



# SAR TEST REPORT

## Test Report No.: 12656075S-A-R1


**Applicant** : Nintendo Co., Ltd.  
**Type of Equipment** : Game Console  
**Model No.** : HDH-001  
**FCC ID** : BKEHDH001  
**Test Standard** : FCC 47CFR §2.1093  
**Test Result** : Complied (Refer to Section 3.3)

Highest Reported SAR [W/kg]				Remarks (DTS band)					Remarks (UNII band)			
DTS band	U-NII band	SAR type		Limit	Frequency [MHz]	Mode	Output power (average) [dBm]		Frequency [MHz]	Mode	Output power (average) [dBm]	
		Body-worn	1g				Measured	Max.			Measured	Max.
0.76 (Antenna 0)	1.42 (Antenna 0)	Body-worn	1g	1.6	2412	11b(1Mbps)	17.08	19	5825	ac20(MCS0,SISO)	13.14	14
0.76 (Antenna 0)	0.64 (Antenna 1)	Hand-held	10g	4	2412	11b(1Mbps)	17.08	19	5670	n40(MCS0)	13.02	15

- \*. **Highest reported SAR values for body-touch and hand-held rf exposure conditions are "1.42 W/kg (1g)" and "0.76 W/kg (10g)" respectively.**  
\*. **Highest reported SAR values for simultaneous transmission (Bluetooth (Antenna 0) + Wi-Fi (Antenna 1)) is "0.67 W/kg (10g)".**  
\*. **Highest reported SAR (1g) values for Co-location (MIMO) is less than 0.04 SPLSR. (\*. Antenna separation distance is 79 mm)**

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- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
- The information provided from the customer for this report is identified in SECTION 1.
- This report (-R1) is a revised version of 12656075-A. 12656075-A report is replaced with this report.

**Date of test:** January 28 ~ February 6, 2019

**Test engineer:**   
Hiroshi Naka  
Engineer, Consumer Technology Division

**Approved by:**   
Toyokazu Imamura  
Leader, Consumer Technology Division

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RTL02610

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN  
Telephone: +81 463 50 6400 / Facsimile: +81 463 50 6401

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**REVISION HISTORY**

Revision	Test report No.	Date	Page revised	Contents
Original	12656075S-A	June 24, 2019	-	-
-R1	12656075S-A-R1	July 26, 2019	p1, 2, 3, 4, 5, 8, 16, 24, 78	(p1) Error correcting.; (p2, Contents) Error correcting.; (p3, 2.2) Error correcting of remarks.; (p4) Error correcting of power table.; (p5, 3.3) The number of figures was unified.; (p8, 4.2) Error correcting.; (p16, 7.1) Error correcting. (p24, Appendix 1-1) An overlap on drawing was corrected.; (p78, Plot 4-14) Error correcting.

\*. By issue of new revision report, the report of an old revision becomes invalid.

**CONTENTS** **PAGE**

**REVISION HISTORY**..... 2

**CONTENTS** ..... 2

**SECTION 1: Customer information** ..... 3

**SECTION 2: Equipment under test (EUT)**..... 3

    2.1 Identification of EUT..... 3

    2.2 Product Description ..... 3

**SECTION 3: Test specification, procedures and results** ..... 5

    3.1 Test specification ..... 5

    3.2 Exposure limit..... 5

    3.3 Procedure and result ..... 5

    3.4 Addition, deviation and exclusion to the test procedure ..... 6

    3.5 Test location ..... 6

    3.6 Confirmation before SAR testing ..... 6

    3.7 Confirmation after SAR testing ..... 6

**SECTION 4: Operation of EUT during testing**..... 7

    4.1 Operation modes for SAR testing ..... 7

    4.2 RF exposure conditions ..... 8

    4.3 SAR test exclusion considerations accordance to KDB 447498 D01 ..... 8

    4.4 Estimated SAR for simultaneous transmission SAR analysis according to KDB447498 D01 ..... 9

**SECTION 5: Uncertainty assessment (SAR measurement)**..... 10

**SECTION 6: Confirmation before testing** ..... 11

    6.1 SAR reference power measurement (antenna terminal conducted average power of EUT) ..... 11

**SECTION 7: SAR Measurement results**..... 16

    7.1 Liquid parameters ..... 16

    7.2 SAR results: 2.4GHz band..... 17

    7.3 SAR results: U-NII-1 and U-NII-2A ..... 18

    7.4 SAR results: U-NII-2C band..... 20

    7.5 SAR results: U-NII-3 band ..... 22

    7.6 SAR Measurement Variability (Repeated measurement requirement) ..... 23

    7.7 Device holder perturbation verification ..... 23

    7.8 Simultaneous transmission and Co-location (MIMO) evaluation..... 23

**Contents of appendices**

**APPENDIX 1: Photographs of EUT and SAR test setup**..... 24

    Appendix 1-1 Photograph of EUT and antenna position..... 24

    Appendix 1-2 EUT and support equipment..... 25

    Appendix 1-3 Photograph of test setup ..... 26

**APPENDIX 2: SAR Measurement data**..... 31

    Appendix 2-1 Evaluation procedure..... 31

    Appendix 2-2 SAR measurement data..... 32

**APPENDIX 3: Test instruments** ..... 85

    Appendix 3-1 Equipment used ..... 85

    Appendix 3-2 Configuration and peripherals ..... 86

    Appendix 3-3 Test system specification ..... 87

    Appendix 3-4 Simulated tissues composition and parameter confirmation ..... 88

    Appendix 3-5 Daily check results..... 88

    Appendix 3-6 Daily check measurement data..... 89

    Appendix 3-7 Daily check uncertainty ..... 93

    Appendix 3-8 Calibration certificate: E-Field Probe (EX3DV4) ..... 94

    Appendix 3-9 Calibration certificate: Dipole (D2450V2) ..... 105

    Appendix 3-10 Calibration certificate: Dipole (D5GHzV2)..... 113

**SECTION 1: Customer information**

Company Name	Nintendo Co., Ltd.
Address	11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan
Telephone Number	+81-75-662-9600
Facsimile Number	+81-75-662-9624
Contact Person	Kazuya Kuramoto

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT)
- SECTION 4: Operation of EUT during testing
- Appendix 1: The part of Antenna location information, Description of EUT and Support Equipment
- \* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2, SECTION 4 and Appendix 1.

**SECTION 2: Equipment under test (EUT)****2.1 Identification of EUT**

Type of Equipment	Game Console
Model Number	HDH-001
Serial Number	XJW01000021163
Condition of EUT	Engineering prototype (*. Not for sale: These samples are equivalent to mass-produced items.)
Receipt Date of Sample (*. Information from test lab.)	December 27, 2018 (*.EUT for power measurement. No modification by the Lab.) January 26, 2019 (*. EUT for SAR test. No modification by the Lab.) (*. After power measurement, the EUT was returned to a customer.)
Country of Mass-production	China
Category Identified	Portable device *. Since EUT may handle by hand and may contact and/or very close to a human body during Wi-Fi operation, the hand-held SAR (10g) and the partial-body SAR (1g) shall be measured.
Rating	DC3.8 V (Battery) *. This device was operated by the re-chargeable Li-ion battery during the SAR test.
Feature of EUT	Model: HDH-001 (referred to as the EUT in this report) is a Game Console.
SAR Accessory	none

**2.2 Product Description (Wireless LAN module, antenna)**

Equipment type	Transceiver	
Frequency of operation	Bluetooth	2.4GHz band: (2402~2480) MHz (BDR (Basic Data Rate), EDR (Enhanced Data Rate), LE (Low Energy mode))
	Wi-Fi	2.4GHz band: (2412~2472) MHz (b, g, n20, n40, ac20, ac40); U-NII-1: (5180~5240) MHz (a, n20, ac20) / (5190, 5230) MHz (n40, ac40) / 5210 MHz (ac80); U-NII-2A: (5260~5320) MHz (a, n20, ac20) / (5270, 5310) MHz (n40, ac40) / 5290 MHz (ac80); U-NII-2C: (5500~5580, 5660~5700) MHz (a, n20, ac20) / (5510, 5550, 5670) MHz (n40, ac40) / 5530 MHz (ac80); U-NII-3: (5745~5825) MHz (a, n20, ac20) / (5755, 5795) MHz (n40, ac40) / 5775 MHz (ac80);
Channel spacing	Bluetooth	1MHz (BDR, EDR), 2MHz (LE)
	Wi-Fi	5 MHz (2.4GHz band), 20 MHz (U-NII-1, U-NII-2A, U-NII-2C, U-NII-3)
Bandwidth	Bluetooth	79MHz
	Wi-Fi	20 MHz (b, g, a, n20, ac20), 40 MHz (n40, ac40), 80 MHz (ac80)
Type of modulation	Bluetooth	FHSS: GFSK (*. EDR: GFSK+ $\pi/4$ -DQPSK, GFSK+8DPSK)
	Wi-Fi	DSSS: DBPSK, DQPSK, CCK (b); OFDM: BPSK, QPSK, 16QAM, 64QAM, 256QAM (g, a, n20, ac20, n40, ac40, ac80) (*.256QAM is only for ac80)
Typical and maximum transmit power	*. The specification of typical and maximum transmit power (which may occur) refer to remarks in below. *. The measured output power (conducted) as SAR reference power refers to section 6 in this report.	

Antenna	Antenna 0 (Bottom edge)	Antenna 1 (Top edge)
Antenna quantity	2 pcs. (*. Separation distance between the antenna #0 and the antenna #1: 79 mm ) Bluetooth: antenna #0, b/g/a: One selected Tx antenna operation, n(20/40HT)/ac(20/40/80VHT); Either one selected Tx antenna operation or two Tx antenna operation simultaneously.	
Antenna type / connector type	Sheet metal antenna / PCB side: MHF2, Antenna side: soldered	
Antenna gain (max.power) (*.installed into the platform)	-0.904 dBi (2.4GHz band), 2.949 dBi (5GHz band) (*.including cable loss)	-0.730 dBi (2.4GHz band), 1.994 dBi (5GHz band) (*.including cable loss)

\*. b: IEEE 802.11b, g: IEEE 802.11g, a: IEEE 802.11a, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT), ac80: IEEE 802.11ac(80VHT).

\*. The EUT do not use the special transmitting technique such as "beam-forming" and "time-space code diversity."

- \*. **Maximum tune-up tolerance limit** (Maximum power, refer to power table in next page.)  
 Maximum tune-up tolerance limit is conducted burst average power and is defined by a customer as Duty cycle 100% (continuous transmitting).  
 The SAR test reference power measurement and the SAR test were applied to the lowest data rate (as higher time-based average power) on each operation mode.

Band	[Power table]		SISO power (Conducted, Duty cycle 100%)						MIMO (Conducted, Duty cycle 100%)							
	Ch.	Frequency [MHz]	Mode	D/R or MCS#.	Typical [dBm]		Max. [dBm]		Mode	D/R or MCS#.	Typical [dBm]			Max. [dBm]		
					Ant.0	Ant.1	Ant.0	Ant.1			Ant.0	Ant.1	Ant.0+1		Ant.0+1	
2.4GHz Bluetooth	0-78	2402-2480	BDR	DH5	-	N/A	2.0	N/A	-	-	-	-	-	-		
	0-78	2402-2480	EDR	2-DH5	-	N/A	2.0	N/A	-	-	-	-	-	-		
	0-78	2402-2480	EDR	3-DH5	-	N/A	2.0	N/A	-	-	-	-	-	-		
	0-39	2402-2480	LE	-	-	N/A	2.0	N/A	-	-	-	-	-	-		
2.4GHz Wi-Fi (DTS)	1-11	2412-2467	b	1~11 Mbps	17.5	17.5	19.0	19.0	-	-	-	-	-	-		
	12	2467			8.5	8.5	10.0	10.0	-	-	-	-	-	-		
	13	2472			3.5	3.5	5.0	5.0	-	-	-	-	-	-		
	1	2412	g	6~18 Mbps	15.5	15.5	17.0	17.0	-	-	-	-	-	-		
				24~54 Mbps	14.5	14.5	16.0	16.0	-	-	-	-	-	-		
	2-11	2417-2462		6~18 Mbps	16.5	16.5	18.0	18.0	-	-	-	-	-	-		
				24~54 Mbps	14.5	14.5	16.0	16.0	-	-	-	-	-	-		
	12	2467		6~54 Mbps	8.5	8.5	10.0	10.0	-	-	-	-	-	-		
	13	2472			3.5	3.5	5.0	5.0	-	-	-	-	-	-		
	1	2412	n20	MCS0-6	15.5	15.5	17.0	17.0	n20	MCS8-15	11.0	11.0	14.0	15.5		
				MCS7	14.5	14.5	16.0	16.0			12.0	12.0	15.0	16.5		
	2-11	2417-2462		MCS0-3	16.5	16.5	18.0	18.0			5.5	5.5	8.5	10.0		
				MCS4-6	15.5	15.5	17.0	17.0			0.5	0.5	3.5	5.0		
	12	2467		MCS7	14.5	14.5	16.0	16.0								
	13	2472		MCS0-7	8.5	8.5	10.0	10.0								
				MCS0-7	3.5	3.5	5.0	5.0								
	1	2412	ac20	MCS0-6	15.5	15.5	17.0	17.0	ac20	MCS0-8	11.0	11.0	14.0	15.5		
				MCS7	14.5	14.5	16.0	16.0			12.0	12.0	15.0	16.5		
	2-11	2417-2462		MCS0-3	16.5	16.5	18.0	18.0			5.5	5.5	8.5	10.0		
				MCS4-6	15.5	15.5	17.0	17.0			0.5	0.5	3.5	5.0		
	12	2467		MCS7	14.5	14.5	16.0	16.0								
	13	2472		MCS8	13.0	13.0	14.5	14.5								
				MCS0-8	8.5	8.5	10.0	10.0								
				MCS0-8	3.5	3.5	5.0	5.0								
3-10	2422-2457	n40		MCS0-7	8.5	8.5	10.0	10.0			n40	MCS8-15	8.0	8.0	11.0	12.5
11	2462			8.5	8.5	10.0	10.0	5.5					5.5	8.5	10.0	
3-10	2422-2457		8.5	8.5	10.0	10.0	8.0	8.0	11.0	12.5						
11	2462	ac40	MCS0-9	8.5	8.5	10.0	10.0	ac40	MCS0-9	5.5	5.5	8.5	10.0			
			8.5	8.5	10.0	10.0										
36-48	5180-5240	a	6-54 Mbps	13.5	13.5	15.0	15.0	-	-	-	-	-	-			
36-48	5180-5240	n20	MCS0-7	13.5	13.5	15.0	15.0	n20	MCS8-15	10.5	10.5	13.5	15.0			
36-48	5180-5240	ac20	MCS0-7	13.5	13.5	15.0	15.0	ac20	MCS0-8	10.5	10.5	13.5	15.0			
			MCS8	13.0	13.0	14.5	14.5									
38	5190	n40	MCS0-7	10.0	10.0	11.5	11.5	n40	MCS8-15	7.0	7.0	10.0	11.5			
46	5230		13.5	13.5	15.0	15.0	10.5			10.5	13.5	15.0				
38	5190	ac40	MCS0-9	10.0	10.0	11.5	11.5	ac40	MCS0-9	7.0	7.0	10.0	11.5			
			MCS0-7	13.5	13.5	15.0	15.0			10.5	10.5	13.5	15.0			
46	5230		MCS8,9	13.0	13.0	14.5	14.5									
42	5210	ac80	MCS0-9	9.0	9.0	10.5	10.5	ac80	MCS0-9	6.0	6.0	9.0	10.5			
52-64	5260-5320	a	6-54 Mbps	13.5	13.5	15.0	15.0	-	-	-	-	-	-			
52-64	5260-5320	n20	MCS0-7	13.5	13.5	15.0	15.0	n20	MCS8-15	10.5	10.5	13.5	15.0			
52-64	5260-5320	ac20	MCS0-7	13.5	13.5	15.0	15.0	ac20	MCS0-8	10.5	10.5	13.5	15.0			
			MCS8	13.0	13.0	14.5	14.5									
54,62	5270,5310	n40	MCS0-7	13.5	13.5	15.0	15.0	n40	MCS8-15	10.5	10.5	13.5	15.0			
54,62	5270,5310	ac40	MCS0-7	13.5	13.5	15.0	15.0	ac40	MCS0-9	10.5	10.5	13.5	15.0			
			MCS8,9	13.0	13.0	14.5	14.5									
58	5290	ac80	MCS0-7	9.0	9.0	10.5	10.5	ac80	MCS0-9	6.0	6.0	9.0	10.5			
100-116	5500-5580	a	6-54 Mbps	13.5	13.5	15.0	15.0	-	-	-	-	-	-			
132-140	5660-5700	n20	MCS0-7	13.5	13.5	15.0	15.0	n20	MCS8-15	10.5	10.5	13.5	15.0			
100-116	5500-5580		13.5	13.5	15.0	15.0	10.5			10.5	13.5	15.0				
132-140	5660-5700	ac20	MCS0-7	13.5	13.5	15.0	15.0	ac20	MCS0-8	10.5	10.5	13.5	15.0			
			MCS8	11.0	11.0	12.5	12.5									
120-128	5600-5640	a,n20,ac20	not use	N/A	N/A	N/A	N/A	n20,ac20	not use	N/A	N/A	N/A	N/A			
144	5720	a,n20,ac20	not use	N/A	N/A	N/A	N/A	n20,ac20	not use	N/A	N/A	N/A	N/A			
102,110	5510,5550	n40	MCS0-7	13.5	13.5	15.0	15.0	n40	MCS8-15	10.5	10.5	13.5	15.0			
134	5670		13.5	13.5	15.0	15.0	10.5			10.5	13.5	15.0				
102,110	5510,5550	ac40	MCS0-7	13.5	13.5	15.0	15.0	ac40	MCS0-9	10.5	10.5	13.5	15.0			
			MCS8,9	12.0	12.0	13.5	13.5									
			MCS0-7	13.5	13.5	15.0	15.0									
134	5670		MCS8,9	12.0	12.0	13.5	13.5									
118,126	5590,5630	n40,ac40	not use	N/A	N/A	N/A	N/A	n40,ac40	not use	N/A	N/A	N/A	N/A			
142	5710	n40,ac40	not use	N/A	N/A	N/A	N/A	n40,ac40	not use	N/A	N/A	N/A	N/A			
106	5530	ac80	MCS0-9	10.5	10.5	12.0	12.0	ac80	MCS0-9	7.5	7.5	10.5	12.0			
122	5610	ac80	not use	N/A	N/A	N/A	N/A	n40,ac40	not use	N/A	N/A	N/A	N/A			
138	5690	ac80	not use	N/A	N/A	N/A	N/A	n40,ac40	not use	N/A	N/A	N/A	N/A			
149-165	5745-5825	a	6-54 Mbps	12.5	12.5	14.0	14.0	-	-	-	-	-	-			
149-165	5745-5825	n20	MCS0-7	12.5	12.5	14.0	14.0	n20	MCS8-15	10.5	10.5	13.5	15.0			
149-165	5745-5825	ac20	MCS0-7	12.5	12.5	14.0	14.0	ac20	MCS0-8	10.5	10.5	13.5	15.0			
			MCS8	11.0	11.0	12.5	12.5									
151,159	5755,5795	n40	MCS0-7	12.5	12.5	14.0	14.0	n40	MCS8-15	10.5	10.5	13.5	15.0			
151,159	5755,5795	ac40	MCS0-7	12.5	12.5	14.0	14.0	ac40	MCS0-9	10.5	10.5	13.5	15.0			
			MCS8,9	12.0	12.0	13.5	13.5									
155	5775	ac80	MCS0-7	12.5	12.5	14.0	14.0	ac80	MCS0-9	10.5	10.5	13.5	15.0			

Ch.: channel, D/R: data rate, MCS#: MCS index number, Ant.: antenna, Max. Maximum tune-up limit power, N/A: Not applicable.

### SECTION 3: Test specification, procedures and results

#### 3.1 Test specification

**FCC47CFR 2.1093:** Radiofrequency radiation exposure evaluation: portable devices.

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. The device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling in accordance with the following measurement procedures.

<b>KDB 447498 D01 (v06):</b>	General RF exposure guidance
<b>KDB 248227 D01 (v02r02):</b>	SAR Guidance for IEEE 802.11 (Wi-Fi) transmitters
<b>KDB 865664 D01 (v01r04):</b>	SAR measurement 100MHz to 6GHz
<b>IEEE Std. 1528-2013:</b>	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

#### 3.2 Exposure limit

Environments of exposure limit	Whole-Body (averaged over the entire body)	Partial-Body (averaged over any 1g of tissue)	Hands, Wrists, Feet and Ankles (averaged over any 10g of tissue)
<b>(A) Limits for Occupational /Controlled Exposure (W/kg)</b>	0.4	8.0	20.0
<b>(B) Limits for General population /Uncontrolled Exposure (W/kg)</b>	0.08	1.6	4.0

\*. **Occupational/Controlled Environments:** are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

\*. **General Population/Uncontrolled Environments:** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

The limit applied in this test report is;

<b>General population / uncontrolled exposure, Partial-Body (averaged over any 1g of tissue) limit: 1.6 W/kg (body touch)</b>
<b>General population / uncontrolled exposure, Extremity (averaged over any 10g of tissue) limit: 4.0 W/kg (hand-held)</b>

#### 3.3 Procedures and Results

Test Procedure	SAR measurement: KDB 447498 D01, KDB 248227 D01, KDB 865664 D01, KDB 914225 D07, IEC Std. 1528																																															
Category	FCC 47CFR §2.1093 (Portable device)				SAR type		Hand-held, hand-operation. (The bottom surface may touch the body.)																																									
Frequency [MHz]	Bluetooth		Wi-Fi (DTS)			Wi-Fi (U-NII-1)			Wi-Fi (U-NII-2A)			Wi-Fi (U-NII-2C)			Wi-Fi (U-NII-3)			Simultaneous transmission																														
	2402-2480		2412-2462			5180-5240			5260-5320			5500-5700			5745-5825																																	
Results (SAR(1g))	Complied (Refer to Section 4.1)		Complied (Refer to Section 7.2)			Complied (Refer to Section 7.3)			Complied (Refer to Section 7.3)			Complied (Refer to Section 7.4)			Complied (Refer to Section 7.5)			Complied (Refer to Section 7.8)																														
Antenna#	Ant.0		Ant.0			Ant.1			Ant.0			Ant.1			Ant.0			Ant.1			Ant.0+Ant.1																											
SAR [W/kg]	1g or 10g		1g		10g			1g			10g			1g			10g			10g																												
	Reported		0.76		0.48			1.08			n/a (*2)			1.27			0.32			0.24			1.15			0.36			0.64			1.42			0.19			0.40			0.67							
Operation mode (*1), Frequency [MHz]	BDR, EDR, BLE		b, 2412		b, 2412			b, 2462			a, 5240			n/a			n/a			ac40, 5310			n40, 5310			ac20, 5500			n40, 5510			ac20, 5825			ac80, 5775			a, 5745										
	Burst average		n/a		17.08		17.08			17.00			13.08			n/a			n/a			0.882			0.222			0.160			0.726			0.218			0.355			1.09			0.117			0.295		
Output power [dBm]	Max. power (scaled factor)		2		19 (1.56)		19 (1.56)			19 (1.58)			15 (1.56)			15 (-)			15 (-)			15 (1.26)			15 (1.26)			15 (1.34)			15 (1.48)			15 (1.46)			15 (1.58)			14 (1.22)			14 (1.26)			14 (1.17)		
	Duty cycle [%]		n/a		99.0		99.0			93.7			n/a			n/a			87.6			87.4			87.4			93.3			87.4			87.4			93.3			77.7			93.7					
Duty scaled factor		n/a		1.01		1.01			1.01			1.07			n/a			n/a			1.14			1.14			1.14			1.07			1.14			1.07			1.29			1.07						

Note: UL Japan's SAR Work Procedures No.13-EM-W0429 and 13-EM-W0430. No addition, deviation nor exclusion has been made from standards

- \*1. The lowest data rate was selected by SAR test in each operation mode.
- \*2. Since reported SAR 1g of U-NII-2A was enough lower than 1.2 W/kg(1g), 3 W/kg (10g), SAR test was only applied to a lower channel of U-NII-1 band.
- \*. Since Bluetooth, Wi-Fi of 2.4GHz and Wi-Fi of 5GHz are used a same antenna, Bluetooth and Wi-Fi, DTS band and UNII band do not transmit simultaneously.
- \*. (Calculating formula) Corrected SAR to max.power (W/kg) = (Measured SAR (W/kg)) × (Duty scaled) × (Tune-up factor) where; Tune-up factor [-] = 1 / (10 ^ (^Amax (max.power - burst average power), dB" / 10)), Duty scaled factor [-] = 100(%) / (duty cycle, %)
- \*. b: IEEE 802.11b, a: IEEE 802.11a, n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11n (40VHT), ac80: IEEE 802.11ac(80VHT), n/a: Not applicable.
- \*. 'yellow marker' in the table; The highest reported SAR(1g, 10g) of each band (DTS, U-NII) is shaded with yellow marker.

### 3.4 Addition, deviation and exclusion to the test procedure

No addition, exclusion nor deviation has been made from the test procedure.

### 3.5 Test Location

#### UL Japan, Inc., Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone number: +81 463 50 6400 / Facsimile number: +81 463 50 6401

JAB Accreditation No.: RTL02610 / FCC Test Firm Registration Number: 839876

Used?	Place	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input type="checkbox"/>	No.1 Semi-anechoic chamber	2973D-1	20.6 × 11.3 × 7.65	20.6 × 11.3	10 m
<input type="checkbox"/>	No.2 Semi-anechoic chamber	2973D-2	20.6 × 11.3 × 7.65	20.6 × 11.3	10 m
<input type="checkbox"/>	No.3 Semi-anechoic chamber	2973D-3	12.7 × 7.7 × 5.35	12.7 × 7.7	5 m
<input type="checkbox"/>	No.4 Semi-anechoic chamber	-	8.1 × 5.1 × 3.55	8.1 × 5.1	-
<input type="checkbox"/>	No.1 Shielded room	-	6.8 × 4.1 × 2.7	6.8 × 4.1	-
<input type="checkbox"/>	No.2 Shielded room	-	6.8 × 4.1 × 2.7	6.8 × 4.1	-
<input type="checkbox"/>	No.3 Shielded room	-	6.3 × 4.7 × 2.7	6.3 × 4.7	-
<input type="checkbox"/>	No.4 Shielded room	-	4.4 × 4.7 × 2.7	4.4 × 4.7	-
<input type="checkbox"/>	No.5 Shielded room	-	7.8 × 6.4 × 2.7	7.8 × 6.4	-
<input type="checkbox"/>	No.6 Shielded room	-	7.8 × 6.4 × 2.7	7.8 × 6.4	-
<input checked="" type="checkbox"/>	No.7 Shielded room	(2973D)	2.76 × 3.76 × 2.4	2.76 × 3.76	-
<input type="checkbox"/>	No.8 Shielded room	-	3.45 × 5.5 × 2.4	3.45 × 5.5	-
<input type="checkbox"/>	No.1 Measurement room	-	2.55 × 4.1 × 2.5	2.55 × 4.1	-

### 3.6 Confirmation before SAR testing

Before SAR test, the RF wiring for the sample had been switched to the antenna conducted power measurement line from the antenna line and the average power was measured. The SAR test reference power measurement and the SAR test were applied to the lowest data rate (as higher time-based average power) on each operation mode. For the SAR test reference power, on each operation band, the average output power was measured on the low/middle/upper and specified channels with the lowest data rate of each operation mode. The result is shown in Section 6.

\*. The EUT transmission power was verified that it was within 2dB lower than the maximum tune-up tolerance limit when it was set the rated power. (Clause 4.1, KDB447498 D01 (v06))

### 3.7 Confirmation after SAR testing

It was checked that the power drift [W] is within ±5% in the evaluation procedure of SAR testing. The verification of power drift during the SAR test is that DASY5 system calculates the power drift by measuring the e-filed at the same location at beginning and the end of the scan measurement for each test position.

The result is shown in APPENDIX 2.

- \*. DASY5 system calculation Power drift value[dB] = 20log(Ea)/(Eb) (where, Before SAR testing: Eb[V/m] / After SAR testing: Ea[V/m])  
 Limit of power drift[W] = ±5%; Power drift limit (X) [dB] = 10log(P\_drift) = 10log(1.05/1) = 10log(1.05) - 10log(1) = 0.21dB  
 from E-filed relations with power;  $S = E \times H = E^2 / \eta = P / (4 \times \pi \times r^2)$  ( $\eta$ : Space impedance) →  $P = (E^2 \times 4 \times \pi \times r^2) / \eta$   
 Therefore, The correlation of power and the E-filed  
 Power drift limit (X) dB = 10log(P\_drift) = 10log(E\_drift)^2 = 20log(E\_drift)  
 From the above mentioned, **the calculated power drift of DASY5 system must be the less than ±0.21dB.**

**SECTION 4: Operation of EUT during testing**

**4.1 Operating modes for SAR testing**

This EUT has Bluetooth (BDR, EDR, BLE) and IEEE 802.11b, g, a, n(HT20), n(HT40), ac(VHT20), ac(VTH40), ac(VHT80) continuous transmitting modes. The frequency and the modulation used in the SAR testing are shown as a following.

Operation mode	b		g		n(HT20)			ac(VHT20)			n(HT40)			ac(VHT40)			BDR	EDR	BLE	
band	DTS (2.4GHz band)																			
Tx band [MHz]	2402~2472									2422~2462						2402~2480				
Antenna#	0	1	0	1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	0	0	0
Tune-up limit [dBm]	19	19	18	18	18	18	13.5+13.5	18	18	13.5+13.5	10	10	9.5+9.5	10	10	9.5+9.5	2	2	2	2
(*1) SAR test considered? (***) initial test setup)	Back	○	○	○	×	×	×	×	×	×	○	○	×	×	×	×	×	×	×	×
	Front	○	○	×	×	×	×	×	×	×	○	○	×	×	×	×	×	×	×	×
	Top	×	○*	×	○	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Bottom	○*	×	○	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Right, Left	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Frequency tested	(*)2	(*)2	(*)2	(*)2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Data rate [Mbps]	1	1	6	6	MCS0	MCS0	MCS0	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	1	2	3	1

Operation mode	a		n(HT20)			ac(VHT20)			n(HT40)			ac(VHT40)			ac(VHT80)					
band	U-NII-1 (*3)																			
Tx band [MHz]	5180~5240									5190,5230						5210				
Antenna#	0	1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1
Tune-up limit [dBm]	15	15	15	15	12+12	15	15	12+12	15	15	12+12	15	15	12+12	10.5	10.5	7.5+7.5			
(*1) SAR test considered? (***) initial test setup)	Back	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Front	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Top	×	×	×	×	×	×	×	×	○	×	×	×	×	×	×	×	×	×	×
	Bottom	○	×	○	×	×	○	×	×	○	×	×	○	×	×	×	×	×	×	×
	Right, Left	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Frequency tested	(*)2	n/a	(*)2	n/a	n/a	(*)2	n/a	n/a	(*)2	(*)2	n/a	(*)2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Data rate [Mbps]	6	6	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0

Operation mode	a		n(HT20)			ac(VHT20)			n(HT40)			ac(VHT40)			ac(VHT80)					
band	U-NII-2A																			
Tx band [MHz]	5260~5320									5270,5310						5290				
Antenna#	0	1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1
Tune-up limit [dBm]	15	15	15	15	12+12	15	15	12+12	15	15	12+12	15	15	12+12	10.5	10.5	7.5+7.5			
(*1) SAR test considered? (***) initial test setup)	Back	×	×	×	×	×	×	×	×	○	×	×	×	×	×	×	×	×	×	×
	Front	○	×	×	×	×	×	×	×	○	○	×	×	×	×	×	×	×	×	×
	Top	×	×	×	×	×	×	×	×	×	○*	×	×	×	×	×	×	×	×	×
	Bottom	○	×	○	×	×	○	×	×	○*	×	×	○	×	×	×	×	×	×	×
	Right, Left	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Frequency tested	(*)2	n/a	(*)2	n/a	n/a	(*)2	n/a	n/a	(*)2	(*)2	n/a	(*)2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Data rate [Mbps]	6	6	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0

Operation mode	a		n(HT20)			ac(VHT20)			n(HT40)			ac(VHT40)			ac(VHT80)					
band	U-NII-2C																			
Tx band [MHz]	5500~5580, 5660~5700									5510, 5550, 5670						5530				
Antenna#	0	1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1
Tune-up limit [dBm]	15	15	15	15	12+12	15	15	12+12	15	15	12+12	15	15	12+12	12	12	9+9			
(*1) SAR test considered? (***) initial test setup)	Back	×	×	×	×	×	×	×	×	○	×	×	×	×	×	×	×	×	×	×
	Front	×	×	×	×	×	×	×	×	○	○	×	×	×	×	×	×	×	×	×
	Top	×	○	×	×	×	×	×	×	×	○*	×	×	×	×	×	×	×	×	×
	Bottom	○	×	○	×	×	○	×	×	○*	×	×	○	×	×	×	×	×	×	×
	Right, Left	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Frequency tested	(*)2	(*)2	(*)2	n/a	n/a	(*)2	n/a	n/a	(*)2	(*)2	n/a	(*)2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Data rate [Mbps]	6	6	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0

Operation mode	a		n(HT20)			ac(VHT20)			n(HT40)			ac(VHT40)			ac(VHT80)					
band	U-NII-3																			
Tx band [MHz]	5745~5825									5755, 5795						5775				
Antenna#	0	1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1	0	1	0+1
Tune-up limit [dBm]	14	14	14	14	12+12	14	14	12+12	14	14	12+12	14	14	12+12	14	14	12+12			
Initial test mode? (*1)	-	-	-	-	N/A	-	-	N/A	yes	yes	N/A	-	-	N/A	N/A	N/A	N/A			
(*1) SAR test considered? (***) initial test setup)	Back	×	×	×	×	×	×	×	×	×	×	×	×	×	×	○	○	×	×	×
	Front	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	○	○	×	×
	Top	×	○	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	○*	×
	Bottom	○	×	○	×	×	○	×	×	○	×	×	○	×	×	×	○*	×	×	×
	Right, Left	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Frequency tested	(*)2	(*)2	(*)2	n/a	n/a	(*)2	n/a	n/a	(*)2	n/a	n/a	(*)2	n/a	n/a	(*)2	(*)2	N/A			
Data rate [Mbps]	6	6	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS8	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0

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\*1. "○": SAR test was applied. "×": SAR test can be reduced.  
 \*2. The tested frequencies refer to SAR test results in Section 7.  
 \*3. b: IEEE 802.11b, g: IEEE 802.11g, a: IEEE 802.11a, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT), ac80: IEEE 802.11ac(80VHT). n/a: not applied.

**4.2 RF exposure conditions**

Antenna separation distances in each test setup plan are shown as follows.

Setup plan	SAR type	Explanation of SAR test setup plan (* Refer to Appendix 1 for the antenna location and the test setup photographs which had been tested.)	D: Separation distance [mm]		
			Antenna 0		Antenna 1
			Wi-Fi	Bluetooth	Wi-Fi
Bottom	Body, 1g	The bottom edge of EUT towards the bottom of the flat phantom.	2.223	2.223	≈81
Back	Hand, 10g	The back surface of EUT towards the bottom of the flat phantom. (* including the grip size for the Antenna 1)	6.03	6.03	≈ 10
Front	Hand, 10g	The front surface of EUT towards the bottom of the flat phantom.	2.61	2.61	2.97
Top	Hand, 10g	The top edge of EUT towards the bottom of the flat phantom.	≈82	≈82	2.723
Left	Hand, 10g	The left-hand grip edge of EUT towards the bottom of the flat phantom.	58.873	58.873	63.673
Right	Hand, 10g	The right-hand grip edge of EUT towards the bottom of the flat phantom.	119.673	119.673	121.473

\*. D: Antenna separation distance. It is the distance from an antenna to the outer surface of the host device which an operator may touch.

\*. Size of EUT: 208.347 mm (width) × 83.72 mm (height) × 13.94 mm (depth) (\* The convex portions (joy stick, hand-grip, buttons, etc.) are not contained in size.)

**4.3 SAR test exclusion considerations accordance to KDB 447498 D01**

The following is based on KDB447498D01.

Step 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max.power of channel, including tune-up tolerance, mW}) / (\text{min.test separation distance, mm})] \times [\sqrt{f}(\text{GHz})] \leq 3.0 (\text{for SAR(1g)}, 7.5 (\text{for SAR(10g)}) \dots \text{formula (1)}$$

If power is calculated from the upper formula (1);

$$[\text{SAR(1g) test exclusion thresholds, mW}] = 3 \times [\text{test separation distance, mm}] / [\sqrt{f}(\text{GHz})] \dots \text{formula (2)}$$

1. The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
2. Power and distance are rounded to the nearest mW and mm before calculation
3. The result is rounded to one decimal place for comparison
4. The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the calculated threshold value by a numerical formula above-mentioned in the following table is 3.0 or less, SAR test can be excluded.

Step 2) At 1500 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following.

$$[\text{test exclusion thresholds, mW}] = [(\text{Power allowed at numeric threshold for 50mm in formula (1)}) + (\text{test separation distance, mm}) - (50\text{mm})] \times 10 \text{ formula (3)}$$

1. The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
2. Power and distance are rounded to the nearest mW and mm before calculation

When output power is less than the calculated threshold value by a numerical formula above-mentioned in the following table, SAR test is excluded.

[SAR exclusion calculations for step 1) antenna ≤ 50mm from the user, and for step 2) antenna > 50mm from the user.]

Antenna #:	Calculated threshold value														
	Antenna 0			Antenna 1			Antenna 0			Antenna 1					
	Bottom	Front	Back	Top	Front	Back	Left	Right	Top	Left	Right	Bottom			
Setup:	≤5			≤5			≈10			≈10					
Antenna separation distance:	≤5			≤5			≈10			≈10					
SAR type (1g: Body/10g: Hand):	1g			10g			10g			1g					
Mode (SISO)	Upper Freq. [MHz]	Tune-up limit [dBm]	[mW]	Step 1) SAR exclusion calculations for antenna ≤ 50mm from the user. Judge: "Exempt" when ≤ 3.0 (SAR (1g)), ≤ 7.5 (SAR (10g)); "Test" (SAR test required) when > 3.0 (SAR(1g)), > 7.5 (SAR(10g)).						Step 2) > 50mm from the user Judge: "Exempt" when Tune-up limit power is less than calculated threshold power value.					
Bluetooth	2480	2.0	2	0.6, Exempt	0.6, Exempt	0.5, Exempt	0.6, Exempt	0.6, Exempt	0.3, Exempt	185 mW, Exempt	795 mW, Exempt	415 mW, Exempt	235 mW, Exempt	805 mW, Exempt	405 mW, Exempt
b	2462	19.0	79	24.8, Test	24.8, Test	20.7, Test	24.8, Test	24.8, Test	12.4, Test	186 mW, Exempt	796 mW, Exempt	416 mW, Exempt	236 mW, Exempt	806 mW, Exempt	406 mW, Exempt
g,n20,ac20	2462	18.0	63	19.8, Test	19.8, Test	16.5, Test	19.8, Test	19.8, Test	9.9, Test	186 mW, Exempt	796 mW, Exempt	416 mW, Exempt	236 mW, Exempt	806 mW, Exempt	406 mW, Exempt
n40,ac40	2462	10.0	10	3.1, Test	3.1, Exempt	2.6, Exempt	3.1, Exempt	3.1, Exempt	1.6, Exempt	186 mW, Exempt	796 mW, Exempt	416 mW, Exempt	236 mW, Exempt	806 mW, Exempt	406 mW, Exempt
a,n20,ac20	5240	15.0	32	14.7, Test	14.7, Test	12.2, Test	14.7, Test	14.7, Test	7.4, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt
n40,ac40	5230	15.0	32	14.6, Test	14.6, Test	12.2, Test	14.6, Test	14.6, Test	7.3, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt
ac80	5210	11.0	13	5.9, Test	5.9, Exempt	4.9, Exempt	5.9, Exempt	5.9, Exempt	5.9, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt
a,n20,ac20	5320	15.0	32	14.8, Test	14.8, Test	12.3, Test	14.8, Test	14.8, Test	7.4, Exempt	155 mW, Exempt	765 mW, Exempt	385 mW, Exempt	205 mW, Exempt	775 mW, Exempt	375 mW, Exempt
n40,ac40	5310	15.0	32	14.7, Test	14.7, Test	12.3, Test	14.7, Test	14.7, Test	7.4, Exempt	155 mW, Exempt	765 mW, Exempt	385 mW, Exempt	205 mW, Exempt	775 mW, Exempt	375 mW, Exempt
ac80	5290	11.0	13	6.0, Test	6.0, Exempt	5.0, Exempt	6.0, Exempt	6.0, Exempt	6.0, Exempt	155 mW, Exempt	765 mW, Exempt	385 mW, Exempt	205 mW, Exempt	775 mW, Exempt	375 mW, Exempt
a,n20,ac20	5700	15.0	32	15.3, Test	15.3, Test	12.7, Test	15.3, Test	15.3, Test	7.7, Test	153 mW, Exempt	763 mW, Exempt	383 mW, Exempt	203 mW, Exempt	773 mW, Exempt	373 mW, Exempt
n40,ac40	5670	15.0	32	15.2, Test	15.2, Test	12.7, Test	15.2, Test	15.2, Test	7.6, Test	153 mW, Exempt	763 mW, Exempt	383 mW, Exempt	203 mW, Exempt	773 mW, Exempt	373 mW, Exempt
ac80	5530	12.0	16	7.5, Test	7.5, Exempt	6.3, Exempt	7.5, Exempt	7.5, Exempt	7.5, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt
a,n20,ac20	5825	14.0	25	12.1, Test	12.1, Test	10.1, Test	12.1, Test	12.1, Test	6.0, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt
n40,ac40	5795	14.0	25	12.1, Test	12.1, Test	10.1, Test	12.1, Test	12.1, Test	6.0, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt
ac80	5775	14.0	25	12.1, Test	12.1, Test	10.1, Test	12.1, Test	12.1, Test	6.0, Exempt	152 mW, Exempt	762 mW, Exempt	382 mW, Exempt	202 mW, Exempt	772 mW, Exempt	372 mW, Exempt

\*. Freq.: Frequency, Mode; b: IEEE 802.11b, g: IEEE 802.11g, a: IEEE 802.11a, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT), ac80: IEEE 802.11ac(80VHT).

Notes: 1. Power and distance are rounded to the nearest mW and mm before calculation.





**SECTION 5: Uncertainty Assessment (SAR measurement)**

Although this standard determines only the limit value of uncertainty, there is no applicable rule of uncertainty in this. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

Uncertainty of SAR measurement (2.4-6GHz) (*.ε&σ: ≤±5%, DAK3.5, Tx: ≈100% duty cycle) (v08)							1g SAR	10g SAR	
Combined measurement uncertainty of the measurement system (k=1)							± 13.7%	± 13.6%	
Expanded uncertainty (k=2)							± 27.4%	± 27.2%	
	Error Description (2.4-6GHz) (v08)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
<b>A</b>	<b>Measurement System (DASY5)</b>						(std. uncertainty)	(std. uncertainty)	
1	Probe Calibration Error	±6.55 %	Normal	1	1	1	±6.55 %	±6.55 %	∞
2	Axial isotropy Error	±4.7 %	Rectangular	√3	√0.5	√0.5	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy Error	±9.6 %	Rectangular	√3	√0.5	√0.5	±3.9 %	±3.9 %	∞
4	Linearity Error	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
5	Probe modulation response	±2.4 %	Rectangular	√3	1	1	±1.4 %	±1.4 %	∞
6	Sensitivity Error (detection limit)	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	Boundary effects Error	±4.3%	Rectangular	√3	1	1	±2.5 %	±2.5 %	∞
8	Readout Electronics Error(DAE)	±0.3 %	Rectangular	√3	1	1	±0.3 %	±0.3 %	∞
9	Response Time Error	±0.8 %	Normal	1	1	1	±0.8 %	±0.8 %	∞
10	Integration Time Error (≈100% duty cycle)	±0 %	Rectangular	√3	1	1	0 %	0 %	∞
11	RF ambient conditions-noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	RF ambient conditions-reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
13	Probe positioner mechanical tolerance	±3.3 %	Rectangular	√3	1	1	±1.9 %	±1.9 %	∞
14	Probe Positioning with respect to phantom shell	±6.7 %	Rectangular	√3	1	1	±3.9 %	±3.9 %	∞
15	Max. SAR evaluation (Post-processing)	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
<b>B</b>	<b>Test Sample Related</b>								
16	Device Holder or Positioner Tolerance	±3.6 %	Normal	1	1	1	±3.6 %	±3.6 %	5
17	Test Sample Positioning Error	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	145
18	Power scaling	±0%	Rectangular	√3	1	1	±0 %	±0 %	∞
19	Drift of output power (measured, <0.2dB)	±2.3%	Rectangular	√3	1	1	±2.9 %	±2.9 %	∞
<b>C</b>	<b>Phantom and Setup</b>								
20	Phantom uncertainty (shape, thickness tolerances)	±7.5 %	Rectangular	√3	1	1	±4.3 %	±4.3 %	∞
21	Algorithm for correcting SAR (ε,σ: ≤5%)	±1.2 %	Normal	1	1	0.84	±1.2 %	±0.97 %	∞
22	Measurement Liquid Conductivity Error (DAK3.5)	±3.0 %	Normal	1	0.78	0.71	±2.3 %	±2.1 %	7
23	Measurement Liquid Permittivity Error (DAK3.5)	±3.1 %	Normal	1	0.23	0.26	±0.7 %	±0.8 %	7
24	Liquid Conductivity-temp.uncertainty (≤2deg.C.)	±5.3 %	Rectangular	√3	0.78	0.71	±2.4 %	±2.2 %	∞
25	Liquid Permittivity-temp.uncertainty (≤2deg.C.)	±0.9 %	Rectangular	√3	0.23	0.26	±0.1 %	±0.1 %	∞
	<b>Combined Standard Uncertainty</b>						±13.7 %	±13.6 %	733
	<b>Expanded Uncertainty (k=2)</b>						±27.4 %	±27.2 %	

\*. Table of uncertainties are listed for ISO/IEC 17025.

\*. This measurement uncertainty budget is suggested by IEEE Std.1528(2013) and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget). Per KDB 865664 D01 (v01r04) SAR Measurement 100 MHz to 6 GHz, Section 2.8.1., when the highest measured SAR(1g) within a frequency band is < 1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std.1528 (2013) is not required in SAR reports submitted for equipment approval.

SECTION 6: Confirmation before testing

6.1 SAR reference power measurement (antenna terminal conducted average power of EUT) - Worst data rate/channel determination

(2.4GHz band)

Table with columns: Mode, Frequency [MHz], CH, Data rate [Mbps], Power spec. [dBm], Duty cycle [%], Antenna 0 power (Wi-Fi, Bluetooth), Antenna 1 power (Wi-Fi), MIMO Ant0+1 power. Includes rows for BLE, BDR, EDR, b, g, n20 SISO, ac20 SISO, n40 SISO, ac40 SISO, n20 MIMO, ac20 MIMO, n40 MIMO, ac40 MIMO.

- \*. Initial SAR test channel was chosen. (shaded yellow marker) This mode has the highest tune-up power, highest duty cycle and lowest modulation.
\*. CH: Channel; Power spec.: Power specification; Max.: Maximum; Set pwr.: Setting power; Burst Ave.: Measured burst average power; SUM Ave.: Sum of antenna 0 power and antenna 1 power; n/a: Not applied, Not applicable; Mode; b: IEEE 802.11b, g: IEEE 802.11g, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT).
\*1. The power setting was adjusted so that measured average power was not more than 2 dB lower than the maximum tune-up tolerance limit.
\*2. According to KDB248227 D01, SAR is required for g, n20, ac20, n40 and ac40 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is >1.2 W/kg.
\*3. 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.
\*4. Since the Bluetooth power was enough lower to exempt the SAR test, the power measurement was also reduced for the Bluetooth operation.

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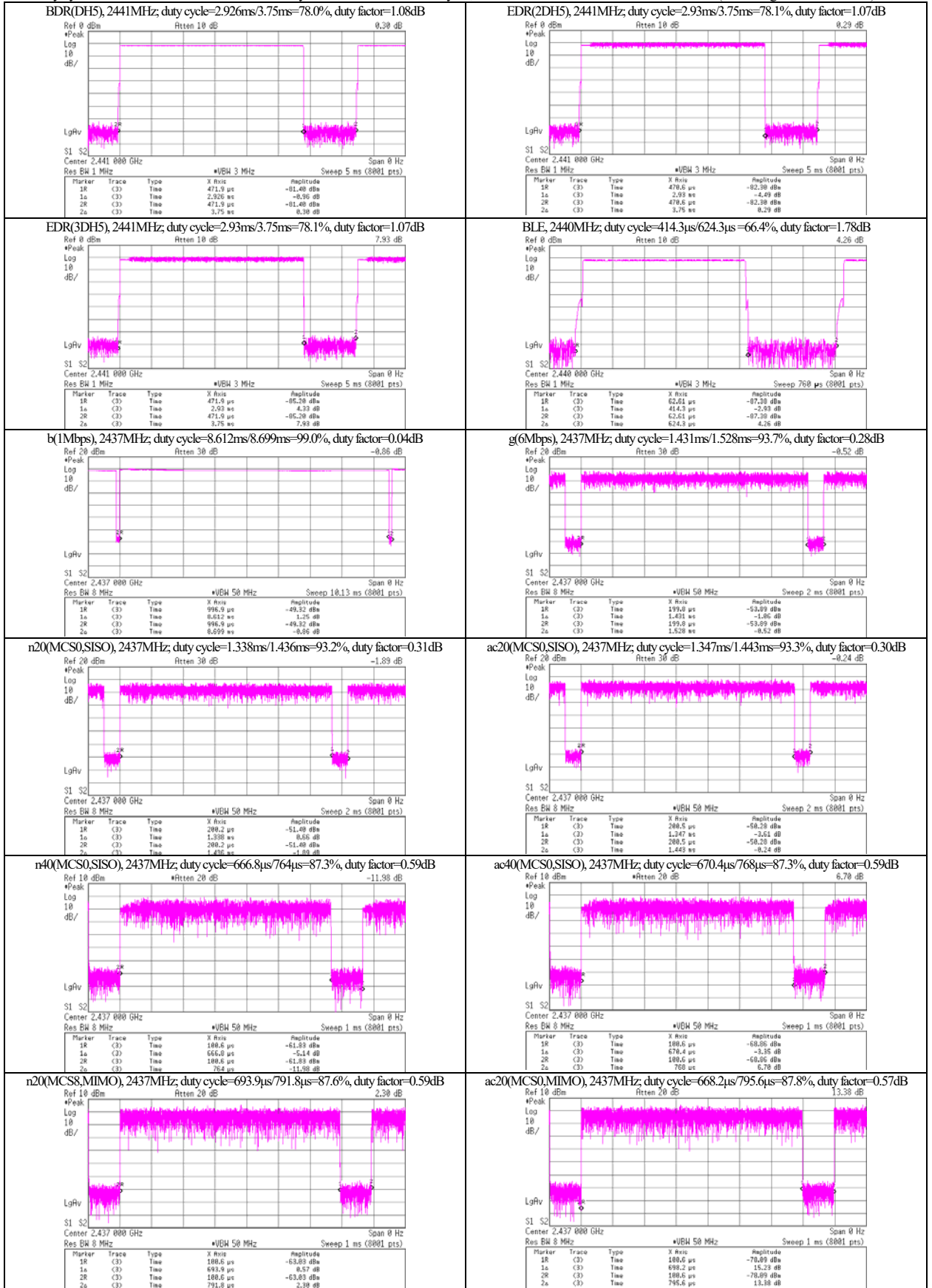
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400 / Facsimile: +81 463 50 6401

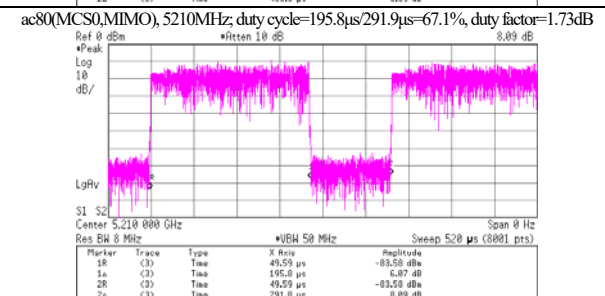
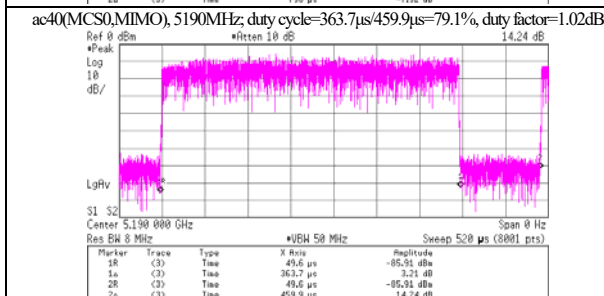
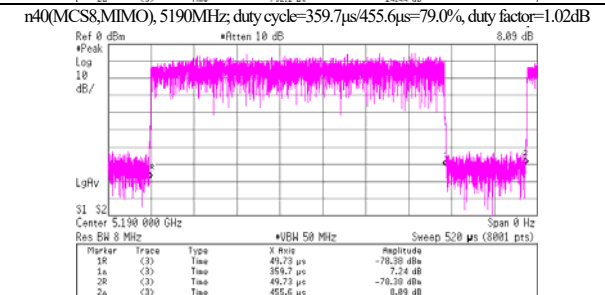
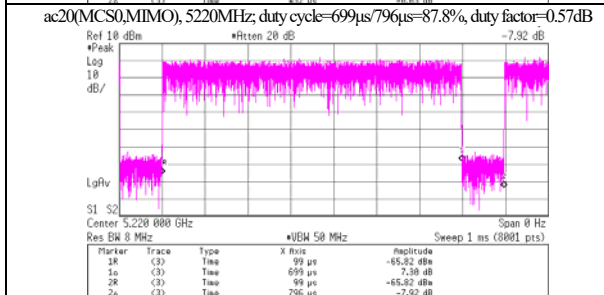
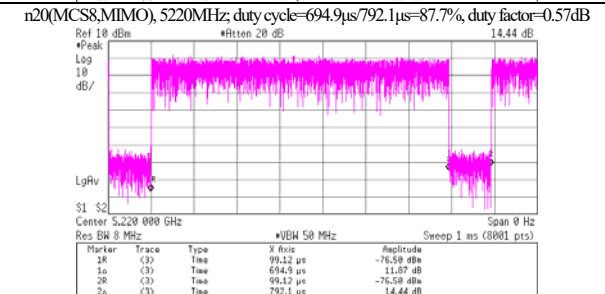
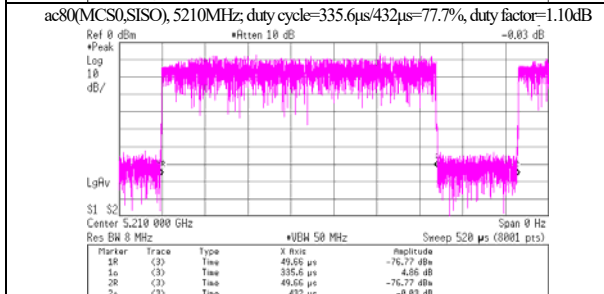
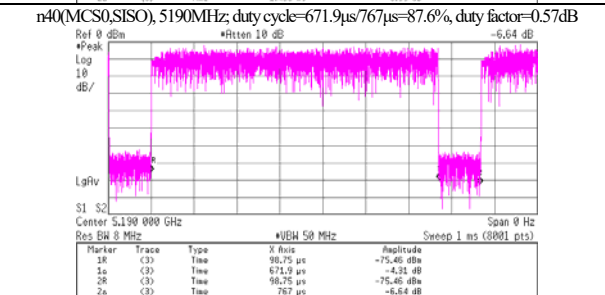
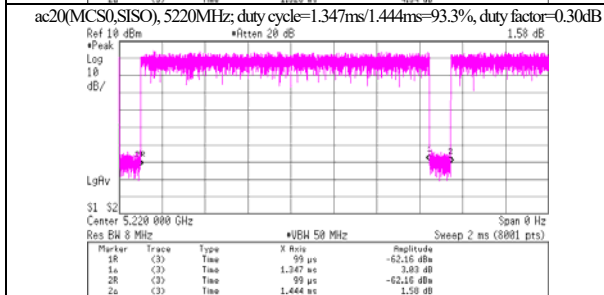
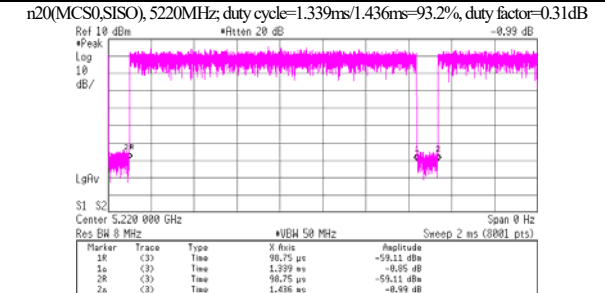
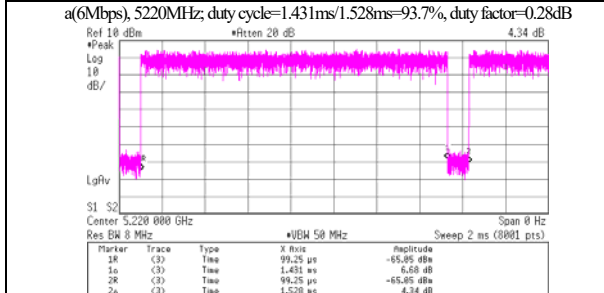
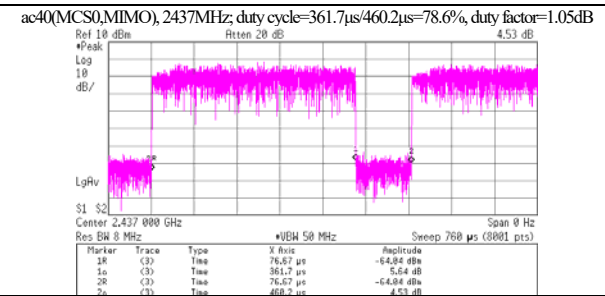
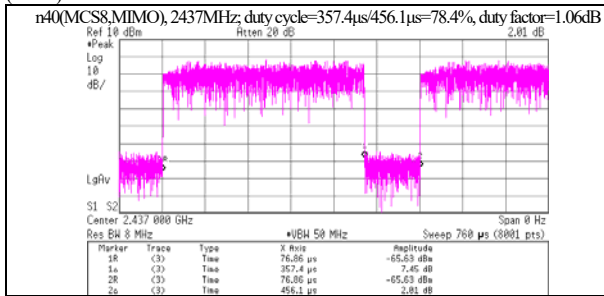




\*. Duty cycle conformation. Date measured: January 8~11, 2019 / Measured by: Y. Ishikawa / Place: No. 1 measurement room. (25 ±1 deg.C/50 ±10 %RH)



(cont'd)



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400 / Facsimile: +81 463 50 6401

SECTION 7: SAR Measurement results

7.1 Liquid parameters

Measurement date: June 28 ~ February 6, 2019

Measurement by: Hiroshi Naka

[Liquid measurement]

Table with columns: Target Frequency [MHz], Liquid type, Permittivity (εr) [-], Conductivity [S/m], Temp. [deg.C], Depth [mm], ASAR Coefficients(\*c), Date measured.

\*1. On January 29, it was within 24 hours from measurement on January 28 and same liquid temperature, so parameters of January 28 were used continuously.

\*a. The target values of (2000, 2450, 3000 and 5800) MHz are parameters defined in Appendix A of KDB 865664 D01. For other frequencies, the target nominal dielectric values shall be obtained by linear interpolation between the higher and lower tabulated figures. Above 5800MHz were obtained using linear extrapolation.

\*b. Calculating formula: ΔSAR(1g)= Cεr ×Δεr + Cσ ×Δσ, Cεr=7.854E-4×f³+9.402E-3×f²-2.742E-2×f+0.2026 / Cσ=9.804E-3×f³-8.661E-2×f²+2.981E-2×f+0.7829

\*c. Since the calculated ΔSAR values of the tested liquid had shown positive correction, the measured SAR was not converted by ΔSAR correction.

Calculating formula: ΔSAR corrected SAR (W/kg) = (Meas. SAR (W/kg)) × (100 - (ΔSAR(%))) / 100



7.2 SAR results: 2.4 GHz band

Table with columns: Test setup, Data rate, Frequency, Duty cycle, Power correction, SAR results [W/kg], SAR plot # in Appendix 2-2, SAR type, SAR Limit [W/kg], Remarks. Rows include Tx: Antenna 0, Tx: Antenna 1, and OFDM mode for both antennas.

- \*a. Since the calculated ΔSAR values of the tested liquid had shown positive correction, the measured SAR was not converted by ΔSAR correction. Calculating formula: ΔSAR corrected SAR (W/kg) = (Meas. SAR (W/kg)) × (100 - (ΔSAR(%)) / 100
\*b. Calculating formula: Reported SAR (W/kg) = (Measured SAR (W/kg)) × (Duty scaled) × (Tune-up factor)
Duty scaled = Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = 100%(%) / (duty cycle, %)
Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = 1 / (10 ^ ("Deviation from max., dB" / 10))

Notes:

- \*. Highest measured output power channel was tested initially according to KDB 248227 D01.
\*. Since the power of 2467 MHz (CH12) and 2472 MHz (CH13) are more than 9 dB lower than other SAR tested frequencies, the SAR test was omitted.
\*. 2.4GHz SAR test reduction procedures, in KDB248227 D01 (v02r02)

- (DSSS mode) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg (for SAR (1g)) or ≤ 2.0 W/kg (for SAR (10g)), , no further SAR testing is required for 802.11b DSSS in that exposure configuration.
(OFDM mode) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg (for SAR(1g)) or ≤ 3W/kg (for SAR(10g)). Refer to the following table for the estimated SAR of OFDM mode.

Table with columns: OFDM mode, ANT. #, Maximum tune-up tolerance limit (DSSS, OFDM), OFDM scaled factor [-], DSSS reported SAR value (type, Setup, [W/kg]), Estimated SAR value: OFDM [W/kg], Exclusion limit [W/kg], Standalone SAR test require? Rows list various antenna configurations and modes.

- \*. Gap: It is the separation distance between the outer surface of product and the bottom outer surface of phantom; CH: Channel; Meas.: Measured value; n/a: not applied; Max.: Maximum; ANT.#: Antenna ID number 0 or 1; Mode: b: IEEE 802.11b, g: IEEE 802.11g, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT).

- \*. During test, the EUT was operated by build-in rechargeable Li-ion battery with connecting USB cable (charging and setting Tx parameters).

- \*. Calibration frequency of the SAR measurement probe (and used conversion factors)

Table with columns: Liquid, SAR test frequency, Probe calibration frequency, Validity, Conversion factor, Uncertainty. Rows for Body and Liquid.

- \*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.



- \*. Subsequent test configuration was excluded from the following table according to KDB 248227 D01. SAR is not required for the following exclusion conditions according to KDB 248227 D01.
- 1) When KDB 447498 D01 SAR test exclusion applies to the initial test configuration.
  - 2) When the highest reported SAR for initial test configuration is adjusted by the ratio of Subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

Subsequent test mode	ANT. #	Maximum tune-up tolerance limit				Scaled factor [-] (b)/(a) $\times 100$	Reported SAR value *. Initial test configuration			Estimated SAR value: Subsequent test configuration [W/kg]	Exclusion limit [W/kg]	Standalone SAR test require?
		Initial test configuration		Subsequent test configuration			type	Setup	[W/kg]			
		[dBm]	[mW] (a)	[dBm]	[mW] (b)							
ac80	0	15.0	32	10.5	11	0.344	1g	Bottom	1.267	<b>0.436</b>	$\leq 1.2$	No
(MIMO) n20/40, ac20/40	0	15.0	32	12.0	16	0.5	1g	Bottom	1.267	<b>0.634</b>	$\leq 1.2$	No
(MIMO) ac80	0	15.0	32	7.5	6	0.188	1g	Bottom	1.267	<b>0.238</b>	$\leq 1.2$	No
ac80	0	15.0	32	10.5	11	0.344	10g	Front	0.319	<b>0.110</b>	$\leq 3$	No
(MIMO) n20/40, ac20/40	0	15.0	32	12.0	16	0.5	10g	Front	0.319	<b>0.160</b>	$\leq 3$	No
(MIMO) ac80	0	15.0	32	7.5	6	0.188	10g	Front	0.319	<b>0.060</b>	$\leq 3$	No
ac80	1	15.0	32	10.5	11	0.344	10g	Top	0.244	<b>0.084</b>	$\leq 3$	No
(MIMO) n20/40, ac20/40	1	15.0	32	12.0	16	0.5	10g	Top	0.244	<b>0.122</b>	$\leq 3$	No
(MIMO) ac80	1	15.0	32	7.5	6	0.188	10g	Top	0.244	<b>0.046</b>	$\leq 3$	No

\*. Gap: It is the separation distance between the outer surface of product and the bottom outer surface of phantom; CH: Channel; Meas.: Measured value; n/a: not applied; Max.: Maximum; ANT.#: Antenna ID number 0 or 1; Mode; a: IEEE 802.11a, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT), ac80: IEEE 802.11ac(80VHT).

\*. During test, the EUT was operated by build-in rechargeable Li-ion battery with connecting USB cable (charging and setting Tx parameters).

\*. Calibration frequency of the SAR measurement probe (and used conversion factors)

Liquid	SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
Body	5180, 5220, 5230, 5240, 5260, 5270, 5300, 5310, 5320 MHz	5250 MHz	within $\pm 10$ MHz of calibration frequency	4.49	$\pm 13.1\%$

\*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

7.4 SAR results: U-NII-2C band

Test setup			Mode	Data rate [Mbps] or [MCS]	Frequency		Duty cycle		Power correction			SAR results [W/kg] (Max. value of multi-peak)			SAR plot # in Appendix 2-2	SAR type	SAR Limit [W/kg]	Remarks	
Test position <sup>**</sup> is Initial test position.	Gap [mm]	Source power			[MHz]	CH	Duty [%]	Duty scaled factor	Tune-up limit [dBm]	Meas. [dBm]	Tune-up factor	Meas.	ΔSAR [%]	ΔSAR corrected					Reported <sup>(*)</sup>
[Tx: Antenna 0] <sup>*</sup> . n40 is the initial test mode which has the higher bandwidth with the highest tune-up power and has the lowest modulation.																			
Bottom <sup>*</sup>	0	Battery	n40	MCS0	5510	102	87.4	1.14	15.0	13.37	1.46	<b>0.690</b>	+0.17	n/a (*a)	<b>1.148</b>	3-3	1g	1.6	>0.8, next ch.
		Battery			5550	110	87.4	1.14	15.0	13.18	1.52	<b>0.590</b>	+0.18	n/a (*a)	<b>1.022</b>	3-4	1g	1.6	<1.2
		Battery			5670	134	87.4	1.14	15.0	13.06	1.56	<b>0.503</b>	+0.18	n/a (*a)	<b>0.895</b>	3-5	1g	1.6	High CH.
		Battery	ac40	MCS0	5510	102	87.6	1.14	15.0	13.39	1.45	<b>0.663</b>	+0.19	n/a (*a)	<b>1.096</b>	3-6	1g	1.6	>0.8, next ch.
		Battery			5550	110	87.6	1.14	15.0	13.23	1.50	<b>0.592</b>	+0.18	n/a (*a)	<b>1.012</b>	3-7	1g	1.6	<1.2
		Battery			5670	134	87.6	1.14	15.0	13.15	1.53	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	1g	1.6	-
		Battery	a	6	5500	100	93.7	1.07	15.0	13.45	1.43	<b>0.731</b>	+0.17	n/a (*a)	<b>1.119</b>	3-8	1g	1.6	>0.8, next ch.
		Battery			5580	100	93.7	1.07	15.0	13.22	1.51	<b>0.623</b>	+0.16	n/a (*a)	<b>1.007</b>	3-9	1g	1.6	<1.2
		Battery			5700	100	93.7	1.07	15.0	13.34	1.47	<b>0.542</b>	+0.15	n/a (*a)	<b>0.853</b>	3-10	1g	1.6	High CH.
		Battery	n20	MCS0	5500	100	93.2	1.07	15.0	13.24	1.50	<b>0.710</b>	+0.17	n/a (*a)	<b>1.140</b>	3-11	1g	1.6	>0.8, next ch.
		Battery			5580	100	93.2	1.07	15.0	13.05	1.57	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	1g	1.6	-
		Battery			5700	100	93.2	1.07	15.0	13.22	1.51	<b>0.547</b>	+0.17	n/a (*a)	<b>0.884</b>	3-12	1g	1.6	<1.2
		Battery	ac20	MCS0	5500	100	93.3	1.07	15.0	13.30	1.48	<b>0.726</b>	+0.17	n/a (*a)	<b>1.150</b>	3-1	1g	1.6	>0.8, next ch. <sup>*</sup> Higher, SAR1g
		Battery			5580	100	93.3	1.07	15.0	13.30	1.48	<b>0.595</b>	+0.17	n/a (*a)	<b>0.942</b>	3-13	1g	1.6	<1.2
Battery	5700	100			93.3	1.07	15.0	13.12	1.54	<b>0.553</b>	+0.18	n/a (*a)	<b>0.911</b>	3-14	1g	1.6	-		
Front	0	USB	n40	MCS0	5510	102	87.4	1.14	15.0	13.37	1.46	<b>0.218</b>	+0.24	n/a (*a)	<b>0.363</b>	3-15	10g	4.0	<1
		USB			5550	110	87.4	1.14	15.0	13.18	1.52	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	-
		USB			5670	134	87.4	1.14	15.0	13.06	1.56	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	-
Back	0	USB	n40	MCS0	5510	102	87.4	1.14	15.0	13.37	1.46	<b>0.097</b>	+0.24	n/a (*a)	<b>0.161</b>	3-16	10g	4.0	-
		USB			5550	110	87.4	1.14	15.0	13.18	1.52	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	-
		USB			5670	134	87.4	1.14	15.0	13.06	1.56	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	<1
[Tx: Antenna 1] <sup>*</sup> . n40 is the initial test mode which has the higher bandwidth with the highest tune-up power and has the lowest modulation.																			
Top <sup>*</sup>	0	USB	n40	MCS0	5510	102	87.4	1.14	15.0	13.53	1.40	<b>0.303</b>	+0.26	n/a (*a)	<b>0.484</b>	3-17	10g	4.0	<1
		USB			5550	110	87.4	1.14	15.0	13.25	1.50	<b>0.338</b>	+0.25	n/a (*a)	<b>0.578</b>	3-18	10g	4.0	-
		USB			5670	134	87.4	1.14	15.0	13.02	1.58	<b>0.355</b>	+0.27	n/a (*a)	<b>0.639</b>	3-2	10g	4.0	<sup>*</sup> Higher, SAR10g
		USB	a	6	5500	100	93.7	1.07	15.0	13.78	1.32	<b>0.323</b>	+0.24	n/a (*a)	<b>0.456</b>	3-19	10g	4.0	<1, Low ch.
		USB			5580	100	93.7	1.07	15.0	13.49	1.42	<b>0.400</b>	+0.25	n/a (*a)	<b>0.608</b>	3-20	10g	4.0	-
		USB			5700	100	93.7	1.07	15.0	13.19	1.52	<b>0.338</b>	+0.28	n/a (*a)	<b>0.550</b>	3-21	10g	4.0	High ch.
Front	0	USB	n40	MCS0	5510	102	87.4	1.14	15.0	13.53	1.40	<b>0.207</b>	+0.24	n/a (*a)	<b>0.330</b>	3-22	10g	4.0	-
		USB			5550	110	87.4	1.14	15.0	13.25	1.50	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	-
		USB			5670	134	87.4	1.14	15.0	13.02	1.58	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	<1
Back	0	USB	n40	MCS0	5510	102	87.4	1.14	15.0	13.53	1.40	<b>0.051</b>	+0.24	n/a (*a)	<b>0.081</b>	3-23	10g	4.0	-
		USB			5550	110	87.4	1.14	15.0	13.25	1.50	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	-
		USB			5670	134	87.4	1.14	15.0	13.02	1.58	<b>n/a</b>	-	n/a (*a)	<b>n/a</b>	-	10g	4.0	<1

\*a. Since the calculated ΔSAR values of the tested liquid had shown positive correction, the measured SAR was not converted by ΔSAR correction.

Calculating formula: ΔSAR corrected SAR (W/kg) = (Meas. SAR (W/kg)) × (100 - (ΔSAR(%)) / 100

\*b. Calculating formula: Reported SAR (W/kg) = (Measured SAR (W/kg)) × (Duty scaled) × (Tune-up factor)

Duty scaled = Duty scaled factor: Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = 100(%) / (duty cycle, %)

Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = 1 / (10 ^ ("Deviation from max., dB" / 10))

Notes:

\*. Highest measured output power channel was tested initially according to KDB 248227 D01.

\*. Since the power of 5190 MHz (CH38) of BW40MHz mode is more than 3 dB lower than other SAR tested frequency, the SAR test was omitted.

\*. According to KDB248227D01

1) Highest reported SAR is ≤ 0.4 W/kg (SAR(1g)), ≤ 1 W/kg (SAR(10g)). Therefore, further SAR measurements within this exposure condition are not required.

2) Highest reported SAR is > 0.4 W/kg (SAR(1g)), > 1 W/kg (SAR(10g)). Due to the highest reported SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR ≤ 0.8 W/kg (SAR(1g)), ≤ 2 W/kg(SAR(10g)) was reported.

3) For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg (SAR(1g)), > 2 W/kg (SAR(10g)), 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 (SAR(1g)), ≤ 3 W/kg(SAR(10g)) or all required test channels are considered.

- \*. Subsequent test configuration was excluded from the following table according to KDB 248227 D01. SAR is not required for the following exclusion conditions according to KDB 248227 D01.
- 1) When KDB 447498 D01 SAR test exclusion applies to the initial test configuration.
  - 2) When the highest reported SAR for initial test configuration is adjusted by the ratio of Subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

Subsequent test mode	ANT. #	Maximum tune-up tolerance limit				Scaled factor [-] (b)/(a)×100	Reported SAR value *. Initial test configuration			Estimated SAR value: Subsequent test configuration [W/kg]	Exclusion limit [W/kg]	Standalone SAR test require?
		Initial test configuration		Subsequent test configuration			type	Setup	[W/kg]			
		[dBm]	[mW] (a)	[dBm]	[mW] (b)							
ac80	0	15.0	32	12.0	16	0.5	1g	Bottom	1.150	<b>0.575</b>	$\leq 1.2$	No
(MIMO) n20/40, ac20/40	0	15.0	32	12.0	16	0.5	1g	Bottom	1.150	<b>0.575</b>	$\leq 1.2$	No
(MIMO) ac80	0	15.0	32	9.0	8	0.25	1g	Bottom	1.150	<b>0.288</b>	$\leq 1.2$	No
ac80	0	15.0	32	10.5	11	0.5	10g	Front	0.363	<b>0.182</b>	$\leq 3$	No
(MIMO) n20/40, ac20/40	0	15.0	32	12.0	16	0.5	10g	Front	0.363	<b>0.182</b>	$\leq 3$	No
(MIMO) ac80	0	15.0	32	7.5	6	0.25	10g	Front	0.363	<b>0.091</b>	$\leq 3$	No
ac80	1	15.0	32	10.5	11	0.5	10g	Top	0.639	<b>0.320</b>	$\leq 3$	No
(MIMO) n20/40, ac20/40	1	15.0	32	12.0	16	0.5	10g	Top	0.639	<b>0.320</b>	$\leq 3$	No
(MIMO) ac80	1	15.0	32	7.5	6	0.25	10g	Top	0.639	<b>0.160</b>	$\leq 3$	No

\*. Gap: It is the separation distance between the outer surface of product and the bottom outer surface of phantom; CH: Channel; Meas.: Measured value; n/a: not applied; Max.: Maximum; ANT.#: Antenna ID number 0 or 1; Mode; a: IEEE 802.11a, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT), ac80: IEEE 802.11ac(80VHT).

\*. During test, the EUT was operated by build-in rechargeable Li-ion battery with connecting USB cable (charging and setting Tx parameters).

\*. Calibration frequency of the SAR measurement probe (and used conversion factors)

Liquid	SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
Body	5500, 5510, 5550, 5580, 5670 MHz	5600 MHz	within $\pm 10$ MHz of calibration frequency	3.92	$\pm 13.1\%$
Body	5700 MHz	5750 MHz	within $\pm 10$ MHz of calibration frequency	4	$\pm 13.1\%$

\*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

7.5 SAR results: U-NII-3 band

Test setup			Mode	Data rate [Mbps] or [MCS]	Frequency		Duty cycle		Power correction			SAR results [W/kg] (Max. value of multi-peak)			SAR plot # in Appendix 2-2	SAR type	SAR Limit [W/kg]	Remarks	
Test position *** is Initial test position.	Gap [mm]	Source power			[MHz]	CH	Duty [%]	Duty scaled factor	Tune-up limit [dBm]	Meas. [dBm]	Tune-up factor	Meas.	ΔSAR [%]	ΔSAR corrected					Reported (*b)
[Tx: Antenna 0] *a. ac80 is the initial test mode which has the higher bandwidth with the highest tune-up power and has the lowest modulation.																			
Bottom*	0	Battery	ac80	MCS0	5775	155	77.7	1.29	14.0	13.01	1.26	<b>0.666</b>	+0.16	n/a (*a)	<b>1.083</b>	4-3	1g	1.6	>0.8
		Battery	n40	MCS0	5755	151	87.4	1.14	14.0	13.17	1.21	<b>0.670</b>	+0.14	n/a (*a)	<b>0.924</b>	4-4	1g	1.6	>0.8, next ch.
		Battery	ac40	MCS0	5795	159	87.4	1.14	14.0	13.16	1.21	<b>0.866</b>	+0.14	n/a (*a)	<b>1.195</b>	4-5	1g	1.6	-
		Battery			5755	151	87.6	1.14	14.0	13.21	1.20	<b>0.703</b>	+0.17	n/a (*a)	<b>0.962</b>	4-6	1g	1.6	>0.8, next ch.
		Battery	a	6	5745	149	93.7	1.07	14.0	13.36	1.16	<b>0.734</b>	+0.15	n/a (*a)	<b>0.911</b>	4-8	1g	1.6	>0.8, next ch.
		Battery			5785	157	93.7	1.07	14.0	13.20	1.20	<b>0.958</b>	+0.15	n/a (*a)	<b>1.230</b>	4-9	1g	1.6	>1.2
		Battery			5825	165	93.7	1.07	14.0	13.21	1.20	<b>1.05</b>	+0.14	n/a (*a)	<b>1.348</b>	4-10	1g	1.6	-
		Battery	n20	MCS0	5745	149	93.2	1.07	14.0	13.29	1.18	<b>0.700</b>	+0.17	n/a (*a)	<b>0.884</b>	4-11	1g	1.6	>0.8, next ch.
		Battery			5785	157	93.2	1.07	14.0	13.25	1.19	<b>0.912</b>	+0.16	n/a (*a)	<b>1.161</b>	4-12	1g	1.6	<1.2
		Battery			5825	165	93.2	1.07	14.0	13.11	1.23	<b>1.07</b>	+0.14	n/a (*a)	<b>1.408</b>	4-13	1g	1.6	*.Worst CH.
		Battery	ac20	MCS0	5745	149	93.3	1.07	14.0	13.32	1.17	<b>0.693</b>	+0.17	n/a (*a)	<b>0.868</b>	4-14	1g	1.6	>0.8, next ch.
		Battery			5785	157	93.3	1.07	14.0	13.21	1.20	<b>0.887</b>	+0.16	n/a (*a)	<b>1.139</b>	4-15	1g	1.6	<1.2
		Battery			5825	165	93.3	1.07	14.0	13.14	1.22	<b>1.09</b>	+0.14	n/a (*a)	<b>1.423</b>	4-1	1g	1.6	*.Higher, SAR 1g
		Front	0	USB	ac80	MCS0	5775	155	77.7	1.29	14.0	13.01	1.26	<b>0.117</b>	+0.25	n/a (*a)	<b>0.190</b>	4-16	10g
Back	0	USB	ac80	MCS0	5775	155	77.7	1.29	14.0	13.01	1.26	<b>0.066</b>	+0.25	n/a (*a)	<b>0.107</b>	4-17	10g	4.0	<1
[Tx: Antenna 1] *a. ac80 is the initial test mode which has the higher bandwidth with the highest tune-up power and has the lowest modulation.																			
Top*	0	USB	ac80	MCS0	5775	155	77.7	1.29	14.0	13.06	1.24	<b>0.217</b>	+0.25	n/a (*a)	<b>0.347</b>	4-18	10g	4.0	<1
		USB	n40	MCS0	5755	151	87.6	1.14	14.0	13.26	1.19	<b>0.258</b>	+0.30	n/a (*a)	<b>0.350</b>	4-19	10g	4.0	-
		USB			5795	159	87.6	1.14	14.0	13.25	1.19	<b>0.231</b>	+0.30	n/a (*a)	<b>0.313</b>	4-20	10g	4.0	-
		USB	a	6	5745	149	93.7	1.07	14.0	13.33	1.17	<b>0.295</b>	+0.30	n/a (*a)	<b>0.399</b>	4-2	10g	4.0	*.Higher, SAR 10g
		USB			5785	157	93.7	1.07	14.0	13.59	1.10	<b>0.259</b>	+0.29	n/a (*a)	<b>0.305</b>	4-21	10g	4.0	-
		USB			5825	165	93.7	1.07	14.0	13.55	1.11	<b>0.239</b>	+0.31	n/a (*a)	<b>0.284</b>	4-22	10g	4.0	-
Front	0	USB	ac80	MCS0	5775	155	77.7	1.29	14.0	13.06	1.24	<b>0.123</b>	+0.25	n/a (*a)	<b>0.197</b>	4-23	10g	4.0	<1
Back	0	USB	ac80	MCS0	5775	155	77.7	1.29	14.0	13.06	1.24	<b>0.023</b>	+0.25	n/a (*a)	<b>0.037</b>	4-24	10g	4.0	<1

\*a. Since the calculated ΔSAR values of the tested liquid had shown positive correction, the measured SAR was not converted by ΔSAR correction.

Calculating formula: ΔSAR corrected SAR (W/kg) = (Meas. SAR (W/kg)) × (100 - (ΔSAR(%)) / 100

\*b. Calculating formula: Reported SAR (W/kg) = (Measured SAR (W/kg)) × (Duty scaled) × (Tune-up factor)

Duty scaled = Duty scaled factor: Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = 100(%) / (duty cycle, %)

Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = 1 / (10<sup>^(("Deviation from max., dB" / 10))</sup>)

Notes:

- \*. Highest measured output power channel was tested initially according to KDB 248227 D01.
- \*. Since the power of 5190 MHz (CH38) of BW40MHz mode is more than 3 dB lower than other SAR tested frequency, the SAR test was omitted.
- \*. According to KDB248227D01
- 1) Highest reported SAR is ≤ 0.4 W/kg (SAR(1g)), ≤ 1 W/kg (SAR(10g)). Therefore, further SAR measurements within this exposure condition are not required.
- 2) Highest reported SAR is > 0.4 W/kg (SAR(1g)), > 1 W/kg (SAR(10g)). Due to the highest reported SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR ≤ 0.8 W/kg (SAR(1g)), ≤ 2 W/kg(SAR(10g))was reported.
- 3) For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg (SAR(1g)), > 2 W/kg (SAR(10g)), 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 (SAR(1g)), ≤ 3 W/kg(SAR(10g)) or all required test channels are considered.
- \*. Subsequent test configuration was excluded from the following table according to KDB 248227 D01. SAR is not required for the following exclusion conditions according to KDB 248227 D01.
- 1) When KDB 447498 D01 SAR test exclusion applies to the initial test configuration.
- 2) When the highest reported SAR for initial test configuration is adjusted by the ratio of Subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

Subsequent test mode	ANT. #	Maximum tune-up tolerance limit				Scaled factor [-] (b)/(a)×100	Reported SAR value * Initial test configuration			Estimated SAR value: Subsequent test configuration [W/kg]	Exclusion limit [W/kg]	Standalone SAR test require?
		Initial test configuration		Subsequent test configuration			type	Setup	[W/kg]			
		[dBm]	[mW] (a)	[dBm]	[mW] (b)							
(MIMO) n20/40, ac20/40/80	0	14.0	25	12.0	16	0.64	1g	Bottom	1.423	<b>0.911</b>	≤ 1.2	No
(MIMO) n20/40, ac20/40/80	0	14.0	25	12.0	16	0.64	10g	Front	0.190	<b>0.122</b>	≤ 3	No
(MIMO) n20/40, ac20/40/80	1	14.0	25	12.0	16	0.64	10g	Top	0.399	<b>0.255</b>	≤ 3	No

\*. Gap: It is the separation distance between the outer surface of product and the bottom outer surface of phantom; CH: Channel; Meas.: Measured value; n/a: not applied; Max.: Maximum; ANT.#: Antenna ID number 0 or 1; Mode; a: IEEE 802.11a, n20: IEEE 802.11n(20HT), n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac40: IEEE 802.11ac(40VHT), ac80: IEEE 802.11ac(80VHT).

\*. During test, the EUT was operated by build-in rechargeable Li-ion battery with connecting USB cable (charging and setting Tx parameters).

\*. Calibration frequency of the SAR measurement probe (and used conversion factors)

Liquid	SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
Body	5745, 5755, 5775, 5785, 5795, 5825 MHz	5750 MHz	within ±110MHz of calibration frequency	4	±13.1%

\*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

### 7.6 SAR Measurement Variability (Repeated measurement requirement)

In accordance with published RF Exposure KDB procedure 865664 D01 (v01r04) SAR measurement 100 MHz to 6 GHz. 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 (< 2 W/kg for SAR(10g)); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg (≥ 2 W/kg for SAR(10g)), 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.

EUT setup			Mode	Frequency [MHz] (Channel)	Measured SAR [W/kg]		Largest to Smallest SAR Ratio	SAR plot # in Appendix 2-2	
Transmit antenna	Position	Gap [mm]			Type	Original		Repeated	Original
Antenna 0	Bottom	0	ac20 (MCS0)	5825 (165)	1g	1.09	1.09	1.00	Plot 4-1 Plot 5-1

\*. Calculating formula: Largest to Smallest SAR Ratio (%) = (Largest SAR (W/kg) / Smallest SAR (W/kg)) \* 100; \*. Mode; ac20: IEEE 802.11ac(20VHT)

### 7.7 Device holder perturbation verification

When the highest reported SAR of an antenna is > 1.2 W/kg (> 3 W/kg for SAR(10g)), holder perturbation verification (by Urethane form alone) is required by using the highest SAR configuration among all applicable frequency bands.

EUT setup			Mode	Frequency [MHz] (Channel)	Measured SAR [W/kg]		Device holder perturbation SAR Ratio	Remarks	
Transmit antenna	Position	Gap [mm]			Type	Device holder			
Antenna 0	Bottom	0	ac20 (MCS0)	5825 (165)	1g	1.09 (Reported: 1.423)	1.1	+0.9 %	*. It was smaller than 5% of uncertainty of the setup, so influence of a device holder was judged to be no problem.
					SAR plot # in Appendix 2-2				
					Plot 4-1		Plot 5-2		

\*. Calculating formula: Device holder perturbation SAR Ratio (%) = {((Measured SAR-none (W/kg)) / Measured SAR-exist (W/kg)) - 1} \* 100

\*. Mode; ac20: IEEE 802.11ac(20VHT)

### 7.8 Simultaneous transmission and Co-location (MIMO) evaluation

Simultaneous transmission scenario														
Test position	Mode	U-NII band	SAR type	Highest Reported SAR (Standalone base) [W/kg]					Σ SAR [W/kg] (1g: ≤1.6 10g: ≤4)	SPLSR Check? (Yes / No)	Antenna separation distance design base [mm]	SPLSR (≤ 0.04)	Volume Scan? (Yes/No)	
				Antenna 1		Antenna 0								
				Wi-Fi (*3) DTS Band	Wi-Fi (*3) UNII band	Wi-Fi (*3) DTS Band	Wi-Fi (*3) UNII band	Bluetooth						
Front	SISO	-	10g	0.385 (b)					0.03 (*1)	0.415	<4, No	-	-	-
	SISO	U-NII-1&2A	10g		0.199 (n40)				0.03 (*1)	0.229	<4, No	-	-	-
		U-NII-2C	10g		0.330 (n40)				0.03 (*1)	0.360	<4, No	-	-	-
		U-NII-3	10g		0.197 (ac80)				0.03 (*1)	0.227	<4, No	-	-	-
	MIMO(*2)	-	10g	0.385 (b)		0.446 (b)				0.831	<4, No	-	-	-
		U-NII-1&2A	10g		0.199 (n40)		0.319 (n40)			0.518	<4, No	-	-	-
U-NII-2C		10g		0.330 (n40)		0.363 (n40)			0.693	<4, No	-	-	-	
Back	SISO	U-NII-3	10g		0.197 (ac80)				0.469	<4, No	-	-	-	
		-	10g	0.097 (b)		0.756 (b)			0.853	<4, No	-	-	-	
		U-NII-1&2A	10g		0.040 (n40)				0.127	<4, No	-	-	-	
	MIMO(*2)	U-NII-2C	10g		0.073 (n40)				0.070	<4, No	-	-	-	
		U-NII-3	10g		0.036 (ac80)				0.103	<4, No	-	-	-	
		U-NII-1&2A	10g		0.040 (n40)		0.159 (n40)		0.063	<4, No	-	-	-	
Top	SISO	U-NII-2C	10g		0.073 (n40)				0.234	<4, No	-	-	-	
		U-NII-3	10g		0.036 (ac80)		0.107 (ac80)		0.143	<4, No	-	-	-	
		-	10g	0.480 (b)					0.03 (*1)	0.510	<4, No	-	-	
	MIMO(*2)	U-NII-1&2A	10g		0.244 (n40)				0.03 (*1)	0.274	<4, No	-	-	
		U-NII-2C	10g		0.639 (n40)				0.03 (*1)	0.669	<4, No	-	-	
		U-NII-3	10g		0.369 (a)				0.03 (*1)	0.399	<4, No	-	-	
Bottom	SISO	-	1g	0.4 (*1)					1.480	<4, No	-	-	-	
		U-NII-1&2A	1g		0.4 (*1)				1.244	<4, No	-	-	-	
		U-NII-2C	1g		0.4 (*1)				1.639	<4, No	-	-	-	
	MIMO(*2)	U-NII-3	1g		0.4 (*1)				1.369	<4, No	-	-	-	
		-	1g	0.4 (*1)		0.759 (b)			1.159	<1.6, No	-	-	-	
		U-NII-1&2A	1g		0.4 (*1)		1.267 (ac40)		1.667	>1.6, Yes	78.774	0.027	No	
MIMO(*2)	U-NII-2C	1g		0.4 (*1)		1.150 (ac20)		1.550	<1.6, No	-	-	-		
	U-NII-3	1g		0.4 (*1)		1.423 (ac20)		1.823	>1.6, Yes	78.774	0.031	No		

Note: \*1. These values are estimated SAR. Refer to section 4.2.

\*2. These SAR values were obtained by the SISO mode which has the higher power than MIMO mode on each antenna.

\*3. ( ) shows the operation mode. b: IEEE 802.11b; a: IEEE 802.11a, n40: IEEE 802.11n(40HT), ac20: IEEE 802.11ac(20VHT), ac80: IEEE 802.11ac(80VHT).

\*. This Wireless module supports both Wi-Fi and Bluetooth on an antenna 0. An antenna 1 is only supported Wi-Fi.

\*. Wi-Fi and Bluetooth cannot transmit simultaneously on an antenna 0.

\*. Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the SAR(1g) is < 1.6 W/kg (SAR(10g) is < 4 W/kg) or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.