



# **RADIO TEST REPORT**

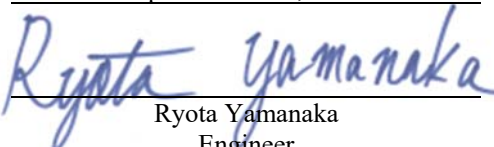
**Test Report No. : 12263172H-R2**

**Applicant** : Calsonic Kansei Corporation  
**Type of Equipment** : RF Transmitter for Keyless Entry  
**Model No.** : T61M0  
**Test regulation** : FCC Part 15 Subpart C: 2018  
**FCC ID** : KBRT61M0  
**Test Result** : Complied

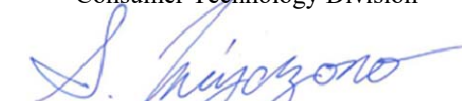
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3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical 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. Ise EMC Lab.
8. This report is a revised version of 12263172H-R1. 12263172H-R1 is replaced with this report.

**Date of test:** April 18 and 24, 2018

**Representative test engineer:**

  
Ryota Yamanaka  
Engineer  
Consumer Technology Division

**Approved by:**

  
Shinichi Miyazono  
Engineer  
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
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13-EM-F0429

## REVISION HISTORY

**Original Test Report No.: 12263172H**

[illegible]

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## **SECTION 1: Customer information**

Company Name : Calsonic Kansei Corporation  
Address : 2-1917 Nisshin-cho, Kita-ku, Saitama-shi, Saitama 331-8501 JAPAN  
Telephone Number : +81-48-660-2111  
Contact Person : Takaichiro Ishida

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

### **2.1 Identification of E.U.T.**

Type of Equipment : RF Transmitter for Keyless Entry  
Model No. : T61M0  
Serial No. : Refer to Clause 4.2  
Rating : DC 3.0 V  
Receipt Date of Sample : April 16, 2018  
Country of Mass-production : Thailand and India  
Condition of EUT : Production model  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model No: T61M0 (referred to as the EUT in this report) is the RF Transmitter for Keyless Entry.

#### **Radio Specification**

Radio Type : Transmitter  
Frequency of Operation : 433.92 MHz  
Modulation : FSK  
Type of Battery : Lithium battery (CR1616)  
Antenna type : PCB pattern antenna  
Clock frequency (maximum) : 13.559 MHz

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### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

#### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission *1)	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.207	N/A	N/A	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Automatically Deactivate	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(a)(1)	N/A	Complied	Radiated
	IC: -	IC: RSS-210 A1.1			
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(b)	9.3 dB 433.920 MHz Vertical PK with Duty factor	Complied	Radiated
	IC: RSS-Gen 6.12	IC: RSS-210 A1.2			
Electric Field Strength of Spurious Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.205 Section 15.209 Section 15.231(b)	4.7 dB 3471.360 MHz Vertical PK with Duty factor	Complied#	Radiated
	IC: RSS-Gen 6.13	IC: RSS-210 A1.2, 4.4 RSS-Gen 8.9			
-20dB Bandwidth	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(c)	N/A	Complied	Radiated
	IC: -	IC: Reference data			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

\*1) The test is not applicable since the EUT does not have AC Mains.

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.

#### **FCC Part 15.31 (e)**

This test was performed with the New Battery (DC 3.0 V) during the tests. Therefore, the EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	IC: RSS-Gen 6.6	IC: RSS-210 A1.3	N/A	Complied	Radiated

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz to 200 MHz	200 MHz to 1000 MHz	30 MHz to 200 MHz	200 MHz to 1000 MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	5.0 dB	6.3 dB	4.9 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz to 6 GHz	6 GHz to 18 GHz	10 GHz to 26.5 GHz	26.5 GHz to 40 GHz	1 GHz to 18 GHz
5.2 dB	5.5 dB	5.9 dB	5.9 dB	5.5 dB

\* Measurement distance

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### 3.5 Test Location

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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test data, Test instruments, and Test set up.

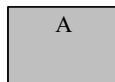
Refer to APPENDIX.

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

### **4.1 Operating Modes**

Test Item	Mode
Automatically Deactivate	Normal use mode
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth	Transmitting mode (Tx)
* The system was configured in typical fashion (as a customer would normally use it) for testing.	

### **4.2 Configuration and peripherals**



\* Test data was taken under worse case conditions.

#### **Description of EUT**

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF Transmitter for Keyless Entry	T61M0	2 *1) 1 *2)	Calsonic Kansei Corporation	EUT

\*1) Used for Transmitting mode

\*2) Used for Normal use mode

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## **SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)**

### **Test Procedure and conditions**

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 1.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 3.

### **[Transmitting mode]**

#### **(Below 30 MHz)**

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

#### **(Above 30 MHz)**

The Radiated Electric Field Strength has been measured on Semi anechoic chamber 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 strength.

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

The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

### **Test Antennas are used as below;**

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.1 kHz	9.1 kHz	120 kHz	PK: S/A: RBW 1 MHz, VBW: 3 MHz

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

Noise levels of all the frequencies were measured at the position.

\*The result is rounded off to the second decimal place, so some differences might be observed.

**Measurement range : 9 kHz - 4.4 GHz**

**Test data : APPENDIX**

**Test result : Pass**

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## **SECTION 6: Automatically deactivate**

### **Test Procedure**

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX  
Test result : Pass

## **SECTION 7: -20 dB and 99 % Occupied Bandwidth**

### **Test Procedure**

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	2 MHz	10 kHz	30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.  
Peak hold was applied as Worst-case measurement.

Test data : APPENDIX  
Test result : Pass

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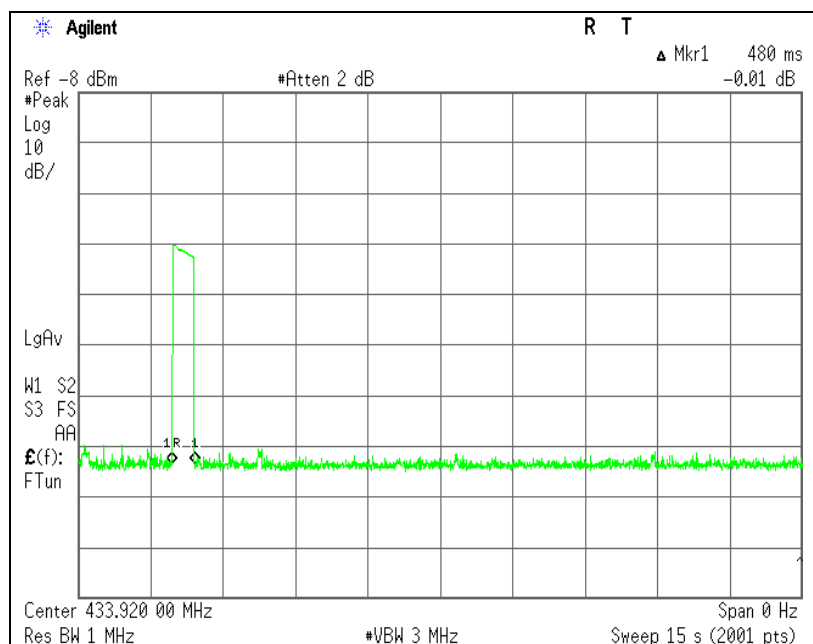
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## APPENDIX 1: Test data

### Automatically deactivate

Report No. 12263172H  
Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Date 04/24/2018  
Temperature/ Humidity 23 deg. C / 41 % RH  
Engineer Ryota Yamanaka  
Mode Normal use mode

Time of Transmitting [sec]	Limit [sec]	Result
0.48	5.00	Pass



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## **Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)**

Report No. 12263172H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date 04/24/2018  
Temperature / Humidity 23 deg. C / 48 % RH  
Engineer Ryota Yamanaka  
(Below 1 GHz)  
Mode Transmitting mode(Tx 433.92 MHz)  
No.2  
04/18/2018  
23 deg. C / 41 % RH  
Ryota Yamanaka  
(Above 1 GHz)

### **PK**

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
433.920	PK	69.7	76.2	16.5	10.8	32.0	-	65.0	71.5	100.8	35.8	29.3	Carrier
867.840	PK	33.9	35.3	21.9	13.0	31.4	-	37.4	38.8	80.8	43.4	42.0	Outside
1301.760	PK	51.5	52.0	25.6	3.8	35.3	-	45.6	46.1	73.9	28.3	27.8	Inside
1735.680	PK	48.6	48.8	26.0	4.1	34.8	-	43.9	44.1	80.8	36.9	36.7	Outside
2169.600	PK	50.1	50.5	26.5	4.3	34.5	-	46.4	46.8	80.8	34.4	34.0	Outside
2603.520	PK	47.0	49.0	27.7	4.5	34.4	-	44.8	46.8	80.8	36.0	34.0	Outside
3037.440	PK	43.3	44.4	28.5	4.8	34.3	-	42.3	43.4	80.8	38.5	37.4	Outside
3471.360	PK	53.1	56.4	28.6	5.0	33.9	-	52.8	56.1	80.8	28.0	24.7	Outside
3905.280	PK	42.0	42.1	29.7	5.2	33.6	-	43.3	43.4	73.9	30.6	30.5	Inside
4339.200	PK	43.8	43.3	30.4	5.4	33.6	-	46.0	45.5	73.9	27.9	28.4	Inside

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

### **PK with Duty factor**

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark
		Hor	Ver					Hor	Ver		Hor	Ver	
433.920	PK	69.7	76.2	16.5	10.8	32.0	0.0	65.0	71.5	80.8	15.8	9.3	Carrier
867.840	PK	33.9	35.3	21.9	13.0	31.4	0.0	37.4	38.8	60.8	23.4	22.0	Outside
1301.760	PK	51.5	52.0	25.6	3.8	35.3	0.0	45.6	46.1	53.9	8.3	7.8	Inside
1735.680	PK	48.6	48.8	26.0	4.1	34.8	0.0	43.9	44.1	60.8	16.9	16.7	Outside
2169.600	PK	50.1	50.5	26.5	4.3	34.5	0.0	46.4	46.8	60.8	14.4	14.0	Outside
2603.520	PK	47.0	49.0	27.7	4.5	34.4	0.0	44.8	46.8	60.8	16.0	14.0	Outside
3037.440	PK	43.3	44.4	28.5	4.8	34.3	0.0	42.3	43.4	60.8	18.5	17.4	Outside
3471.360	PK	53.1	56.4	28.6	5.0	33.9	0.0	52.8	56.1	60.8	8.0	4.7	Outside
3905.280	PK	42.0	42.1	29.7	5.2	33.6	0.0	43.3	43.4	53.9	10.6	10.5	Inside
4339.200	PK	43.8	43.3	30.4	5.4	33.6	0.0	46.0	45.5	53.9	7.9	8.4	Inside

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

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

Sample calculation:

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

Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator + Filter) - Gain (Amplifier) + Duty factor

For above 1GHz : Distance Factor:  $20 \times \log(3.75 \text{ m}/3.0 \text{ m}) = 1.94 \text{ dB}$

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

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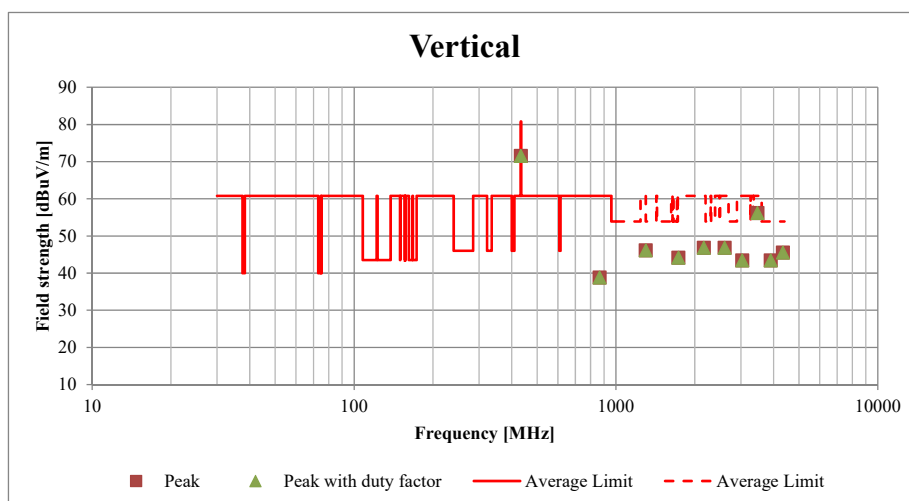
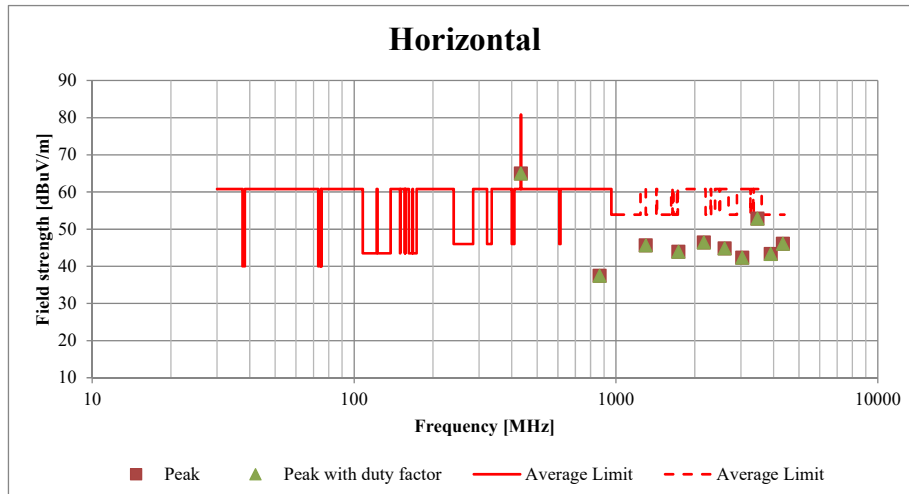
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## **Radiated Spurious Emission** **(Plot data, Worst case)**

Report No. 12263172H  
Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Date 04/18/2018  
Temperature/ Humidity 24 deg. C / 41 % RH  
Engineer Ryota Yamanaka  
Mode Transmitting mode(Tx 433.92 MHz)



\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

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### -20dB and 99% Occupied Bandwidth

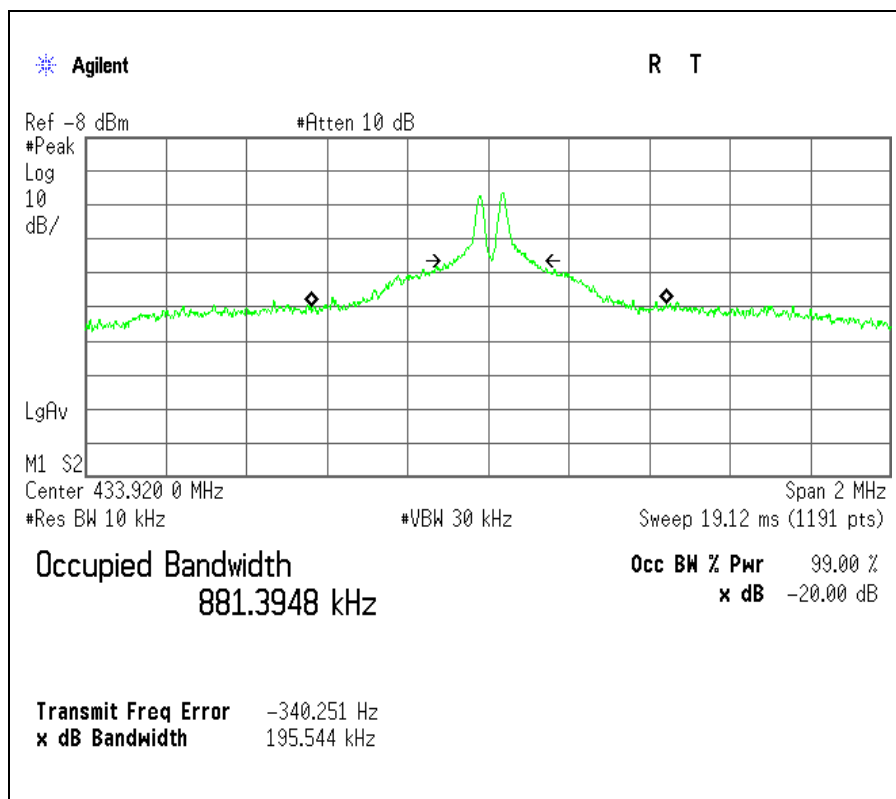
Report No. 12263172H  
Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Date 04/24/2018  
Temperature/ Humidity 23 deg. C / 48 % RH  
Engineer Ryota Yamanaka  
Mode Transmitting mode(Tx 433.92 MHz)

Bandwidth Limit : Fundamental Frequency  $433.92 \text{ MHz} \times 0.25\% = 1084.800 \text{ kHz}$

\* The above limit was calculated from more stringent nominal frequency.

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
195.5440	1084.800	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
881.3948	1084.800	Pass



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## APPENDIX 2: Test Instruments

### Test Instruments

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	8/7/2017	8/31/2018	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142182	Measure	KOMELON	KMC-36	-	-	-	-
RE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	0003	12/21/2017	12/31/2018	12
RE	142004	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	8/31/2017	8/31/2018	12
RE	141579	Pre Amplifier	AGILENT	8449B	3008A02142	1/23/2018	1/31/2019	12
RE	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	8/4/2017	8/31/2018	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	2/25/2018	2/27/2019	12
RE	141903	Spectrum Analyzer	AGILENT	E4440A	MY46186390	9/20/2017	9/30/2018	12
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-180	1501	1/24/2018	1/31/2019	12
RE	142011	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	10/30/2017	10/31/2018	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/12/2017	10/31/2018	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	12/10/2017	12/31/2018	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	1/31/2019	12
RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/9/2018	1/31/2019	12
RE	141397	Coaxial Cable	UL Japan	-	-	6/22/2017	6/30/2018	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	11/23/2017	11/30/2018	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260833	2/27/2018	2/28/2019	12
RE	142645	Loop Antenna	UL Japan	-	-	-	-	-

\*Hyphens for 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, 99 % Occupied Bandwidth, -20 dB bandwidth, and Automatically deactivate tests

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