SAR TEST REPORT

Test Report No.: 11884511S-A

Applicant : **Fujifilm Corporation**

Type of Equipment : **Digital Camera**

Model No. : **FF170001**

FCC ID : **W2Z-02000004**

Test Standard : **FCC 47CFR §2.1093**

Test Result : **Complied**

Highest Reported SAR(1g) [W/kg] (DTS band)				Remarks (Wi-Fi tested conditions)		
Standalone	Simultaneous transmission	SAR Type	Limit	Frequency	Mode	Output power measured
Wi-Fi: FZ00010935-800	Wi-Fi: FZ00010935-800 (16dBm. max) BLE: WM-BN-BM-26_A (6dBm. max)					
1.25 (Wi-Fi) (measured) (16dBm.max.)	**1.27** (Wi-Fi+BLE, estimated) (Refer to Clause 7.3)	**Body-touch**	**1.6**	2462MHz	11b (1Mbps)	14.35 dBm (average)

***. Highest reported SAR of this device for body-worn and simultaneous transmission are "1.25 W/kg" and "1.27 W/kg (estimated)".**

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Date of test: August 4, 2017

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

Approved by: T. Imamura
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Leader, Consumer Technology Division

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ilac-MRA LAB JAB Testing RTL02610

REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	11884511S-A	September 1, 2017	-	-

*. 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	Fujifilm Corporation
Brand Name	FUJIFILM
Address	7-3, Akasaka 9-Chome, Minato-ku, Tokyo 107-0052 Japan
Telephone Number	+81 3 6271 1654
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Contact Person	Takao Ozaki

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type of Equipment	Digital Camera
Model Number	FF170001
Serial Number	P1000006
FCC ID	W2Z-02000004
Condition of EUT	Engineering prototype (Not for sale: This samples is equivalent to mass-produced items.)
Country of Mass-production	China
Receipt Date of Sample	July 27, 2017 (*. Power measurement sample.) *. No modification by the Lab. July 31, 2017 (*. SAR test sample) *. No modification by the Lab.
Category Identified	Portable device (*. Since this device may contact and/or very close to a human body during Wi-Fi, Bluetooth and Wi-Fi+Bluetooth operation, the partial-body SAR (1g) shall be observed.)
Rating	DC 7.2V (Li-ion battery operation)
Feature of EUT	EUT is a digital camera which has two RF modules and supports Wi-Fi, Bluetooth and Wi-Fi+Bluetooth operation.
SAR Accessory	None

2.2 Product Description (Wireless LAN module, Bluetooth module)

Equipment name	Wireless LAN module				Bluetooth module	
Equipment type	Transceiver				Transceiver	
Model number	FZ00010935-800				WM-BN-BM-26_A	
Serial number	sar01				sar01	
FCC ID	W2Z-02000003				COF-WMBNBM26A	
Condition	Production model				Production model	
Power supply	DC 3.3V from host device/				DC 3.6V from host device/	
Operation mode	Wi-Fi				Bluetooth (BLE: Low energy)	
Frequency of operation	b/g/n(20HT): 2412 MHz - 2462 MHz				2402 MHz - 2480 MHz	
Number of channel	b/g/n(20HT):11				40	
Channel spacing	b/g/n(20HT): 5 MHz				2MHz	
Bandwidth	b/g/n(20HT): 20 MHz				2MHz	
Type of modulation	DSSS: DBPSK, DQPSK, CCK OFDM: BPSK, QPSK, 16QAM, 64QAM				FHSS: GFSK	
Antenna type	PCB printed invert-F antenna				Chip antenna	
Antenna connector	Not applicable				Not applicable	
Antenna gain (Peak)	-4.14 dBi				3.68 dBi	
Transmit average power [dBm] (*1)	Typical	13.5 (b)	12 (g)	12 (n(20HT))	Typical	4
	Maximum	16 (b)	14.5 (g)	14.5 (n(20HT))	Maximum	6

*1. The measured transmit average power (conducted) refers to section 6 in this report.

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

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 (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
General population / uncontrolled exposure, Hands (averaged over any 10g of tissue) limit: 4 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

Model of RF module	FZ00010935-800	WM-BN-BM-26_A	Simultaneous transmission
Mode / Band (Operation frequency)	Wi-Fi ((2412-2462)MHz)	Bluetooth ((2402-2480)MHz)	
Results (Reported SAR(1g))	Complied (measured)	Complied (estimated)	Complied (estimated)
SAR (1g) Limit [W/kg]	1.6	1.6	1.6
Reported SAR(1g) value	1.25 W/kg	0.14 W/kg (*. Estimated, Refer to Clause 7.3)	1.27 W/kg (*.Refer to Clause 7.3)
Measured SAR value	0.845 W/kg	- (Estimated)	- (Estimated)
Mode, frequency[MHz]	11b(1Mbps), 2462	BLE	Wi-Fi(11b)+BLE
Duty cycle [%] (scaled factor)	98.9 (×1.01)	- (*. Estimated by 100%)	- (*. Estimated by 100%)
Output average power [dBm] (max. power, scaled factor)	14.35 (16, ×1.46)	6 dBm maximum	Wi-Fi:: 16 dBm maximum BLE: 6dBm maximum

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
*. (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, %)

3.4 Test Location

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

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3.5 Confirmation before SAR testing

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

*. The transmission power was verified that it was within 2dB lower than the maximum power when it was set the rated power. (Clause 4.1, KDB447498 D01 (v06))

Data rate (*. Model: FZ00010935-800 and WM-BN-BM-26_A support the following data rate in each operation mode.)

FZ00010935-800												WM-BN-BM-26_A	
11b		11g				11n(20HT)						Bluetooth (BLE)	
Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	MCS Index	Spatial Stream	Modulation	MCS Index	Spatial Stream	Modulation	Modulation	Packet type (Data rate)
DBPSK/DSSS	1	BPSK/OFDM	6	16QAM/OFDM	24	MCS0	1	BPSK/OFDM	MCS4	1	16QAM/OFDM	GFSK/FHSS	BLE (1Mbps)
DQPSK/DSSS	2	BPSK/OFDM	9	16QAM/OFDM	36	MCS1	1	QPSK/OFDM	MCS5	1	64QAM/OFDM		
CCK/DSSS	5.5	QPSK/OFDM	12	64QAM/OFDM	48	MCS2	1	QPSK/OFDM	MCS6	1	64QAM/OFDM		
CCK/DSSS	11	QPSK/OFDM	18	64QAM/OFDM	54	MCS3	1	16QAM/OFDM	MCS7	1	64QAM/OFDM		

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.

Setup plan	Explanation of SAR test setup plan (*. Refer to Appendix 1 for test setup photographs which had been tested.)	Model: FZ00010935-800, Operation: Wi-Fi — D [mm]	Wi-Fi — SAR Tested /Reduced	Model: WM-BN-BM-26_A, Operation: BLE — D [mm]	BLE — SAR Tested /Reduced	SAR type
Rear	A rear of camera (LCD side) was touched to the Flat phantom.	**30.44**	**Tested**	**6.18**	*Reduced*	Body-touch
Right-front	A front portion of right of a camera was touched to the Flat phantom.	**6.28**	**Tested**	**14.77**	*Reduced*	
Front-lens	A front of a camera was tilted to the lens direction and touched to the Flat phantom.	**8.14**	**Tested**	**32.43**	*Reduced*	
Front	A point of a right hand grip in the front of a camera was touched to the Flat phantom.	**8.14**	**Tested**	**32.43**	*Reduced*	
Front-right	A front of a camera was tilted to the right direction and touched to the Flat phantom.	**8.14**	**Tested**	**32.43**	*Reduced*	
Bottom	A bottom of camera is touched to the Flat phantom.	**16.25**	**Tested**	**38.66**	*Reduced*	
Top	(When test is required,) A top of camera is touched to the Flat phantom.	**55.15**	*Reduced*	**32.14**	*Reduced*	
Left	(When test is required,) A left of camera is touched to the Flat phantom.	**103.5**	*Reduced*	**104.43**	*Reduced*	

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

*. Size of EUT (digital camera): 121.3 mm (width) × 73.9 mm (height) × 42.7 mm (depth) (This size is when the lens unit is detached. The convex portion is not contained in size.)

<u>*. Consideration for SAR evaluation exemption</u>

<u>KDB 447498 D01 (v06) was taken into consideration to reduce SAR test.</u>

Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, ≤50mm)

Mode	Setup Position	Minimum distance [mm]	Minimum distance [mm] (rounded)	Upper frequency [GHz]	Maximum power [dBm]	Maximum power [mW]	Maximum power [mW] (rounded)	Calculation of exclusion (*2)	SAR type	SAR test exclusion: Judge for Exclusion	SAR test exclusion: Standalone SAR test required?	Remarks
Model: WM-BN-BM-26_A												
BLE	Rear	6.18	**6**	2.480	6	3.98	**4**	**1.0**	1g	**≤3.0**	Not required	*.SAR test was <u>reduced</u>
	Other positions	>6.18	**6**	2.480	6	3.98	**4**	**1.0**	1g	**≤3.0**	Not required	*.SAR test was <u>reduced</u>
Model: FZ00010935-800												
Wi–Fi (b)	Right-front	6.28	**6**	2.462	16	39.81	**40**	**12.6**	1g	**≤3.0**	Required	-
	Front, Front-lens, Front-right	8.14	**8**					**3.1**	1g	**≤3.0**	Required	-
	Bottom	16.25	**16**					**2.9**	1g	**≤3.0**	Not required	*.SAR test was <u>applied.</u>
	Rear	30.44	**30**					**2.5**	1g	**≤3.0**	Not required	*.SAR test was <u>applied.</u>
	Top, Left	≥50	**50**					**1.3**	1g	**≤3.0**	Not required	*.SAR test was <u>reduced</u>

*2. Parenthesis 1), Clause 4.3.1, KDB 447498 D01 (v06) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 100MHz-6GHz at test separation distance ≤50mm.

[(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 (2a)

<u><Conclusion for consideration for SAR test reduction></u>

1) **At Bluetooth operation of WM-BN-BM-26_A, the SAR test is reduced because it has lower power and judge of SAR test exclusion is smaller than 3.**
2) **At Wi-Fi operation of FZ00010935-800, the SAR setups of near antenna which includes "Right-front", "Front", "Front-lens" and "Front-right" are considered and applied the SAR test in body-liquid.**
   The SAR setups of "Bottom" and "Rear" are also applied the SAR test in body-liquid even if the SAR test exclusion judge was "It may reduce SAR test".
   The SAR setups of "Top" and "Left" are reduced because the judge of SAR test exclusion is smaller than 3.

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

For Wi-Fi module (model: FZ00010935-800), worst SAR search by DSSS mode with a highest measurement output power channel in body liquid. To confirm the influence to SAR of a frequency, the frequency is changed to lower/middle/upper channel. Add SAR test for OFDM mode, if it's necessary.

*. 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 Wireless LAN mode (IEEE 802.11b, g, n(20HT)), BLE mode and Wireless LAN+BLE continuous transmitting modes. For inspection of standalone SAR and simultaneous transmission SAR, the EUT was operated in the following conditions.

Module model	WM-BN-BM-26_A	Wi-Fi: FZ00010935-800		
Operation mode	Bluetooth: BLE	b	g	n(20HT)
Tx band [MHz]	2402~2480	2412~2462		
Bandwidth [MHz]	2	20	20	20
Max.power [dBm]	6	16	14.5	14.5
Modulation	FHSS	DSSS	OFDM	OFDM
Data rate [Mbps]	1	1	6	MCS0
Tested frequency [MHz]	*.SAR test was reduced	2412, 2437, 2462	2412, 2437, 2462	2412, 2437, 2462

Controlled software	Camera firmware: body-version 1.00 BLE command: HyperFFW with DSC_JigCommand_BT_v01.csv was installed into the host PC. Wi-Fi command: HyperFFW with DSC_JigCommand_wlan_ninsho.csv was installed into the host PC.

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 (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 (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)

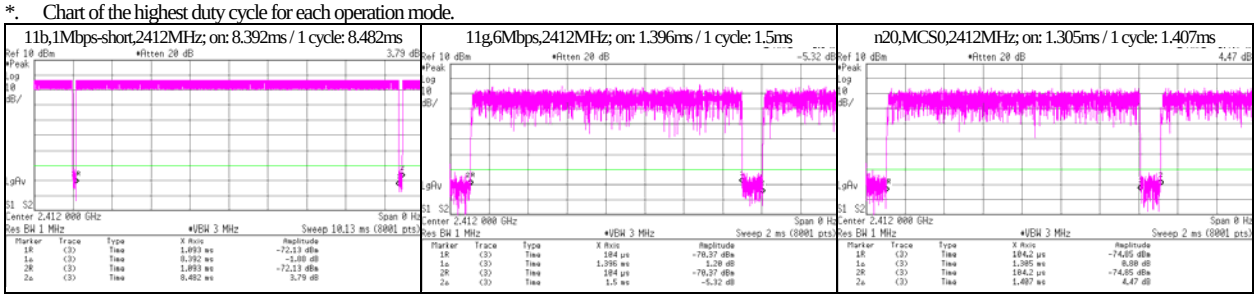
Mode	Frequency		Data rate	Power Setting (software)	Duty cycle	Duty factor	Duty scaled factor	Measurement Result				Power correction			Power Tune-up?	Remarks
								Time average power		Burst power		Max. power	Δ from max.	Tune-up factor		
	[MHz]	CH	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[dB]	[-]		
Model: WM-BN-BM-26_A (Antenna gain (peak): 3.68 dBi)																
BLE	2402	0	1	(fix)	100	0.00	×1.00	3.92	2.47	**3.92**	2.47	6	-2.08	×1.61	not applied	-
	2440	19	1	(fix)	100	0.00	×1.00	4.08	2.56	**4.08**	2.56	6	-1.92	×1.56	not applied	-
	2480	39	1	(fix)	100	0.00	×1.00	4.64	2.91	**4.64**	2.91	6	-1.36	×1.37	not applied	-
Model: FZ00010935-800 (Antenna gain (peak): -4.14 dBi)																
11b	2412	1	1	(fix)	98.9	0.05	×1.01	14.19	26.24	**14.24**	26.55	16	-1.76	×1.50	not applied	-
	2437	6	1	(fix)	98.9	0.05	×1.01	14.16	26.06	**14.21**	26.36	16	-1.79	×1.51	not applied	-
	2462	11	1	(fix)	98.9	0.05	×1.01	14.30	26.92	**14.35**	27.23	16	-1.65	×1.46	not applied	-
11g	2412	1	6	(fix)	93.1	0.32	×1.07	12.24	16.75	**12.56**	18.03	14.5	-1.94	×1.56	not applied	-
	2437	6	6	(fix)	93.1	0.32	×1.07	12.19	16.56	**12.51**	17.82	14.5	-1.99	×1.58	not applied	-
	2462	11	6	(fix)	93.1	0.32	×1.07	12.35	17.18	**12.67**	18.49	14.5	-1.83	×1.52	not applied	-
11n (20HT)	2412	1	MCS0	(fix)	92.8	0.33	×1.08	12.24	16.75	**12.57**	18.07	14.5	-1.93	×1.56	not applied	-
	2437	6	MCS0	(fix)	92.8	0.33	×1.08	12.20	16.60	**12.53**	17.91	14.5	-1.97	×1.57	not applied	-
	2462	11	MCS0	(fix)	92.8	0.33	×1.08	12.36	17.22	**12.69**	18.58	14.5	-1.81	×1.52	not applied	-

*. : SAR test was applied. *. xx.xx highlight is shown the higher measured output power in each operation mode, in each band.

*. 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)																			
11b (2412MHz)				11g (2412MHz)								11n(20HT) (2412MHz)							
D/R	Duty cycle (%)	Duty factor (dB)	Power	D/R	Duty cycle (%)	Duty factor (dB)	Power	D/R	Duty cycle (%)	Duty factor (dB)	Power	D/R	Duty cycle (%)	Duty factor (dB)	Power	D/R	Duty cycle (%)	Duty factor (dB)	Power
1	98.9	0.05	**14.19**	**6**	93.1	0.32	**12.24**	24	78.0	1.08	11.35	**MCS0**	92.8	0.33	**12.24**	MCS4	70.9	1.50	11.01
2	97.8	0.10	14.07	9	90.0	0.46	12.07	36	71.5	1.46	10.98	MCS1	86.7	0.63	11.87	MCS5	66.0	1.81	10.63
5.5	94.5	0.25	13.96	12	87.2	0.60	11.86	48	65.4	1.85	10.56	MCS2	81.7	0.88	11.62	MCS6	64.4	1.92	10.54
11	90.7	0.43	13.79	18	82.3	0.85	11.65	56	63.6	1.97	10.47	MCS3	77.6	1.11	11.39	MCS7	62.2	2.07	10.42

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



*. 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: July 27, 2017 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C. / 57 %RH)

*. Uncertainty of antenna port conducted test; Power measurement uncertainty above 1GHz for this test was: (±) 0.72 dB(Average)/(±) 0.85 dB(Peak).

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

SECTION 7: SAR Measurement results

7.1 SAR measurement results

Measurement date: August 4, 2017 Measurement by: Hiroshi Naka

[Liquid measurement]

Frequency [MHz]	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	Body	***52.75***	50.86	-3.6	-5% ≤ εr-meas. ≤ 0%	***1.914***	1.966	+2.7	0% ≤ σ-meas. ≤ +5%	22.2	152	+2.14	not required.	August 4. 2017, before SAR test
2437		***52.72***	50.79	-3.7		***1.938***	2.002	+3.3				+2.43	not required.	
2462		***52.68***	50.64	-3.9		***1.967***	2.035	+3.5				+2.52	not required.	

[Measured and Reported (Scaled) SAR results]

SAR measurement results										Reported SAR (1g) [W/kg]						Remarks
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)	
			Position	Gap [mm]	Battery ID	Max.value of multi-peak				Duty [%]	Duty scaled	Meas. [dBm].	Max. [dBm]	Tune-up factor		
						Meas.	ΔSAR [%]	ΔSAR corrected								
Model: FZ00010935-800																
11b	2462(11)	1	**Rear**	0	#1	**0.077**	+2.52	n/a (*c)	Plot 2-1	98.9	×1.01	14.35	16	×1.46	**0.114**	-
			Bottom	0	#2	**0.058**	+2.52	n/a (*c)	Plot 2-2	98.9	×1.01	14.35	16	×1.46	**0.086**	-
			Right-front	0	#1	**0.775**	+2.52	n/a (*c)	Plot 2-3	98.9	×1.01	14.35	16	×1.46	**1.143**	-
			Front-lens	0	#1	**0.616**	+2.52	n/a (*c)	Plot 2-4	98.9	×1.01	14.35	16	×1.46	**0.908**	-
			Front	0	#2	**0.763**	+2.52	n/a (*c)	Plot 2-5	98.9	×1.01	14.35	16	×1.46	**1.125**	-
			Front-right	0	#2	**0.845**	+2.52	n/a (*c)	Plot 1-1	98.9	×1.01	14.35	16	×1.46	**1.246**	Higher, Wi-Fi.
	2412(1)			0	#1	**0.721**	+2.14	n/a (*c)	Plot 2-6	98.9	×1.01	14.24	16	×1.50	**1.092**	-
	2437(6)			0	#2	**0.814**	+2.43	n/a (*c)	Plot 2-7	98.9	×1.01	14.21	16	×1.51	**1.241**	-
11g	2462(11)	6	**Front-right**	0	#1	**0.641**	+2.52	n/a (*c)	Plot 2-8	93.1	×1.07	12.67	14.5	×1.52	**1.043**	<1.2W/kg by measured
	2412(1)			0	#1	**0.554**	+2.14	n/a (*c)	Plot 2-9	93.1	×1.07	12.56	14.5	×1.56	**0.925**	<1.2W/kg by measured
	2437(6)			0	#2	**0.580**	+2.43	n/a (*c)	Plot 2-10	93.1	×1.07	12.51	14.5	×1.58	**0.981**	<1.2W/kg by measured
n(20HT)	2462(11)	MCS0	**Front-right**	0	#1	**0.648**	+2.52	n/a (*c)	Plot 2-11	92.8	×1.08	12.69	14.5	×1.52	**1.064**	<1.2W/kg by measured
	2412(1)			0	#1	**0.579**	+2.14	n/a (*c)	Plot 2-12	92.8	×1.08	12.57	14.5	×1.56	**0.975**	<1.2W/kg by measured
	2437(6)			0	#2	**0.623**	+2.43	n/a (*c)	Plot 2-13	92.8	×1.08	12.53	14.5	×1.57	**1.056**	<1.2W/kg by measured

Notes: *. Gap: It is the separation distance between the nearest position of EUT outer surface and the bottom outer surface of phantom;
Battery ID: Battery ID No.#1 and #2 are same. Refer to Appendix 1 for more detail.; Max.: maximum, Meas.: Measured; 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
2412, 2437, 2462 MHz	2450MHz	within ±50MHz of calibration frequency	7.38	±12.0%

*. 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 (v01r04), the dielectric parameters suggested for head and body tissue simulating liquid are given at 2000 and 2450MHz. Parameters for the frequencies 2000-2450MHz were obtained using linear interpolation.

*b. Refer to KDB865664 D01 (v01r04), 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. Calculating formula: $\Delta SAR(1g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = -7.854E\text{-}4 \times f^3 + 9.402E\text{-}3 \times f^2 - 2.742E\text{-}2 \times f - 0.2026$ / $C\sigma = 9.804E\text{-}3 \times f^3 - 8.661E\text{-}2 \times f^2 + 2.981E\text{-}2 \times f + 0.7829$
ΔSAR corrected SAR (1g) (W/kg) = (Meas. SAR(1g) (W/kg)) × (100 - (ΔSAR(%)) / 100

*d. Calculating formula: Reported SAR (1g) (W/kg) = (Measured SAR (1g) (W/kg)) × (Duty scaled) × (Tune-up factor)
Duty scaled = Duty scaled factor: Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = 100(%) / (duty cycle, %)
Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = 1 / (10 ^ ("Deviation from max., dB" / 10))

Notes: (Clause 5.2, 2.4GHz SAR Procedures, in KDB248227 D01 (v02r02))

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.

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.

7.2 SAR Measurement Variability / Device holder perturbation verification

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

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

When the highest reported SAR of an antenna is > 1.2 W/kg, holder perturbation verification is required for each antenna, using the highest SAR configuration among all applicable frequency bands.

SAR measurement results										Reported SAR (1g) [W/kg]						
Mode	Frequency [MHz] (Channel)	Data rate [Mbps]	EUT setup Position	Gap [mm]	Battery ID	SAR (1g) [W/kg] Max.value of multi-peak Meas.	ΔSAR [%]	ΔSAR corrected	SAR plot # in Appendix 2-2	Duty cycle correction Duty [%]	Duty cycle correction Duty scaled	Output burst average power correction Meas. [dBm].	Output burst average power correction Max. [dBm]	Output burst average power correction Tune-up factor	SAR Corrected (*d)	Remarks
Model: FZ00010935-800																
11b	2462(11)	1	**Front-right**	0	#2	**0.845**	+2.52	n/a (*c)	Plot 1-1	98.9	×1.01	14.35	16	×1.46	**1.246**	Measured maximum.
11b	2462(11)	1	**Front-right**	0	#1	**0.844**	+2.52	n/a (*c)	Plot 3-1	98.9	×1.01	14.35	16	×1.46	**1.245**	*. Repeated
11b	2462(11)	1	**Front-right**	0	#1	**0.805**	+2.52	n/a (*c)	Plot 3-2	98.9	×1.01	14.35	16	×1.46	**1.187**	*. No "Device-holder"

[SAR Measurement Variability]

Mode	Frequency [MHz]	Data rate	EUT setup position	Measured SAR (1g) [W/kg] Original	Measured SAR (1g) [W/kg] Repeated	Largest to Smallest SAR Ratio	SAR plot # in Appendix 2-2	Remarks
11b	2462 (11ch)	1Mbps	**Front-right**	**0.845**	**0.844**	**1.001**	Original: Plot 1-1 Repeated: Plot 3-1	*. 2nd repeated measurement is not required since the ratio of the largest to smallest SAR for the original and 1st repeated measurement is not > 1.20.

[Device holder perturbation verification]

Mode	Frequency [MHz]	Data rate	EUT setup position	Reported SAR (1g) [W/kg] Device holder Exist	Reported SAR (1g) [W/kg] Device holder None	Device holder perturbation SAR Ratio	Remarks
11b	2462 (11ch)	1Mbps	**Front-right**	**1.246** (plot 1-1)	**1.187** (plot 3-2)	**-4.7 %**	*.It was smaller than 5% of uncertainty of the setup, so influence of a device holder was judged to be no problem.

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

7.3 Simultaneous transmission evaluation

The Wireless LAN module (FZ00010935-800) operates with the Bluetooth module (WM-BN-BM-26_A) in the following simultaneously transmission.

[Reported SAR summation of simultaneously transmission]

Simultaneous transmission scenario Test position	Highest reported SAR(1g) [W/kg] (Standalone base) FZ00010935-800 Wi-Fi	Highest reported SAR(1g) [W/kg] (Standalone base) WM-BN-BM-26_A BLE	Σ1g SAR [W/kg] (≤1.6)	SPLSR (Yes / No)	Calculated distance [mm]	SPLSR (≤ 0.04)	Volume Scan (Yes/No)	Figure	Remarks
Front-right	**1.246** (*.Actual measured)	**0.026** (*.Estimated)	**1.272**	No	-	-	-	-	Wi-Fi+BLE
Rear	**0.114** (*.Actual measured)	**0.140** (*.Estimated)	**0.254**	No	-	-	-	-	Wi-Fi+BLE

General Note:

1) The Reported SAR simulation is calculated based on the same configuration and test position.
2) Per KDB447498 D01(v06), simultaneously transmission SAR is compliant if;
   (1) Reported SAR summation < 1.6 W/kg
   (2) "SPLSR = (SAR1 + SAR2)^1.5 / (minimum antenna separation distance, mm)", and the peak separation distance is determined form the square root of [(x1-x2)^2 + (y1-y2)^2 + (z1-z2^2)], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR location in the zoom scan.
   (where; "SAR1" is simulated SAR(1g) of Bluetooth, "SAR2" is highest reported SAR(1g) on antenna when it is 5GHz Wi-Fi operated.)
   (3) if SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   (4) Simultaneously transmission SAR, and the reported multi-band SAR < 1.6 W/kg.
3) For simultaneously transmission analysis, Bluetooth SAR and Wi-Fi SAR are estimated per KDB447498 D01(v06) based on the formula below.
   (1) [(max. power of channel, including tune-up tolerance, mW) / (minimum test separation distance, mm)]·[√f(GHz)/x] W/kg, for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR
   (2) The minimum separation distance was decided in Appendix 1-1: Photograph of EUT and antenna position.

Transmitter	Maximum power Mode	dBm	mW	Exposure Position	Antenna separation distance [mm] Rounded	Antenna separation distance [mm] Appendix 1-1	Upper frequency [GHz]	Reported SAR(1g) [W/kg] Estimated	Reported SAR(1g) [W/kg] Actual	Remarks
WM-BN-BM-26_A	BLE	6	4	Rear	6	6.18	2.480	**0.140**	(n/a)	"Estimated value" uses for simultaneously Tx calculation.
				Front-right	32	32.43	2.480	**0.026**	(n/a)	"Front-right" setup was worst SAR position of Wi-Fi.
FZ00010935-800	b	16	40	Rear	30	30.44	2.462	(0.28)	**0.114**	"Actual value" uses for simultaneously Tx calculation. "Front-right" setup was worst SAR position of Wi-Fi.
				Front-right	8	8.14	2.462	(1.05)	**1.246**	