SAR TEST REPORT

Test Report No.: 12261909S-A

Applicant : **OLYMPUS CORPORATION**
Type of Equipment : **Wireless LAN/Bluetooth Module**
Model No. : **S080WIFI-PCA** (*. Installed into the specified platform: Digital Camera)
FCC ID : **YSKW80**
Test Standard : **FCC 47CFR §2.1093**
Test Result : **Complied**

Highest Reported SAR(1g) [W/kg]				Platform			Remarks (DTS band)				Remarks (UNII band)				Reference report number
DTS band	U-NII band	SAR type	SAR Limit	No.	Type	Model	Frequency [MHz]	Mode	Output power (average) [dBm]		Frequency [MHz]	Mode	Output power (average) [dBm]		
									Measured	Max.			Measured	Max	
0.17	0.34	Body-worn	1.6	2	Digital Camera	IM010	2412	11b	11.16	12.5	5290	ac80	9.39	10	This report.
*. This Wireless LAN/Bluetooth Module had installed into the following platforms under 0.8W/kg of reported SAR(1g) (KDB447498 D01 (v06);															
0.59	0.54	Body-worn	1.6	1	DIGITAL VOICE RECORDER	DS-9500	2412	11g	12.48	12.5	5700	11a	7.70	9	11834856S-A

*. **Highest reported SAR (1g) across all exposure conditions and on all platforms = "0.59 W/kg (body-worn)."**
*. Since highest reported SAR (1g) on a platform of S080WIFI-PCA (EUT) which obtained in accordance with KDB447498 (v06) was kept under 0.8 W/kg, this EUT was approved to operate multi-platform (which were tested in above.).

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7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. 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: May 11~21 and August 8~21, 2018

Test engineer: H. Naka
Hiroshi Naka
Engineer, Consumer Technology Division

Approved by: T. Imamura
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".

ilac-MRA
JAB Testing
RTL02610

REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	12261909S-A	September 12, 2018	-	-

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

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Contents of appendixes

SECTION 1: Customer information

Company Name	OLYMPUS CORPORATION
Address	2951 Ishikawa-machi, Hachioji-shi, Tokyo 192-8507, Japan
Telephone Number	81-42-642-2283
Contact Person	Mami Nakanishi

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT and platform

	EUT	Platform
Type of Equipment	Wireless LAN/Bluetooth Module	Digital Camera
Model Number	S080WIFI-PCA	IM010
Serial Number	No. 45	PP1-1-26
Condition of EUT	Production prototype	Engineering prototype
	(*. Not for sale: These samples are equivalent to mass-produced items.)	
Receipt Date of Sample	April 24, 2018 (*. EUT for power measurement.) *. No modification by the test Lab. July 25, 2018 (*. EUT for SAR test.) *. No modification by the test Lab. *.After power measurement, the EUT was returned to a customer to install into a platform.	
Rating	DC3.35V~ DC4.2V	DC7.4V (Li-ion battery) / DC9V (AC adaptor) / DC 15V (USB PD)
	*. The EUT is installed into the specified the platform that was operated by the re-chargeable Li-ion battery.	
Country of Mass-production	Vietnam	Vietnam
Category Identified	Portable device (*. Since EUT may contact and/or very close to a human body during Wi-Fi or Bluetooth operation, the partial-body SAR (1g) shall be observed.)	
Feature of EUT	Model: S080WIFI-PCA (referred to as the EUT in this report) is a Wireless LAN/Bluetooth Module which installs into the specified platform.	
SAR Accessory	None	

2.2 Product Description (Wireless LAN/Bluetooth Module)

Equipment type		Transceiver
Frequency of operation	Bluetooth	2.4GHz band: (2402~2480) MHz (BDR (Basic Data Rate), EDR (Enhanced Data Rate), BLE (Low Energy mode))
	Wi-Fi	2.4GHz band: (2412~2462) MHz (b, g, n20); 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 (BLE)
	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+ π/4-DQPSK, GFSK+ 8DPSK)
	Wi-Fi	DSSS: DBPSK, DQPSK, CCK (b); OFDM: BPSK, QPSK, 16QAM, 64QAM, 256QAM (*.256QAM is only for ac80) (g, a, n20, ac20, n40, ac40, ac80)

Typical and maximum transmit power (*. The measured output power (conducted) refers to section 6 in this report.)

Mode	Data rate	2.4GHz		U-NII-1		U-NII-2A		U-NII-2C		U-NII-3	
		Typical	Max.	Typical	Max.	Typical	Max.	Typical	Max.	Typical	Max.
BDR	1Mbps	N/A	8.3 dBm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EDR	1Mbps	N/A	4.1 dBm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLE	2Mbps	N/A	7.3 dBm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
b	1~11Mbps	10 dBm	12.5 dBm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
g	6~54Mbps	10 dBm	12.5 dBm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
a	6~54Mbps	N/A	N/A	8 dBm	10 dBm	8 dBm	10 dBm	7 dBm	9 dBm	7 dBm	9 dBm
n20	MCS0~7	10 dBm	12.5 dBm	8 dBm	10 dBm	8 dBm	10 dBm	7 dBm	9 dBm	7 dBm	9 dBm
ac20	MCS0~8	N/A	N/A	8 dBm	10 dBm	8 dBm	10 dBm	7 dBm	9 dBm	7 dBm	9 dBm
n40	MCS0~7	N/A	N/A	8 dBm	10 dBm	8 dBm	10 dBm	7 dBm	9 dBm	7 dBm	9 dBm
ac40	MCS0~9	N/A	N/A	8 dBm	10 dBm	8 dBm	10 dBm	7 dBm	9 dBm	7 dBm	9 dBm
ac80	MCS0~9	N/A	N/A	8 dBm	10 dBm	8 dBm	10 dBm	7 dBm	9 dBm	7 dBm	9 dBm

Power rating	DC 3.35V~ DC 4.2V				
Quantity of Antenna	1 piece	Antenna type	Invert L	Antenna connector type	Not applicable (printed)
Antenna gain (peak)	-2.9 dBi (2.4GHz band), 1.3 dBi (5GHz band)				

*. BLE: Bluetooth Low Energy; BDR: Basic Data Rate; EDR: Enhanced Data Rate; 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 802.11n(40VHT), ac80: IEEE 802.11ac(80VHT)

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

*. Wi-Fi and Bluetooth were not transmitted simultaneously. Therefore, simultaneously transmitted SAR was not considered.

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.

KDB 447498 D01 (v06):	General RF exposure guidance
KDB 248227 D01 (v02r02):	SAR Guidance for IEEE 802.11 (Wi-Fi) transmitters
KDB 865664 D01 (v01r04):	SAR measurement 100MHz to 6GHz
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.

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

Test Procedure	SAR measurement; KDB 447498, KDB 248227, KDB 865664, IEEE Std.1528					
Category	FCC 47CFR §2.1093 (Portable device)			**SAR type**	Body touch	
Band (Operation frequency [MHz])	**Bluetooth** (2402-2480)	**Wi-Fi (DTS)** (2412-2462)	**Wi-Fi (U-NII-1)** (5180~5240)	**Wi-Fi (U-NII-2A)** (5260~5320)	**Wi-Fi (U-NII-2C)** (5500~5700)	**Wi-Fi (U-NII-3)** (5745~5825)
Results (Reported SAR(1g))	SAR test: Not required (lower power)	**Complied**	SAR test: Not required (<1.2W/kg at U-NII-2A)	**Complied**	**Complied**	**Complied**
SAR (1g) Limit [W/kg]	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**
Reported SAR(1g) value	n/a	**0.17 W/kg**	n/a	**0.34 W/kg**	**0.24 W/kg**	**0.24 W/kg**
Measured SAR value	n/a	0.121 W/kg	n/a	0.227 W/kg	0.160 W/kg	0.166 W/kg
Mode, frequency[MHz]	BLE	b(1Mbps), 2412	n/a	ac80(MCS0), 5290	ac80(MCS0), 5530	ac80(MCS0), 5775
Duty cycle [%] (scaled factor)	-	99.0 (×1.01)	-	77.0 (×1.14)	77.0 (×1.14)	77.0 (×1.14)
Output average power [dBm] (max. power, scaled factor)	max.power: 7.5 dBm	11.16 (max.12.5, ×1.36)		9.39 (max.10, ×1.15)	8.31 (max.9, ×1.17)	8.57 (max.9, ×1.10)

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

*. BLE: Bluetooth Low Energy; BDR: Basic Data Rate; EDR: Enhanced Data Rate; 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 802.11n(40VHT), ac80: IEEE 802.11ac(80VHT), n/a: not applied.

*. Since Bluetooth, Wii-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 ^ ("Δmax (max.power - burst average power), dB" / 10)), Duty scaled factor [-] = 100(%) / (duty cycle, %)

Test outline: Where the EUT is built into a new platform (2), it was verified whether multi-platform conditions can be suited in according with section 2) of 5.2.2 in KDB447498 D01 (v06).

Consideration of the test results:	**The highest reported SAR (1g) of this platform (2) was kept; ≤ 0.8 W/kg.** **Since highest reported SAR (1g) on this EUT's platform obtained in accordance with KDB447498 D01 (v06) was kept under 0.8 W/kg, this EUT was approved to operate multi-platform.**

3.4 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
*. Refers to next page for the test room which was used.

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

3.5 Confirmation before SAR testing

Average power for SAR tests

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.

*. 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))

Step.1 Data rate check (*. The power measurement was applied to the following data rate in each operation mode.)

802.11b		802.11g		802.11a		802.11n(20HT) (1×SS)			802.11n(40HT) (1×SS)			Bluetooth		
Modulation	Data rate	Modulation	Data rate	Modulation	Data rate	MCS Index	Data rate	Modulation	MCS Index	Data rate	Modulation	Type	Modulation	Packet type
DBPSK/DSSS	1	BPSK/OFDM	6	BPSK/OFDM	6	0	6.5	BPSK/OFDM	0	13.5	BPSK/OFDM	BLE	GFSK/FHSS	BLE (1Mbps)
DQPSK/DSSS	2	BPSK/OFDM	9	BPSK/OFDM	9	1	13	QPSK/OFDM	1	27	QPSK/OFDM	BDR	GFSK/FHSS	DH5 (1Mbps)
CCK/DSSS	5.5	QPSK/OFDM	12	QPSK/OFDM	12	2	19.5	QPSK/OFDM	2	40.5	QPSK/OFDM	EDR2	π/4-DQPSK/FHSS	2-DH5 (2Mbps)
CCK/DSSS	11	QPSK/OFDM	18	QPSK/OFDM	18	3	26	16QAM/OFDM	3	54	16QAM/OFDM	EDR3	8DPSK/FSSS	3-DH5 (3Mbps)
Data rate: [Mbps]		16QAM/OFDM	24	16QAM/OFDM	24	4	39	16QAM/OFDM	4	81	16QAM/OFDM			
SS: Spatial Stream		16QAM/OFDM	36	16QAM/OFDM	36	5	52	64QAM/OFDM	5	108	64QAM/OFDM			
		64QAM/OFDM	48	64QAM/OFDM	48	6	58.5	64QAM/OFDM	6	121.5	64QAM/OFDM			
		64QAM/OFDM	54	64QAM/OFDM	54	7	65	64QAM/OFDM	7	135	64QAM/OFDM			

802.11ac(VHT20) (1×SS)				802.11ac(VHT40) (1×SS)				802.11ac(VHT80) (1×SS)			
MCS	Modulation	MCS	Modulation	MCS	Modulation	MCS	Modulation	MCS	Modulation	MCS	Modulation
0	BPSK/OFDM	5	64QAM/OFDM	0	BPSK/OFDM	5	64QAM/OFDM	0	BPSK/OFDM	5	64QAM/OFDM
1	QPSK/OFDM	6	64QAM/OFDM	1	QPSK/OFDM	6	64QAM/OFDM	1	QPSK/OFDM	6	64QAM/OFDM
2	QPSK/OFDM	7	64QAM/OFDM	2	QPSK/OFDM	7	64QAM/OFDM	2	QPSK/OFDM	7	64QAM/OFDM
3	16QAM/OFDM	8	256QAM/OFDM	3	16QAM/OFDM	8	256QAM/OFDM	3	16QAM/OFDM	8	256QAM/OFDM
4	16QAM/OFDM			4	16QAM/OFDM	9	256QAM/OFDM	4	16QAM/OFDM	9	256QAM/OFDM

Step.2 Consideration of SAR test channel

For the SAR test reference, on each operation band, the average output power was measured on the lower/middle/upper and specified channels with the worst data rate condition.

3.6 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×H=E^2/η=P/(4×π×r^2) (η: Space impedance) → P=(E^2×4×π×r^2)/η
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.**

3.7 Test setup of EUT and SAR measurement procedure

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

Mode:		Wi-Fi		Bluetooth		
Setup plan	**Explanation of SAR test setup plan** (*. Refer to Appendix 1 for test setup photographs which had been tested.)	**D [mm]**	**SAR Tested /Reduced**	**D [mm]**	**SAR Tested /Reduced**	**SAR type**
Front-right	A right portion of front on a camera is touched to the Flat phantom.	**5.543**	**Tested**	**5.543**	*Reduced*	Body-touch
Right-front	A front portion of right on a camera is touched to the Flat phantom.	**5.543**	**Tested**	**5.543**	*Reduced*	
Right	A right surface of camera is touched to the Flat phantom.	**12.12**	**Tested**	**12.12**	*Reduced*	
Front	A front of a camera is touched to the Flat phantom in parallel.	**13.92**	**Tested**	**13.92**	*Reduced*	
Bottom	A bottom surface of camera is touched to the Flat phantom.	**59.8**	*Reduced*	**59.8**	*Reduced*	
Rear	A rear of camera is touched to the Flat phantom. (LCD: open/close)	**61.425**	*Reduced*	**61.425**	*Reduced*	
Top-right	A right portion of top on a camera is touched to the Flat phantom.	**≈62**	*Reduced*	**≈62**	*Reduced*	
Left	A left surface of camera is touched to the Flat phantom.	**123.25**	*Reduced*	**123.25**	*Reduced*	
Rear	A rear of camera (View-finder, LCD side) is touched to the Flat phantom.	**61.425**	*Reduced*	**61.425**	*Reduced*	front-of-face

*. **D:** Antenna separation distance. It is the distance from the antenna to the outer surface of platform which an operator may touch.
*. Size of EUT: 10 mm (width) × 29.5 mm (height) × 2.8 mm (thickness)
*. Size of platform: 144.37 mm (width) × 146.765 mm (height) × 75.345 mm (depth)

***. Consideration for SAR evaluation exemption**

SAR test exclusion considerations according to KDB447498 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:
[(max.power of channel, including tune-up tolerance, mW) / (min.test separation distance, mm)] × [√f(GHz)] ≤ 3.0 (for SAR(1g)), 7.5(for SAR(10g)) ··formula (1)
If power is calculated from the upper formula (1);
[SAR(1g) test exclusion thresholds, mW] = 3 × [test separation distance, mm] / [√f(GHz)] ·····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,
[test exclusion thresholds, mW] = [(Power allowed at numeric threshold for 50mm in formula (1))] + [(test separation distance, mm) - (50mm)] × 10 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.]

					Step 1) SAR exclusion calculations for antenna ≤50mm from the user.				Step 2) > 50mm from the user
Band	Tx mode	Upper Frequency [MHz]	Maximum output power [dBm]	[mW]	Calculated threshold value				
					Setup	Front-right	Right-front	Right	Front	Bottom, Rear, Top. Left
					D[mm]	6	6	12	14	≥60
2.4GHz	BLE	2480	7.5	6	Judge	1.6, Reduce	1.6, Reduce	0.8, Reduce	0.7, Reduce	≥195mW, Reduce
2.4GHz	b,g,n20	2462	12.5	18	Judge	**4.7, Measure**	**4.7, Measure**	2.4, Reduce	2.0, Reduce	≥196mW, Reduce
U-NII-1	a,n20/40,ac20/40/80	5240	10	10	Judge	**3.8, Measure**	**3.8, Measure**	1.9, Reduce	1.6, Reduce	≥166mW, Reduce
U-NII-2A	a,n20/40,ac20/40/80	5320	10	10	Judge	**3.8, Measure**	**3.8, Measure**	1.9, Reduce	1.6, Reduce	≥165mW, Reduce
U-NII-2C	a,n20/40,ac20/40/80	5700	9	8	Judge	**3.2, Measure**	**3.2, Measure**	1.6, Reduce	1.4, Reduce	≥163mW, Reduce
U-NII-3	a,n20/40,ac20/40/80	5825	9	8	Judge	**3.2, Measure**	**3.2, Measure**	1.6, Reduce	1.4, Reduce	≥162mW, Reduce

*. D: Antenna separation distance, BLE: Bluetooth Low Energy, 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 802.11n(40VHT), ac80: IEEE 802.11ac(80VHT)

<Conclusion for consideration for SAR test reduction>

1) For Wi-Fi operation, "Front-right "and "Right-front" setup which are near an antenna is applied the SAR test in body-liquid. The SAR test of "Right" and "Front" are tested in order to search the SAR peak location even if the SAR test exclusion judge value are smaller than "3". The SAR test of other SAR setups ("Bottom", "Rear", "Top" and "Left") are reduced because the SAR test exclusion judge value are smaller than "3" and they have enough antenna separation distance (more than 60 mm).
2) For Bluetooth operation, the SAR test is reduced for all SAR setups, because the SAR test exclusion judge value are smaller than "3."
3) The SAR test of front-of-face (tested by head liquid) wasn't considered, because the SAR test exclusion judge value are smaller than "3."
4) The all SAR tests were conservatively performed with test separation distance 0mm.

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

Step 1	On 2.4GHz band, in body liquid, worst SAR search by DSSS mode with a highest measurement output power channel. Add test for OFDM mode, if it's necessary.
Step 2 ~Step 4	On U-NII-2A, band, in body liquid, worst SAR search by largest channel bandwidth mode with a highest measurement output power channel. Add test for other bandwidth mode, if it's necessary. Repeat same test procedure in above for U-NII-2C band (step 3) and U-NII-3 band (step 4).

*. 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

The EUT has Bluetooth (BDR, EDR, Low energy) and IEEE 802.11b, g, a, n(20HT), n(40HT), ac(20VHT), ac(40VHT) and ac(80VHT) continuous transmitting modes. The frequency and the modulation used in the SAR testing are shown as a following.

Operation mode	BDR	EDR	BLE	b	g	n20	a	n20	ac20	n40	ac40	ac80	a	n20	ac20	n40	ac40	ac80
band	Bluetooth			2.4GHz band			U-NII-1						U-NII-2A					
Tx band [MHz]	2402~2480			2412~2462			5180~5240			5190, 5230		5210	5260~5320			5270, 5310		5290
Bandwidth [MHz]	1	1	2	20	20	20	20	20	20	40	40	80	20	20	20	40	40	80
Max.power [dBm]	8.3	4.1	7.3	12.5	12.5	12.5	10	10	10	10	10	10	10	10	10	10	10	10
Modulation	FHSS	FHSS	FHSS	DSSS	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM
D/R [Mbps]	1	2~3	1	1	6	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0
Frequency tested [MHz]	*. BDR/EDR are not supported in this platform.		n/a	2412, 2437, 2462	n/a (*1)	n/a (*1)	n/a (*2)	n/a (*2)	n/a (*2)	n/a (*2)	n/a (*2)	n/a (*2)	n/a (*3)	n/a (*3)	n/a (*3)	n/a (*3)	n/a (*3)	5290

Operation mode	a	n20	ac20	n40	ac40	ac80	a	n20	ac20	n40	ac40	ac80
band	U-NII-2C						U-NII-3					
Tx band [MHz]	5500~5580, 5660~5700			5510,5550,5670		5530	5745~5825			5755, 5795		5775
Bandwidth [MHz]	20	20	20	40	40	80	20	20	20	40	40	80
Max.power [dBm]	9	9	9	9	9	9	9	9	9	9	9	9
Modulation	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM
D/R [Mbps]	6	MCS0	MCS0	MCS0	MCS0	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0
Frequency tested [MHz]	n/a (*3)	n/a (*3)	n/a (*3)	n/a (*3)	n/a (*3)	5530	n/a (*3)	n/a (*3)	n/a (*3)	n/a (*3)	n/a (*3)	5775

Controlled software		
	Power measurement	Bluetooth operation: CYW20704 <CYPRESS> by Blue Tool (v1.9.3). Wi-Fi operation: BCM4339 <BROADCOM> by Tera-Term (v4.8.3).
	SAR test	Wireless Test (Version 1.00.1)

*. D/R: Data rate, n/a: SAR test was not applied.
*. BLE: Bluetooth Low Energy; BDR: Basic Data Rate; EDR: Enhanced Data Rate; 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 802.11n(40VHT), ac80: IEEE 802.11ac(80VHT)
*1. Since reported SAR1g value of DSSS mode was shown lower than 0.8W/kg, SAR test of OFDM mode was omitted.
*2. Since reported SAR1g value of U-NII-2A band was shown lower than 1.2W/kg, SAR test of U-NII-1 band was omitted.
*3. Since reported SAR1g value of highest channel band width (80MHz) shown lower than 0.8W/kg, SAR test of lower channel band width (20MHz, 40MHz) was omitted.

SAR test reduction consideration

[Table 1. Output power and Body-SAR test channel selection and Reported SAR(1g) [W/kg] (Results) and test reduction plan]

802.11 Modes	b	g	n20	a	n20	ac20	n40	ac40	ac80
Data rate [Mbps]	1	6	MCS0	6	MCS0	MCS0	MCS0	MCS0	MCS0
2.4GHz, Ch.	*1* / *6* / *11*	*1* / *6* / *11*	*1* / *6* / *11*						
Max. power [mW]	18 / 18 / 18	18 / 18 / 18	18 / 18 / 18						
Measured Ave. [mW]	13 / 13 / 13	16 / 16 / 16	14 / 14 / 14						
Reported SAR 1g	**0.17** / **0.14** / **0.14**	11b reported SAR: ≤ 1.2W/kg							
U-NII-1, Ch.				*36* / *40* / *44* / *48*	*36* / *40* / *44* / *48*	*36* / *40* / *44* / *48*	*38* / *46*	*38* / *46*	*42*
Max. power [mW]				10 / 10 / 10 / 10	10 / 10 / 10 / 10	10 / 10 / 10 / 10	10 / 10	10 / 10	10
Measured Ave. [mW]				8 / 8 / 8 / 8	7 / 7 / 7 / 8	7 / 7 / 7 / 8	8 / 8	8 / 9	8
Reported SAR 1g				Not required (U-NII-2A reported SAR: ≤1.2 W/kg)					
U-NII-2A, Ch.				*52* / *56* / *60* / *64*	*52* / *56* / *60* / *64*	*52* / *56* / *60* / *64*	*54* / *62*	*54* / *62*	*58*
Max. power [mW]				10 / 10 / 10 / 10	10 / 10 / 10 / 10	10 / 10 / 10 / 10	10 / 10	10 / 10	10
Measured Ave. [mW]				8 / 8 / 8 / 8	8 / 8 / 8 / 8	8 / 8 / 8 / 8	8 / 9	8 / 9	9
Reported SAR 1g				BW80 reported SAR: ≤ 0.4 W/kg					**0.34**
U-NII-2C, Ch.				*100* / *116* / *140*	*100* / *116* / *140*	*100* / *116* / *140*	*102* / *110* / *134*	*102* / *110* / *134*	*106*
Max. power [mW]				8 / 8 / 8	8 / 8 / 8	8 / 8 / 8	8 / 8 / 8	8 / 8 / 8	8
Measured Ave. [mW]				6 / 6 / 6	6 / 5 / 6	6 / 5 / 6	7 / 6 / 6	7 / 7 / 6	7
Reported SAR 1g				BW80 reported SAR: ≤ 0.4 W/kg					**0.24**
U-NII-3, Ch.				*149* / *157* / *165*	*149* / *157* / *165*	*149* / *157* / *165*	*151* / *159*	*151* / *159*	*155*
Max. power [mW]				8 / 8 / 8	8 / 8 / 8	8 / 8 / 8	8 / 8	8 / 8	10
Measured Ave. [mW]				6 / 6 / 6	6 / 6 / 6	6 / 6 / 6	7 / 7	7 / 7	7
Reported SAR 1g				BW80 reported SAR: ≤ 0.4 W/kg					**0.24**

SECTION 5: Uncertainty Assessment (SAR measurement)

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
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 (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 %	∞
	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 (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)

*. Antenna gain (peak): -2.9 dBi (2.4GHz band), +1.3 dBi 5GHz band)

Mode	Frequency		Data rate	Power Setting (software)	Duty cycle	Duty factor	Duty scaled factor	Measurement Result				Power correction				Power tuning applied?	Remarks
								Burst power		Time average power		Power Typical	Power Max.	Δ from max.	Tune-up factor		
	[MHz]	CH	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[dBm]	[dB]	[-]		
BLE	2402	0	1	n/a(fix)	64.3	1.92	×1.56	**5.25**	3.35	3.33	2.15	n/a	7.5	-2.25	×1.68	n/a (fix)	(*1)
	2440	19		n/a(fix)	64.3	1.92	×1.56	**5.13**	3.26	3.21	2.09	n/a	7.5	-2.37	×1.73	n/a (fix)	(*1)
	2480	39		n/a(fix)	64.3	1.92	×1.56	**4.58**	2.87	2.66	1.85	n/a	7.5	-2.92	×1.96	n/a (fix)	(*1)
BT, BDR	2402	0	1 (DH5)	n/a(fix)	78.1	1.07	×1.28	**6.48**	4.45	5.41	3.48	n/a	8.3	-1.82	×1.52	n/a (fix)	(*1) *. BDR/EDR are not supported with this platform. The SAR test was not considered and not applied to BDR /EDR operation.
	2441	39		n/a(fix)	78.1	1.07	×1.28	**6.31**	4.28	5.24	3.34	n/a	8.3	-1.99	×1.58	n/a (fix)	
	2480	78		n/a(fix)	78.1	1.07	×1.28	**5.82**	3.82	4.75	2.99	n/a	8.3	-2.48	×1.77	n/a (fix)	
BT, EDR	2402	0	2 (2-DH5)	n/a(fix)	78.3	1.08	×1.28	**2.49**	1.77	1.41	1.38	n/a	4.1	-1.61	×1.45	n/a (fix)	
	2441	39		n/a(fix)	78.3	1.08	×1.28	**2.49**	1.77	1.41	1.38	n/a	4.1	-1.61	×1.45	n/a (fix)	
	2480	78		n/a(fix)	78.3	1.08	×1.28	**1.99**	1.58	0.91	1.23	n/a	4.1	-2.11	×1.63	n/a (fix)	
BT, EDR	2402	0	3 (3-DH5)	n/a(fix)	78.3	1.08	×1.28	**2.40**	1.74	1.32	1.36	n/a	4.1	-1.70	×1.48	n/a (fix)	
	2441	39		n/a(fix)	78.3	1.08	×1.28	**2.50**	1.78	1.42	1.39	n/a	4.1	-1.60	×1.45	n/a (fix)	
	2480	78		n/a(fix)	78.3	1.08	×1.28	**2.02**	1.59	0.94	1.24	n/a	4.1	-2.08	×1.61	n/a (fix)	
11b	2412	1	1	11	99.0	0.04	×1.01	**11.16**	13.06	11.12	12.94	10.0	12.5	-1.34	×1.36	adjusted	-
	2437	6	1	11	99.0	0.04	×1.01	**11.11**	12.91	11.07	12.79	10.0	12.5	-1.39	×1.38	adjusted	-
	2462	11	1	11	99.0	0.04	×1.01	**11.14**	13.00	11.10	12.88	10.0	12.5	-1.36	×1.37	adjusted	-
11g	2412	1	6	11	93.6	0.29	×1.07	**12.00**	15.85	11.71	14.83	10.0	12.5	-0.50	×1.12	adjusted	-
	2437	6	6	11	93.6	0.29	×1.07	**12.06**	16.07	11.77	15.03	10.0	12.5	-0.44	×1.11	adjusted	-
	2462	11	6	11	93.6	0.29	×1.07	**12.11**	16.26	11.82	15.21	10.0	12.5	-0.39	×1.09	adjusted	-
11n (20HT)	2412	1	MCS0	11	93.1	0.31	×1.07	**11.51**	14.16	11.20	13.18	10.0	12.5	-0.99	×1.26	adjusted	-
	2437	6	MCS0	11	93.1	0.31	×1.07	**11.49**	14.09	11.18	13.12	10.0	12.5	-1.01	×1.26	adjusted	-
	2462	11	MCS0	11	93.1	0.31	×1.07	**11.49**	14.09	11.18	13.12	10.0	12.5	-1.01	×1.26	adjusted	-
11a	5180	36	6	7	93.7	0.28	×1.07	**8.93**	7.82	8.65	7.33	8.0	10.0	-1.07	×1.28	adjusted	-
	5200	40	6	7	93.7	0.28	×1.07	**8.89**	7.74	8.61	7.26	8.0	10.0	-1.11	×1.29	adjusted	-
	5220	44	6	7	93.7	0.28	×1.07	**9.06**	8.05	8.78	7.55	8.0	10.0	-0.94	×1.24	adjusted	-
	5240	48	6	7	93.7	0.28	×1.07	**9.11**	8.15	8.83	7.64	8.0	10.0	-0.89	×1.23	adjusted	-
	5260	52	6	7	93.7	0.28	×1.07	**9.17**	8.26	8.89	7.74	8.0	10.0	-0.83	×1.21	adjusted	-
	5280	56	6	7	93.7	0.28	×1.07	**9.20**	8.32	8.92	7.80	8.0	10.0	-0.80	×1.20	adjusted	-
	5300	60	6	7	93.7	0.28	×1.07	**9.18**	8.28	8.90	7.76	8.0	10.0	-0.82	×1.21	adjusted	-
	5320	64	6	7	93.7	0.28	×1.07	**9.24**	8.39	8.96	7.87	8.0	10.0	-0.76	×1.19	adjusted	-
	5500	100	6	6	93.7	0.28	×1.07	**7.99**	6.30	7.71	5.90	7.0	9.0	-1.01	×1.26	adjusted	-
	5580	116	6	6	93.7	0.28	×1.07	**8.12**	6.49	7.84	6.08	7.0	9.0	-0.88	×1.22	adjusted	-
	5700	140	6	6	93.7	0.28	×1.07	**7.83**	6.07	7.55	5.69	7.0	9.0	-1.17	×1.31	adjusted	-
	5745	149	6	6	93.7	0.28	×1.07	**7.88**	6.14	7.60	5.75	7.0	9.0	-1.12	×1.29	adjusted	-
	5785	157	6	6	93.7	0.28	×1.07	**8.01**	6.32	7.73	5.93	7.0	9.0	-0.99	×1.26	adjusted	-
	5825	165	6	6	93.7	0.28	×1.07	**7.91**	6.18	7.63	5.79	7.0	9.0	-1.09	×1.29	adjusted	-
11n (20HT)	5180	36	MCS0	7	93.2	0.31	×1.07	**8.69**	7.40	8.39	6.90	8.0	10.0	-1.31	×1.35	adjusted	-
	5200	40	MCS0	7	93.2	0.31	×1.07	**8.65**	7.33	8.35	6.84	8.0	10.0	-1.35	×1.36	adjusted	-
	5220	44	MCS0	7	93.2	0.31	×1.07	**8.66**	7.35	8.36	6.85	8.0	10.0	-1.34	×1.36	adjusted	-
	5240	48	MCS0	7	93.2	0.31	×1.07	**8.89**	7.74	8.59	7.23	8.0	10.0	-1.11	×1.29	adjusted	-
	5260	52	MCS0	7	93.2	0.31	×1.07	**8.82**	7.62	8.52	7.11	8.0	10.0	-1.18	×1.31	adjusted	-
	5280	56	MCS0	7	93.2	0.31	×1.07	**8.82**	7.62	8.52	7.11	8.0	10.0	-1.18	×1.31	adjusted	-
	5300	60	MCS0	7	93.2	0.31	×1.07	**8.86**	7.69	8.56	7.18	8.0	10.0	-1.14	×1.30	adjusted	-
	5320	64	MCS0	7	93.2	0.31	×1.07	**8.92**	7.80	8.62	7.28	8.0	10.0	-1.08	×1.28	adjusted	-
	5500	100	MCS0	6	93.2	0.31	×1.07	**7.83**	6.07	7.53	5.66	7.0	9.0	-1.17	×1.31	adjusted	-
	5580	116	MCS0	6	93.2	0.31	×1.07	**7.31**	5.38	7.01	5.02	7.0	9.0	-1.69	×1.48	adjusted	-
	5700	140	MCS0	6	93.2	0.31	×1.07	**7.61**	5.77	7.31	5.38	7.0	9.0	-1.39	×1.38	adjusted	-
	5745	149	MCS0	6	93.2	0.31	×1.07	**7.68**	5.86	7.38	5.47	7.0	9.0	-1.32	×1.36	adjusted	-
	5785	157	MCS0	6	93.2	0.31	×1.07	**7.54**	5.68	7.24	5.30	7.0	9.0	-1.46	×1.40	adjusted	-
	5825	165	MCS0	6	93.2	0.31	×1.07	**7.67**	5.85	7.37	5.46	7.0	9.0	-1.33	×1.36	adjusted	-
11ac (20VHT)	5180	36	MCS0	7	93.3	0.30	×1.07	**8.73**	7.46	8.43	6.97	8.0	10.0	-1.27	×1.34	adjusted	-
	5200	40	MCS0	7	93.3	0.30	×1.07	**8.63**	7.29	8.33	6.81	8.0	10.0	-1.37	×1.37	adjusted	-
	5220	44	MCS0	7	93.3	0.30	×1.07	**8.79**	7.57	8.49	7.06	8.0	10.0	-1.21	×1.32	adjusted	-
	5240	48	MCS0	7	93.3	0.30	×1.07	**8.84**	7.66	8.54	7.14	8.0	10.0	-1.16	×1.31	adjusted	-
	5260	52	MCS0	7	93.3	0.30	×1.07	**8.81**	7.60	8.51	7.10	8.0	10.0	-1.19	×1.32	adjusted	-
	5280	56	MCS0	7	93.3	0.30	×1.07	**8.86**	7.69	8.56	7.18	8.0	10.0	-1.14	×1.30	adjusted	-
	5300	60	MCS0	7	93.3	0.30	×1.07	**8.88**	7.73	8.58	7.21	8.0	10.0	-1.12	×1.29	adjusted	-
	5320	64	MCS0	7	93.3	0.30	×1.07	**8.95**	7.85	8.65	7.33	8.0	10.0	-1.05	×1.27	adjusted	-
	5500	100	MCS0	6	93.3	0.30	×1.07	**7.83**	6.07	7.53	5.66	7.0	9.0	-1.17	×1.31	adjusted	-
	5580	116	MCS0	6	93.3	0.30	×1.07	**7.34**	5.42	7.04	5.06	7.0	9.0	-1.66	×1.47	adjusted	-
	5700	140	MCS0	6	93.3	0.30	×1.07	**7.61**	5.77	7.31	5.38	7.0	9.0	-1.39	×1.38	adjusted	-
	5745	149	MCS0	6	93.3	0.30	×1.07	**7.65**	5.82	7.35	5.43	7.0	9.0	-1.35	×1.36	adjusted	-
	5785	157	MCS0	6	93.3	0.30	×1.07	**7.55**	5.69	7.25	5.31	7.0	9.0	-1.45	×1.40	adjusted	-
	5825	165	MCS0	6	93.3	0.30	×1.07	**7.53**	5.66	7.23	5.28	7.0	9.0	-1.47	×1.40	adjusted	-

(cont'd)

(cont'd)

Mode	Frequency		Data rate	Power Setting (software)	Duty cycle	Duty factor	Duty scaled factor	Measurement Result				Power correction				Power tuning applied?	Remarks
								Burst power		Time average power		Power		Δ from max.	Tune-up factor		
												Typical	Max.				
	[MHz]	CH	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[dBm]	[dB]	[-]		
11n (40HT)	5190	38	MCS0	7	87.0	0.60	×1.15	**9.12**	8.17	8.52	7.11	8.0	10.0	-0.88	×1.22	adjusted	-
	5230	46	MCS0	7	87.0	0.60	×1.15	**9.25**	8.41	8.65	7.33	8.0	10.0	-0.75	×1.19	adjusted	-
	5270	54	MCS0	7	87.0	0.60	×1.15	**9.29**	8.49	8.69	7.40	8.0	10.0	-0.71	×1.18	adjusted	-
	5310	62	MCS0	7	87.0	0.60	×1.15	**9.36**	8.63	8.76	7.52	8.0	10.0	-0.64	×1.16	adjusted	-
	5510	102	MCS0	6	87.0	0.60	×1.15	**8.17**	6.56	7.57	5.71	7.0	9.0	-0.83	×1.21	adjusted	-
	5550	110	MCS0	6	87.0	0.60	×1.15	**8.00**	6.31	7.40	5.50	7.0	9.0	-1.00	×1.26	adjusted	-
	5670	134	MCS0	6	87.0	0.60	×1.15	**8.08**	6.43	7.48	5.60	7.0	9.0	-0.92	×1.24	adjusted	-
	5755	151	MCS0	6	87.0	0.60	×1.15	**8.57**	7.19	7.97	6.27	7.0	9.0	-0.43	×1.10	adjusted	-
	5795	159	MCS0	6	87.0	0.60	×1.15	**8.38**	6.89	7.78	6.00	7.0	9.0	-0.62	×1.15	adjusted	-
11ac (40VHT)	5190	38	MCS0	7	87.0	0.60	×1.15	**9.19**	8.30	8.59	7.23	8.0	10.0	-0.81	×1.21	adjusted	-
	5230	46	MCS0	7	87.0	0.60	×1.15	**9.39**	8.69	8.79	7.57	8.0	10.0	-0.61	×1.15	adjusted	-
	5270	54	MCS0	7	87.0	0.60	×1.15	**9.29**	8.49	8.69	7.40	8.0	10.0	-0.71	×1.18	adjusted	-
	5310	62	MCS0	7	87.0	0.60	×1.15	**9.37**	8.65	8.77	7.53	8.0	10.0	-0.63	×1.16	adjusted	-
	5510	102	MCS0	6	87.0	0.60	×1.15	**8.19**	6.59	7.59	5.74	7.0	9.0	-0.81	×1.21	adjusted	-
	5550	110	MCS0	6	87.0	0.60	×1.15	**8.20**	6.61	7.60	5.75	7.0	9.0	-0.80	×1.20	adjusted	-
	5670	134	MCS0	6	87.0	0.60	×1.15	**8.02**	6.34	7.42	5.52	7.0	9.0	-0.98	×1.25	adjusted	-
	5755	151	MCS0	6	87.0	0.60	×1.15	**8.26**	6.70	7.66	5.83	7.0	9.0	-0.74	×1.19	adjusted	-
	5795	159	MCS0	6	87.0	0.60	×1.15	**8.40**	6.92	7.80	6.03	7.0	9.0	-0.60	×1.15	adjusted	-
11ac (80VHT)	5210	42	MCS0	7	77.0	1.14	×1.30	**9.27**	8.45	8.13	6.50	8.0	10.0	-0.73	×1.18	adjusted	-
	5290	58	MCS0	7	77.0	1.14	×1.30	**9.39**	8.69	8.25	6.68	8.0	10.0	-0.61	×1.15	adjusted	-
	5530	106	MCS0	6	77.0	1.14	×1.30	**8.31**	6.78	7.17	5.21	7.0	9.0	-0.69	×1.17	adjusted	-
	5775	155	MCS0	6	77.0	1.14	×1.30	**8.57**	7.19	7.43	5.53	7.0	9.0	-0.43	×1.10	adjusted	-

*. : SAR test was applied.

*1. The measured duty cycle number of BLE, BDR and EDR was nearly equal to highest theory duty cycle.

*. BLE: Bluetooth Low Energy; BDR: Basic Data Rate; EDR: Enhanced Data Rate; 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 802.11n(40VHT), ac80: IEEE 802.11ac(80VHT)

*. The SAR test power of Wi-Fi mode was adjusted to not more than 2dB lower than maximum tune-up power (KDB 447498 D01 (v06) requirement).

*. Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test in following tables.

Data rate (D/R) vs Time average power (dBm) (*.The bold character shows the data rate which has the highest measured power.)

11b		11g		11n(20HT)		11a		11n(20HT)		11ac(20VHT)		11n(40HT)		11ac(40VHT)		11ac(80VHT)	
2437MHz		2437MHz		2437MHz		5180MHz		5180MHz		5180MHz		5190MHz		5190MHz		5210MHz	
D/R	Power	D/R	Power	D/R	Power	D/R	Power	D/R	Power	D/R	Power	D/R	Power	D/R	Power	D/R	Power
[Mbps]	**12.5**max	[Mbps]	**12.5**max	[Mbps]	**12.5**max	[Mbps]	**10**max	[Mbps]	**10**max	[Mbps]	**10**max	[Mbps]	**10**max	[Mbps]	**10**max	[Mbps]	**10**max
1	**11.12**	**6**	**11.71**	**MCS0**	**11.20**	**6**	**8.67**	**MCS0**	**8.39**	**MCS0**	**8.43**	**MCS0**	**8.52**	**MCS0**	**8.59**	**MCS0**	**8.13**
2	11.26	9	11.63	MCS1	10.94	9	8.54	MCS1	8.22	MCS1	8.00	MCS1	8.05	MCS1	8.00	MCS1	7.39
5.5	**11.31**	12	11.54	MCS2	10.69	12	8.51	MCS2	7.85	MCS2	7.76	MCS2	7.69	MCS2	7.66	MCS2	6.92
11	10.92	18	11.06	MCS3	10.45	18	8.29	MCS3	7.67	MCS3	7.48	MCS3	7.43	MCS3	7.39	MCS3	6.55
*. Lowest data rate (as highest duty cycle) was selected for the SAR test.		24	10.80	MCS4	9.87	24	7.76	MCS4	7.37	MCS4	7.25	MCS4	6.74	MCS4	6.78	MCS4	5.89
		36	10.37	MCS5	9.76	36	7.66	MCS5	6.94	MCS5	6.95	MCS5	6.36	MCS5	6.56	MCS5	5.62
		48	10.12	MCS6	9.66	48	7.26	MCS6	6.85	MCS6	6.88	MCS6	6.27	MCS6	6.15	MCS6	5.53
		56	9.98	MCS7	9.36	56	7.17	MCS7	6.66	MCS7	6.81	MCS7	5.97	MCS7	6.08	MCS7	5.39
										MCS8	6.69			MCS8	5.89	MCS8	5.25
														MCS9	5.72	MCS9	5.14

*. CH: channel, Max: Maximum.

*. Calculating formula: Result-Time average power (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)
Result-Burst power (dBm) (*.equal to 100% duty cycle) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)+(duty factor, dB)
Duty factor (dBm) = 10 × log (100/(duty cycle, %))
Δ form max. (dB) = (Results-Burst power (average, dBm)) - (Max.-specification output power (average, dBm))
Duty scaled factor (Duty cycle correction factor for obtained SAR value) (unit: (-)) = 100(%) / (duty cycle, %)
Tune-up factor (Power tune-up factor for obtained SAR value) (unit: (-)) = 1 / (10 ^ ("Deviation from max., dB" / 10))

*. Date measured: May 11~21, 2018 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. ((24~25) deg.C. / (45~55) %RH)

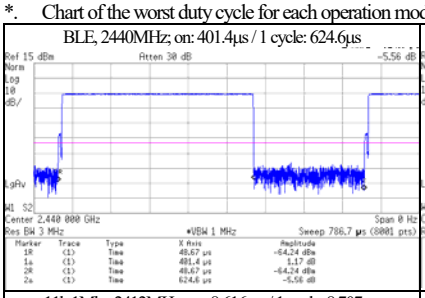
*. Uncertainty of antenna port conducted test; Power measurement uncertainty above 1GHz for this test was: (±) 0.48 dB(Average)/(±) 0.66 dB(Peak).

*. Uncertainty of antenna port conducted test; Duty cycle and time measurement: (±) 0.012 %.

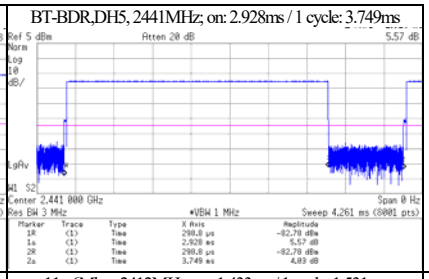
*. Chart of the worst duty cycle for each operation mode. (Refer to next page)

*. Chart of the worst duty cycle for each operation mode.

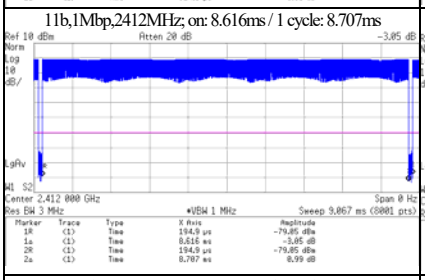
BLE, 2440MHz; on: 401.4µs / 1 cycle: 624.6µs



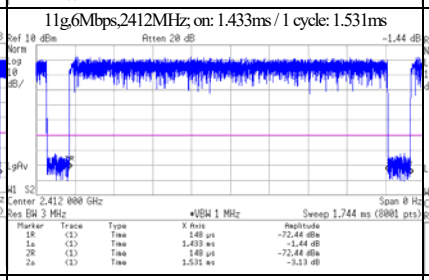
BT-BDR,DH5, 2441MHz; on: 2.928ms / 1 cycle: 3.749ms



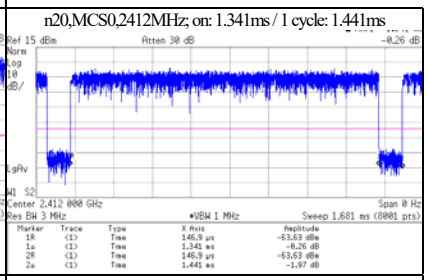
11b,1Mbp,2412MHz; on: 8.616ms / 1 cycle: 8.707ms



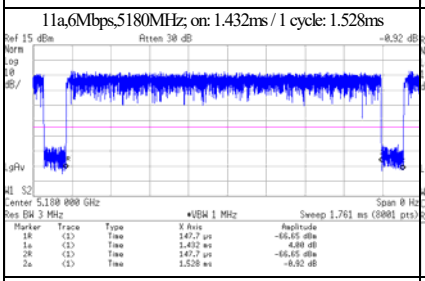
11g,6Mbps,2412MHz; on: 1.433ms / 1 cycle: 1.531ms



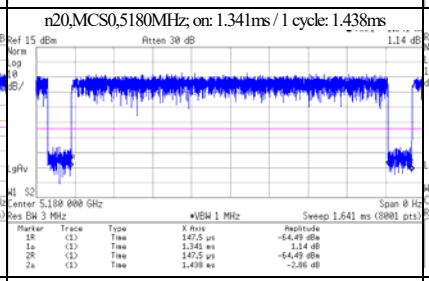
n20,MCS0,2412MHz; on: 1.341ms / 1 cycle: 1.441ms



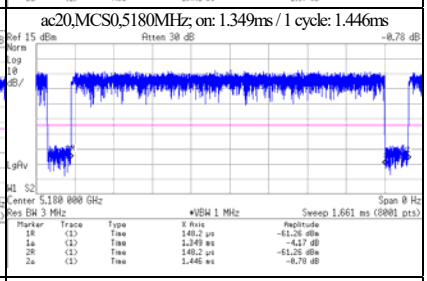
11a,6Mbps,5180MHz; on: 1.432ms / 1 cycle: 1.528ms



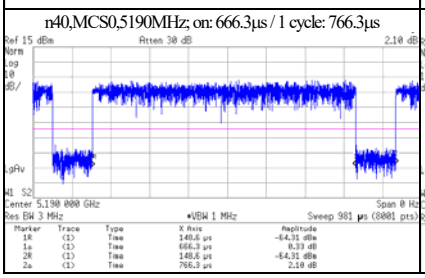
n20,MCS0,5180MHz; on: 1.341ms / 1 cycle: 1.438ms



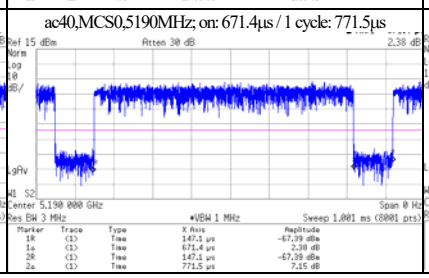
ac20,MCS0,5180MHz; on: 1.349ms / 1 cycle: 1.446ms



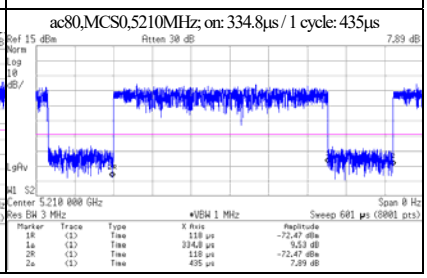
n40,MCS0,5190MHz; on: 666.3µs / 1 cycle: 766.3µs



ac40,MCS0,5190MHz; on: 671.4µs / 1 cycle: 771.5µs



ac80,MCS0,5210MHz; on: 334.8µs / 1 cycle: 435µs



SECTION 7: SAR Measurement results

Measurement date: August8~21, 2018 Measurement by: Hiroshi Naka

7.1 Liquid parameters

Frequency [MHz] (Channel)	Liquid type	Liquid parameters (*a)								Temp. [deg.C.]	Depth [mm]	ΔSAR Coefficients(*b)		Date measured
		Permittivity (εr) [-]				Conductivity [S/m]						ΔSAR		
		Target	Measured		Limit	Target	Measured		Limit			1g {%}	Correction required?	
			Meas.	Δεr [%]			Meas.	Δσ [%]						
2412 (1)	Body	52.75	50.82	-3.7	-5% ≤ εr-meas. ≤ 0%	1.914	1.931	+0.9	0% ≤ σ-meas. ≤ +5%	22.3	151	+1.26	not required.	August 8, 2018, before SAR test
2437 (6)	Body	52.72	50.67	-3.9		1.938	1.969	+1.4				+1.52	not required.	
2462 (11)	Body	52.68	50.56	-4.0		1.967	2.008	+1.4				+1.55	not required.	
5290 (58)	Body	48.89	46.72	-4.4	-5% ≤ εr-meas. ≤ 0%	5.404	5.538	+2.5	0% ≤ σ-meas. ≤ +5%	23.9	150	+0.77	not required.	August 10, 2018, before SAR test
5530 (106)	Body	48.57	46.40	-4.5		5.685	5.845	+2.8				+0.77	not required.	
5775 (155)	Body	48.23	46.02	-4.6		5.971	6.171	+3.4				+0.76	not required.	
5530 (106)	Body	48.57	46.52	-4.2		5.685	5.814	+2.3		24.0	150	+0.75	not required.	August 20, 2018, before SAR test
5775 (155)	Body	48.23	46.13	-4.4		5.971	6.155	+3.1		24.0	150	+0.73	not required.	August 21, 2018, before SAR test

7.2 SAR measurement results

[Measured and Reported (Scaled) SAR results]

SAR measurement results										Reported SAR (1g) [W/kg]						
Mode	Frequency [MHz] (Channel)	Data rate [Mbps]	EUT setup			SAR (1g) [W/kg]			SAR plot # in Appendix 2-2	Duty cycle correction		Output burst average power correction			SAR Corrected (*d)	Remarks
			Position	Source power	Gap [mm]	Max. value of multi-peak				Duty [%]	Duty scaled	Meas. [dBm].	Max. [dBm]	Tune-up factor		
						Meas.	ΔSAR [%]	ΔSAR corrected								
Step 1: 2.4GHz Band																
11b	2437(6)	1	Front	Adaptor	0	0.081	+1.52	n/a (*c)	Plot 1-2	99.0	×1.01	11.11	12.5	×1.38	0.113	-
11b	2437(6)	1	Right	Adaptor	0	0.052	+1.52	n/a (*c)	Plot 1-3	99.0	×1.01	11.11	12.5	×1.38	0.072	-
11b	2437(6)	1	Right-front	Adaptor	0	0.092	+1.52	n/a (*c)	Plot 1-4	99.0	×1.01	11.11	12.5	×1.38	0.128	-
11b	2437(6)	1	Front-right	Adaptor	0	0.102	+1.52	n/a (*c)	Plot 1-5	99.0	×1.01	11.11	12.5	×1.38	0.142	-
11b	2412(1)	1	Front-right	Adaptor	0	0.121	+1.26	n/a (*c)	Plot 1-1	99.0	×1.01	11.16	12.5	×1.36	0.166	Higher SAR, 2.4GHz
11b	2462(11)	1	Front-right	Adaptor	0	0.104	+1.55	n/a (*c)	Plot 1-6	99.0	×1.01	11.14	12.5	×1.37	0.144	-
Step 2: U-NII-2A Band																
ac(80VHT)	5290(58)	MCS0	Front	Adaptor	0	0.128	+0.77	n/a (*c)	Plot 2-2	77.0	×1.30	9.39	10.0	×1.15	0.191	-
ac(80VHT)	5290(58)	MCS0	Right	Adaptor	0	0.057	+0.77	n/a (*c)	Plot 2-3	77.0	×1.30	9.39	10.0	×1.15	0.085	-
ac(80VHT)	5290(58)	MCS0	Right-front	Adaptor	0	0.169	+0.77	n/a (*c)	Plot 2-4	77.0	×1.30	9.39	10.0	×1.15	0.253	-
ac(80VHT)	5290(58)	MCS0	Front-right	Adaptor	0	0.227	+0.77	n/a (*c)	Plot 2-1	77.0	×1.30	9.39	10.0	×1.15	0.339	Higher SAR, U^NII-2A
Step 3: U-NII-2C Band																
ac(80VHT)	5530(106)	MCS0	Front	Adaptor	0	0.091	+0.77	n/a (*c)	Plot 3-2	77.0	×1.30	8.31	9.0	×1.17	0.138	-
ac(80VHT)	5530(106)	MCS0	Right	Adaptor	0	0.045	+0.77	n/a (*c)	Plot 3-3	77.0	×1.30	8.31	9.0	×1.17	0.068	-
ac(80VHT)	5530(106)	MCS0	Right-front	Adaptor	0	0.142	+0.75	n/a (*c)	Plot 3-4	77.0	×1.30	8.31	9.0	×1.17	0.216	-
ac(80VHT)	5530(106)	MCS0	Front-right	Adaptor	0	0.160	+0.75	n/a (*c)	Plot 3-1	77.0	×1.30	8.31	9.0	×1.17	0.243	Higher SAR, U^NII-2C
Step 4: U-NII-3 Band																
ac(80VHT)	5775(155)	MCS0	Front	Adaptor	0	0.136	+0.76	n/a (*c)	Plot 4-2	77.0	×1.30	8.57	9.0	×1.10	0.194	-
ac(80VHT)	5775(155)	MCS0	Right	Adaptor	0	0.046	+0.76	n/a (*c)	Plot 4-3	77.0	×1.30	8.57	9.0	×1.10	0.066	-
ac(80VHT)	5775(155)	MCS0	Right-front	Adaptor	0	0.142	+0.73	n/a (*c)	Plot 4-4	77.0	×1.30	8.57	9.0	×1.10	0.203	-
ac(80VHT)	5775(155)	MCS0	Front-right	Adaptor	0	0.166	+0.73	n/a (*c)	Plot 4-1	77.0	×1.30	8.57	9.0	×1.10	0.237	Higher SAR, U^NII-3

Notes: *. Gap: It is the separation distance between the outer surface of product and the bottom outer surface of phantom; Max.: Maximum; Meas.: Measured value; n/a: not applied; BLE: Bluetooth Low Energy; 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 802.11n(40VHT), ac80: IEEE 802.11ac(80VHT)

*. During test, the EUT was operated by AC adaptor and with connecting the host pc via USB cable.

*. Calibration frequency of the SAR measurement probe (and used conversion factors) (The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.)	Liquid	SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
	Body	2412, 2437, 2462 MHz	2450 MHz	within ±50 MHz of calibration frequency	7.32	±12.0 %
	Body	5290 MHz	5250 MHz	within ±110 MHz of calibration frequency	4.49	±13.1 %
	Body	5530 MHz	5600 MHz	within ±110 MHz of calibration frequency	3.92	±13.1 %
	Body	5775 MHz	5750 MHz	within ±110 MHz of calibration frequency	4.00	±13.1 %

Memo

*a. The target value is a parameter defined in Appendix A of KDB865664 D01 (v01r04), the dielectric parameters suggested are given at 2000, 2450, 3000 and 5800MHz. Parameters for the frequencies between 2000 MHz and 5800 MHz were obtained using linear interpolation. Above 5800MHz were obtained using linear extrapolation.

*b. Calculating formula: $\Delta SAR(1g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = -7.854E\text{-}4 \times f^3 + 9.402E\text{-}3 \times f^2 - 2.742E\text{-}2 \times f + 0.2026$ / $C\sigma = 9.804E\text{-}3 \times f^3 - 8.661E\text{-}2 \times f^2 + 2.981E\text{-}2 \times f + 0.7829$

*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

*d. 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))

(Clause 5, SAR TEST PROCEDURES, in KDB248227 D01 (v02r02))

5.1.1 Initial Test Position SAR Test Reduction Procedure

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

a) **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 combinations within the frequency band** or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).

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.

5.2.2 2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) 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.

*. On this platform, SAR test of OFDM mode was reduced, because the estimate reported SAR was ≤ 1.2 W/kg by using the highest reported SAR of DSSS mode.

OFDM mode	Maximum tune-up tolerance limit				OFDM scaled factor [-]	DSSS reported SAR(1g) value		Estimated SAR(1g) value: OFDM [W/kg]	Exclusion limit [W/kg]	Standalone SAR test require?
	DSSS		OFDM							
	[dBm]	[mW] (a)	[dBm]	[mW] (b)	(b)/(a)×100	Setup	[W/kg]			
11g	12.5	18	12.5	18	1.000	Front-right	0.092	**0.159**	**≤ 1.2**	**No**
n (20HT)	12.5	18	12.5	18	1.000	Front-right	0.092	**0.159**	**≤ 1.2**	**No**

5.3.1 U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following, with respect to the highest reported SAR and maximum output power specified for production units. The procedures are applied independently to each exposure configuration; for example, head, body, hotspot mode etc.

a) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.

5.3.2 OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures.

a) When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined by applying the following steps sequentially.
   1) **The largest channel bandwidth configuration is selected** among the multiple configurations in a frequency band with the same specified maximum output power.
   2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
   3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
   4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.
b) After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
   1) The channel closest to mid-band frequency is selected for SAR measurement.
   2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.