



RADIO TEST REPORT

Test Report No.: 11984162S-R2

Applicant : Fukuda Denshi Co., Ltd.
Type of Equipment : ECG & Respiration Transmitter
Model No. : LX-8100
FCC ID : DV8LX8100
Test regulation : FCC Part 95 Subpart H: 2017
FCC Part 2 Subpart J: 2017
Test result : Complied

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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.
7. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
8. This report is a revised version of 11984162S-R1. 11984162S-R1 is replaced with this report.

Date of test:

October 11 to 20, 2017

Representative test engineer:

Kazuya Noda

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".

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Shonan EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11984162S

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SECTION 1: Customer information

Company Name : Fukuda Denshi Co., Ltd.
Address : 35-8, Hongo 2-chome, Bunkyo-ku, Tokyo 113-8420, Japan
Telephone Number : +81-3-5684-1300
Facsimile Number : +81-3-5684-1449
Contact Person : Yasuhiro Yonekawa

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of equipment : ECG & Respiration Transmitter
Model No. : LX-8100
Serial No. : Refer to Clause 4.2
Rating : DC 1.5 V(Battery)
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.
Receipt Date of Sample : September 6, 2017

2.2 Product description

Model: LX-8100 (referred to as the EUT in this report) is an ECG & Respiration Transmitter.

Clock frequency(ies) in the system : 84 kHz, 8 MHz, 9.6 MHz

Radio specification:

Radio Type : Transmitter
Frequency of Operation : 608.0125 MHz to 613.9875 MHz
Modulation : FSK
RF Output Power : 1 mW $\pm$ 2 dB *1)
RF Output Power Limit : 200 mV/m at 3 m (= 106.0 dBuV/m at 3 m)
Antenna type : Cable antenna (Monopole antenna)
Antenna gain : -6.5 dBi
Frequency stability : 2.5 ppm

*1) RF Output Power is fixed as shown in the document "Theory of Operation" and this product is shipped.
(* maximum measurement value was 0.70 mW. Refer to APPENDIX 1 (p.15 to p.17).)

Supplied voltage:

The EUT is a battery-operated device and test was performed with the new battery. Therefore, the EUT complies with power supply regulation.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 95 Subpart H,
FCC Part 95 final revised on September 20, 2017 and effective October 20, 2017

Title : FCC 47CFR Part 95 Personal Radio Services
Subpart H Wireless Medical Telemetry Service

* The revision on September 20, 2017, does not affect the test specification applied to the EUT.

Test specification : FCC Part 2 Subpart J,
FCC Part 2 final revised on November 2, 2017

Title : FCC 47CFR
Part 2 Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Subpart J Equipment Authorization Procedures

* The revision after testing does not affect the test specification applied to the EUT.

The EUT is used for the purpose of being related with medical treatment. Therefore this device applies to §15.103(e), exempted from FCC Part 15 Subpart B.

3.2 Procedures & Results

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst margin	Results
Conducted emissions	ANSI C63.4: 2014	FCC 15.207	-	N/A *3)	-	N/A
Field strength of fundamental emission	FCC 2.1046, ANSI/TIA-603-E	FCC 95.2369 (a)	Radiated	N/A	18.9 dB 611.000 MHz Horizontal, QP Tx 611.000 MHz, 613.988 MHz Horizontal, QP Tx 613.9875 MHz	Complied
Field strength of spurious emissions	FCC 2.1053, ANSI/TIA-603-E	FCC 95.2379	Radiated	N/A	9.5 dB 1227.975 MHz Vertical, AV Tx 613.9875 MHz	Complied
Frequency stability	FCC 2.1055, ANSI/TIA-603-E	FCC 95.2365	Radiated	N/A	-	Complied
Bandwidth	FCC 2.1049, ANSI/TIA-603-E	Applicant specification	Radiated	N/A	-	Complied
Spurious emission at antenna terminals	FCC 2.1051, ANSI/TIA-603-E	-	Conducted	N/A *2)	-	N/A

Note: UL Japan, Inc.'s EMI Work Test Procedure 13-EM-W0420.

*1) These tests were also referred to "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards" (TIA-603-E: 2016).

*2) The test is not applicable since the EUT has no antenna terminals.

*3) The test is not applicable since the EUT has no AC mains.

3.3 Addition to standard

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

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3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.
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Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.91 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

3.5 Test location

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

	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 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test setup, Test data & Test instruments

Refer to APPENDIX 1 to 3.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

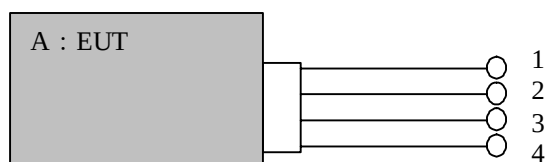
Test item	Operating mode	Tested frequency
All items	Transmitting (Modulated)	608.0125 MHz 611.0000 MHz 613.9875 MHz

Software: V01-01

Power setting: Fixed

Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	ECG & Respiration Transmitter	LX-8100	FA2	FUKUDA DENSHI	EUT

List of cables used

No.	Name	Length (m)	Shield (Cable)	Shield (Connector)	Remarks
1	Signal	0.7	Shielded	Shielded	-
2	Signal	0.7	Shielded	Shielded	-
3	Signal	0.7	Shielded	Shielded	-
4	Signal	0.7	Shielded	Shielded	-

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SECTION 5: Bandwidth & Occupied bandwidth (99 %)

Test procedure

The bandwidth was measured with a spectrum analyzer.

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 6: Frequency stability

Test procedure

The frequency stability was measured with a spectrum analyzer.

The temperature test was started after the temperature stabilization time of 30 minutes.

Tested temperature was -30 deg.C. to +50 deg.C

* The test result on 50 deg.C., 0 deg.C., -10 deg.C., -20 deg.C, and -30 deg.C were reference data, since the specification of operating temperature of EUT was 10 deg.C to 40 deg.C.
(It used the manufacturer's specified conditions (refer to FCC 95.2365))

Summary of the test results: Pass
Refer to APPENDIX 1

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SECTION 7: Field strength of fundamental emission and spurious emissions

7.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

7.2 Test configuration

EUT was placed on a polystyrene platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

7.3 Test conditions

Frequency range : 9 kHz to 7 GHz
EUT position : Table top

7.4 Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3 m. The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with QP and AV detector.

The radiated emission measurements were made with the following detector function.

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Test Receiver	Spectrum Analyzer *1)
Detector IF Bandwidth	QP: BW 120 kHz	AV RBW: 1 MHz VBW: 10 Hz (No pulse emission detected)
Measuring antenna	Biconical (30 MHz - 200 MHz) Logperiodic (200 MHz - 1 GHz)	Horn

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Worst case: Refer to the data.

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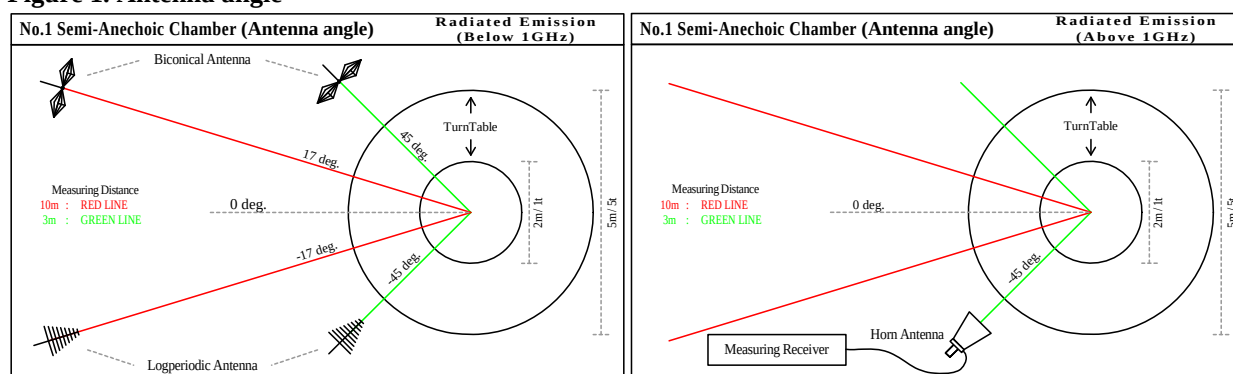
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Figure 1. Antenna angle



7.5 Band edge

To determine the level of band-edge spurious, we use the following procedure:

Set the resolution bandwidth to 1 kHz in the peak detector mode.

Because we don't want to include in-band emission at Band edge measurement if center frequencies are "608.0125 MHz" or "613.9875 MHz" and Band edges are "608 MHz" or "614 MHz",

(The supplementation: There are some granted test report that were measured by 3 kHz RBW for the equipment that has 350 kHz for 26 dB bandwidth in similar case.)

*As we started at section 7.5, we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 (971168 D01 Power Meas License Digital Systems v02r02).

Measure the maximum level of the in-band channel closest to the band edge and the maximum level of the out-of-band emissions close to the same band edge.

Determine the ratio of the in-band signal to the out-of-band emissions. Then, measure the level of the in-band channel in Average mode (= VBW 10 Hz) with 1MHz bandwidth. Using the ratio obtained, we calculate the equivalent level of the out-of-band emissions to determine compliance with the limits.

The emission tests, except for the band edge, were performed with the average mode of the spectrum analyzer. (Bandwidth: 1 MHz)

7.6 Results

Summary of the test results : Pass

* No noise from radio part was detected in 9 kHz to 30 MHz.

Refer to APPENDIX 1

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APPENDIX 1: Data of Radio tests**Frequency Stability**

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	October 16, 2017	
Temperature / Humidity	23 deg.C / 56 %RH	
Engineer	Kazuya Noda	
Mode	Transmitting	

Test Condition deg.C Voltage		Test Timing	Measured frequency [MHz]	Frequency error [MHz]	Result [ppm]	Limit [+/- ppm]	Margin [ppm]
20 deg.C	DC 0.9 V (Vmin)	Power on	608.012394	-0.000106	-0.17	2.50	2.33
		on 2 min.	608.012463	-0.000037	-0.06	2.50	2.44
		on 5 min.	608.012519	0.000019	0.03	2.50	2.47
		on 10 min.	608.012588	0.000088	0.14	2.50	2.36
	DC 1.5 V (Vnom)	Power on	608.012553	0.000053	0.09	2.50	2.41
		on 2 min.	608.012384	-0.000116	-0.19	2.50	2.31
		on 5 min.	608.012467	-0.000033	-0.05	2.50	2.45
		on 10 min.	608.012466	-0.000034	-0.06	2.50	2.44
50 deg.C.	DC 1.5V	Power on	608.012032	-0.000469	-0.77	-	-
		on 2 min.	608.012052	-0.000449	-0.74	-	-
		on 5 min.	608.011984	-0.000516	-0.85	-	-
		on 10 min.	608.011955	-0.000545	-0.90	-	-
40 deg.C.		Power on	608.012133	-0.000367	-0.60	2.50	1.90
		on 2 min.	608.012167	-0.000333	-0.55	2.50	1.95
		on 5 min.	608.012256	-0.000244	-0.40	2.50	2.10
		on 10 min.	608.012294	-0.000206	-0.34	2.50	2.16
30 deg.C.		Power on	608.012201	-0.000299	-0.49	2.50	2.01
		on 2 min.	608.012112	-0.000388	-0.64	2.50	1.86
		on 5 min.	608.012375	-0.000125	-0.21	2.50	2.29
		on 10 min.	608.012371	-0.000129	-0.21	2.50	2.29
20 deg.C.		Power on	608.012456	-0.000044	-0.07	2.50	2.43
		on 2 min.	608.012451	-0.000049	-0.08	2.50	2.42
		on 5 min.	608.012219	-0.000281	-0.46	2.50	2.04
		on 10 min.	608.012388	-0.000112	-0.18	2.50	2.32
10 deg.C.		Power on	608.012687	0.000187	0.31	2.50	2.19
		on 2 min.	608.012701	0.000201	0.33	2.50	2.17
		on 5 min.	608.012744	0.000244	0.40	2.50	2.10
		on 10 min.	608.012756	0.000256	0.42	2.50	2.08
0 deg.C.		Power on	608.012262	-0.000238	-0.39	-	-
		on 2 min.	608.012131	-0.000369	-0.61	-	-
		on 5 min.	608.012130	-0.000370	-0.61	-	-
		on 10 min.	608.012156	-0.000344	-0.57	-	-
-10deg.C.		Power on	608.011831	-0.000669	-1.10	-	-
		on 2 min.	608.011274	-0.001226	-2.02	-	-
		on 5 min.	608.010989	-0.001511	-2.49	-	-
		on 10 min.	608.011292	-0.001208	-1.99	-	-
-20 deg.C		Power on	608.009229	-0.003271	-5.38	-	-
		on 2 min.	608.009328	-0.003172	-5.22	-	-
		on 5 min.	608.008967	-0.003533	-5.81	-	-
		on 10 min.	608.008917	-0.003583	-5.89	-	-
-30 deg.C		Power on	608.004647	-0.007853	-12.92	-	-
		on 2 min.	608.004459	-0.008041	-13.23	-	-
		on 5 min.	608.004353	-0.008147	-13.40	-	-
		on 10 min.	608.004028	-0.008472	-13.93	-	-

Limit : 608.0125 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.001520 MHz

*The test on 50deg.C., 0deg.C., -10deg.C., -20deg.C. and -30deg.C. were not apply, since the specification of operating temperature of EUT was 10deg.C to 40deg.C. (It used the manufacturer's specified conditions (refer to FCC 95.2365))

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Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	October 16, 2017	
Temperature / Humidity	23 deg.C / 56 %RH	
Engineer	Kazuya Noda	
Mode	Transmitting	

Test Condition deg.C Voltage		Test Timing	Measured frequency [MHz]	Frequency error [MHz]	Result [ppm]	Limit [+/- ppm]	Margin [ppm]
20 deg.C	DC 0.9 V (Vmin)	Power on	610.999828	-0.000172	-0.28	2.50	2.22
		on 2 min.	610.999833	-0.000167	-0.27	2.50	2.23
		on 5 min.	610.999643	-0.000357	-0.58	2.50	1.92
		on 10 min.	610.999743	-0.000257	-0.42	2.50	2.08
	DC 1.5 V (Vnom)	Power on	610.999837	-0.000163	-0.27	2.50	2.23
		on 2 min.	610.999848	-0.000152	-0.25	2.50	2.25
		on 5 min.	610.999887	-0.000113	-0.18	2.50	2.32
		on 10 min.	610.999839	-0.000161	-0.26	2.50	2.24
50 deg.C.	DC 1.5V	Power on	610.999603	-0.000397	-0.65	-	-
		on 2 min.	610.999591	-0.000409	-0.67	-	-
		on 5 min.	610.999657	-0.000343	-0.56	-	-
		on 10 min.	610.999395	-0.000605	-0.99	-	-
40 deg.C.		Power on	610.999662	-0.000338	-0.55	2.50	1.95
		on 2 min.	610.999761	-0.000239	-0.39	2.50	2.11
		on 5 min.	610.999568	-0.000432	-0.71	2.50	1.79
		on 10 min.	610.999612	-0.000388	-0.64	2.50	1.86
30 deg.C.		Power on	610.999612	-0.000388	-0.64	2.50	1.86
		on 2 min.	610.999675	-0.000325	-0.53	2.50	1.97
		on 5 min.	610.999693	-0.000307	-0.50	2.50	2.00
		on 10 min.	610.999497	-0.000503	-0.82	2.50	1.68
20 deg.C.		Power on	610.999897	-0.000103	-0.17	2.50	2.33
		on 2 min.	610.999847	-0.000153	-0.25	2.50	2.25
		on 5 min.	610.999869	-0.000131	-0.21	2.50	2.29
		on 10 min.	610.999791	-0.000209	-0.34	2.50	2.16
10 deg.C.		Power on	610.999612	-0.000388	-0.64	2.50	1.86
		on 2 min.	610.999781	-0.000219	-0.36	2.50	2.14
		on 5 min.	610.999812	-0.000188	-0.31	2.50	2.19
		on 10 min.	610.999481	-0.000519	-0.85	2.50	1.65
0 deg.C.		Power on	610.999744	-0.000256	-0.42	-	-
		on 2 min.	610.999763	-0.000237	-0.39	-	-
		on 5 min.	610.999815	-0.000185	-0.30	-	-
		on 10 min.	610.999731	-0.000269	-0.44	-	-
-10deg.C.		Power on	610.999175	-0.000825	-1.35	-	-
		on 2 min.	610.998943	-0.001057	-1.73	-	-
		on 5 min.	610.999325	-0.000675	-1.10	-	-
		on 10 min.	610.999103	-0.000897	-1.47	-	-
-20 deg.C		Power on	610.995492	-0.004508	-7.38	-	-
		on 2 min.	610.994804	-0.005196	-8.50	-	-
		on 5 min.	610.995431	-0.004569	-7.48	-	-
		on 10 min.	610.995501	-0.004499	-7.36	-	-
-30 deg.C		Power on	610.991878	-0.008122	-13.29	-	-
		on 2 min.	610.991753	-0.008247	-13.50	-	-
		on 5 min.	610.991678	-0.008322	-13.62	-	-
		on 10 min.	610.991409	-0.008591	-14.06	-	-

Limit : 611 MHz $\pm 0.00025\%$ (± 2.5 ppm) = ± 0.001528 MHz

*The test on 50deg.C., 0deg.C., -10deg.C., -20deg.C. and -30deg.C. were not apply, since the specification of operating temperature of EUT was 10deg.C to 40deg.C. (It used the manufacturer's specified conditions (refer to FCC 95.2365))

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Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	October 16, 2017	
Temperature / Humidity	23 deg.C / 56 %RH	
Engineer	Kazuya Noda	
Mode	Transmitting	

Test Condition deg.C Voltage		Test Timing	Measured frequency [MHz]	Frequency error [MHz]	Result [ppm]	Limit [+/- ppm]	Margin [ppm]
20 deg.C	DC 0.9 V (Vmin)	Power on	613.987464	-0.000036	-0.06	2.50	2.44
		on 2 min.	613.987409	-0.000091	-0.15	2.50	2.35
		on 5 min.	613.987227	-0.000273	-0.44	2.50	2.06
		on 10 min.	613.987397	-0.000103	-0.17	2.50	2.33
	DC 1.5 V (Vnom)	Power on	613.987412	-0.000088	-0.14	2.50	2.36
		on 2 min.	613.987371	-0.000129	-0.21	2.50	2.29
		on 5 min.	613.987352	-0.000148	-0.24	2.50	2.26
		on 10 min.	613.987441	-0.000059	-0.10	2.50	2.40
50 deg.C.	DC 1.5V	Power on	613.987042	-0.000458	-0.75	-	-
		on 2 min.	613.986982	-0.000518	-0.84	-	-
		on 5 min.	613.986688	-0.000812	-1.32	-	-
		on 10 min.	613.986851	-0.000649	-1.06	-	-
40 deg.C.		Power on	613.987181	-0.000319	-0.52	2.50	1.98
		on 2 min.	613.987050	-0.000450	-0.73	2.50	1.77
		on 5 min.	613.987101	-0.000399	-0.65	2.50	1.85
		on 10 min.	613.987169	-0.000331	-0.54	2.50	1.96
30 deg.C.		Power on	613.987193	-0.000307	-0.50	2.50	2.00
		on 2 min.	613.986995	-0.000505	-0.82	2.50	1.68
		on 5 min.	613.987193	-0.000307	-0.50	2.50	2.00
		on 10 min.	613.986981	-0.000519	-0.85	2.50	1.65
20 deg.C.		Power on	613.987319	-0.000181	-0.29	2.50	2.21
		on 2 min.	613.987287	-0.000213	-0.35	2.50	2.15
		on 5 min.	613.987409	-0.000091	-0.15	2.50	2.35
		on 10 min.	613.987351	-0.000149	-0.24	2.50	2.26
10 deg.C.		Power on	613.987869	0.000369	0.60	2.50	1.90
		on 2 min.	613.987819	0.000319	0.52	2.50	1.98
		on 5 min.	613.987644	0.000144	0.23	2.50	2.27
		on 10 min.	613.987687	0.000187	0.30	2.50	2.20
0 deg.C.		Power on	613.987387	-0.000113	-0.18	-	-
		on 2 min.	613.987325	-0.000175	-0.29	-	-
		on 5 min.	613.987401	-0.000099	-0.16	-	-
		on 10 min.	613.987019	-0.000481	-0.78	-	-
-10deg.C.		Power on	613.986762	-0.000738	-1.20	-	-
		on 2 min.	613.986712	-0.000788	-1.28	-	-
		on 5 min.	613.986534	-0.000966	-1.57	-	-
		on 10 min.	613.986503	-0.000997	-1.62	-	-
-20 deg.C		Power on	613.983804	-0.003696	-6.02	-	-
		on 2 min.	613.984036	-0.003464	-5.64	-	-
		on 5 min.	613.983748	-0.003752	-6.11	-	-
		on 10 min.	613.983842	-0.003658	-5.96	-	-
-30 deg.C		Power on	613.979221	-0.008279	-13.48	-	-
		on 2 min.	613.979229	-0.008271	-13.47	-	-
		on 5 min.	613.979040	-0.008460	-13.78	-	-
		on 10 min.	613.979022	-0.008478	-13.81	-	-

Limit : 613.9875 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.001535 MHz

*The test on 50deg.C., 0deg.C., -10deg.C., -20deg.C. and -30deg.C. were not apply, since the specification of operating temperature of EUT was 10deg.C to 40deg.C. (It used the manufacturer's specified conditions (refer to FCC 95.2365))

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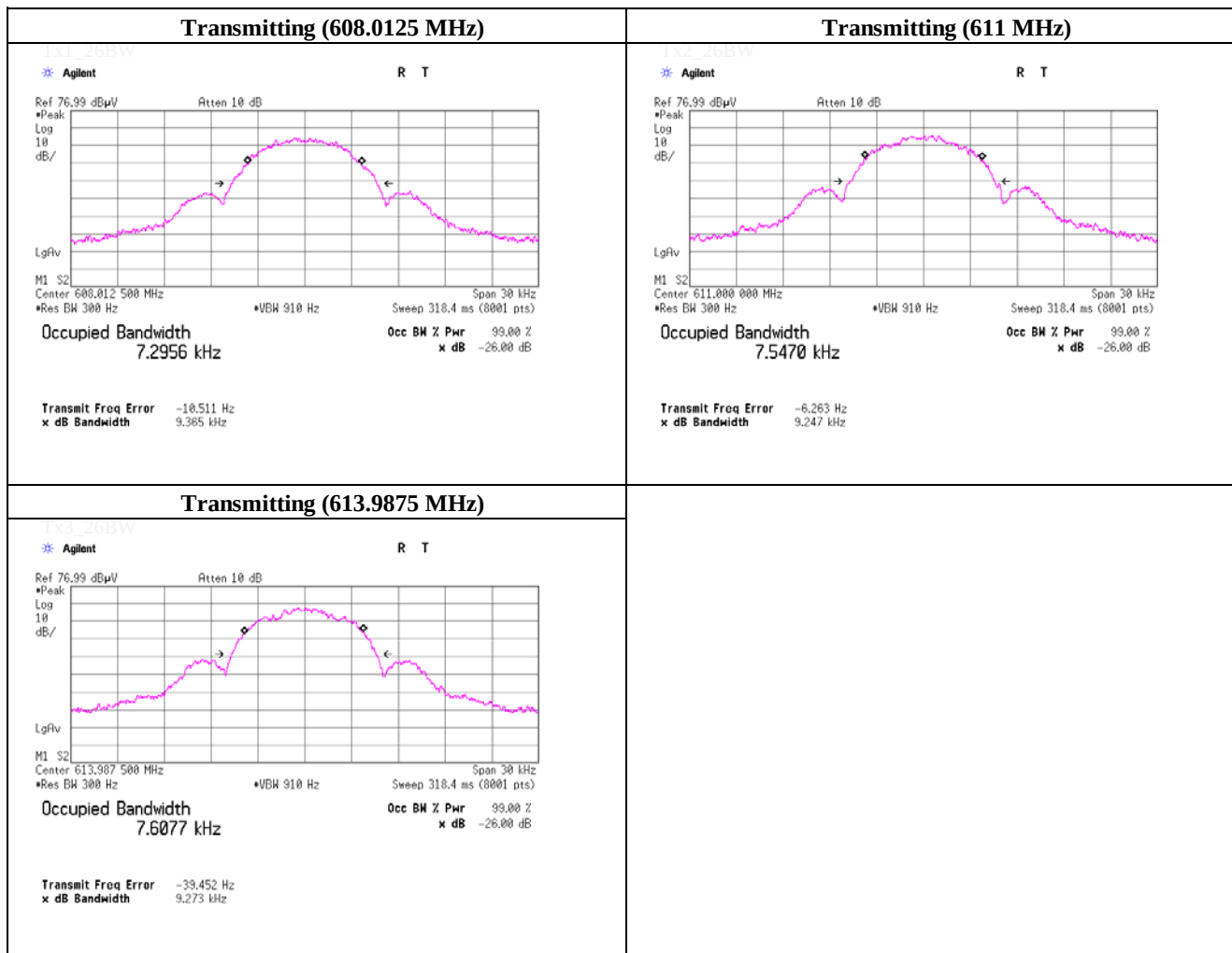
-26 dB Bandwidth

Test place UL Japan, Inc. Shonan EMC Lab.
 Date October 16, 2017
 Temperature / Humidity 23 deg.C / 56 %RH
 Engineer Kazuya Noda
 Mode Transmitting

No.5 Shielded Room

Freq. [MHz]	-26 dB Bandwidth [kHz]
608.0125	9.365
611.0000	9.247
613.9875	9.273

No limit applies to -26 dB Bandwidth.



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Mode	Tx,	608.0125 MHz	EUT worst axis: below 1 GHz Hori: X, Vert: Z / above 1 GHz Hori: Y, Vert: Y Antenna worst axis: below 1 GHz Hori: X, Vert: Y / above 1 GHz Hori: X, Vert: X
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Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	October 12, 2017	October 20, 2017
Temperature / Humidity	21 deg.C / 60 %RH	21 deg.C / 52 %RH
Engineer	Hikaru Shirasawa (9 kHz - 30 MHz)	Kazutaka Takeyama (30 MHz - 7 GHz)
Mode	Tx, 611.0000 MHz	EUT worst axis: below 1 GHz Hori: X, Vert: Z / above 1 GHz Hori: Y, Vert: Y Antenna worst axis: below 1 GHz Hori: X, Vert: Y / above 1 GHz Hori: X, Vert: X

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	150.000	QP	21.82	14.89	8.72	31.77	13.7	46.0	32.3	300	0	Carrier
Hori.	300.000	QP	21.75	13.51	6.78	31.76	10.3	46.0	35.7	100	0	
Hori.	611.000	QP	91.19	19.21	8.64	31.97	87.1	106.0	18.9	164	349	
Hori.	1222.000	AV	43.58	24.58	4.04	41.05	31.2	54.0	22.9	226	109	VBW:10Hz
Hori.	1833.000	AV	48.03	25.58	3.84	41.03	36.4	54.0	17.6	113	169	VBW:10Hz
Hori.	2444.000	AV	44.32	27.32	4.48	40.82	35.3	54.0	18.7	109	118	VBW:10Hz
Hori.	3055.000	AV	39.78	28.64	4.94	41.45	31.9	54.0	22.1	100	24	VBW:10Hz
Hori.	3666.000	AV	39.61	29.07	5.21	41.84	32.1	54.0	21.9	100	231	VBW:10Hz
Hori.	4277.000	AV	37.72	30.14	5.62	42.21	31.3	54.0	22.7	100	200	VBW:10Hz
Hori.	4888.000	AV	35.79	31.32	6.05	41.75	31.4	54.0	22.6	100	0	VBW:10Hz
Hori.	5499.000	AV	35.31	31.96	6.38	41.51	32.1	54.0	21.9	100	0	VBW:10Hz
Hori.	6110.000	AV	35.27	33.21	6.75	41.08	34.2	54.0	19.9	100	0	VBW:10Hz
Vert.	150.000	QP	21.81	14.89	8.72	31.77	13.7	46.0	32.4	100	0	Carrier
Vert.	300.000	QP	21.53	13.51	6.78	31.76	10.1	46.0	35.9	100	0	
Vert.	611.000	QP	89.16	19.21	8.64	31.97	85.0	106.0	21.0	166	234	
Vert.	1222.000	AV	56.44	24.58	4.04	41.05	44.0	54.0	10.0	100	151	VBW:10Hz
Vert.	1833.000	AV	50.55	25.58	3.84	41.03	38.9	54.0	15.1	100	28	VBW:10Hz
Vert.	2444.000	AV	42.57	27.32	4.48	40.82	33.6	54.0	20.5	100	143	VBW:10Hz
Vert.	3055.000	AV	38.45	28.64	4.94	41.45	30.6	54.0	23.4	100	189	VBW:10Hz
Vert.	3666.000	AV	37.04	29.07	5.21	41.84	29.5	54.0	24.5	100	170	VBW:10Hz
Vert.	4277.000	AV	36.19	30.14	5.62	42.21	29.7	54.0	24.3	100	323	VBW:10Hz
Vert.	4888.000	AV	35.49	31.32	6.05	41.75	31.1	54.0	22.9	100	0	VBW:10Hz
Vert.	5499.000	AV	35.44	31.96	6.38	41.51	32.3	54.0	21.7	100	0	VBW:10Hz
Vert.	6110.000	AV	35.24	33.21	6.75	41.08	34.1	54.0	19.9	100	0	VBW:10Hz

*The 10th harmonic was not seen so the result was its base noise level.

[RF output power]

	Result [dBuV/m]	Result 1 [mW]
carrier Level	87.1	0.68

$$\text{Result 1 [mW]} = (((10^{(\text{Result [dBuV/m]} / 20)} \times (10^{-6})) \times (\text{distance} = 3 \text{ [m]})^2) / (30 \times (\text{gain} = 10^{(-6.5 \text{ dB} / 10)}))) \times 10^3$$

	EIRP [W]
carrier Level	0.0002

$$\text{EIRP [W]} = ((10^{(\text{Result [dBuV/m]} / 20)} \times (10^{-6})) \times (\text{distance} = 3 \text{ [m]})^2) / 30$$

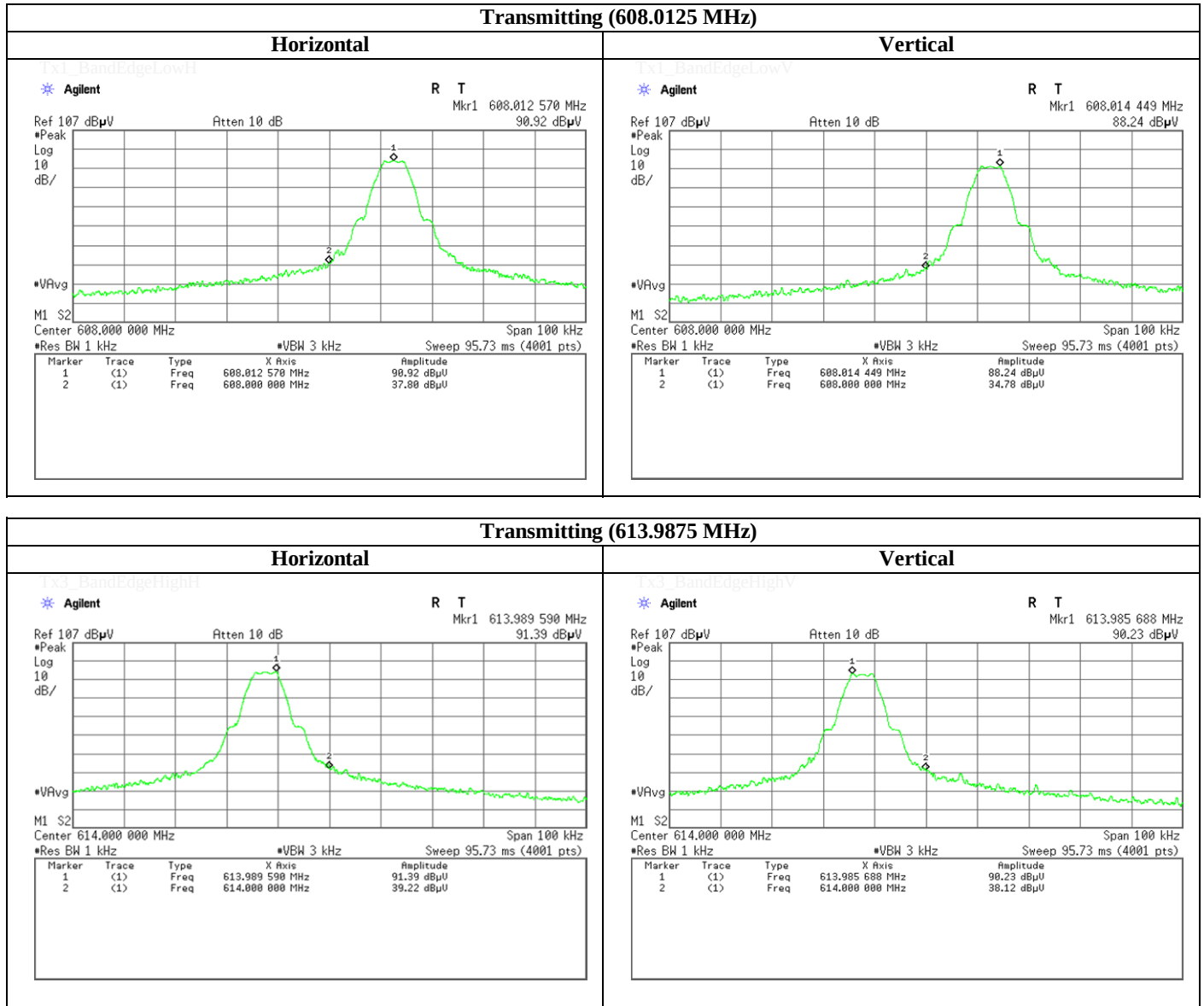
Antenna worst axis: below 1 GHz Hori: X, Vert: Y / above 1 GHz Hori: X, Vert: X

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Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	October 12, 2017	October 20, 2017
Temperature / Humidity	21 deg.C / 60 %RH	21 deg.C / 52 %RH
Engineer	Hikaru Shirasawa	Kazutaka Takeyama
	(9 kHz - 30 MHz)	(30 MHz - 7 GHz)

Field Strength(Electric Field Strength of Fundamental Emission , Spurious Emission and Band Edge Compliance)

Band Edge compliance(for Marker Delta Method)



UL Japan, Inc.

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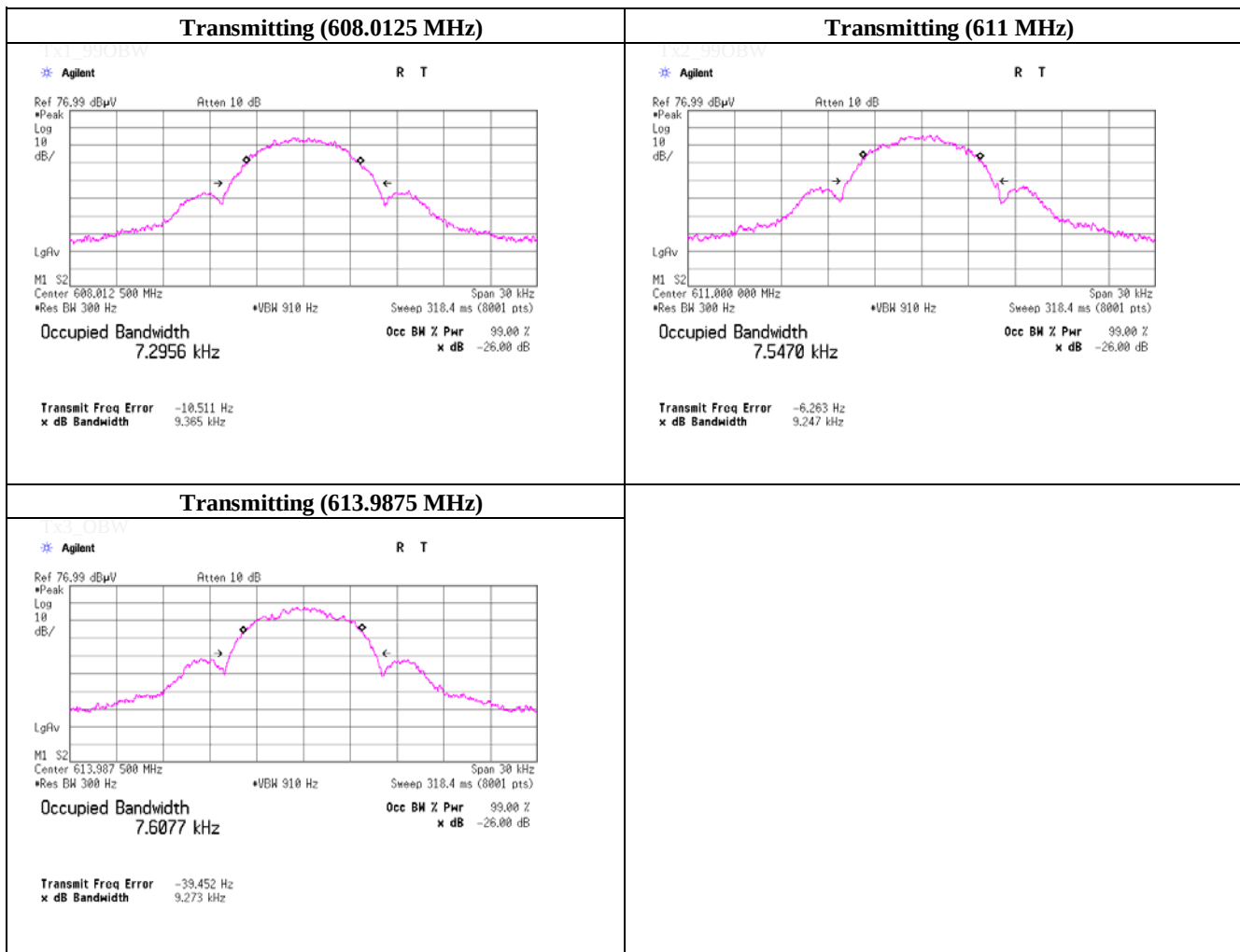
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99 % Occupied Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	October 16, 2017	
Temperature / Humidity	23 deg.C / 56 %RH	
Engineer	Kazuya Noda	
Mode	Transmitting	

Freq. [MHz]	99 % Occupied Bandwidth [kHz]
608.0125	7.296
611.0000	7.547
613.9875	7.608



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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-01	Pre Amplifier	SONOMA	310N	290211	ME,RE	2017/02/09 * 12
SAT6-12	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	ME	2017/08/24 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	ME,RE	2017/04/07 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	ME,RE	2016/10/12 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	ME,RE	2017/03/23 * 12
KJM-09	Measure	KOMELON	KMC-36	-	ME,RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	ME,RE	2017/06/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFLMF)	-	ME,RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	ME,RE	2016/10/17 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	ME	2016/10/28 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2016/12/15 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2017/08/24 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2016/10/15 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/01/05 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2016/10/11 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2017/03/17 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2017/01/08 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SFL-01	Highpass Filter	MICRO-TRONICS	HPM50115	001	RE	2016/11/29 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	TF	2017/08/20 * 12
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	TF	2017/04/17 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	TF	2017/10/11 * 12

The expiration date of the calibration is the end of the expired month .

As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

ME: Magnetic emission,
RE: Radiated emission,
TF: Test Fixture

End of Report