



RADIO TEST REPORT

Test Report No. : 13272774S-R3

Applicant : Fukuda Denshi Co., Ltd.
Type of EUT : ECG, Respiration and SpO2 Transmitter
Model Number of EUT : LX-8300M(G)
FCC ID : DV8LX8300MG
Test regulation : FCC Part 95 Subpart H: 2020
FCC Part 2 Subpart J: 2020
Test Result : Complied (Refer to SECTION 3.2)

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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 the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
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.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13272774S-R2. 13272774S-R2 is replaced with this report.

Date of test: March 16 to 28, 2020

Representative test engineer:

Kenichi Adachi
Engineer
Consumer Technology Division

Approved by:

Toyokazu Imamura
Leader
Consumer Technology Division



CERTIFICATE 1266.03

- ☐ 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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REVISION HISTORY

Original Test Report No.: 13272774S

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13272774S	April 27, 2020	-	-
1	13272774S-R1	May 25, 2020	5	Correction of Frequency of Operation in 2.2: "1395.0375 MHz - 1399.9675 MHz, 1427.0375 MHz - 1426.2625 MHz" to "1395.0375 MHz - 1399.9625 MHz, 1427.0375 MHz - 1431.4625 MHz"
2	13272774S-R2	May 26, 2020	6 13-18	Correction of error in applicable item number (WMTS field strength limits 90.2369(a) to 90.2369(b)) Correction of error of discription temperature and error of reason. ("on 50 deg.C., 0 deg.C., -10 deg.C. and -20 deg.C" to "on 50 deg.C., 0 deg.C., -10 deg.C., -20 deg.C and -30 deg.C" , "were not apply" to "were reference data")
3	13272774S-R3	May 28, 2020	21-23, 25-27	Added the E.I.R.P. value of RF output power.

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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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

The information provided from the customer is as follows;

- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
 - Operating/Test Mode(s) (Mode(s)) on all the relevant pages
 - SECTION 1: Customer information
 - SECTION 2: Equipment under test (EUT) other than the Receipt Date
 - SECTION 4: Operation of EUT during testing
- * The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type	:	ECG, Respiration and SpO2 Transmitter
Model Number	:	LX-8300M(G)
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 3.0 V (Battery)
Receipt Date	:	March 16, 2020
Country of Mass-production	:	Japan
Condition	:	Production model
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: LX-8300M(G) (referred to as the EUT in this report) is an ECG, Respiration and SpO2 Transmitter.

Clock frequency(ies) in the system	:	32.768 kHz, 84 kHz, 4.915 MHz, 8 MHz (Not Radio part), 13 MHz (Radio part, TCXO)
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Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	1395.0375 MHz - 1399.9625 MHz, 1427.0375 MHz - 1431.4625 MHz
Modulation	:	FSK
RF Output Power	:	7 dBm $\pm$ 2 dB *1)
RF Output Power Limit	:	740 mV/m at 3 m (= 117.38 dBuV/m at 3 m)
Antenna type	:	Dielectric antenna
Antenna gain	:	-1.62 dBi or below (for 1395 MHz - 1400 MHz), -1.32 dBi or below (for 1427 MHz - 1432 MHz)
Frequency stability	:	$\pm$ 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 5.002 mW (= 6.991 dBm). Refer to APPENDIX 1.)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test specification : FCC Part 95 Subpart H,
FCC Part 95 final revised on April 1, 2020 and effective June 1, 2020

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

Test specification : FCC Part 2 Subpart J, FCC Part 2 final revised on April 1, 2020 and effective June 1, 2020

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

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 and results

Item	Test Procedure *1)	Specification	Test method	Worst margin	Results	Remarks
Conducted emissions	ANSI C63.4: 2014	FCC 15.207	-	-	N/A	N/A *2)
WMTS field strength limits	FCC 2.1046, ANSI/TIA-603-E	FCC 95.2369 (b)	Radiated	16.4 dB (Horizontal, AV, Mode: Tx 1429.2625 MHz)	Complied a)	N/A
WMTS unwanted emissions limits	FCC 2.1053, ANSI/TIA-603-E	FCC 95.2379	Radiated	5.2 dB (8588.775 MHz, Horizontal, AV, Mode: Tx 1431.4625 MHz)	Complied a)	N/A
WMTS frequency accuracy	FCC 2.1055, ANSI/TIA-603-E	FCC 95.2365	Radiated	-	Complied b)	N/A
Bandwidth	FCC 2.1049, ANSI/TIA-603-E	Applicant specification	Radiated	-	Complied c)	N/A
Spurious emission at antenna terminals	FCC 2.1051, ANSI/TIA-603-E	-	Conducted	-	N/A	N/A *3)
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 AC mains. *3) The test is not applicable since the EUT has no antenna terminals. a) Refer to APPENDIX 1 (data of Field Strength (Radiated Emission)) b) Refer to APPENDIX 1 (data of Frequency Stability) c) Refer to APPENDIX 1 (data of Bandwidth) Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.						

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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3.3 Addition to standard

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

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. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 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	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

3.5 Test Location

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A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	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 data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

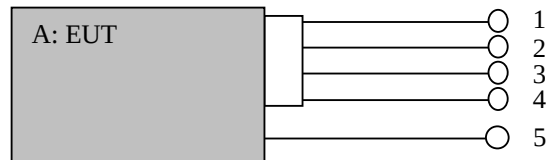
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items	Transmitting (Modulated)	1395.0375 MHz, 1397.5125 MHz, 1399.9625 MHz 1427.0375 MHz, 1429.2625 MHz, 1431.4625 MHz

Software: V01-01 (Date: 2020.3.16, Storage location: EUT memory)

Power setting: Fixed

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and 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 and SpO2 Transmitter	LX-8300M(G)	No.1	Fukuda Denshi Co., Ltd.	EUT

List of cables used

No.	Name	Length (m)	Shield (Cable)	Shield (Connector)	Remarks
1	Signal	0.8	Shielded	Shielded	-
2	Signal	0.8	Shielded	Shielded	-
3	Signal	0.8	Shielded	Shielded	-
4	Signal	0.8	Shielded	Shielded	-
5	Signal	0.9	Shielded	Shielded	-

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SECTION 5: Bandwidth & Occupied bandwidth (99 %)

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data	: APPENDIX
Test result	: Pass

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))

Test data	: APPENDIX
Test result	: Pass

SECTION 7: Field Strength (Fundamental Emission & Out of band emissions)

Test Procedure

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane, and at a distance of 3 m.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

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

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Test Receiver	Spectrum Analyzer *1)
Detector IF Bandwidth	QP: RBW 200 Hz (9 kHz - 150 kHz), QP: RBW 9 kHz (150 kHz - 30 MHz), QP: BW 120 kHz (30 MHz - 1000 MHz)	AV: RBW: 1 MHz VBW: 10 Hz (No pulse emission detected)
Measuring antenna	Loop (9 kHz - 30 MHz), 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.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

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 BandEdge measurement if center frequencies are following cases,

BandEdge of "1395.0375 MHz" is "1395 MHz" or, BandEdge of "1399.9625 MHz" is "1400 MHz" or,

BandEdge of "1427.0375 MHz" is "1427 MHz" or, BandEdge of "1431.4625 MHz" is "1432 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.)

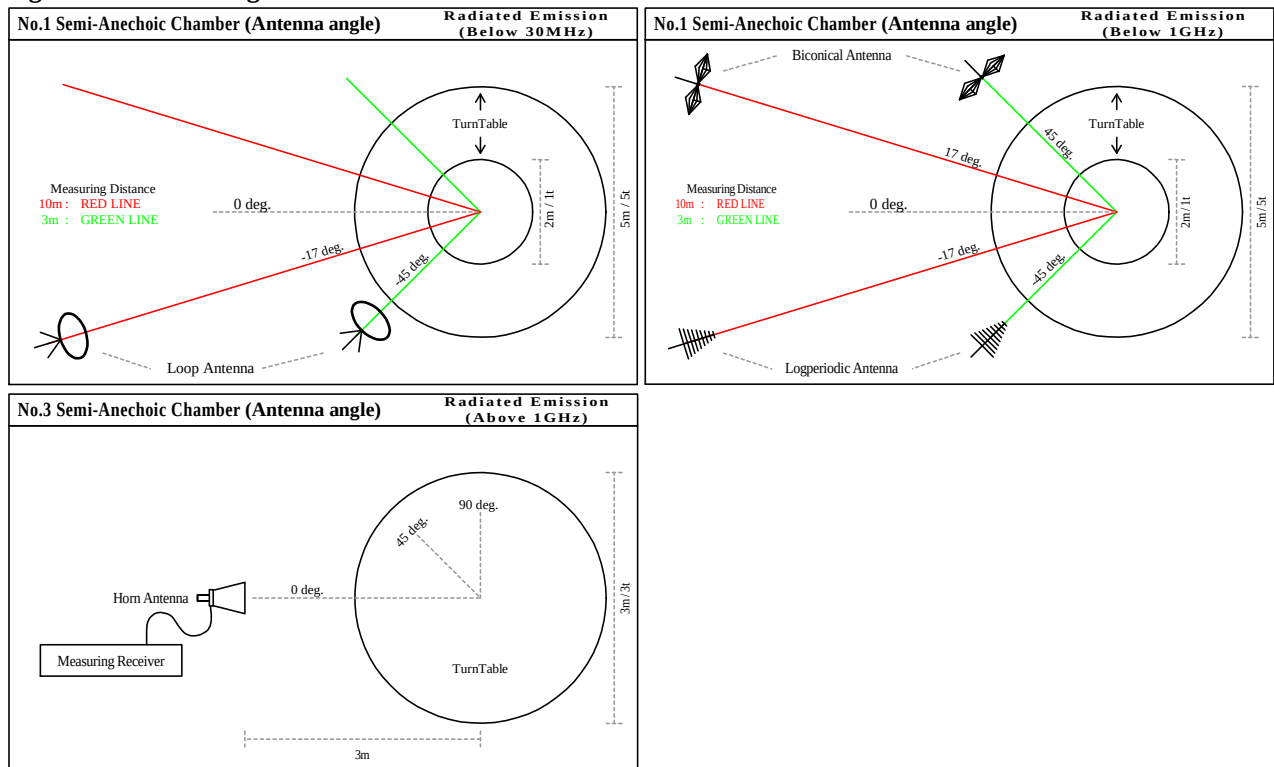
We used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (971168 D01 Power Meas License Digital Systems v03r01).

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 CISPR quasi-peak mode with 120 kHz 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 quasi-peak mode of the spectrum analyzer. (Bandwidth: 1 MHz)

Figure 1. Antenna angle



Measurement range : 9 kHz - 15 GHz

Test data : APPENDIX

Test result : Pass

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

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

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 17, 2020	March 18, 2020 March 19, 2020
Temperature / Humidity	21 deg.C / 45 %RH	23 deg.C / 35 %RH 25 deg.C / 35 %RH
Engineer	Kenichi Adachi	Kenichi Adachi 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 1.88 V (Vmin)	Power on	1395.037918	0.000417	0.299	2.50	2.201
		on 2 min.	1395.038018	0.000518	0.371	2.50	2.129
		on 5 min.	1395.037827	0.000327	0.234	2.50	2.266
		on 10 min.	1395.037761	0.000261	0.187	2.50	2.313
	DC 3 V (Vnom)	Power on	1395.037899	0.000399	0.286	2.50	2.214
		on 2 min.	1395.037836	0.000336	0.241	2.50	2.259
		on 5 min.	1395.038005	0.000505	0.362	2.50	2.138
		on 10 min.	1395.038040	0.000540	0.387	2.50	2.113
50 deg.C.	DC 3 V	Power on	1395.037442	-0.000058	-0.042	-	-
		on 2 min.	1395.037640	0.000139	0.100	-	-
		on 5 min.	1395.037511	0.000011	0.008	-	-
		on 10 min.	1395.037755	0.000255	0.183	-	-
40 deg.C.		Power on	1395.037783	0.000283	0.203	2.50	2.297
		on 2 min.	1395.037380	-0.000120	-0.086	2.50	2.414
		on 5 min.	1395.037736	0.000236	0.169	2.50	2.331
		on 10 min.	1395.037636	0.000136	0.097	2.50	2.403
30 deg.C.		Power on	1395.037333	-0.000167	-0.120	2.50	2.380
		on 2 min.	1395.037792	0.000292	0.209	2.50	2.291
		on 5 min.	1395.037633	0.000133	0.095	2.50	2.405
		on 10 min.	1395.037911	0.000411	0.295	2.50	2.205
20 deg.C.		Power on	1395.037505	0.000005	0.004	2.50	2.496
		on 2 min.	1395.037624	0.000123	0.089	2.50	2.411
		on 5 min.	1395.037374	-0.000127	-0.091	2.50	2.409
		on 10 min.	1395.037715	0.000215	0.154	2.50	2.346
10 deg.C.		Power on	1395.037361	-0.000139	-0.100	2.50	2.400
		on 2 min.	1395.037658	0.000158	0.113	2.50	2.387
		on 5 min.	1395.037261	-0.000239	-0.172	2.50	2.328
		on 10 min.	1395.037596	0.000096	0.068	2.50	2.432
0 deg.C.		Power on	1395.037314	-0.000186	-0.133	-	-
		on 2 min.	1395.037298	-0.000202	-0.145	-	-
		on 5 min.	1395.037524	0.000024	0.017	-	-
		on 10 min.	1395.037711	0.000211	0.151	-	-
-10deg.C.		Power on	1395.037308	-0.000192	-0.138	-	-
		on 2 min.	1395.037580	0.000080	0.057	-	-
		on 5 min.	1395.037386	-0.000114	-0.082	-	-
		on 10 min.	1395.037298	-0.000202	-0.145	-	-
-20 deg.C		Power on	1395.037339	-0.000161	-0.116	-	-
		on 2 min.	1395.037796	0.000295	0.212	-	-
		on 5 min.	1395.037311	-0.000189	-0.135	-	-
		on 10 min.	1395.037755	0.000255	0.182	-	-
-30 deg.C		Power on	1395.037386	-0.000114	-0.082	-	-
		on 2 min.	1395.037411	-0.000089	-0.064	-	-
		on 5 min.	1395.037505	0.000005	0.003	-	-
		on 10 min.	1395.037430	-0.000070	-0.051	-	-

Limit : 1395.0375 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.003488 MHz

*The test 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))

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room	
Date	March 17, 2020	March 18, 2020	March 19, 2020
Temperature / Humidity	21 deg.C / 45 %RH	23 deg.C / 35 %RH	25 deg.C / 35 %RH
Engineer	Kenichi Adachi	Kenichi Adachi	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 1.88 V (Vmin)	Power on	1397.512846	0.000345	0.247	2.50	2.253
		on 2 min.	1397.512812	0.000312	0.223	2.50	2.277
		on 5 min.	1397.512958	0.000458	0.328	2.50	2.172
		on 10 min.	1397.512965	0.000465	0.332	2.50	2.168
	DC 3 V (Vnom)	Power on	1397.512864	0.000364	0.260	2.50	2.240
		on 2 min.	1397.512868	0.000368	0.263	2.50	2.237
		on 5 min.	1397.513008	0.000508	0.364	2.50	2.136
		on 10 min.	1397.513021	0.000520	0.372	2.50	2.128
50 deg.C.	DC 3 V	Power on	1397.512452	-0.000049	-0.035	-	-
		on 2 min.	1397.512565	0.000065	0.046	-	-
		on 5 min.	1397.512542	0.000042	0.030	-	-
		on 10 min.	1397.512173	-0.000327	-0.234	-	-
40 deg.C.		Power on	1397.512502	0.000001	0.001	2.50	2.499
		on 2 min.	1397.512480	-0.000021	-0.015	2.50	2.485
		on 5 min.	1397.512862	0.000361	0.259	2.50	2.241
		on 10 min.	1397.512611	0.000111	0.079	2.50	2.421
30 deg.C.		Power on	1397.512883	0.000383	0.274	2.50	2.226
		on 2 min.	1397.512615	0.000114	0.082	2.50	2.418
		on 5 min.	1397.512730	0.000230	0.165	2.50	2.335
		on 10 min.	1397.512899	0.000398	0.285	2.50	2.215
20 deg.C.		Power on	1397.512411	-0.000090	-0.064	2.50	2.436
		on 2 min.	1397.512499	-0.000002	-0.001	2.50	2.499
		on 5 min.	1397.512930	0.000430	0.308	2.50	2.192
		on 10 min.	1397.512692	0.000192	0.137	2.50	2.363
10 deg.C.		Power on	1397.512474	-0.000027	-0.019	2.50	2.481
		on 2 min.	1397.512427	-0.000074	-0.053	2.50	2.447
		on 5 min.	1397.512489	-0.000011	-0.008	2.50	2.492
		on 10 min.	1397.512711	0.000211	0.151	2.50	2.349
0 deg.C.		Power on	1397.512614	0.000114	0.082	-	-
		on 2 min.	1397.512708	0.000208	0.149	-	-
		on 5 min.	1397.512480	-0.000020	-0.014	-	-
		on 10 min.	1397.512217	-0.000283	-0.203	-	-
-10deg.C.		Power on	1397.512499	-0.000002	-0.001	-	-
		on 2 min.	1397.512267	-0.000233	-0.167	-	-
		on 5 min.	1397.512305	-0.000195	-0.140	-	-
		on 10 min.	1397.512599	0.000098	0.070	-	-
-20 deg.C		Power on	1397.512718	0.000217	0.156	-	-
		on 2 min.	1397.512399	-0.000102	-0.073	-	-
		on 5 min.	1397.512320	-0.000180	-0.129	-	-
		on 10 min.	1397.512402	-0.000098	-0.070	-	-
-30 deg.C		Power on	1397.512577	0.000076	0.055	-	-
		on 2 min.	1397.512467	-0.000033	-0.024	-	-
		on 5 min.	1397.512283	-0.000217	-0.156	-	-
		on 10 min.	1397.512677	0.000176	0.126	-	-

Limit : 1397.5125 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.003494 MHz

*The test 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))

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Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room	
Date	March 17, 2020	March 18, 2020	March 19, 2020
Temperature / Humidity	21 deg.C / 45 %RH	23 deg.C / 35 %RH	25 deg.C / 35 %RH
Engineer	Kenichi Adachi	Kenichi Adachi	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 1.88 V (Vmin)	Power on	1399.962939	0.000439	0.314	2.50	2.186
		on 2 min.	1399.962961	0.000461	0.329	2.50	2.171
		on 5 min.	1399.962908	0.000408	0.291	2.50	2.209
		on 10 min.	1399.962799	0.000299	0.213	2.50	2.287
	DC 3 V (Vnom)	Power on	1399.962868	0.000367	0.263	2.50	2.237
		on 2 min.	1399.962811	0.000311	0.222	2.50	2.278
		on 5 min.	1399.962987	0.000487	0.348	2.50	2.152
		on 10 min.	1399.962939	0.000439	0.314	2.50	2.186
50 deg.C.	DC 3 V	Power on	1399.962555	0.000054	0.039	-	-
		on 2 min.	1399.962708	0.000208	0.149	-	-
		on 5 min.	1399.962652	0.000151	0.108	-	-
		on 10 min.	1399.962342	-0.000158	-0.113	-	-
40 deg.C.		Power on	1399.962586	0.000086	0.061	2.50	2.439
		on 2 min.	1399.962733	0.000233	0.166	2.50	2.334
		on 5 min.	1399.962471	-0.000029	-0.021	2.50	2.479
		on 10 min.	1399.962777	0.000277	0.198	2.50	2.302
30 deg.C.		Power on	1399.962864	0.000364	0.260	2.50	2.240
		on 2 min.	1399.962899	0.000398	0.285	2.50	2.215
		on 5 min.	1399.962905	0.000405	0.289	2.50	2.211
		on 10 min.	1399.962602	0.000101	0.073	2.50	2.427
20 deg.C.		Power on	1399.962833	0.000333	0.238	2.50	2.262
		on 2 min.	1399.962736	0.000236	0.169	2.50	2.331
		on 5 min.	1399.962561	0.000061	0.044	2.50	2.456
		on 10 min.	1399.962543	0.000042	0.030	2.50	2.470
10 deg.C.		Power on	1399.962464	-0.000036	-0.026	2.50	2.474
		on 2 min.	1399.962370	-0.000130	-0.093	2.50	2.407
		on 5 min.	1399.962083	-0.000418	-0.298	2.50	2.202
		on 10 min.	1399.962714	0.000214	0.153	2.50	2.347
0 deg.C.		Power on	1399.962424	-0.000076	-0.055	-	-
		on 2 min.	1399.962564	0.000064	0.046	-	-
		on 5 min.	1399.962345	-0.000155	-0.111	-	-
		on 10 min.	1399.962233	-0.000268	-0.191	-	-
-10deg.C.		Power on	1399.962624	0.000123	0.088	-	-
		on 2 min.	1399.962473	-0.000027	-0.019	-	-
		on 5 min.	1399.962264	-0.000237	-0.169	-	-
		on 10 min.	1399.962343	-0.000158	-0.113	-	-
-20 deg.C		Power on	1399.962474	-0.000027	-0.019	-	-
		on 2 min.	1399.962383	-0.000118	-0.084	-	-
		on 5 min.	1399.962377	-0.000123	-0.088	-	-
		on 10 min.	1399.962252	-0.000248	-0.178	-	-
-30 deg.C		Power on	1399.962364	-0.000136	-0.097	-	-
		on 2 min.	1399.962239	-0.000261	-0.186	-	-
		on 5 min.	1399.962467	-0.000033	-0.024	-	-
		on 10 min.	1399.962511	0.000010	0.008	-	-

Limit : 1399.9625 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.003500 MHz

*The test 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))

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Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room	
Date	March 17, 2020	March 18, 2020	March 19, 2020
Temperature / Humidity	21 deg.C / 45 %RH	23 deg.C / 35 %RH	25 deg.C / 35 %RH
Engineer	Kenichi Adachi	Kenichi Adachi	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 1.88 V (Vmin)	Power on	1427.037870	0.000370	0.259	2.50	2.241
		on 2 min.	1427.037808	0.000308	0.216	2.50	2.284
		on 5 min.	1427.037783	0.000283	0.198	2.50	2.302
		on 10 min.	1427.037996	0.000495	0.347	2.50	2.153
	DC 3 V (Vnom)	Power on	1427.037808	0.000308	0.216	2.50	2.284
		on 2 min.	1427.037917	0.000417	0.292	2.50	2.208
		on 5 min.	1427.037899	0.000399	0.280	2.50	2.220
		on 10 min.	1427.037955	0.000455	0.319	2.50	2.181
50 deg.C.	DC 3 V	Power on	1427.037717	0.000217	0.152	-	-
		on 2 min.	1427.037864	0.000364	0.255	-	-
		on 5 min.	1427.037611	0.000111	0.077	-	-
		on 10 min.	1427.037721	0.000221	0.155	-	-
40 deg.C.		Power on	1427.037799	0.000299	0.209	2.50	2.291
		on 2 min.	1427.037574	0.000074	0.052	2.50	2.448
		on 5 min.	1427.037787	0.000287	0.201	2.50	2.299
		on 10 min.	1427.037633	0.000133	0.093	2.50	2.407
30 deg.C.		Power on	1427.037736	0.000236	0.165	2.50	2.335
		on 2 min.	1427.037783	0.000283	0.198	2.50	2.302
		on 5 min.	1427.037743	0.000243	0.170	2.50	2.330
		on 10 min.	1427.037877	0.000377	0.264	2.50	2.236
20 deg.C.		Power on	1427.037636	0.000135	0.095	2.50	2.405
		on 2 min.	1427.037642	0.000142	0.100	2.50	2.400
		on 5 min.	1427.037880	0.000380	0.266	2.50	2.234
		on 10 min.	1427.037752	0.000252	0.176	2.50	2.324
10 deg.C.		Power on	1427.037614	0.000114	0.080	2.50	2.420
		on 2 min.	1427.037580	0.000080	0.056	2.50	2.444
		on 5 min.	1427.037505	0.000005	0.003	2.50	2.497
		on 10 min.	1427.037730	0.000230	0.161	2.50	2.339
0 deg.C.		Power on	1427.037596	0.000096	0.067	-	-
		on 2 min.	1427.037574	0.000074	0.052	-	-
		on 5 min.	1427.037508	0.000008	0.005	-	-
		on 10 min.	1427.037577	0.000076	0.054	-	-
-10deg.C.		Power on	1427.037345	-0.000155	-0.109	-	-
		on 2 min.	1427.037642	0.000142	0.100	-	-
		on 5 min.	1427.037583	0.000083	0.058	-	-
		on 10 min.	1427.037089	-0.000411	-0.288	-	-
-20 deg.C		Power on	1427.037930	0.000429	0.301	-	-
		on 2 min.	1427.037614	0.000114	0.080	-	-
		on 5 min.	1427.037189	-0.000311	-0.218	-	-
		on 10 min.	1427.037915	0.000415	0.290	-	-
-30 deg.C		Power on	1427.037483	-0.000017	-0.012	-	-
		on 2 min.	1427.037442	-0.000058	-0.041	-	-
		on 5 min.	1427.037427	-0.000073	-0.052	-	-
		on 10 min.	1427.037474	-0.000026	-0.019	-	-

Limit : 1427.0375 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.003568 MHz

*The test 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))

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Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room	
Date	March 17, 2020	March 18, 2020	March 19, 2020
Temperature / Humidity	21 deg.C / 45 %RH	23 deg.C / 35 %RH	25 deg.C / 35 %RH
Engineer	Kenichi Adachi	Kenichi Adachi	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 1.88 V (Vmin)	Power on	1429.262974	0.000473	0.331	2.50	2.169
		on 2 min.	1429.262942	0.000442	0.309	2.50	2.191
		on 5 min.	1429.262858	0.000358	0.250	2.50	2.250
		on 10 min.	1429.262833	0.000333	0.233	2.50	2.267
	DC 3 V (Vnom)	Power on	1429.263011	0.000511	0.358	2.50	2.142
		on 2 min.	1429.262964	0.000464	0.325	2.50	2.175
		on 5 min.	1429.263008	0.000508	0.355	2.50	2.145
		on 10 min.	1429.262933	0.000433	0.303	2.50	2.197
50 deg.C.	DC 3 V	Power on	1429.262680	0.000180	0.126	-	-
		on 2 min.	1429.262899	0.000399	0.279	-	-
		on 5 min.	1429.262617	0.000117	0.082	-	-
		on 10 min.	1429.262573	0.000073	0.051	-	-
40 deg.C.		Power on	1429.262849	0.000348	0.244	2.50	2.256
		on 2 min.	1429.262620	0.000120	0.084	2.50	2.416
		on 5 min.	1429.262921	0.000421	0.294	2.50	2.206
		on 10 min.	1429.262749	0.000248	0.174	2.50	2.326
30 deg.C.		Power on	1429.262796	0.000295	0.207	2.50	2.293
		on 2 min.	1429.262905	0.000405	0.283	2.50	2.217
		on 5 min.	1429.262768	0.000267	0.187	2.50	2.313
		on 10 min.	1429.262670	0.000170	0.119	2.50	2.381
20 deg.C.		Power on	1429.262574	0.000074	0.051	2.50	2.449
		on 2 min.	1429.262526	0.000026	0.018	2.50	2.482
		on 5 min.	1429.262827	0.000326	0.228	2.50	2.272
		on 10 min.	1429.262902	0.000401	0.281	2.50	2.219
10 deg.C.		Power on	1429.262802	0.000301	0.211	2.50	2.289
		on 2 min.	1429.262527	0.000027	0.019	2.50	2.481
		on 5 min.	1429.262711	0.000211	0.148	2.50	2.352
		on 10 min.	1429.262580	0.000079	0.056	2.50	2.444
0 deg.C.		Power on	1429.262486	-0.000014	-0.010	-	-
		on 2 min.	1429.262592	0.000092	0.064	-	-
		on 5 min.	1429.262623	0.000123	0.086	-	-
		on 10 min.	1429.262739	0.000239	0.167	-	-
-10deg.C.		Power on	1429.262495	-0.000005	-0.003	-	-
		on 2 min.	1429.262727	0.000227	0.158	-	-
		on 5 min.	1429.262508	0.000008	0.005	-	-
		on 10 min.	1429.262605	0.000105	0.073	-	-
-20 deg.C		Power on	1429.262418	-0.000082	-0.058	-	-
		on 2 min.	1429.262333	-0.000168	-0.117	-	-
		on 5 min.	1429.262408	-0.000092	-0.064	-	-
		on 10 min.	1429.262370	-0.000130	-0.091	-	-
-30 deg.C		Power on	1429.262339	-0.000161	-0.113	-	-
		on 2 min.	1429.262430	-0.000070	-0.049	-	-
		on 5 min.	1429.262617	0.000117	0.082	-	-
		on 10 min.	1429.262530	0.000029	0.021	-	-

Limit : 1429.2625 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.003573 MHz

*The test 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))

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Frequency Stability

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room	
Date	March 17, 2020	March 18, 2020	March 19, 2020
Temperature / Humidity	21 deg.C / 45 %RH	23 deg.C / 35 %RH	25 deg.C / 35 %RH
Engineer	Kenichi Adachi	Kenichi Adachi	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 1.88 V (Vmin)	Power on	1431.462996	0.000495	0.346	2.50	2.154
		on 2 min.	1431.462880	0.000380	0.265	2.50	2.235
		on 5 min.	1431.462977	0.000477	0.333	2.50	2.167
		on 10 min.	1431.462855	0.000355	0.248	2.50	2.252
	DC 3 V (Vnom)	Power on	1431.462874	0.000374	0.261	2.50	2.239
		on 2 min.	1431.462909	0.000408	0.285	2.50	2.215
		on 5 min.	1431.462934	0.000433	0.303	2.50	2.197
		on 10 min.	1431.463077	0.000577	0.403	2.50	2.097
50 deg.C.	DC 3 V	Power on	1431.462402	-0.000098	-0.068	-	-
		on 2 min.	1431.462752	0.000252	0.176	-	-
		on 5 min.	1431.462734	0.000233	0.163	-	-
		on 10 min.	1431.462705	0.000205	0.143	-	-
40 deg.C.		Power on	1431.462518	0.000018	0.012	2.50	2.488
		on 2 min.	1431.462812	0.000311	0.218	2.50	2.282
		on 5 min.	1431.462777	0.000277	0.194	2.50	2.306
		on 10 min.	1431.462731	0.000230	0.161	2.50	2.339
30 deg.C.		Power on	1431.462990	0.000489	0.342	2.50	2.158
		on 2 min.	1431.463009	0.000508	0.355	2.50	2.145
		on 5 min.	1431.462899	0.000399	0.279	2.50	2.221
		on 10 min.	1431.462834	0.000333	0.233	2.50	2.267
20 deg.C.		Power on	1431.462787	0.000286	0.200	2.50	2.300
		on 2 min.	1431.462756	0.000255	0.178	2.50	2.322
		on 5 min.	1431.462615	0.000114	0.080	2.50	2.420
		on 10 min.	1431.462696	0.000195	0.137	2.50	2.363
10 deg.C.		Power on	1431.462584	0.000084	0.058	2.50	2.442
		on 2 min.	1431.462696	0.000195	0.137	2.50	2.363
		on 5 min.	1431.462333	-0.000167	-0.117	2.50	2.383
		on 10 min.	1431.462255	-0.000246	-0.172	2.50	2.328
0 deg.C.		Power on	1431.462540	0.000039	0.028	-	-
		on 2 min.	1431.462199	-0.000302	-0.211	-	-
		on 5 min.	1431.462599	0.000098	0.069	-	-
		on 10 min.	1431.462440	-0.000061	-0.042	-	-
-10deg.C.		Power on	1431.462549	0.000049	0.034	-	-
		on 2 min.	1431.462393	-0.000108	-0.075	-	-
		on 5 min.	1431.462449	-0.000052	-0.036	-	-
		on 10 min.	1431.462155	-0.000346	-0.241	-	-
-20 deg.C		Power on	1431.462543	0.000042	0.030	-	-
		on 2 min.	1431.462377	-0.000123	-0.086	-	-
		on 5 min.	1431.462443	-0.000057	-0.040	-	-
		on 10 min.	1431.462449	-0.000051	-0.036	-	-
-30 deg.C		Power on	1431.462455	-0.000045	-0.031	-	-
		on 2 min.	1431.462399	-0.000102	-0.071	-	-
		on 5 min.	1431.462455	-0.000045	-0.031	-	-
		on 10 min.	1431.462421	-0.000080	-0.056	-	-

Limit : 1431.4625 MHz +/-0.00025 % (+/-2.5 ppm) = +/- 0.003579 MHz

*The test 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))

UL Japan, Inc.

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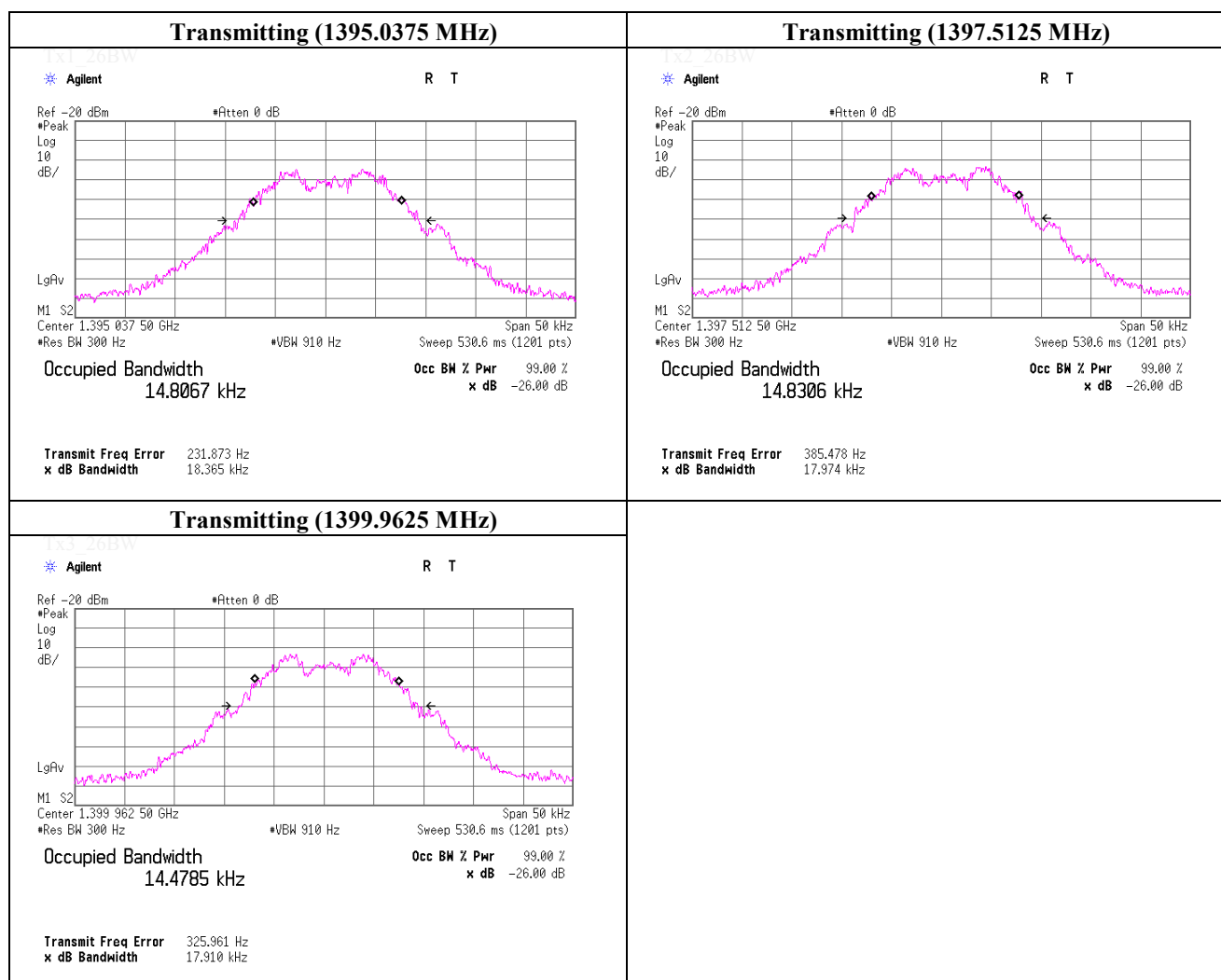
Facsimile : +81 463 50 6401

-26 dB Bandwidth and 99 % Occupied Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 19, 2020	
Temperature / Humidity	25 deg.C / 35 %RH	
Engineer	Kazuya Noda	
Mode	Transmitting	

Freq. [MHz]	-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
1395.0375	18.365	14.8067
1397.5125	17.974	14.8306
1399.9625	17.910	14.4785

No limit applies to -26 dB Bandwidth and 99 % Occupied Bandwidth.



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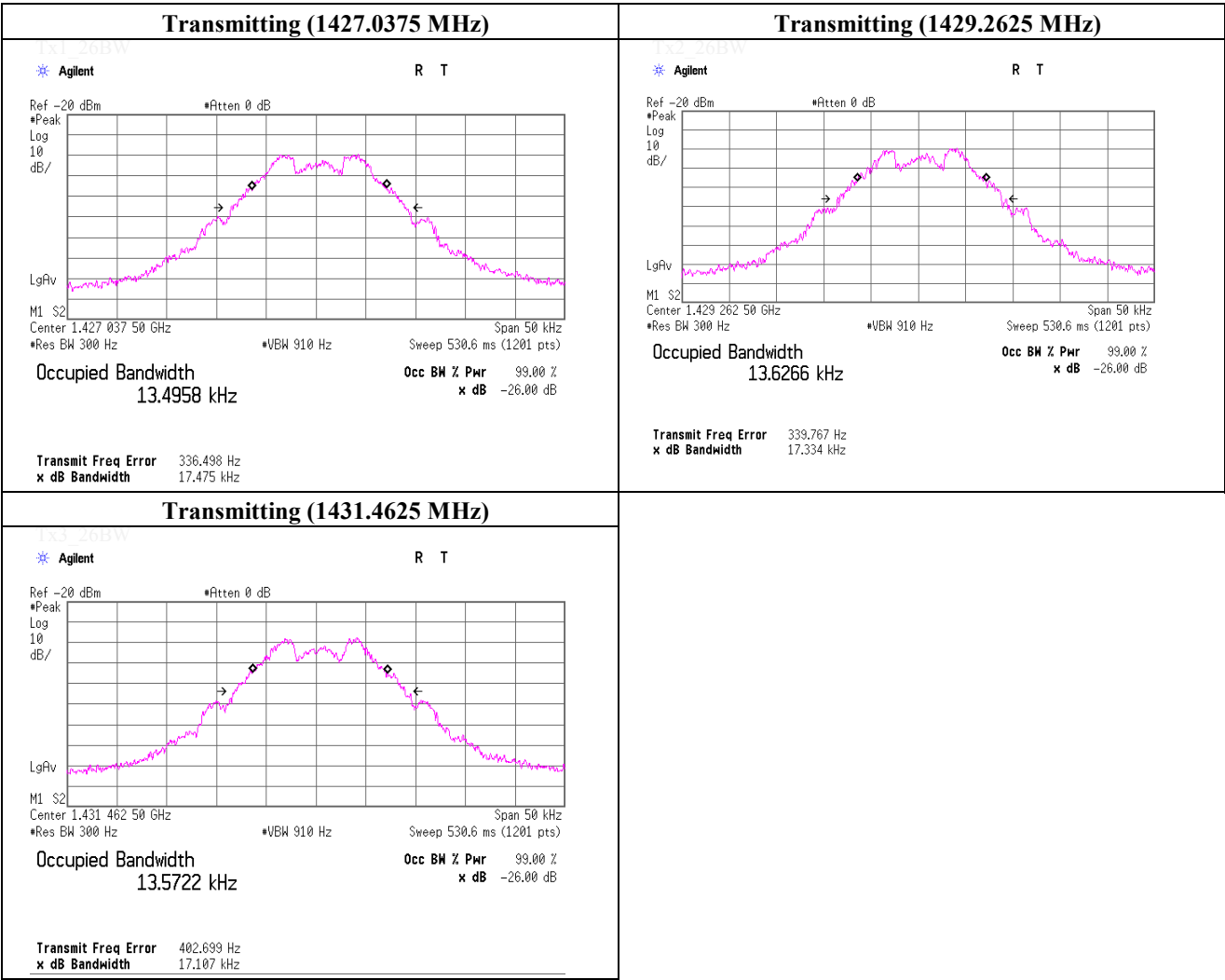
Facsimile : +81 463 50 6401

-26 dB Bandwidth and 99 % Occupied Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 19, 2020	
Temperature / Humidity	25 deg.C / 35 %RH	
Engineer	Kazuya Noda	
Mode	Transmitting	

Freq. [MHz]	-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
1427.0375	17.475	13.4958
1429.2625	17.334	13.6266
1431.4625	17.107	13.5722

No limit applies to -26 dB Bandwidth and 99 % Occupied Bandwidth.



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

Test place UL Japan, Inc. Shonan EMC Lab.
 No.1 Semi Anechoic Chamber No.3 Semi Anechoic Chamber
Date March 28, 2020 March 16, 2020
Temperature / Humidity 21 deg.C / 55 %RH 23 deg.C / 39 %RH
Engineer Kazuya Noda Takahiro Kawakami
 (9 kHz - 30 MHz, 30 MHz - 1000 MHz) (1 GHz - 15 GHz)
Mode Tx, 1395.0375 MHz EUT worst axis : below 1 GHz Hori: Z, Vert: Z / above 1 GHz Hori: Y, 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.	245.771	QP	26.0	17.1	10.0	31.8	21.3	46.0	24.7	136	197	-
Hori.	308.634	QP	30.3	13.9	7.3	31.8	19.7	46.0	26.3	100	114	-
Hori.	317.028	QP	30.9	13.9	7.4	31.8	20.4	46.0	25.6	100	125	-
Hori.	1395.000	AV	47.8	25.7	12.6	41.1	45.0	53.9	-	108	322	VBW 3 kHz,(Refer to Marker Delta Method)
Hori.	1395.0375	AV	101.8	25.7	12.6	41.1	99.0	117.3	18.3	108	322	Carrier, VBW 10 Hz
Hori.	2790.075	AV	53.1	28.7	4.4	41.8	44.4	53.9	9.5	102	66	VBW:10 Hz
Hori.	4185.112	AV	50.3	30.3	5.2	42.5	43.3	53.9	10.6	107	159	VBW:10 Hz
Hori.	5580.150	AV	51.6	32.4	6.1	43.5	46.6	53.9	7.3	104	177	VBW:10 Hz
Hori.	6975.188	AV	44.0	36.4	6.8	43.2	44.0	53.9	9.9	152	147	VBW:10 Hz
Hori.	8370.225	AV	43.1	37.3	7.4	43.3	44.5	53.9	9.4	157	35	VBW:10 Hz
Hori.	9765.263	AV	35.7	39.3	8.2	43.0	40.2	53.9	13.7	162	107	VBW:10 Hz
Hori.	11160.300	AV	34.7	39.9	8.6	42.8	40.4	53.9	13.5	100	0	VBW:10 Hz
Hori.	12555.340	AV	33.9	38.8	9.2	42.0	39.9	53.9	14.0	100	0	VBW:10 Hz
Hori.	13950.380	AV	34.5	42.0	9.7	41.9	44.3	53.9	9.6	100	0	VBW:10 Hz
Vert.	288.286	QP	21.0	18.9	10.4	31.8	18.5	46.0	27.5	100	0	-
Vert.	867.089	QP	20.9	21.9	9.7	31.6	20.9	46.0	25.1	100	359	-
Vert.	1395.000	AV	45.3	25.7	12.6	41.1	42.5	53.9	-	100	97	VBW 3 kHz,(Refer to Marker Delta Method)
Vert.	1395.0375	AV	97.6	25.7	12.6	41.1	94.8	117.3	22.5	100	97	Carrier, VBW 10 Hz
Vert.	2790.075	AV	51.8	28.7	4.4	41.8	43.1	53.9	10.8	111	337	VBW 10 Hz
Vert.	4185.112	AV	51.1	30.3	5.2	42.5	44.1	53.9	9.8	104	158	VBW 10 Hz,
Vert.	5580.150	AV	52.6	32.4	6.1	43.5	47.6	53.9	6.3	102	189	VBW 10 Hz,
Vert.	6975.188	AV	42.8	36.4	6.8	43.2	42.8	53.9	11.1	100	177	VBW 10 Hz,
Vert.	8370.225	AV	35.0	37.3	7.4	43.3	36.4	53.9	17.5	130	241	VBW 10 Hz,
Vert.	9765.263	AV	34.8	39.3	8.2	43.0	39.3	53.9	14.6	130	0	VBW 10 Hz,
Vert.	11160.300	AV	34.7	39.9	8.6	42.8	40.4	53.9	13.5	100	0	VBW 10 Hz,
Vert.	12555.340	AV	33.9	38.8	9.2	42.0	39.9	53.9	14.0	100	0	VBW 10 Hz,
Vert.	13950.380	AV	34.4	42.0	9.7	41.9	44.2	53.9	9.7	100	0	VBW 10 Hz,

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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

Marker Delta Method(Test distance 3 m)

		AV			
	Polarity	Hor.		Ver.	
		[dBuV]	[dBuV/m]	[dBuV]	[dBuV/m]
Step1	Fundamental(1395.0375 MHz)	101.8	99.0	97.6	94.8
Step2	Fundamental(1395.0375 MHz)	101.6	98.8	97.1	94.3
	Band-edge(1395 MHz)	47.8	45.0	45.3	42.5
	Amplitude delta	-	53.8	51.8	51.8
Step3	Field strength of band-edge	-	45.2	-	43.0
	Limit	-	53.9	-	53.9
	Margin	-	8.7	-	10.9

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*1 Amplitude delta = Fundamental(RBW:1 kHz,VBW:3 kHz) - Band-edge(RBW:1 kHz,VBW:3 kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section 7 ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

(for RF Exposure sheet)

[RF output power]			
	Result 0 [dBuV/m]	Result 1 [mW]	Result 2 [mW]
carrier	99.0	3.460	2.383
Level			

Calculation: (*Result 0 is the maximum value (Result) in the table above)

Result 1 [mW] = (((10^(Result [dBuV/m] / 20)) x 10^(-6))
x (distance=) 3 [m]) ^2) / (30 x (gain=) 10^(-1.62 dB / 10)) x 10^3

* antenna gain value is average value. (refer to Antenna Specifications.)
(for frequency range 1395-1400 MHz)

Result 2 [mW] = (((10^(Result [dBuV/m] / 20)) x 10^(-6))
x (distance=) 3 [m]) ^2) / (30 x 1) x 10^3

(*Result 1: Antenna power value, Result 2: E.I.R.P. value)

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Field Strength(Electric Field Strength of Fundamental Emission , Spurious Emission)

Test place	UL Japan, Inc. Shonan EMC Lab.	
	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	March 28, 2020	March 16, 2020
Temperature / Humidity	21 deg.C / 55 %RH	23 deg.C / 39 %RH
Engineer	Kazuya Noda	Takahiro Kawakami
	(9 kHz - 30 MHz, 30 MHz - 1000 MHz)	(1 GHz - 15 GHz)
Mode	Tx, 1397.5125 MHz EUT worst axis : below 1 GHz Hori: Z, Vert: Z / above 1 GHz Hori: Y, 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.	208.903	QP	24.0	16.6	9.5	31.8	18.3	46.0	27.7	149	211	-
Hori.	307.211	QP	30.9	13.9	7.3	31.8	20.3	46.0	25.7	102	111	-
Hori.	319.494	QP	29.4	14.0	7.4	31.8	19.0	46.0	27.0	100	130	-
Hori.	1397.5125	AV	103.2	25.7	12.6	41.1	100.4	117.3	16.9	108	22	Carrier, VBW 10Hz,
Hori.	2795.025	AV	53.2	28.7	4.4	41.8	44.5	53.9	9.4	100	146	VBW 10Hz,
Hori.	4192.538	AV	51.7	30.3	5.2	42.5	44.7	53.9	9.2	107	159	VBW 10Hz,
Hori.	5590.050	AV	51.6	32.4	6.1	43.5	46.6	53.9	7.3	105	177	VBW 10Hz,
Hori.	6987.563	AV	43.9	36.4	6.8	43.2	43.9	53.9	10.0	150	144	VBW 10Hz,
Hori.	8385.075	AV	42.2	37.3	7.4	43.3	43.6	53.9	10.3	157	43	VBW 10Hz,
Hori.	9782.588	AV	35.7	39.4	8.2	42.9	40.4	53.9	13.5	148	107	VBW 10Hz,
Hori.	11180.100	AV	34.9	39.9	8.6	42.8	40.6	53.9	13.3	100	0	VBW 10Hz,
Hori.	12577.610	AV	33.8	38.8	9.3	42.0	39.9	53.9	14.0	100	0	VBW 10Hz,
Hori.	13975.130	AV	34.6	42.1	9.7	41.9	44.5	53.9	9.4	100	0	VBW 10Hz,
Vert.	289.506	QP	20.9	19.0	10.4	31.8	18.5	46.0	27.5	100	0	-
Vert.	913.466	QP	20.5	22.0	9.9	31.4	21.0	46.0	25.0	100	359	-
Vert.	1397.5125	AV	98.6	25.7	12.6	41.1	95.8	117.3	21.5	185	133	Carrier, VBW 10Hz,
Vert.	2795.025	AV	47.8	28.7	4.4	41.8	39.1	53.9	14.8	123	312	VBW 10Hz,
Vert.	4192.538	AV	51.0	30.3	5.2	42.5	44.0	53.9	9.9	104	158	VBW 10Hz,
Vert.	5590.050	AV	51.9	32.4	6.1	43.5	46.9	53.9	7.0	102	189	VBW 10Hz,
Vert.	6987.563	AV	43.0	36.4	6.8	43.2	43.0	53.9	10.9	101	173	VBW 10Hz,
Vert.	8385.075	AV	42.2	37.3	7.4	43.3	43.6	53.9	10.3	170	197	VBW 10Hz,
Vert.	9782.588	AV	35.8	39.4	8.2	42.9	40.5	53.9	13.4	177	204	VBW 10Hz,
Vert.	11180.100	AV	35.2	39.9	8.6	42.8	40.9	53.9	13.0	100	0	VBW 10Hz,
Vert.	12577.610	AV	34.0	38.8	9.3	42.0	40.1	53.9	13.8	100	0	VBW 10Hz,
Vert.	13975.130	AV	34.4	42.1	9.7	41.9	44.3	53.9	9.6	100	0	VBW 10Hz,

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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

(for RF Exposure sheet)

[RF output power]

	Result 0 [dBuV/m]	Result 1 [mW]	Result 2 [mW]
carrier Level	100.4	4.777	3.289

Calculation:

(*Result 0 is the maximum value (Result) in the table above)

Result 1 [mW] = (((10^(Result [dBuV/m] / 20)) x 10^(-6))
x (distance=) 3 [m]) ^2) / (30 x (gain=) 10^(-1.62 dBi / 10)) x 10^3
* antenna gain value is average value. (refer to Antenna Specifications.)

(for frequency range 1395-1400 MHz)

Result 2 [mW] = (((10^(Result [dBuV/m] / 20)) x 10^(-6))
x (distance=) 3 [m]) ^2) / (30 x 1) x 10^3

(*Result 1: Antenna power value, Result 2: E.I.R.P. value)

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

Test place	UL Japan, Inc. Shonan EMC Lab.	
	No.1 Semi Anechoic Chamber	No.3 Semi Anechoic Chamber
Date	March 28, 2020	March 16, 2020
Temperature / Humidity	21 deg.C / 55 %RH	23 deg.C / 39 %RH
Engineer	Kazuya Noda	Takahiro Kawakami
	(9 kHz - 30 MHz, 30 MHz - 1000 MHz)	(1 GHz - 15 GHz)
Mode	Tx, 1399.9625 MHz EUT worst axis : below 1 GHz Hori: Z, Vert: Z / above 1 GHz Hori: Y, 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.	208.902	QP	24.1	16.6	9.5	31.8	18.4	46.0	27.6	155	191	-
Hori.	307.209	QP	31.2	13.9	7.3	31.8	20.6	46.0	25.4	104	113	-
Hori.	319.488	QP	30.1	14.0	7.4	31.8	19.7	46.0	26.3	100	114	-
Hori.	1399.9625	AV	103.4	25.7	12.6	41.1	100.6	117.3	16.7	110	23	Carrier, VBW 10 Hz
Hori.	1400.000	AV	48.8	25.7	12.6	41.1	46.0	53.9	-	110	23	VBW 3 kHz,(Refer to Marker Delta Method)
Hori.	2799.925	AV	53.6	28.7	4.4	41.8	44.9	53.9	9.0	100	148	VBW 10Hz
Hori.	4199.888	AV	52.2	30.3	5.2	42.6	45.1	53.9	8.8	107	161	VBW 10Hz
Hori.	5599.850	AV	50.8	32.4	6.1	43.5	45.8	53.9	8.1	105	177	VBW 10Hz
Hori.	6999.813	AV	44.0	36.5	6.8	43.2	44.1	53.9	9.8	151	142	VBW 10Hz
Hori.	8399.775	AV	42.8	37.4	7.4	43.3	44.3	53.9	9.6	156	38	VBW 10Hz
Hori.	9799.737	AV	35.8	39.4	8.2	42.9	40.5	53.9	13.4	140	113	VBW 10Hz
Hori.	11199.700	AV	35.0	39.8	8.6	42.8	40.6	53.9	13.3	100	0	VBW 10Hz
Hori.	12599.660	AV	34.0	38.9	9.3	42.0	40.2	53.9	13.7	100	0	VBW 10Hz
Hori.	13999.630	AV	34.7	42.2	9.7	41.9	44.7	53.9	9.2	100	0	VBW 10Hz
Vert.	289.506	QP	20.9	19.0	10.4	31.8	18.5	46.0	27.5	100	0	
Vert.	913.466	QP	20.5	22.0	9.9	31.4	21.0	46.0	25.0	100	359	
Hori.	1399.9625	AV	101.1	25.7	12.6	41.1	98.3	117.3	19.0	152	10	Carrier, VBW 10 Hz
Hori.	1400.000	AV	47.5	25.7	12.6	41.1	44.7	53.9	-	152	10	VBW 3 kHz,(Refer to Marker Delta Method)
Vert.	2799.925	AV	52.7	28.7	4.4	41.8	44.0	53.9	9.9	113	340	VBW 10Hz
Vert.	4199.888	AV	50.8	30.3	5.2	42.6	43.7	53.9	10.2	103	156	
Vert.	5599.850	AV	50.6	32.4	6.1	43.5	45.6	53.9	8.3	103	188	VBW 10Hz
Vert.	6999.813	AV	42.3	36.5	6.8	43.2	42.4	53.9	11.5	100	175	VBW 10Hz
Vert.	8399.775	AV	41.5	37.4	7.4	43.3	43.0	53.9	10.9	170	199	VBW 10Hz
Vert.	9799.737	AV	35.6	39.4	8.2	42.9	40.3	53.9	13.6	143	217	VBW 10Hz
Vert.	11199.700	AV	34.9	39.8	8.6	42.8	40.5	53.9	13.4	100	0	VBW 10Hz
Vert.	12599.660	AV	33.8	38.9	9.3	42.0	40.0	53.9	13.9	100	0	VBW 10Hz
Vert.	13999.630	AV	34.2	42.2	9.7	41.9	44.2	53.9	9.7	100	0	VBW 10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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

Marker Delta Method(Test distance 3 m)

		AV			
	Polarity	Hor.		Ver.	
		[dBuV]	[dBuV/m]	[dBuV]	[dBuV/m]
Step1	Fundamental(1399.9625 MHz)	103.4	100.6	101.1	98.3
Step2	Fundamental(1399.9625 MHz)	103.2	100.4	100.7	97.9
	Band-edge(1400 MHz)	48.8	46.0	47.5	44.7
	Amplitude delta	-	54.4	53.2	53.2
Step3	Field strength of band-edge	-	46.2	-	45.1
	Limit	-	53.9	-	53.9
	Margin	-	7.7	-	8.8

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*1 Amplitude delta = Fundamental(RBW:1 kHz,VBW:3 kHz) - Band-edge(RBW:1 kHz,VBW:3 kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section 7 ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

(for RF Exposure sheet)

[RF output power]

	Result 0 [dBuV/m]	Result 1 [mW]	Result 2 [mW]
carrier	100.6	5.002	3.444
Level			

Calculation:

(*Result 0 is the maximum value (Result) in the table above)

$$\text{Result 1 [mW]} = (((10^{(\text{Result [dBuV/m]} / 20)}) \times 10^{(-6)})) \times (\text{distance} = 3 \text{ [m]})^2 / (30 \times (\text{gain} = 10^{(-1.62 \text{ dBi} / 10)})) \times 10^3$$
* antenna gain value is average value. (refer to Antenna Specifications.)
(for frequency range 1395-1400 MHz)
$$\text{Result 2 [mW]} = (((10^{(\text{Result [dBuV/m]} / 20)}) \times 10^{(-6)})) \times (\text{distance} = 3 \text{ [m]})^2 / (30 \times 1) \times 10^3$$

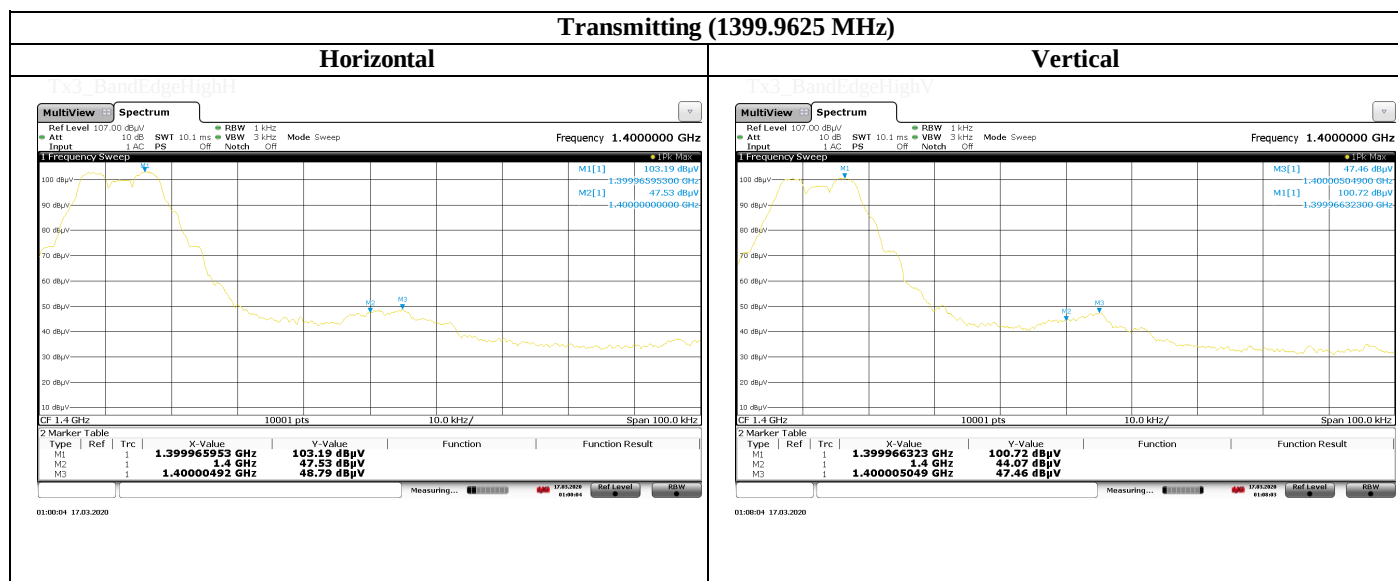
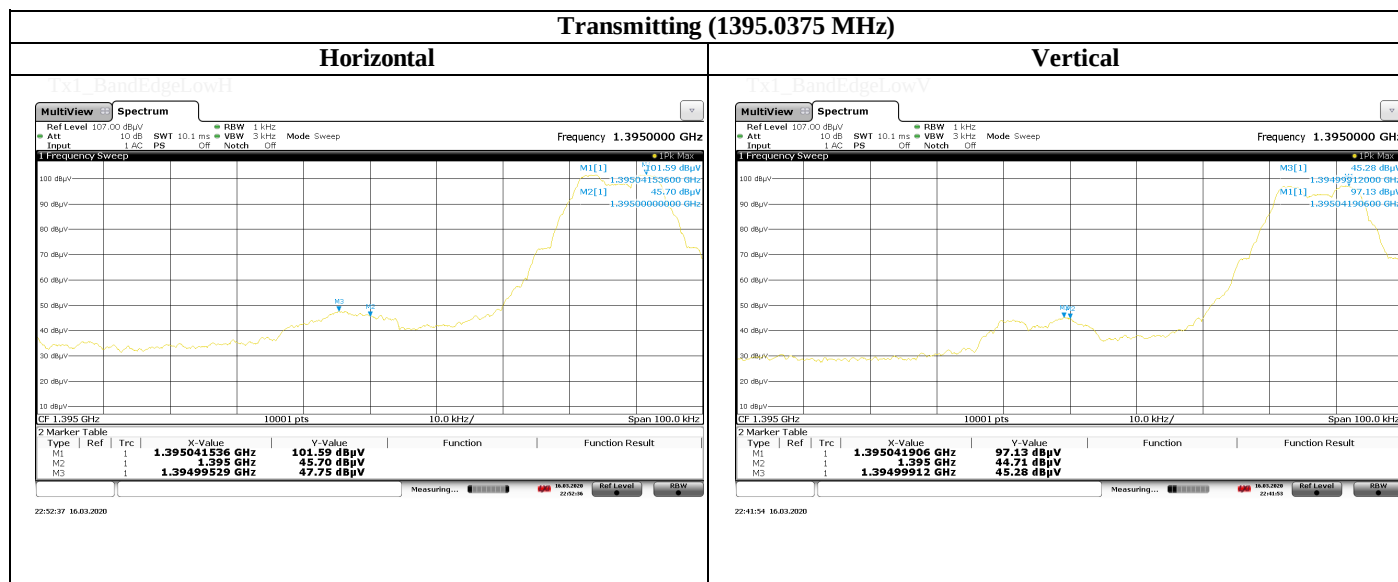
(*Result 1: Antenna power value, Result 2: E.I.R.P. value)

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Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date March 16, 2020 March 16, 2020
Temperature / Humidity 22 deg.C / 32 %RH 23 deg.C / 39 %RH
Engineer Kenichi Adachi Takahiro Kawakami

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

Band Edge compliance(for Marker Delta Method)



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

Test place UL Japan, Inc. Shonan EMC Lab.
 No.1 Semi Anechoic Chamber No.3 Semi Anechoic Chamber
 Date March 28, 2020 March 16, 2020
 Temperature / Humidity 21 deg.C / 55 %RH 22 deg.C / 32 %RH
 Engineer Kazuya Noda Kenichi Adachi
 (9 kHz - 30 MHz, 30 MHz - 1000 MHz) (1 GHz - 15 GHz)
 Mode Tx, 1427.0375 MHz EUT worst axis : below 1 GHz Hori: Z, Vert: Z / above 1 GHz Hori: Y, 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.	208.899	QP	24.1	16.6	9.5	31.8	18.4	46.0	27.6	150	205	-
Hori.	307.212	QP	31.3	13.9	7.3	31.8	20.7	46.0	25.3	111	113	-
Hori.	319.494	QP	29.8	14.0	7.4	31.8	19.4	46.0	26.6	100	102	-
Hori.	1427.000	AV	46.2	25.7	12.7	41.1	43.5	53.9	-	107	3	VBW 3 kHz,(Refer to Marker Delta Method)
Hori.	1427.0375	AV	99.5	25.7	12.7	41.1	96.8	117.3	20.5	107	3	Carrier, VBW 10 Hz,
Hori.	2854.075	AV	51.1	28.8	5.7	41.8	43.8	53.9	10.1	154	291	VBW 10 Hz
Hori.	4281.113	AV	51.6	30.5	5.3	42.6	44.8	53.9	9.1	100	271	VBW 10 Hz
Hori.	5708.150	AV	50.1	32.6	6.1	43.4	45.4	53.9	8.5	154	54	VBW 10 Hz
Hori.	7135.188	AV	42.3	37.1	6.8	43.3	42.9	53.9	11.0	186	149	VBW 10 Hz
Hori.	8562.225	AV	41.8	37.8	7.5	43.4	43.7	53.9	10.2	139	57	VBW 10 Hz
Hori.	9989.263	AV	37.6	39.0	8.1	42.7	42.0	53.9	11.9	149	296	VBW 10 Hz
Hori.	11416.300	AV	34.3	40.0	8.7	42.7	40.3	53.9	13.6	100	0	VBW 10 Hz
Hori.	12843.340	AV	34.2	39.4	9.7	41.9	41.4	53.9	12.5	100	0	VBW 10 Hz
Hori.	14270.380	AV	33.0	42.5	9.9	41.6	43.8	53.9	10.1	100	0	VBW 10 Hz
Vert.	290.427	QP	20.8	19.0	10.4	31.8	18.4	46.0	27.6	100	359	-
Vert.	851.170	QP	20.8	21.6	9.7	31.7	20.4	46.0	25.6	100	0	-
Vert.	1427.000	AV	45.9	25.7	12.7	41.1	43.2	53.9	-	131	324	VBW 3 kHz,(Refer to Marker Delta Method)
Vert.	1427.0375	AV	99.3	25.7	12.7	41.1	96.6	117.3	20.7	131	324	Carrier, VBW 10 Hz,
Vert.	2854.075	AV	51.7	28.8	5.7	41.8	44.4	53.9	9.5	136	2	VBW 10 Hz
Vert.	4281.113	AV	53.4	30.5	5.3	42.6	46.6	53.9	7.3	105	151	VBW 10 Hz
Vert.	5708.150	AV	48.6	32.6	6.1	43.4	43.9	53.9	10.0	139	0	VBW 10 Hz
Vert.	7135.188	AV	42.1	37.1	6.8	43.3	42.7	53.9	11.2	196	335	VBW 10 Hz
Vert.	8562.225	AV	44.4	37.8	7.5	43.4	46.3	53.9	7.6	130	19	VBW 10 Hz
Vert.	9989.263	AV	37.9	39.0	8.1	42.7	42.3	53.9	11.6	102	21	VBW 10 Hz
Vert.	11416.300	AV	34.3	40.0	8.7	42.7	40.3	53.9	13.6	100	0	VBW 10 Hz
Vert.	12843.340	AV	34.2	39.4	9.7	41.9	41.4	53.9	12.5	100	0	VBW 10 Hz
Vert.	14270.380	AV	33.0	42.5	9.9	41.6	43.8	53.9	10.1	100	0	VBW 10 Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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

Marker Delta Method(Test distance 3 m)

		AV				
		Polarity	Hor.		Ver.	
			[dBuV]	[dBuV/m]	[dBuV]	[dBuV/m]
		VBW RBW	Reading	Result	Reading	Result
Step1	Fundamental(1427.0375 MHz)	1 M / 10 Hz	99.5	96.8	99.3	96.6
Step2	Fundamental(1427.0375 MHz)	1 kHz/3 kHz	98.6	95.9	98.4	95.7
	Band-edge(1427 MHz)	1 kHz/3 kHz	46.2	43.5	45.9	43.2
	Amplitude delta	-	52.4	52.4	52.5	52.5
Step3	Field strength of band-edge	-	-	44.4	-	44.1
	Limit	-	-	53.9	-	53.9
	Margin	-	-	9.5	-	9.8

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*1 Amplitude delta = Fundamental(RBW:1 kHz,VBW:3 kHz) - Band-edge(RBW:1 kHz,VBW:3 kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section 7 ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

(for RF Exposure sheet)

[RF output power]			
	Result 0 [dBuV/m]	Result 1 [mW]	Result 2 [mW]
carrier	96.8	1.946	1.436
Level			

Calculation: (*Result 0 is the maximum value (Result) in the table above)

Result 1 [mW] = (((10^(Result [dBuV/m] / 20) x 10^(-6))
 x (distance=) 3 [m]) ^2) / (30 x (gain=) 10^(-1.32 dBi / 10)) x 10^3

* antenna gain value is average value. (refer to Antenna Specifications.)
 (for frequency range 1427-1432 MHz)

Result 2 [mW] = (((10^(Result [dBuV/m] / 20) x 10^(-6))
 x (distance=) 3 [m]) ^2) / (30 x 1) x 10^3

(*Result 1: Antenna power value, Result 2: E.I.R.P. value)

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Field Strength(Electric Field Strength of Fundamental Emission , Spurious Emission)

Test place UL Japan, Inc. Shonan EMC Lab.
 No.1 Semi Anechoic Chamber No.3 Semi Anechoic Chamber
 Date March 28, 2020 March 16, 2020
 Temperature / Humidity 21 deg.C / 55 %RH 23 deg.C / 39 %RH
 Engineer Kazuya Noda Takahiro Kawakami
 (9 kHz - 30 MHz, 30 MHz - 1000 MHz) (1 GHz - 15 GHz)
 Mode Tx, 1429.2625 MHz EUT worst axis : below 1 GHz Hori: Z, Vert: Z / above 1 GHz Hori: Y, 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.	208.902	QP	24.2	16.6	9.5	31.8	18.5	46.0	27.5	155	4	-
Hori.	307.213	QP	31.3	13.9	7.3	31.8	20.7	46.0	25.3	103	111	-
Hori.	319.500	QP	29.7	14.0	7.4	31.8	19.3	46.0	26.7	100	105	-
Hori.	1429.2625	AV	103.6	25.7	12.7	41.1	100.9	117.3	16.4	106	327	Carrier, VBW 10Hz,
Hori.	2858.525	AV	51.7	28.8	5.7	41.8	44.4	53.9	9.5	154	301	VBW 10Hz
Hori.	4287.788	AV	53.6	30.5	5.3	42.7	46.7	53.9	7.2	104	163	VBW 10Hz
Hori.	5717.050	AV	47.8	32.7	6.1	43.4	43.2	53.9	10.7	103	354	VBW 10Hz
Hori.	7146.313	AV	41.1	37.1	6.8	43.3	41.7	53.9	12.2	182	63	VBW 10Hz
Hori.	8575.575	AV	44.4	37.8	7.5	43.4	46.3	53.9	7.6	127	70	VBW 10Hz
Hori.	10004.840	AV	36.6	39.0	8.1	42.7	41.0	53.9	12.9	123	134	VBW 10Hz
Hori.	11434.100	AV	34.1	40.0	8.7	42.7	40.1	53.9	13.8	100	0	VBW 10Hz
Hori.	12863.360	AV	33.9	39.4	9.7	41.9	41.1	53.9	12.8	100	0	VBW 10Hz
Hori.	14292.630	AV	33.6	42.4	9.7	41.6	44.1	53.9	9.8	100	0	VBW 10Hz
Vert.	288.794	QP	20.9	19.0	10.4	31.8	18.5	46.0	27.5	100	0	-
Vert.	854.214	QP	21.0	21.7	9.7	31.7	20.7	46.0	25.3	100	359	-
Vert.	1429.2625	AV	100.3	25.7	12.7	41.1	97.6	117.3	19.7	147	0	Carrier, VBW 10Hz,
Vert.	2858.525	AV	50.5	28.8	5.7	41.8	43.2	53.9	10.7	164	325	VBW 10Hz
Vert.	4287.788	AV	53.8	30.5	5.3	42.7	46.9	53.9	7.0	116	161	VBW 10Hz
Vert.	5717.050	AV	49.5	32.7	6.1	43.4	44.9	53.9	9.0	105	357	VBW 10Hz
Vert.	7146.313	AV	40.7	37.1	6.8	43.3	41.3	53.9	12.6	183	179	VBW 10Hz
Vert.	8575.575	AV	43.8	37.8	7.5	43.4	45.7	53.9	8.2	157	188	VBW 10Hz
Vert.	10004.840	AV	36.0	39.0	8.1	42.7	40.4	53.9	13.5	100	239	VBW 10Hz
Vert.	11434.100	AV	34.1	40.0	8.7	42.7	40.1	53.9	13.8	100	0	VBW 10Hz
Vert.	12863.360	AV	33.8	39.4	9.7	41.9	41.0	53.9	12.9	100	0	VBW 10Hz
Vert.	14292.630	AV	33.5	42.4	9.9	41.6	44.2	53.9	9.7	100	0	VBW 10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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

(for RF Exposure sheet)

[RF output power]

	Result 0 [dBuV/m]	Result 1 [mW]	Result 2 [mW]
carrier	100.9	5.002	3.691
Level			

Calculation: (*Result 0 is the maximum value (Result) in the table above)

Result 1 [mW] = (((10^(Result [dBuV/m] / 20) x 10^(-6))
 x (distance=) 3 [m]) ^2) / (30 x (gain=) 10^(-1.32 dBi / 10)) x 10^3
 * antenna gain value is average value. (refer to Antenna Specifications.)
 (for frequency range 1427-1432 MHz)

Result 2 [mW] = (((10^(Result [dBuV/m] / 20) x 10^(-6))
 x (distance=) 3 [m]) ^2) / (30 x 1) x 10^3

(*Result 1: Antenna power value, Result 2: E.I.R.P. value)

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

Test place UL Japan, Inc. Shonan EMC Lab.
No.1 Semi Anechoic Chamber No.3 Semi Anechoic Chamber
Date March 28, 2020 March 16, 2020
Temperature / Humidity 21 deg.C / 55 %RH 23 deg.C / 39 %RH
Engineer Kazuya Noda Takahiro Kawakami
(9 kHz - 30 MHz, 30 MHz - 1000 MHz) (1 GHz - 15 GHz)
Mode Tx, 1431.4625 MHz EUT worst axis : below 1 GHz Hori: Z, Vert: Z / above 1 GHz Hori: Y, 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.	208.902	QP	24.2	16.6	9.5	31.8	18.5	46.0	27.5	153	359	-
Hori.	307.212	QP	31.3	13.9	7.3	31.8	20.7	46.0	25.3	111	113	-
Hori.	319.496	QP	29.9	14.0	7.4	31.8	19.5	46.0	26.5	100	105	-
Hori.	1431.4625	AV	102.5	25.7	12.7	41.1	99.8	117.3	17.5	105	329	Carrier, VBW 10Hz,
Hori.	1432.000	AV	22.0	25.7	12.7	41.1	19.3	53.9	-	105	329	VBW 3 kHz,(Refer to Marker Delta Method)
Hori.	2862.925	AV	54.9	28.8	5.6	41.8	47.5	53.9	6.4	100	86	VBW 10Hz
Hori.	4294.388	AV	52.8	30.5	5.3	42.7	45.9	53.9	8.0	133	63	VBW 10Hz
Hori.	5725.850	AV	50.5	32.7	6.1	43.4	45.9	53.9	8.0	164	60	VBW 10Hz
Hori.	7157.313	AV	44.8	37.1	6.9	43.3	45.5	53.9	8.4	158	148	VBW 10Hz
Hori.	8588.775	AV	46.8	37.8	7.5	43.4	48.7	53.9	5.2	144	61	VBW 10Hz
Hori.	10020.240	AV	36.3	39.0	8.1	42.7	40.7	53.9	13.2	125	135	VBW 10Hz
Hori.	11451.700	AV	34.0	40.0	8.7	42.7	40.0	53.9	13.9	100	0	VBW 10Hz
Hori.	12883.160	AV	34.2	39.4	9.7	41.9	41.4	53.9	12.5	100	0	VBW 10Hz
Hori.	14314.630	AV	33.6	42.4	9.9	41.6	44.3	53.9	9.6	100	0	VBW 10Hz
Vert.	285.958	QP	20.9	18.8	10.4	31.8	18.3	46.0	27.7	100	0	-
Vert.	939.272	QP	20.5	22.0	10.0	31.2	21.3	46.0	24.7	100	359	-
Vert.	1431.4625	AV	102.3	25.7	12.7	41.1	99.6	117.3	17.7	149	0	Carrier, VBW 10Hz,
Vert.	1432.000	AV	21.5	25.7	12.7	41.1	18.8	53.9	-	149	0	VBW 3 kHz,(Refer to Marker Delta Method)
Vert.	2862.925	AV	52.4	28.8	5.6	41.8	45.0	53.9	8.9	112	161	VBW 10Hz
Vert.	4294.388	AV	54.6	30.5	5.3	42.7	47.7	53.9	6.2	117	155	VBW 10Hz
Vert.	5725.850	AV	48.3	32.7	6.1	43.4	43.7	53.9	10.2	104	6	VBW 10Hz
Vert.	7157.313	AV	41.3	37.1	6.9	43.3	42.0	53.9	11.9	183	179	VBW 10Hz
Vert.	8588.775	AV	46.3	37.8	7.5	43.4	48.2	53.9	5.7	165	201	VBW 10Hz
Vert.	10020.240	AV	36.4	39.0	8.1	42.7	40.8	53.9	13.1	164	315	VBW 10Hz
Vert.	11451.700	AV	34.0	40.0	8.7	42.7	40.0	53.9	13.9	100	0	VBW 10Hz
Vert.	12883.160	AV	34.1	39.4	9.7	41.9	41.3	53.9	12.6	100	0	VBW 10Hz
Vert.	14314.630	AV	33.6	42.4	9.9	41.6	44.3	53.9	9.6	100	0	VBW 10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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

Marker Delta Method(Test distance 3 m)

		AV			
	Polarity	Hor.		Ver.	
		[dBuV]	[dBuV/m]	[dBuV]	[dBuV/m]
Step1	Fundamental(1431.4625 MHz)	102.5	99.8	102.3	99.6
Step2	Fundamental(1431.4625 MHz)	101.9	99.2	101.3	98.6
	Band-edge(1432 MHz)	22.0	19.3	21.5	18.8
Step3	Amplitude delta	-	79.9	79.9	79.8
	Field strength of band-edge	-	19.9	-	19.8
	Limit	-	53.9	-	53.9
	Margin	-	34.0	-	34.1

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*1 Amplitude delta = Fundamental(RBW:1 kHz,VBW:3 kHz) - Band-edge(RBW:1 kHz,VBW:3 kHz)

*2 Field strength of band-edge = Fundamental(AV) - Amplitude delta

*As we stated at section 7 ("Bandedge" section), we used RBW = 1 kHz (greater than 1 % bandwidth) to prevent to detect in-band emission. Refer to KDB 971168 D01 (KDB 971168 D01 Power Meas Licence Digital System D03r01).

(for RF Exposure sheet)

[RF output power]			
	Result 0 [dBuV/m]	Result 1 [mW]	Result 2 [mW]
carrier	99.8	3.883	2.865
Level			

Calculation: (*Result 0 is the maximum value (Result) in the table above)

Result 1 [mW] = (((10^(Result [dBuV/m] / 20)) x 10^(-6))
x (distance=) 3 [m]) ^2) / (30 x (gain=) 10^(-1.32 dBi / 10)) x 10^3

* antenna gain value is average value. (refer to Antenna Specifications.)
(for frequency range 1427-1432 MHz)

Result 2 [mW] = (((10^(Result [dBuV/m] / 20)) x 10^(-6))
x (distance=) 3 [m]) ^2) / (30 x 1) x 10^3

(*Result 1: Antenna power value, Result 2: E.I.R.P. value)

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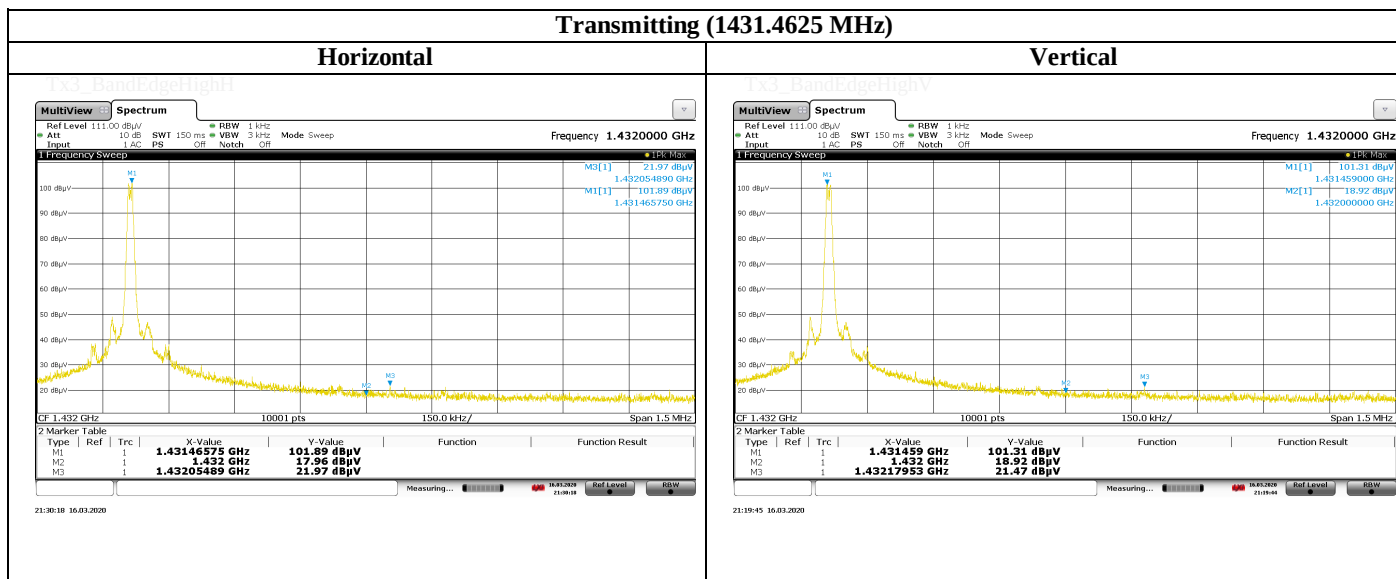
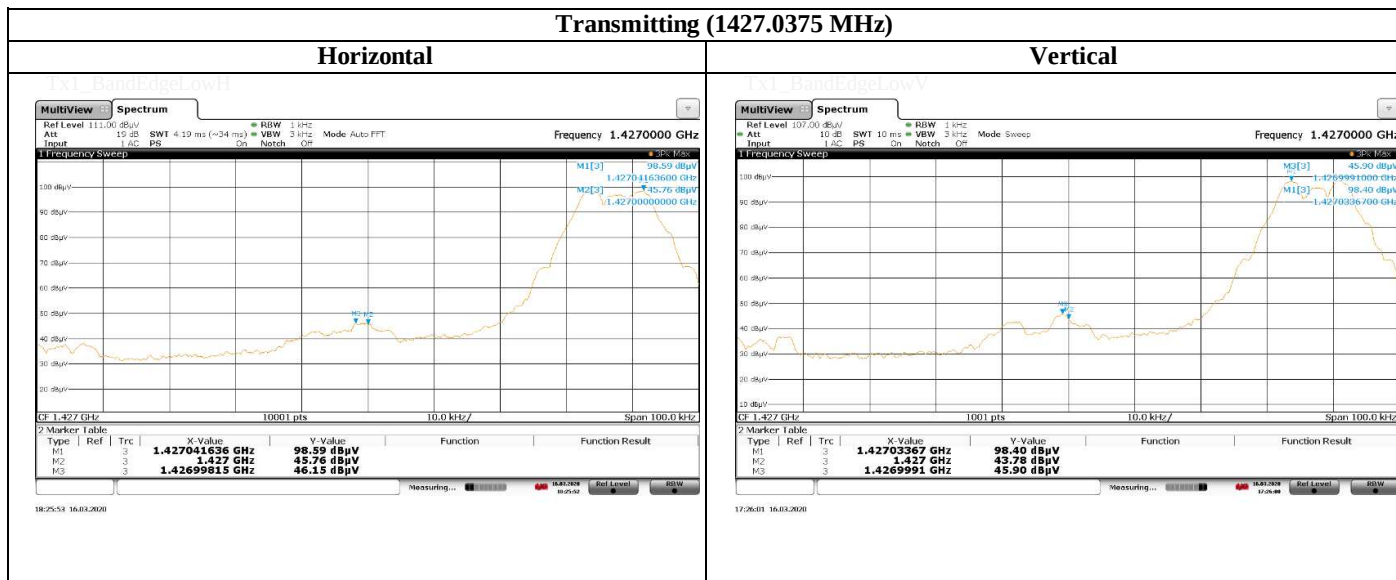
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Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date March 16, 2020 March 16, 2020
Temperature / Humidity 22 deg.C / 32 %RH 23 deg.C / 39 %RH
Engineer Kenichi Adachi Takahiro Kawakami

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

Band Edge compliance(for Marker Delta Method)



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APPENDIX 2: Test instruments**Test Instruments (1/2)**

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,M E,PE)	-	-	-
RE	KAT6-04	144899	Attenuator	Inmet	18N-6dB	-	2019/12/05	12
RE	KBA-01	146343	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	1748	2019/06/05	12
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	KJM-09	145929	Measure	KOMELON	KMC-36	-	-	-
RE	SAEC-01(NSA)	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2019/04/02	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2019/04/08	12
RE	SAF-01	145003	Pre Amplifier	SONOMA	310N	290211	2020/02/19	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2020/02/20	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2019/11/06	12
RE	SAT3-09	144959	Attenuator	JFW	50HF-003N	-	2019/08/06	12
RE	SAT6-15	167096	Attenuator	JFW	50HF-006N	-	2020/02/21	12
RE	SCC-A1/A3/A5/A7/A8/A13/SRS E-01	144967	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS 4906	-/0901-269(RF Selector)	2019/04/19	12
RE	SCC-A2/A4/A6/A7/A8/A13/SRS E-01	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS 4906	-/0901-269(RF Selector)	2019/04/19	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104 E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SCC-M1	194601	Coaxial Cable	Fujikura	5D-2W	-	2019/12/17	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2019/04/16	12
RE	SFL-22	168802	Highpass Filter	MICRO-TRONICS	HPM50114	G035	2019/04/16	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-739	2019/06/26	12
RE	SLA-01	145531	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	UHALP9108A	UHALP 9108-A 0888	2019/06/05	12
RE	SOS-20	191837	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	STR-01	145790	Test Receiver	Rohde & Schwarz	ESU40	100093	2019/04/14	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
RE	STS-01	145792	Digital Hitester	Hioki	3805-50	80997812	2019/10/01	12
RE	STS-03	146210	Digital Hitester	Hioki	3805-50	80997823	2019/10/01	12
RE	TLP-05	174863	Loop Antenna	Rohde & Schwarz	HFH2-Z2	826532/009	2019/11/12	12

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

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Test Instruments (2/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
TF	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
TF	SCH-01	145200	Temperature and Humidity Chamber	ESPEC	PL-1KT	14020837	2019/04/16	12
TF	SOS-19	175823	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/19	12
TF	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2019/08/08	12
TF	SSCA-01	146178	Search coil	Langer	RF-R 400-1	02-0634	-	-

*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

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

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

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

Test item: RE: Radiated Emission test
TF: Test fixture tests

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