



SAR TEST REPORT

Test Report No.: 10668346S-B-R1

Applicant : silex technology, Inc.
Type of Equipment : SDIO Wireless Module (*. Installed into a specified platform.)
Model No. : SX-SDMAN
FCC ID : N6C-SDMAN
Test Standard : FCC 47CFR §2.1093
Test Result : Complied

Highest Reported SAR(1g) Value	Operation Band	Remarks
< 0.10 W/kg	2412-2472MHz	(DTS) 2437 MHz, 11b (1Mbps), Output power: 12.87 dBm.
0.20 W/kg	5180-5825 MHz	(UNII) 5600 MHz, 11a (6Mbps), Output power: 12.35 dBm.

- *. The highest reported SAR (1g) value across all exposure condition is "0.20 W/kg" = grant listing.
*. Since highest reported SAR (1g) on a platforms of SX-SDMAN (EUT) which obtained in accordance with KDB447498 (v05) were kept under 0.8 W/kg, this EUT was approved to operate multiple host platform.

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 test 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 any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: February 2~7, 2015

Test engineer: 
Hiroshi Naka
Engineer, Consumer Technology Division

Approved by: 
Toyokazu Imamura
Leader, Consumer Technology Division

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".



REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	10668346S-B	March 25, 2015	-	-
Original	10668346S-B-R1	August 5, 2015	all pages	Revised and corrected for all pages by reason of KDB revise.
1	10668346S-B-R1	September 3, 2015	P7	Correction of erroneous description.

*. 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 (Wireless LAN module, antenna)	3
2.3 Tx output power (typical) specification (antenna port terminal conducted)	4
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 Test location	5
3.5 Confirmation before SAR testing	6
3.6 Confirmation after SAR testing	6
3.7 Test setup of EUT and SAR measurement procedure	7
SECTION 4: Operation of EUT during SAR testing	8
SECTION 5: Uncertainty assessment (SAR measurement)	8
SECTION 6: Confirmation before testing	9
6.1 Assessment for the antenna terminal port conducted power of EUT	9
SECTION 7: Measurement results	12
7.1 SAR test results (Body)	12

Contents of appendices

APPENDIX 1: Photographs of test setup	14
Appendix 1-1 Photograph of EUT and antenna position	14
Appendix 1-2 EUT and support equipment	15
Appendix 1-3 Photograph of SAR test setup	16
APPENDIX 2: SAR Measurement data	17
Appendix 2-1 Evaluation procedure	17
Appendix 2-2 Measurement data	18
APPENDIX 3: Test instruments	29
Appendix 3-1 Equipment used	29
Appendix 3-2 Configuration and peripherals	30
Appendix 3-3 Test system specification	31
Appendix 3-4 Simulated tissues composition and parameter confirmation	32
Appendix 3-5 System check results	32
Appendix 3-6 System check measurement data	33
Appendix 3-7 System check uncertainty	35
Appendix 3-8 Calibration certificate: E-Field Probe (EX3DV4)	36
Appendix 3-9 Calibration certificate: Dipole (D2450V2)	47
Appendix 3-10 Calibration certificate: Dipole (D5GHzV2)	55

SECTION 1: Customer information

Company Name	silex technology, Inc.
Address	2-3-1 Hikaridai, Seika-cho, Kyoto 619-0237, Japan
Telephone Number	+81-774-98-3678
Facsimile Number	+81-774-98-3758
Contact Person	Toshiro Kometani

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

	EUT	Platform
Type of Equipment	SDIO Wireless Module	RIONOTE Main Control Unit
Model Number	SX-SDMAN	SA-A1
Serial Number	0080925B200A	11
Condition of EUT	Production prototype (*: Not for sale. This sample is equivalent to mass-production items)	Engineering prototype
Receipt Date of Sample	February 2, 2015 (*: No modification by the Lab.)	
Country of Mass-production	Japan	Japan
Rating	DC3.3V (*: Supplied from the platform which EUT was installed.)	DC7.4V (*: Supplied from the rechargeable Li-Ion battery)
Category Identified	Portable device (*: Since the EUT installed in the platform may contact and/or very close to a human body during Wi-Fi operation, the partial-body SAR (1g) shall be observed.)	
SAR Accessory	For the platform, any body-worn accessory was not applied.	

2.2 Product Description (RF module, antenna)

Frequency band	2.4GHz band		5GHz band		
Frequency of operation (MHz) (*.ch.: channel)	11b.g, n(20HT)	2412-2462 (*.ch.1-11)	11a, n(20HT) n(40HT)	5180-5320 (*.ch.36-64) 5190-5310 (*.ch.38-62)	5500-5700 (*.ch.100-140) 5745-5825 (*.ch.149-165) 5755, 5795 (*.ch.151,159)
Channel spacing (MHz)	5 (11b.g,n(20HT))		20 (11b.g,n(20HT)) / 40 (11n(40HT))		
Bandwidth (MHz)	20 (11b.g,n(20HT))		20 (11b.g,n(20HT)) / 40 (11n(40HT))		
Type of modulation	DSSS: DBPSK, DQPSK, CCK (11b), OFDM: BPSK, QPSK, 16QAM, 64QAM (11g,a,n(20HT),n(40HT))				
Transmit power (including manufacture variation) (dBm)	11b	13.0	11a	14.0	14.0±2.0
	11g	13.0	n(20HT)	14.0	14.0±2.0
	n(20HT)	12.5	n(40HT)	14.0	14.0±2.0
	*. The measured Tx output power (conducted) refers to section 6 in this report. Refer to clause 2.3 for more detail power specification.				
Power supply	DC 3.3V (*. DC3.3V is supplied from the main unit via constant voltage circuit.)				

Antenna	antenna #0 (Wireless LAN)
Antenna quantity	1 pc. (*1)
Antenna model	1000418
Antenna type / connector type	Stamped metal antenna / Connector, PCB side: U.FL, Antenna side: soldered
Antenna gain (max.peak)	2.4GHz: 2.0dBi (including cable loss0.5dB), 5GHz: 2.5dBi (including cable loss1.0dB)

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

*. The EUT has another antenna for ZigBee operation with a separation distance of 47.7 mm. Since the Wi-Fi and Zigbee can not operate simultaneously, the simultaneously SAR evaluation is not applied.

*. Bluetooth doesn't function in this host. Therefore Bluetooth isn't evaluated.

2.3 Tx average output power specification (antenna port terminal conducted) (*. including manufacture variation)

		Target Power [dBm] (average)																			
		11b				11g								11n(20HT)							
[MHz]	CH	1	2	5.5	11	6	9	12	18	24	36	48	54	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
2412	1	13	13	13	13	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	5
2417	2	13	13	13	13	13	13	13	13	13	13	12.5	11	12.5	12.5	12.5	12	12	12	10.5	5
2422	3	13	13	13	13	12.5	12.5	12.5	12.5	12.5	12.5	12	10.5	11.5	11.5	11.5	11.5	11.5	11.5	10	5
2427	4	13	13	13	13	12	12	12	12	12	12	11.5	10	11	11	11	11	11	11	9.5	5
2432	5	13	13	13	13	11.5	11.5	11.5	11.5	11.5	11.5	11	10	10.5	10.5	10.5	10.5	10.5	10.5	9.5	5
2437	6	13	13	13	13	11	11	11	11	11	11	10.5	9.5	10	10	10	10	10	10	9	5
2442	7	13	13	13	13	10.5	10.5	10.5	10.5	10.5	10.5	10	9.5	9.5	9.5	9.5	9.5	9.5	9.5	8.5	5
2447	8	13	13	13	13	10	10	10	10	10	10	9.5	9.0	9	9	9	9	9	9	8.5	5
2452	9	13	13	13	13	9.5	9.5	9.5	9.5	9.5	9.5	9	9	8.5	8.5	8.5	8.5	8.5	8.5	8	5
2457	10	13	13	13	13	9	9	9	9	9	9	8.5	8.5	8	8	8	8	8	8	7.5	5
2462	11	13	13	13	13	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	5

		Target Power [dBm] (average)															
		11a								11n(20HT)							
[MHz]	CH	6	9	12	18	24	36	48	54	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
5180	36	14	14	14	14	14	14	12.5	11.5	13	13	13	13	13	12.5	11	8
5200	40	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5220	44	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5240	48	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5260	52	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5280	56	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5300	60	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5320	64	14	14	14	14	14	14	12.5	11.5	14	14	14	14	14	12.5	11	8
5500	100	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5520	104	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5540	108	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5560	112	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5580	116	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5600	120	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5620	124	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5640	128	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5660	132	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5680	136	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5700	140	14	14	14	14	14	12.5	12	11	14	14	14	14	12.5	12.5	10	6.5
5745	149	13	13	13	13	13	12	11.5	9.5	13	13	13	13	12	11	9.5	5
5765	153	13	13	13	13	13	12	11.5	9.5	13	13	13	13	12	11	9.5	5
5785	157	13	13	13	13	13	12	11.5	9.5	13	13	13	13	12	11	9.5	5
5805	161	13	13	13	13	13	12	11.5	9.5	13	13	13	13	12	11	9.5	5
5825	165	13	13	13	13	13	12	11.5	9.5	13	13	13	13	12	11	9.5	5

		Target Power [dBm] (average)							
		11n(40HT)							
[MHz]	CH	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
5190	38	9.5	9.5	9.5	9.5	9.5	9.5	9.5	8
5230	46	14	14	14	14	14	12.5	11	8
5270	54	14	14	14	14	14	12.5	11	8
5310	62	11.5	11.5	11.5	11.5	11.5	11.5	11	9
5510	102	14	14	14	14	14	12.5	10	6.5
5550	110	14	14	14	14	14	12.5	10	6.5
5590	118	14	14	14	14	14	12.5	10	6.5
5630	126	14	14	14	14	14	12.5	10	6.5
5670	134	14	14	14	14	14	12.5	10	6.5
5755	151	13	13	13	13	12	11	9.5	5
5795	159	13	13	13	13	12	11	9.5	5

SECTION 3: Test specification, procedures and results

3.1 Test specification

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..

KDB 447498 D01 (v05r02): General RF exposure guidance

KDB 248227 D01 (v02r01): SAR Guidance for IEEE 802.11 (Wi-Fi) transmitters

KDB 865664 D01 (v01r03): SAR measurement 100MHz to 6GHz

IEEE Std. 1528-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

IEEE Std. 1528-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

(* The reference for Uncertainty in SAR correction for deviations in permittivity and conductivity, in clause E.3.2.)

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)
(A) Limits for Occupational /Controlled Exposure (W/kg)	0.4	8.0	20.0
(B) Limits for General population /Uncontrolled Exposure (W/kg)	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;

General population / uncontrolled exposure, Partial-Body (averaged over any 1g of tissue) limit: 1.6 W/kg

3.3 Procedures and Results

	Wi-Fi (DTS) (2412-2462MHz)	Wi-Fi (UNII) (5180-5240MHz)	Wi-Fi (UNII) (5260-5320MHz)	Wi-Fi (UNII) (5500-5700MHz)	Wi-Fi (UNII) (5745-5825MHz)
Test Procedure	SAR measurement; KDB 447498, KDB 248227, KDB 865664, IEEE Std.1528				
Category	FCC 47CFR §2.1093				
Results (SAR(1g))	Complied	Complied	Complied	Complied	Complied
Liquid type	Body liquid				
Reported SAR value (* Scaled)	0.089 W/kg	not applied (* ≤1.2 W/kg for UNII-2A)	0.154 W/kg	0.203 W/kg	0.158 W/kg
Measured SAR value	0.086 W/kg	-	0.119 W/kg	0.136 W/kg	0.131 W/kg
Operation mode, frequency[MHz] (ch.)	11b, 1Mbps, 2437 (6ch)	-	11n(40HT), MCS0, 5270 (54ch)	11a, 6Mbps, 5600 (120ch)	11a, 6Mbps, 5785 (157ch)
Output power (max. power, scaled factor)	12.87 dBm (13 dBm, ×1.03)	-	13.07 dBm (14 dBm, ×1.24)	12.35 dBm (14 dBm, ×1.46)	12.29 dBm (13 dBm, ×1.14)
Duty factor	×1.00	-	×1.04	×1.02	×1.02

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

*. Since highest reported SAR (1g) on a platforms of SX-SDMAN (EUT) which obtained in accordance with KDB447498 (v05) were kept under 0.8 W/kg, this EUT was approved to operate multiple host platform.

3.4 Test Location

No.7 shielded room (2.76 m (Width) × 3.76 m (Depth) × 2.4 m (Height)) for SAR testing.

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

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

3.5 Confirmation before SAR testing

3.5.1 Average power for SAR test

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 result is shown in Section 6.

Step.1 Data rate check

The data rate check was measurement on one of the channel for 802.11b,g,a,n(20HT) and n(40HT) at each frequency band.

11b		11g		11a		11n(20HT)			11n(40HT)		
Mod (DSSS)	Data rate	Mod (OFDM)	Data rate	Mod (OFDM)	Data rate	MCS Index	Spatial Stream	Mod (OFDM)	MCS Index	Spatial Stream	Mod (OFDM)
DBPSK	1 Mbps	BPSK	6 Mbps	BPSK	6 Mbps	MCS0	1	BPSK	MCS0	1	BPSK
DQPSK	2 Mbps	BPSK	9 Mbps	BPSK	9 Mbps	MCS1	1	QPSK	MCS1	1	QPSK
CCK	5.5 Mbps	QPSK	12 Mbps	QPSK	12 Mbps	MCS2	1	QPSK	MCS2	1	QPSK
CCK	11 Mbps	QPSK	18 Mbps	QPSK	18 Mbps	MCS3	1	16QAM	MCS3	1	16QAM
*.Mod; Modulation		16QAM	24 Mbps	16QAM	24 Mbps	MCS4	1	16QAM	MCS4	1	16QAM
		16QAM	36 Mbps	16QAM	36 Mbps	MCS5	1	64QAM	MCS5	1	64QAM
		64QAM	48 Mbps	64QAM	48 Mbps	MCS6	1	64QAM	MCS6	1	64QAM
		64QAM	54 Mbps	64QAM	54 Mbps	MCS7	1	64QAM	MCS7	1	64QAM

*. The average power related with the data rate was measured on one of the channel for 802.11b/g/a/n(20HT)/n(40HT) modes.

Step.2 Decision of SAR test channel

For the SAR test reference, the average output power was measured on all channels for both 2.4GHz and 5GHz bands with the worst data rate condition in step 1 in the above. (*. SAR test considered middle frequency of each band with priority.)

3.6 Confirmation after SAR testing

It was checked that the power drift [W] is within $\pm 5\%$ 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-field 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] = $20\log(E_a)/(E_b)$ (where, Before SAR testing: $E_b[V/m]$ / After SAR testing: $E_a[V/m]$)

Limit of power drift[W] = $\pm 5\%$

Power drift limit (X) [dB] = $10\log(P_drift) = 10\log(1.05/1) = 10\log(1.05) - 10\log(1) = 0.21\text{dB}$

from E-field relations with power.

$S = E \times H = E^2 / \eta = P / (4 \times \pi \times r^2)$ (η : Space impedance) $\rightarrow P = (E^2 \times 4 \times \pi \times r^2) / \eta$

Therefore, The correlation of power and the E-field

Power drift limit (X) dB = $10\log(P_drift) = 10\log(E_drift^2) = 20\log(E_drift)$

From the above mentioned, the calculated power drift of DASY5 system must be the less than $\pm 0.21\text{dB}$.

3.7 Test setup of EUT and SAR measurement procedure

3.7.1 Consideration of SAR test reduction by the antenna separation distance

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

Setup plan	Explanation of SAR test setup plan (*: Refer to Appendix 1 for test setup photographs which had been tested.)	D [mm]	SAR type
Top	When test is required, the top surface of platform is touched to the Flat phantom.	5.9	Body-touch
Front	When test is required, the front surface of platform (LCD side) is touched to the Flat phantom.	13.3	
Rear	When test is required, the rear surface of platform is touched to the Flat phantom.	16.7	
Left	When test is required, the left surface of platform is touched to the Flat phantom.	112.5	
Right	When test is required, the right surface of platform is touched to the Flat phantom.	117.6	
Bottom	When test is required, the bottom surface of platform is touched to the Flat phantom.	171.0	

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

*: Size of platform: 275.1 mm (width) × 188.2 mm (depth) × 30.0 mm (height)

KDB 447498 D01 (v05) was taken into consideration to reduce SAR test.

Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, ≤50mm)												
Band, Mode		Setup Position	Minimum distance		Upper frequency [GHz]	Maximum power			Exclusion factor (*1)	Standalone SAR Test Required? (>3, Tested)		Remarks
			[mm]	[mm] (rounded)		[dBm]	[mW]	[mW] (rounded)				
Wi-Fi, 2.4GHz	11b, 11g (2ch)	Top	5.9	6	2.462	13	20.0	20	5.2	>3.0	Require	SAR for n(20HT) is also reduced. (Power: 11b > n(20))
		Front	13.3	13	2.462	13	20.0	20	2.4	≤3.0	Reduced	
		Rear	16.7	17	2.462	13	20.0	20	1.8	≤3.0	Reduced	
	n(20HT)	Top	5.9	6	2.462	12.5	17.8	18	4.7	>3.0	Require	
Wi-Fi, W52	11a n(20HT) n(40HT)	Top	5.9	6	5.24	14	25.1	25	9.5	>3.0	Require	-
		Front	13.3	13	5.24	14	25.1	25	4.4	>3.0	Require	-
		Rear	16.7	17	5.24	14	25.1	25	3.4	>3.0	Require	-
Wi-Fi, W53	11a n(20HT) n(40HT)	Top	5.9	6	5.32	14	25.1	25	9.6	>3.0	Require	-
		Front	13.3	13	5.32	14	25.1	25	4.4	>3.0	Require	-
		Rear	16.7	17	5.32	14	25.1	25	3.4	>3.0	Require	-
Wi-Fi, W56	11a n(20HT) n(40HT)	Top	5.9	6	5.7	14	25.1	25	9.9	>3.0	Require	-
		Front	13.3	13	5.7	14	25.1	25	4.6	>3.0	Require	-
		Rear	16.7	17	5.7	14	25.1	25	3.5	>3.0	Require	-
Wi-Fi, W58	11a n(20HT) n(40HT)	Top	5.9	6	5.825	13	20.0	20	8.0	>3.0	Require	-
		Front	13.3	13	5.825	13	20.0	20	3.7	>3.0	Require	-
		Rear	16.7	17	5.825	13	20.0	20	2.8	≤3.0	Reduced	-

Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, >50mm)											
Band, Mode		Setup Position (separation (mm))	Minimum distance		Upper frequency [GHz]	Max. tune-up power			Test exclusion thresholds [mW] (*2)	Standalone SAR test Required?	Remarks
			[mm]	[mm] (rounded)		[dBm]	[mW]	[mW] (rounded)			
Wi-Fi, 2.4GHz	11b, 11g (2ch)	Left (112.5) Right (117.6) Bottom (171.0)	112.5	113	2.462	13	20.0	20	726	Reduced	-
	n(20HT)				2.462	12.5	17.8	18	726	Reduced	-
Wi-Fi, W52	11a, n(20HT), n(40HT)				5.24	14	25.1	25	696	Reduced	-
Wi-Fi, W53	11a, n(20HT), n(40HT)				5.32	14	25.1	25	695	Reduced	-
Wi-Fi, W56	11a, n(20HT), n(40HT)				5.7	14	25.1	25	693	Reduced	-
Wi-Fi, W58	11a, n(20HT), n(40HT)				5.825	14	20.0	20	692	Reduced	-

*1. Parenthesis 1), Clause 4.3.1, KDB 447498 D01 (v05r01) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 100MHz-6GHz at test separation distance ≤50mm.

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

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

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

*2. Parenthesis 2), Clause 4.3.1, KDB 447498 D01 (v05r01) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 1.5-6GHz at test separation distance >50mm.

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

By the determined test setup shown above, the SAR test was applied in the following procedures.

Step 1	For 2.4GHz band; Determine "Initial test position" by manufacture's antenna location drawing. Determine the highest reported SAR(1g) of DSSS mode. (*: 11b mode has higher average power than 11g, n(20HT) for all channels.) Determine the highest reported SAR(1g) of OFDM mode.
Step 2	For 5GHz band; Determine the highest reported SAR(1g) of OFDM mode.

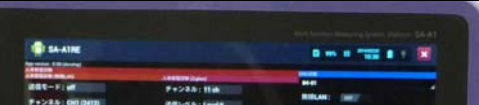
*: During SAR test, the radiated power is always monitored by Spectrum Analyzer.

SECTION 4: Operation of EUT during testing

4.1 Operation mode for SAR testing

This EUT has IEEE.802.11b, g, a, 11n(20HT) and 11n(40HT) continuous transmitting modes.

The frequency and the operation mode which carried out the SAR test are shown below.

Operation mode	11b	11g	11n (20HT)	11a	11n (20HT)	11n (40HT)	11a	11n (20HT)	11n (40HT)	11a	11n (20HT)	11n (40HT)	11a	11n (20HT)	11n (40HT)
Tx band [MHz]	2412~2462			5180~5240 5190 ~5230		5260~5320 5270 ~5310		5500~5700 5510 ~5670		5745~5825 5755 ~5795					
SAR tested/reduced?	tested	tested	reduced	(UNII-1) reduced		(UNII-2A) reduced		(UNII-2C) reduced		(UNII-3) reduced					
Frequency [MHz]	2437	2417	n/a (*)	n/a (*)	n/a (*)	n/a (*)	5300	n/a (*)	5270	5600,	n/a (*)	5590	5785,	n/a (*)	5795
(*) Data rate [Mbps]	1	6	-	-	-	-	6	-	MCS0	6	-	MCS0	6	-	MCS0
Modulation	DBPSK /DSSS	BPSK /OFDM	-	-	-	-	BPSK /OFDM	-	BPSK /OFDM	BPSK /OFDM	-	BPSK /OFDM	BPSK /OFDM	-	BPSK /OFDM
Controlled software	Tx Controlled software: SA-A1RE, version 0.08 Mode: tx99 mode. Frequency: Selected the target frequency. Data Rate: Selected the target data rate. HT40: Selected when 11n(40HT) was tested.														

*. n/a: SAR test was not applied.

*1. (KDB248227, clause 5.3.2) The SAR was measured by lowest data rate.

*2. (KDB248227, clause 5.3.2) The SAR was only measured by lower order modulation of OFDM mode.

*3. (KDB248227, clause 5.3.1) Since highest reported SAR(1g) of UNII-2A was ≤1.2 W/kg, SAR measurement of UNII-1 band was omitted.



SECTION 5: Uncertainty Assessment (SAR measurement)

Uncertainty of SAR measurement (2.4-6GHz) (*.e&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
A Measurement System (DASY5)						(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 Test Sample Related								
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 %	∞
C Phantom and Setup								
20 Phantom uncertainty (shape, thickness tolerances)	±7.5 %	Rectangular	√3	1	1	±4.3 %	±4.3 %	∞
21 Algorithm for correcting SAR (e',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 %	∞
Combined Standard Uncertainty						±13.7 %	±13.6 %	733
Expanded Uncertainty (k=2)						±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 SAR Measurement 100 MHz to 6 GHz v01r01 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.

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 6: Confirmation before testing**6.1 Assessment for the antenna terminal port conducted power of EUT (Worst data rate, worst channel determination)**

Mode	Freq.	Data rate	Power Setting (soft)	Duty cycle	Duty factor	Duty scaled factor	Average power			Peak power	PAR	Target power & factor			SAR Tested/ Reduced	EMC reference power		
							Result		ΔRef.			[dBm]	Deviation from max (-2≤x<0)	Tune-up factor		Average [dBm]	Peak [dBm]	Reference Report
							[dBm]	[mW]										
11b	2412	1	13(default)	99.6	0.02	×1.00	11.94	15.63	-0.93	15.19	3.25	13.0	-1.06	×1.28	Reduced	-	-	-
	2412	2	13(default)	99.1	0.04	×1.01	11.93	15.60	-	15.29	3.36	13.0	-1.07	×1.28	-	-	-	
	2412	5.5	13(default)	98.2	0.08	×1.02	11.93	15.60	-	15.52	3.59	13.0	-1.07	×1.28	-	-	-	
	2412	11	13(default)	98.0	0.09	×1.02	11.88	15.42	-	15.55	3.57	13.0	-1.12	×1.29	-	-	-	
	2437	1	13(default)	99.6	0.02	×1.00	12.87	19.36	(Ref)	16.24	3.37	13.0	-0.13	×1.03	Tested	-	16.67	#1
11g	2462	1	13(default)	99.6	0.02	×1.00	12.90	19.50	0.03	16.60	3.70	13.0	-0.10	×1.02	Reduced	-	-	-
	2412	6	8(default)	98.9	0.05	×1.01	7.37	5.46	-5.60	19.14	11.77	8.0	-0.63	×1.16	Reduced	-	-	-
	2417	6	13(default)	98.9	0.05	×1.01	12.97	19.82	(Ref)	23.36	10.39	13.0	-0.03	×1.01	Tested	-	-	-
	2417	9	13(default)	98.3	0.07	×1.02	11.85	15.31	-	22.63	10.78	13.0	-1.15	×1.30	-	-	-	
	2417	12	13(default)	97.2	0.12	×1.03	11.86	15.35	-	22.58	10.72	13.0	-1.14	×1.30	-	-	-	
	2417	18	13(default)	95.9	0.18	×1.04	11.93	15.60	-	22.82	10.89	13.0	-1.07	×1.28	-	-	-	
	2417	24	13(default)	94.3	0.25	×1.06	12.88	19.41	-	23.58	10.70	13.0	-0.12	×1.03	-	-	-	
	2417	36	13(default)	91.7	0.37	×1.09	12.90	19.50	-	23.55	10.65	13.0	-0.10	×1.02	-	-	-	
	2417	48	12.5(default)	89.8	0.47	×1.11	12.38	17.30	-	22.96	10.58	12.5	-0.12	×1.03	-	-	-	
	2417	56	11(default)	88.8	0.52	×1.13	10.43	11.04	-	21.96	11.53	11.0	-0.57	×1.14	-	-	-	
	2422	6	12.5(default)	98.9	0.05	×1.01	11.52	14.19	-1.45	22.66	11.14	12.5	-0.98	×1.25	-	-	-	
	2427	6	12(default)	98.9	0.05	×1.01	11.04	12.71	-1.93	22.44	11.40	12.0	-0.96	×1.25	-	-	-	
	2432	6	11.5(default)	98.9	0.05	×1.01	10.63	11.56	-2.34	22.13	11.50	11.5	-0.87	×1.22	-	-	-	
	2437	6	11(default)	98.9	0.05	×1.01	10.23	10.54	-2.74	21.87	11.64	11.0	-0.77	×1.19	Reduced	-	22.32	#1
	2442	6	10.5(default)	98.9	0.05	×1.01	9.84	9.64	-3.13	21.64	11.80	10.5	-0.66	×1.16	-	-	-	
	2447	6	10(default)	98.9	0.05	×1.01	9.56	9.04	-3.41	21.94	12.38	0.0	-0.44	×1.11	-	-	-	
	2452	6	9.5(default)	98.9	0.05	×1.01	9.16	8.24	-3.81	20.78	11.62	9.5	-0.34	×1.08	-	-	-	
2457	6	9(default)	98.9	0.05	×1.01	8.87	7.71	-4.10	20.81	11.94	9.0	-0.13	×1.03	-	-	-		
2462	6	8.5(default)	98.9	0.05	×1.01	8.44	6.98	-4.53	20.25	11.81	8.5	-0.06	×1.01	Reduced	-	-	-	
11n (20HT)	2412	MCS0	7(default)	98.5	0.07	×1.02	6.80	4.79	-5.16	18.59	11.79	7.0	-0.20	×1.05	Reduced	-	-	-
	2417	MCS0	12.5(default)	98.5	0.07	×1.02	11.96	15.70	(Ref)	22.69	10.73	12.5	-0.54	×1.13	Reduced	-	-	-
	2417	MCS1	12.5(default)	96.6	0.15	×1.04	11.84	15.28	-	22.34	10.50	12.5	-0.66	×1.16	-	-	-	
	2417	MCS2	12.5(default)	95.6	0.19	×1.05	11.90	15.49	-	22.69	10.79	12.5	-0.60	×1.15	-	-	-	
	2417	MCS3	12(default)	94.3	0.25	×1.06	11.84	15.28	-	22.84	11.00	12.0	-0.16	×1.04	-	-	-	
	2417	MCS4	12(default)	91.4	0.39	×1.09	11.87	15.38	-	22.91	11.04	12.0	-0.13	×1.03	-	-	-	
	2417	MCS5	12(default)	89.5	0.48	×1.12	11.88	15.42	-	22.77	10.89	12.0	-0.12	×1.03	-	-	-	
	2417	MCS6	10.5(default)	88.9	0.51	×1.12	10.06	10.14	-	22.45	12.39	10.5	-0.44	×1.11	-	-	-	
	2417	MCS7	5(default)	87.7	0.57	×1.14	4.29	2.69	-	16.05	11.76	5.0	-0.71	×1.18	-	-	-	
	2422	MCS0	11.5(default)	98.5	0.07	×1.02	11.19	13.15	-0.77	22.39	11.20	11.5	-0.31	×1.07	-	-	-	
	2427	MCS0	11(default)	98.5	0.07	×1.02	10.58	11.43	-1.38	21.96	11.38	11.0	-0.42	×1.10	-	-	-	
	2432	MCS0	10.5(default)	98.5	0.07	×1.02	10.17	10.40	-1.79	21.61	11.44	10.5	-0.33	×1.08	-	-	-	
	2437	MCS0	10(default)	98.5	0.07	×1.02	9.76	9.46	-2.20	21.33	11.57	10.0	-0.24	×1.06	Reduced	-	21.81	#1-
	2442	MCS0	9.5(default)	98.5	0.07	×1.02	9.36	8.63	-2.60	20.39	11.03	9.5	-0.14	×1.03	-	-	-	
	2447	MCS0	9(default)	98.5	0.07	×1.02	8.89	7.74	-3.07	20.66	11.77	9.0	-0.11	×1.03	-	-	-	
	2452	MCS0	8.5(default)	98.5	0.07	×1.02	8.36	6.85	-3.60	20.52	12.16	8.5	-0.14	×1.03	-	-	-	
	2457	MCS0	8(default)	98.5	0.07	×1.02	7.89	6.15	-4.07	20.08	12.19	8.0	-0.11	×1.03	-	-	-	
2462	MCS0	7.5(default)	98.5	0.07	×1.02	7.29	5.36	-4.67	18.63	11.34	7.5	-0.21	×1.05	Reduced	-	-	-	

(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

(cont'd)

Mode	Freq.	Data rate	Power Setting (soft)	Duty cycle	Duty factor	Duty scaled factor	Average power		Peak power	PAR	Target power & factor			SAR Tested/ Reduced	EMC reference power		
							Result				ΔRef.	Target (including variation)	Deviation from max (-2≤x<0)		Tune-up factor [-]	Average [dBm]	Reference Report
							[dBm]	[mW]									
11a (W56)	[MHz]	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dB]	[dB]	[dBm]	[dB]	[-]	-	-		
	5520	6	14(default)	98.3	0.08	×1.02	12.34	17.14	-0.01	19.56	7.22	14.0	-1.66	×1.47	-	-	
	5540	6	14(default)	98.3	0.08	×1.02	12.28	16.90	-0.07	19.33	7.05	14.0	-1.72	×1.49	-	-	
	5560	6	14(default)	98.3	0.08	×1.02	12.34	17.14	-0.01	19.21	6.87	14.0	-1.66	×1.47	-	-	
	5580	6	14(default)	98.3	0.08	×1.02	12.16	16.44	-0.19	19.32	7.16	14.0	-1.84	×1.53	-	-	
	5600	6	14(default)	98.3	0.08	×1.02	12.35	17.18	(Ref)	19.44	7.09	14.0	-1.65	×1.46	Tested	-	-
	5620	6	14(default)	98.3	0.08	×1.02	12.28	16.90	-0.07	19.24	6.96	14.0	-1.72	×1.49	-	-	
	5640	6	14(default)	98.3	0.08	×1.02	12.19	16.56	-0.16	19.43	7.24	14.0	-1.81	×1.52	-	-	
	5660	6	14(default)	98.3	0.08	×1.02	12.12	16.29	-0.23	19.29	7.17	14.0	-1.88	×1.54	-	-	
	5680	6	14(default)	98.3	0.08	×1.02	12.32	17.06	-0.03	19.26	6.94	14.0	-1.68	×1.47	-	-	
11a (W58)	5700	6	14(default)	98.3	0.08	×1.02	12.31	17.02	-0.04	19.11	6.80	14.0	-1.69	×1.48	Reduced	12.315 (24Mbps)	#4
	5745	6	13(default)	98.3	0.08	×1.02	12.32	17.06	0.03	19.72	7.40	13.0	-0.68	×1.17	Reduced	12.33	#3
	5765	6	13(default)	98.3	0.08	×1.02	12.31	17.02	0.02	19.84	7.53	13.0	-0.69	×1.17	-	-	
	5785	6	13(default)	98.3	0.08	×1.02	12.29	16.94	(Ref)	19.62	7.33	13.0	-0.71	×1.18	Tested	-	-
	5785	9	13(default)	97.9	0.09	×1.02	12.23	16.71	-	19.58	7.35	13.0	-0.77	×1.19	-	-	
	5785	12	13(default)	96.3	0.16	×1.04	12.26	16.83	-	19.58	7.32	13.0	-0.74	×1.19	-	-	
	5785	18	13(default)	94.6	0.24	×1.06	12.30	16.98	-	19.30	7.00	13.0	-0.70	×1.17	-	-	
	5785	24	13(default)	93.3	0.30	×1.07	12.31	17.02	-	19.66	7.35	13.0	-0.69	×1.17	-	-	
	5785	36	12(default)	90.8	0.42	×1.10	11.47	14.03	-	19.55	8.08	12.0	-0.53	×1.13	-	-	
	5785	48	11.5(default)	87.7	0.57	×1.14	11.22	13.24	-	19.27	8.05	11.5	-0.28	×1.07	-	-	
11n (20HT) (W52)	5785	56	9.5(default)	87.3	0.59	×1.15	9.32	8.55	-	18.47	9.15	9.5	-0.18	×1.04	-	-	
	5805	6	13(default)	98.3	0.08	×1.02	11.99	15.81	-0.30	19.68	7.69	13.0	-1.01	×1.26	-	-	
	5825	6	13(default)	98.3	0.08	×1.02	12.21	16.63	-0.08	19.59	7.38	13.0	-0.79	×1.20	-	12.33	#3
	5180	MCS0	13(default)	98.2	0.08	×1.02	12.45	17.58	-1.33	21.81	9.36	13.0	-0.55	×1.14	Reduced	-	-
	5200	MCS0	14(default)	98.2	0.08	×1.02	13.58	22.80	-0.20	22.39	8.81	14.0	-0.42	×1.10	-	-	
	5220	MCS0	14(default)	98.2	0.08	×1.02	13.78	23.88	0.00	22.23	8.45	14.0	-0.22	×1.05	Reduced	13.92 (MCS1)	#2
	5240	MCS0	14(default)	98.2	0.08	×1.02	13.80	23.99	0.02	22.25	8.45	14.0	-0.20	×1.05	Reduced	-	-
	5260	MCS0	14(default)	98.2	0.08	×1.02	13.71	23.50	0.23	21.88	8.17	14.0	-0.29	×1.07	Reduced	-	-
	5260	MCS1	14(default)	96.2	0.17	×1.04	13.53	22.54	-	21.76	8.23	14.0	-0.47	×1.11	-	-	
	5260	MCS2	14(default)	94.0	0.27	×1.06	13.64	23.12	-	22.01	8.37	14.0	-0.36	×1.09	-	-	
11n (20HT) (W53)	5260	MCS3	14(default)	92.4	0.34	×1.08	13.67	23.28	-	22.08	8.41	14.0	-0.33	×1.08	-	-	
	5260	MCS4	14(default)	91.7	0.38	×1.09	13.65	23.17	-	21.88	8.23	14.0	-0.35	×1.08	-	-	
	5260	MCS5	12.5(default)	90.9	0.41	×1.10	11.98	15.78	-	20.93	8.95	12.5	-0.52	×1.13	-	-	
	5260	MCS6	11(default)	87.3	0.59	×1.15	10.64	11.59	-	20.68	10.04	11.0	-0.36	×1.09	-	-	
	5260	MCS7	8(default)	85.9	0.66	×1.16	7.48	5.60	-	17.48	10.00	8.0	-0.52	×1.13	-	-	
	5280	MCS0	14(default)	98.2	0.08	×1.02	13.67	23.28	0.19	22.05	8.38	14.0	-0.33	×1.08	-	-	
	5300	MCS0	14(default)	98.2	0.08	×1.02	13.48	22.28	(Ref)	22.14	8.66	14.0	-0.52	×1.13	Tested	-	-
	5320	MCS0	14(default)	98.2	0.08	×1.02	13.44	22.08	-0.04	22.11	8.67	14.0	-0.56	×1.14	Reduced	13.74 (MCS1)	#2
	5500	MCS0	14(default)	98.2	0.08	×1.02	12.34	17.14	-0.02	19.39	7.05	14.0	-1.66	×1.47	Reduced	-	-
	5500	MCS1	14(default)	96.2	0.17	×1.04	12.22	16.67	-	19.22	7.00	14.0	-1.78	×1.51	-	-	
11n (20HT) (W56)	5500	MCS2	14(default)	94.0	0.27	×1.06	12.32	17.06	-	19.41	7.09	14.0	-1.68	×1.47	-	-	
	5500	MCS3	14(default)	92.4	0.34	×1.08	12.27	16.87	-	19.36	7.09	14.0	-1.73	×1.49	-	-	
	5500	MCS4	12.5(default)	91.7	0.38	×1.09	11.26	13.37	-	18.98	7.72	12.5	-1.24	×1.33	-	-	
	5500	MCS5	12.5(default)	90.9	0.41	×1.10	11.24	13.30	-	18.86	7.62	12.5	-1.26	×1.34	-	-	
	5500	MCS6	10(default)	87.3	0.59	×1.15	8.88	7.73	-	18.21	9.33	10.0	-1.12	×1.29	-	-	
	5500	MCS7	6.5(default)	85.9	0.66	×1.16	5.36	3.44	-	14.48	9.12	6.5	-1.14	×1.30	-	-	
	5520	MCS0	14(default)	98.2	0.08	×1.02	12.33	17.10	-0.03	18.97	6.64	14.0	-1.67	×1.47	-	-	
	5540	MCS0	14(default)	98.2	0.08	×1.02	12.33	17.10	-0.03	19.09	6.76	14.0	-1.67	×1.47	-	-	
	5560	MCS0	14(default)	98.2	0.08	×1.02	12.35	17.18	-0.01	19.43	7.08	14.0	-1.65	×1.46	-	-	
	5580	MCS0	14(default)	98.2	0.08	×1.02	12.28	16.90	-0.08	19.58	7.30	14.0	-1.72	×1.49	-	-	
11n (20HT) (W58)	5600	MCS0	14(default)	98.2	0.08	×1.02	12.36	17.22	(Ref)	19.55	7.19	14.0	-1.64	×1.46	Tested	-	-
	5620	MCS0	14(default)	98.2	0.08	×1.02	12.39	17.34	0.03	19.41	7.02	14.0	-1.61	×1.45	-	-	
	5640	MCS0	14(default)	98.2	0.08	×1.02	12.36	17.22	0.00	19.30	6.94	14.0	-1.64	×1.46	-	-	
	5660	MCS0	14(default)	98.2	0.08	×1.02	12.31	17.02	-0.05	19.23	6.92	14.0	-1.69	×1.48	-	-	
	5680	MCS0	14(default)	98.2	0.08	×1.02	12.38	17.30	0.02	19.31	6.93	14.0	-1.62	×1.45	-	-	
	5700	MCS0	14(default)	98.2	0.08	×1.02	12.47	17.66	0.11	19.40	6.93	14.0	-1.53	×1.42	Reduced	13.123 (MCS1)	#4
	5745	MCS0	13(default)	98.2	0.08	×1.02	12.54	17.95	0.14	19.96	7.42	13.0	-0.46	×1.11	Reduced	12.68 (MCS3)	#3
	5765	MCS0	13(default)	98.2	0.08	×1.02	12.52	17.86	0.12	20.04	7.52	13.0	-0.48	×1.12	-	-	
	5785	MCS0	13(default)	98.2	0.08	×1.02	12.40	17.38	(Ref)	19.84	7.44	13.0	-0.60	×1.15	Tested	-	-
	5785	MCS1	13(default)	96.2	0.17	×1.04	12.32	17.06	-	19.68	7.36	13.0	-0.68	×1.17	-	-	

(cont'd)

UL Japan, Inc.

Shonan EMC Lab.

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

(cont'd)

Mode	Freq.	Data rate	Power Setting (soft)	Duty cycle	Duty factor	Duty scaled factor	Average power			Peak power	PAR	Target power & factor			SAR Tested/ Reduced	EMC reference power	
							Result		ΔRef.			Target (including variation)	Deviation from max (-2≤x<0)	Tune-up factor [-]		Average [dBm]	Reference Report
							[dBm]	[mW]									
11n (40HT) (W52)	5190	MCS0	9.5(default)	96.7	0.15	×1.04	8.15	6.53	-4.81	18.13	9.98	9.5	-1.35	×1.36	Reduced	-	-
	5230	MCS0	14(default)	96.7	0.15	×1.04	12.96	19.77	(Ref)	21.49	8.53	14.0	-1.04	×1.27	Reduced	12.99 (MCS3)-	#2
11n (40HT) (W53)	5270	MCS0	14(default)	96.7	0.15	×1.04	13.07	20.28	2.20	21.46	8.39	14.0	-0.93	×1.24	Tested	-	-
	5270	MCS1	14(default)	94.8	0.23	×1.05	12.95	19.72	-	21.45	8.50	14.0	-1.05	×1.27	-	-	-
	5270	MCS2	14(default)	92.0	0.36	×1.09	12.95	19.72	-	21.52	8.57	14.0	-1.05	×1.27	-	-	-
	5270	MCS3	14(default)	89.7	0.47	×1.11	13.02	20.04	-	21.78	8.76	14.0	-0.98	×1.25	-	13.07	#2
	5270	MCS4	14(default)	86.8	0.62	×1.15	13.04	20.14	-	21.70	8.66	14.0	-0.96	×1.25	-	-	-
	5270	MCS5	12.5(default)	83.7	0.77	×1.19	12.00	15.85	-	21.12	9.12	12.5	-0.50	×1.12	-	-	-
	5270	MCS6	11(default)	82.9	0.81	×1.21	10.09	10.21	-	19.77	9.68	11.0	-0.91	×1.23	-	-	-
	5270	MCS7	8(default)	82.8	0.82	×1.21	7.29	5.36	-	16.29	9.00	8.0	-0.71	×1.18	-	-	-
	5310	MCS0	11.5(default)	96.7	0.15	×1.04	10.87	12.22	(Ref)	21.01	10.14	11.5	-0.63	×1.16	Reduced	-	-
	5510	MCS0	14(default)	96.7	0.15	×1.04	12.29	16.94	-0.03	19.60	7.31	14.0	-1.71	×1.48	Reduced	-	-
11n (40HT) (W56)	5510	MCS1	14(default)	94.8	0.23	×1.05	12.07	16.11	-	19.26	7.19	14.0	-1.93	×1.56	-	-	-
	5510	MCS2	14(default)	92.0	0.36	×1.09	12.08	16.14	-	19.39	7.31	14.0	-1.92	×1.56	-	-	-
	5510	MCS3	14(default)	89.7	0.47	×1.11	12.25	16.79	-	19.55	7.30	14.0	-1.75	×1.50	-	-	-
	5510	MCS4	12.5(default)	86.8	0.62	×1.15	11.26	13.37	-	19.12	7.86	12.5	-1.24	×1.33	-	-	-
	5510	MCS5	12.5(default)	83.7	0.77	×1.19	11.31	13.52	-	19.27	7.96	12.5	-1.19	×1.32	-	-	-
	5510	MCS6	10(default)	82.9	0.81	×1.21	8.85	7.67	-	17.80	8.95	10.0	-1.15	×1.30	-	-	-
	5510	MCS7	6.5(default)	82.8	0.82	×1.21	5.15	3.27	-	14.03	8.88	6.5	-1.35	×1.36	-	-	-
	5550	MCS0	14(default)	96.7	0.15	×1.04	12.33	17.10	0.01	19.02	6.69	14.0	-1.67	×1.47	-	-	-
	5590	MCS0	14(default)	96.7	0.15	×1.04	12.32	17.06	(Ref)	19.61	7.29	14.0	-1.68	×1.47	Tested	-	-
	5630	MCS0	14(default)	96.7	0.15	×1.04	12.31	17.02	-0.01	19.38	7.07	14.0	-1.69	×1.48	-	-	-
5670	MCS0	14(default)	96.7	0.15	×1.04	12.29	16.94	-0.03	19.34	7.05	14.0	-1.71	×1.48	Reduced	-	-	
11n (40HT) (W58)	5755	MCS0	13(default)	96.7	0.15	×1.04	12.36	17.22	-0.07	20.36	8.00	14.0	-0.64	×1.16	Reduced	12.80 (MCS3)	#3
	5795	MCS0	13(default)	96.7	0.15	×1.04	12.43	17.50	(Ref)	20.09	7.66	13.0	-0.57	×1.14	Tested	-	-
	5795	MCS1	13(default)	94.8	0.23	×1.05	12.26	16.83	-	19.94	7.68	13.0	-0.74	×1.19	-	-	-
	5795	MCS2	13(default)	92.0	0.36	×1.09	12.39	17.34	-	20.03	7.64	13.0	-0.61	×1.15	-	-	-
	5795	MCS3	13(default)	89.7	0.47	×1.11	12.34	17.14	-	20.21	7.87	13.0	-0.66	×1.16	-	-	-
	5795	MCS4	12(default)	86.8	0.62	×1.15	11.84	15.28	-	19.58	7.74	13.0	-0.16	×1.04	-	-	-
	5795	MCS5	11(default)	83.7	0.77	×1.19	10.87	12.22	-	19.53	8.66	12.0	-0.13	×1.03	-	-	-
	5795	MCS6	9.5(default)	82.9	0.81	×1.21	9.39	8.69	-	18.68	9.29	11.0	-0.11	×1.03	-	-	-
	5795	MCS7	5(default)	82.8	0.82	×1.21	4.85	3.05	-	13.55	8.70	9.5	-0.15	×1.04	-	-	-

*. SAR test was applied.

*. Freq.: Frequency, PAR: Peak average ratio ("Peak power"- "Average power", in dBm), Ch: channel, D/R: Data Rate, pwr: power, Ref: Reference.

*. Calculating formula: Average power-result: Results (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)+(duty factor, dB)

Peak power-result: Results (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)

Duty factor: (duty factor, dBm) = $10 \times \log(100/(\text{duty cycle, \%}))$

Deviation from max.: (Power deviation, dB) = (results power (average, dBm)) - (Max.-specification output power (average, dBm))

Duty scaled factor: Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = $100(\%) / (\text{duty cycle, \%})$ Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = $1 / (10^{(\text{"Deviation from max., dB"} / 10)})$

*. Date measured February 2-5, 2015 / measured by: Tomochika Sato (23~24 deg C./36~45 %RH, at S/R#7)

*. (Reference report number) #1: 32IE0154-HO-01-A-R1; #2: 32IE0154-HO-01-C-R1; #3: 10517042H-R1, #1~#3 reports were tested and published by UL Japan.

#4: SL13032601-SLX-003 (FCC 14.407) RF Rev1.0, #4 report was tested and published by SIEMIC, INC..

*. Uncertainty of antenna port conducted test; Power measurement uncertainty above 1GHz for this test was: ($\pm$) 1.5dB

SECTION 7: Measurement results**7.1 SAR test results (Body)**

Measurement date: February 6 and 7, 2015

Measurement by: Tomochika Sato

Target Frequency [MHz]	Liquid type	Liquid parameters (Body liquid) (*a)							ASAR Coefficients (*c)		Date measured			
		Permittivity (εr) [-]			Conductivity [S/m]			Temp. [deg.C.]	Depth [mm]	ΔSAR (1g) [%]		Correction required?		
		Target	Measured		Limit (*b)	Target	Measured						Limit (*b)	
			Meas.	Δεr [%]			Meas.							Δσ [%]
2417	Body	52.74	51.88	-1.6	-5% ≤ εr-meas. ≤ 0%	1.918	1.937	+1.0	21.5	154	+0.85	not required.	February 6, 2015 before SAR test	
2437		52.72	51.84	-1.7		1.938	1.967	+1.5			+1.12	not required.		
5270		48.92	47.29	-3.3		5.381	5.526	+2.7	22.2	153	+0.59	not required.	February 6, 2015 before SAR test	
5300		48.88	47.32	-3.2		5.416	5.594	+3.3			+0.53	not required.		
5590		48.49	46.80	-3.5		5.755	5.947	+3.4	22.2	153	+0.54	not required.	February 7, 2015 before SAR test	
5600		48.47	46.83	-3.4		5.766	5.972	+3.6			+0.52	not required.		
5785		48.22	46.48	-3.6		5.982	6.237	+4.3			+0.53	not required.		
5795		48.21	46.39	-3.8		5.994	6.237	+4.1			+0.57	not required.		

[SAR measurement results]

*. Initial test was determined by the manufacture's detail drawing for antenna location of platform.

SAR measurement results (Body)											Reported SAR (1g) [W/kg]						Remarks
Mode	Freq. [MHz]	Data rate	Setup		Liq. temp. [deg.C]	Power drift [dB]	SAR (1g) [W/kg]			SAR plot # in Appendix 2-2	Conducted power [dBm]		Scaled factor	Tuned -up SAR (*d)	Duty scaled factor H	SAR duty corrected	
			Position	Gap [mm]			Max.value of multi-peak				Ave.	Max.					
							Meas.	ASAR [%]	ASAR corrected								
1) 2.4GHz band:																	
11g	2417	6Mbps /OFDM	Top	0	21.6/21.6	-0.20	0.034	+0.85	n/a (*c)	Plot 1-1	12.97	13.0	×1.01	0.034	×1.01	0.034	-
11b	2437	1Mbps /DSSS	Top	0	21.6/21.6	0.02	0.086	+1.12	n/a (*c)	Plot 1-2	12.87	13.0	×1.03	0.089	×1.00	0.089	Highest,2.4GHz
2) W53 band (UNII-2A, 5260 MHz-5320 MHz):																	
11a	5300	6Mbps /OFDM	Top	0	22.0/22.0	0.13	0.122	+0.53	n/a (*c)	Plot 2-1	13.50	14.0	×1.12	0.137	×1.02	0.140	-
			Rear	0	22.0/22.0	-0.15	0.025	+0.53	n/a (*c)	Plot 2-2	13.50	14.0	×1.12	0.028	×1.02	0.029	-
			Front	0	22.0/22.0	-0.18	0.016	+0.53	n/a (*c)	Plot 2-3	13.50	14.0	×1.12	0.018	×1.02	0.018	-
n(40HT)	5270	MCS0 /OFDM	Top	0	22.0/22.0	-0.08	0.119	+0.59	n/a (*c)	Plot 2-4	13.07	14.0	×1.24	0.148	×1.04	0.154	Highest,W53
3) W56 band (UNII-2C, 5500 MHz-5700 MHz):																	
11a	5600	6Mbps /OFDM	Top	0	22.0/22.0	0	0.136	+0.52	n/a (*c)	Plot 3-1	12.35	14.0	×1.46	0.199	×1.02	0.203	Highest,W56
			Rear	0	22.0/22.0	-0.20	0.033	+0.52	n/a (*c)	Plot 3-2	12.35	14.0	×1.46	0.048	×1.02	0.049	-
			Front	0	22.0/22.0	0.16	0.027	+0.52	n/a (*c)	Plot 3-3	12.35	14.0	×1.46	0.040	×1.02	0.041	-
n(40HT)	5590	MCS0 /OFDM	Top	0	22.0/22.0	-0.03	0.130	+0.54	n/a (*c)	Plot 3-4	12.32	14.0	×1.47	0.191	×1.04	0.199	-
4) W58 band (UNII-3, 5745 MHz-5825 MHz):																	
11a	5785	6Mbps /OFDM	Top	0	22.0/22.0	-0.20	0.131	+0.53	n/a (*c)	Plot 4-1	12.29	13.0	×1.18	0.155	×1.02	0.158	Highest,W58
			Rear	0	22.0/22.0	-0.18	0.040	+0.53	n/a (*c)	Plot 4-2	12.29	13.0	×1.18	0.047	×1.02	0.048	-
			Front	0	22.0/22.0	0.17	0.043	+0.53	n/a (*c)	Plot 4-3	12.29	13.0	×1.18	0.051	×1.02	0.052	-
n(40HT)	5795	MCS0 /OFDM	Top	0	22.0/22.0	-0.04	0.084	+0.57	n/a (*c)	Plot 4-4	12.43	13.0	×1.14	0.096	×1.04	0.100	-

Notes:

*. (KDB248227, clause 5.3.1) Since highest reported SAR(1g) of UNII-2A was ≤1.2 W/kg, SAR measurement of UNII-1 band was omitted.

*. Freq.: Frequency; Gap: It is the separation distance between the nearest position of platform outer surface and the bottom outer surface of phantom;

Liq.temp: Liquid temperature; Max.: maximum; Meas.: Measured value; Ave.: Average; n/a: not applied.

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

SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
2417, 2437 MHz	2450 MHz	within ±50 MHz of calibration frequency	6.88	±12.0 %
5270, 5300 MHz	5300 MHz	within ±110 MHz of calibration frequency	4.18	±13.1 %
5590, 5600 MHz	5600 MHz	within ±110 MHz of calibration frequency	3.81	±13.1 %
5785, 5795 MHz	5800 MHz	within ±110 MHz of calibration frequency	4.05	±13.1 %

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

*a. The target value is a parameter defined in Appendix A of KDB865664 D01, the dielectric parameters suggested for head and body tissue simulating liquid are given at 3000 and 5800 MHz. Parameters for the frequencies 3000-5800 MHz were obtained using linear interpolation. Above 5800MHz were obtained using linear extrapolation.

*b. Refer to KDB865664 D01, item 2), Clause 2.6; "When nominal tissue dielectric parameters are recorded in the probe calibration data; for example, only target values and tolerance are reported, the measured εr and σ of the liquid used in routine measurements must be: ≤ the target εr and ≥ the target σ values and also within 5% of the required target dielectric parameters."

c. The coefficients are parameters defined in clause E.3.3.2, IEEE Std 1528(2013). Since the measured liquid parameters were ≤ the target εr and ≥ the target σ values and also within 5% of the required target dielectric parameters, the measured SAR was not compensated by ΔSAR coefficients (. Clause 2) of 2.6, KDB865664 D01).

Calculating formula: $\Delta\text{SAR}(1\text{g}) = C_{\text{er}} \times \Delta\epsilon_r + C_{\sigma} \times \Delta\sigma$, $C_{\text{er}} = 7.854\text{E-}4 \times \text{F}^3 + 9.402\text{E-}3 \times \text{F}^2 - 2.742\text{E-}2 \times \text{F} + 0.2026 / C_{\sigma} = 9.804\text{E-}3 \times \text{F}^3 - 8.661\text{E-}2 \times \text{F}^2 + 2.981\text{E-}2 \times \text{F} + 0.7829$

ASAR corrected SAR (1g) (W/kg) = (Meas. SAR(1g) (W/kg)) × (100 - (ΔSAR(%)) / 100

(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

(cont'd)

- *d. Tuned-up SAR by scaled factor: Accordance with KDB 447498 D01; "When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance (clause 4, 4.1, 4))." (Refer to section 6 in this report for "Scaled factor" of channels, each operation mode.)

Calculating formula: $\text{Tuned-up SAR (1g) (W/kg)} = (\Delta\text{SAR corrected SAR (1g) (W/kg)}) \times (\text{Scaled factor})$

- *e. (KDB248227 D01v02)(Clause 2.2; Duty Factor Control)

When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance.

Calculating formula: $\text{Reported SAR (1g) (=SAR duty corrected SAR (1g) (W/kg))} = (\text{Tuned-up SAR (1g) (W/kg)}) \times (\text{Duty scaled factor})$

(Clause 5: SAR TEST PROCEDURE, in KDB248227 D01v02)

5.1.1 Initial Test Position SAR Test Reduction Procedure

- 1) When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combination within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
- 2) When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
- 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 is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

5.2.1 802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

- 1) When the reported SAR of the highest measured maximum output power channel (section 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.