.0	21.16	0.026	0.032		

14.1.8. LTE Band 12

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	23130	711	25	0	22.4	21.29	0.879	1.135	21	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	23095	707.5	1	0	24.0	23.00	0.046	0.058	22	
Edge3 tilt	0	QPSK	23095	707.5	1	0	24.0	23.00	0.028	0.035		

14.1.9. LTE Band 13

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	23230	782	50	0	20.8	19.99	0.966	1.164	23	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	23230	782	25	12	23.0	21.48	0.034	0.048	24	
Edge3 tilt	0	QPSK	23230	782	25	12	23.0	21.48	0.015	0.021		

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14.1.10. LTE Band 25

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	26590	1905	1	49	17.9	16.80	0.705	0.908	25	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	26365	1882.5	1	0	24.0	22.48	0.091	0.129	26	
Edge3 tilt	0	QPSK	26365	1882.5	1	0	24.0	22.48	0.021	0.030		

14.1.11. LTE Band 26

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	26965	841.5	36	0	19.0	17.82	0.519	0.681	27	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	26965	841.5	1	74	24.0	22.58	0.064	0.089	28	
Edge3 tilt	0	QPSK	26965	841.5	1	74	24.0	22.58	0.034	0.047		

14.1.12. LTE Band 41

Reduced Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge1 tilt	0	QPSK	41490	2680	1	49	16.8	16.21	0.312	0.357	29	

Full Power Operation

Test Position	Dist. (mm)	Modu-lation	UL CH #	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas. Avg	Meas.	Scaled		
Edge2 tilt	0	QPSK	41490	2680	1	49	23.0	21.38	0.061	0.089		
Edge3 tilt	0	QPSK	41490	2680	1	49	23.0	21.38	0.063	0.091	30	

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14.1.13. SAR Measurement Variability and Uncertainty for WWAN

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

5) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
6) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
7) 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).
8) 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.

Wireless Technologies	Test Configuration		Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Plot No.
	Exposure	Position					Original	Repeated		
WCDMA Band 2	Body	Edge 1 tilt Prox. On	Rel 99 RMC12.2kbps	0	9262	1852.4	0.872	0.871	1.00	4
WCDMA Band 4	Body	Edge 1 tilt Prox. On	Rel 99 RMC12.2kbps	0	1312	1712.4	0.364	N/A	1.00	
WCDMA Band 5	Body	Edge 1 tilt Prox. On	Rel 99 RMC12.2kbps	0	4183	836.6	0.621	N/A	1.00	
LTE Band 2	Body	Edge 1 tilt Prox. On	RB Allocation 50 RB Start 24	0	19100	1900	0.787	N/A	1.00	
LTE Band 4	Body	Edge 1 tilt Prox. On	RB Allocation 50 RB Start 24	0	20050	1720	0.345	N/A	1.00	
LTE Band 5	Body	Edge 1 tilt Prox. On	RB Allocation 25 RB Start 0	0	20600	844	0.861	0.860	1.00	5
LTE Band 7	Body	Edge 1 tilt Prox. Off	RB Allocation 1 RB Start 49	10	21350	2560	0.748	N/A	1.00	
LTE Band 12	Body	Edge 1 tilt Prox. On	RB Allocation 25 RB Start 0	0	23130	711	0.879	0.844	1.04	6
LTE Band 13	Body	Edge 1 tilt Prox. On	RB Allocation 50 RB Start 0	0	23230	782	0.966	0.906	1.07	7
LTE Band 25	Body	Edge 1 tilt Prox. On	RB Allocation 1 RB Start 49	0	26590	1905	0.705	N/A	1.00	
LTE Band 26	Body	Edge 1 tilt Prox. On	RB Allocation 36 RB Start 0	0	26965	841.5	0.591	N/A	1.00	
LTE Band 41	Body	Edge 1 tilt Prox. Off	RB Allocation 1 RB Start 49	10	41490	2680	0.312	N/A	1.00	

Note(s):

- Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

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14.2. WLAN / Bluetooth SAR Results

Additional WWAN SAR tests were measured with the highest SAR channel reported by the SAR report 12108956H-A for WLAN (submitted under FCC ID ACJ9TGWL16A).

14.2.1. Estimated SAR for additional WLAN/Bluetooth SAR test

Estimated SAR

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)	Estimated 1-g SAR Value (W/kg)
			dBm	mW	Edge2 tilt	Edge2 tilt
Aux	WLAN	2472	15.00	32	159.70	0.400
Aux	WLAM	5240	13.50	22	159.70	0.400
Aux	WLAM	5320	13.50	22	159.70	0.400
Aux	WLAM	5720	13.50	22	159.70	0.400
Aux	WLAM	5825	13.50	22	159.70	0.400
Aux	BT	2480	10.50	11	159.70	0.400

Notes:

1. The separation distances from antennas to the back side or the edge were input. For antennas <50 mm from the back side or edge the separation distance used for the SAR exclusion calculations is 5 mm.
2. For antennas <50 mm from the back side or edge the separation distance when SAR testing are mentioned above table.

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14.2.2. SAR Test Reduction criteria are as follows for WLAN

KDB 248227 D01 SAR meas for 802.11 v02r02:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the *initial test position*, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the *initial test position*.

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14.2.3. Wi-Fi 2.4 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11b	0	6	2437	15.00	14.99	0.018	0.018		
Edge 1 tilt	802.11b	0	6	2437	15.00	14.99	0.000	0.000		
Edge 2 tilt	802.11b	0	6	2437	15.00	14.99	0.000	0.000		
Edge 3 tilt	802.11b	0	6	2437	15.00	14.99	0.315	0.316	31	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11b	0	11	2462	15.00	14.84	0.011	0.011		
Edge 1 tilt	802.11b	0	11	2462	15.00	14.84	0.103	0.107	32	
Edge 3 tilt	802.11b	0	11	2462	15.00	14.84	0.000	0.000		

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14.2.4. Wi-Fi 5.3 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11n40	0	62	5310	13.50	13.49	0.041	0.041		
Edge 1 tilt	802.11n40	0	62	5310	13.50	13.49	0.012	0.012		
Edge 2 tilt	802.11n40	0	62	5310	13.50	13.49	0.000	0.000		
Edge 3 tilt	802.11n40	0	62	5310	13.50	13.49	0.195	0.195	33	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11n40	0	62	5310	13.50	13.46	0.046	0.046		
Edge 1 tilt	802.11n40	0	62	5310	13.50	13.46	0.061	0.062	34	
Edge 3 tilt	802.11n40	0	62	5310	13.50	13.46	0.004	0.004		

14.2.5. Wi-Fi 5.5 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11ac80	0	138	5690	13.50	13.42	0.039	0.040		
Edge 1 tilt	802.11ac80	0	138	5690	13.50	13.42	0.007	0.007		
Edge 2 tilt	802.11ac80	0	138	5690	13.50	13.42	0.000	0.000		
Edge 3 tilt	802.11ac80	0	138	5690	13.50	13.42	0.210	0.214	35	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11ac80	0	138	5690	13.50	13.44	0.047	0.048		
Edge 1 tilt	802.11ac80	0	138	5690	13.50	13.44	0.049	0.050	36	
Edge 3 tilt	802.11ac80	0	138	5690	13.50	13.44	0.000	0.000		

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14.2.6. Wi-Fi 5.8 GHz Band

Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11n40	0	159	5795	13.50	13.48	0.058	0.058		
Edge 1 tilt	802.11n40	0	159	5795	13.50	13.48	0.015	0.015		
Edge 2 tilt	802.11n40	0	159	5795	13.50	13.48	0.000	0.000		
Edge 3 tilt	802.11n40	0	159	5795	13.50	13.48	0.214	0.215	37	

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear2	802.11n40	0	159	5795	13.50	13.45	0.044	0.045		
Edge 1 tilt	802.11n40	0	159	5795	13.50	13.45	0.061	0.062	38	
Edge 3 tilt	802.11n40	0	159	5795	13.50	13.45	0.000	0.000		

14.2.7. Bluetooth

Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear 2	DH5	0	39	2441	10.50	10.32	0.005	0.005		
Edge1 tilt	DH5	0	39	2441	10.50	10.32	0.034	0.035	39	
Edge3 tilt	DH5	0	39	2441	10.50	10.32	0.000	0.000		

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14.2.8. SAR Measurement Variability and Uncertainty for WLAN and Bluetooth

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

9) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
10) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
11) 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).
12) 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.

Repeated measurement was not performed when the original highest measured SAR is < 0.80 W/kg

Wireless Technologies	Test Configuration			Mode	Dist. (mm)	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Plot No.
	Transmit Antenna	Exposure	Position				Original	Repeated		
WLAN 2.4 GHz	Main	Body	Edge 3 tilt	802.11b	0	2437	0.315	N/A	N/A	-
WLAN 5.2/5.3 GHz	Main	Body	Edge 3 tilt	802.11n40	0	5310	0.195	N/A	N/A	-
WLAN 5.5 GHz	Main	Body	Edge 3 tilt	802.11ac80	0	5690	0.210	N/A	N/A	-
WLAN 5.8 GHz	Main	Body	Edge 3 tilt	802.11n40	0	5795	0.214	N/A	N/A	-
Bluetooth	Aux	Body	Edge 1 tilt	DH5	0	2441	0.034	N/A	N/A	-

Note(s):

- Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

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15. Simultaneous Transmission SAR Analysis

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

Maximum of Sum of the 1-g SAR: 1.588 W/kg
Maximum of the SPLSR: 0.01

For detailed analysis, please refer to section 16.4(Appendix).

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16. Appendixes

Refer to separated files for the following appendixes.

16.1. System Performance Check Plots

16.2. SAR Test Plots

16.3. SAR test plots for Repeat Measurement

16.4. Data of Simultaneous Transmission SAR Analysis

16.5. Calibration Certificate for E-Field Probe EX3DV4

16.6. Calibration Certificate for below 2GHz

16.7. Calibration Certificate for above 2GHz

16.8. SAR Tissue Ingredients

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