RADIO TEST REPORT

Test Report No. : 11840080H-A-R1

Applicant	:	**OMRON Automotive Electronics Co. Ltd.**
Type of Equipment	:	**FOB ASSY**
Model No.	:	**GHR-H015-T**
Test regulation	:	**FCC Part 15 Subpart C: 2017**
FCC ID	:	**OUCGHR-H015T**
Test Result	:	**Complied**

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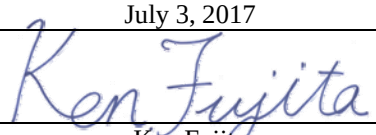
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
7. This report is a revised version of 11840080H-A .

Date of test: July 3, 2017

Representative test engineer:



Ken Fujita
Engineer
Consumer Technology Division

Approved by:

Motoya Imura
Engineer
Consumer Technology Division

NVLAP TESTING
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,
http://japan.ul.com/resources/emc_accredited/

REVISION HISTORY

Original Test Report No.: 11840080H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11840080H-A	July 28, 2017	-	-
1	11840080H-A-R1	August 7, 2017	P. 9	Correction of Measurement range in SECTION 5.

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CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	OMRON Automotive Electronics Co. Ltd.
Address	:	6368 NENJOZAKA OKUSA KOMAKI AICHI, 485-0802 JAPAN
Telephone Number	:	+81-568-78-6159
Facsimile Number	:	+81-568-78-7659
Contact Person	:	Takashi Betsui

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

2.1 Identification of E.U.T.

Type of Equipment	:	FOB ASSY
Model No.	:	GHR-H015-T
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.0 V
Receipt Date of Sample	:	May 30, 2017
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: GHR-H015-T (referred to as the EUT in this report) is the FOB ASSY.

General Specification

Clock frequencies in the system	:	27.6 MHz (Crystal)

Radio Specification

[Transmitter part]

Equipment Type	:	Transceiver
Frequency of operation	:	433.92 MHz
Power Supply (radio part input)	:	DC 3.0 V
Type of Modulation	:	FSK
Antenna Type	:	Pattern Antenna
Method of Frequency Generation	:	Crystal resonator
Operating temperature range	:	-20 deg.C to +60 deg.C

[Receiver part]

Radio Type	:	Receiver
Frequency of Operation	:	125 kHz *1)

*1) The test of receiver part was performed separately from this test report, and the conformability is confirmed.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.231 Periodic operation in the band 40.66 - 40.70MHz and above 70MHz

* The revision on June 14, 2017, does not affect the test specification applied to the EUT.

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	**FCC:** ANSI C63.10:2013 6 Standard test methods	**FCC:** Section 15.207	N/A	N/A*1)	-
	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)	1.0 dB 433.920 MHz Horizontal 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)	0.8 dB 4339.200 MHz Horizontal 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.					

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.

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

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

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	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 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	5.5 dB	5.4 dB	5.5 dB

* Measurement distance

Radiated emission test(3 m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 2.0m 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.

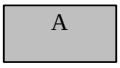
Refer to APPENDIX.

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	FOB ASSY	GHR-H015-T	10 *1) 4 *2)	OMRON Automotive Electronics Co. Ltd.	EUT

*1) Used for Transmitting mode.
*2) Used for Normal use mode.

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, 0.5 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	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	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.

This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test with mechanical key was the worst case. Therefore the test with mechanical key was performed only.

*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

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	200 kHz	15 kHz	43kHz	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

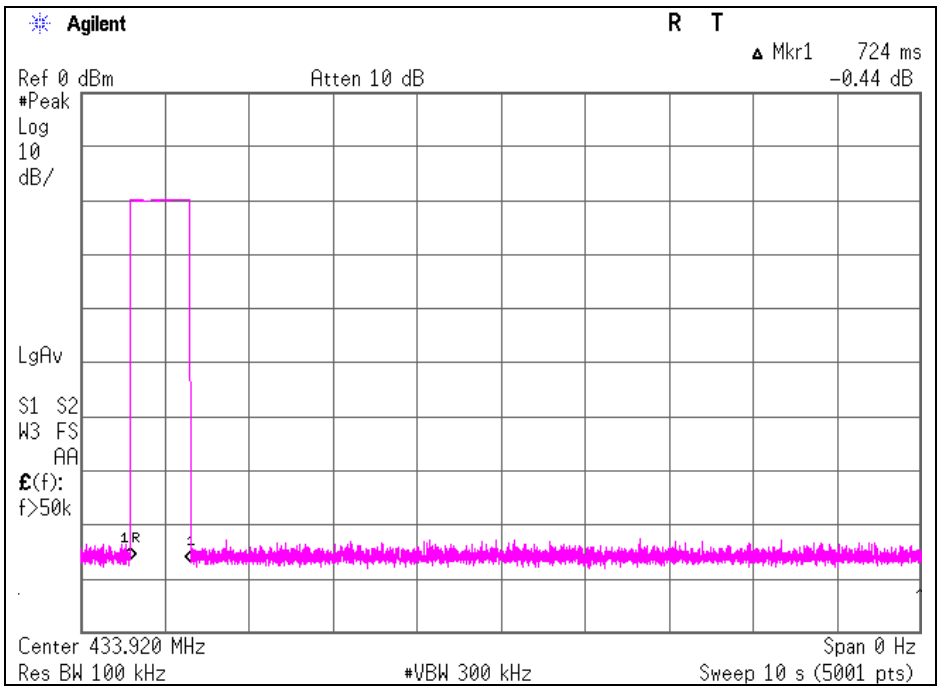
APPENDIX 1: Test data

Automatically deactivate

433.92 MHz

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11840080H
Date	07/03/2017
Temperature/ Humidity	22 deg. C / 68 % RH
Engineer	Ken Fujita
Mode	Normal use mode 433.92 MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.724	5.00	Pass



* The test was performed by a button-pressed operation as representative, because the EUT transmits UHF when LF signal is received from a car or a button on the EUT is pressed, and the UHF transmission is stopped within 5 seconds even when receiving request signal.

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

433.92 MHz

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Report No.	11840080H
Date	07/03/2017
Temperature/ Humidity	22 deg. C / 68 % RH
Engineer	Ken Fujita
	(Below 1 GHz / Above 1 GHz)
Mode	Transmitting mode (Tx), 433.92 MHz

PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark Inside or Outside
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	of Restricted Bands
433.920	PK	81.9	81.6	16.4	9.4	27.9	-	79.8	79.5	100.8	21.0	21.3	Carrier
867.840	PK	31.2	30.4	21.7	11.1	26.9	-	37.1	36.3	80.8	43.7	44.5	Outside
1301.760	PK	48.4	47.3	24.9	3.7	35.4	-	41.6	40.5	73.9	32.3	33.4	Inside
1735.680	PK	53.1	56.0	26.6	3.9	35.0	-	48.6	51.5	80.8	32.2	29.3	Outside
2169.600	PK	46.8	46.2	27.2	4.2	34.7	-	43.5	42.9	80.8	37.3	37.9	Outside
2603.520	PK	49.5	49.7	27.2	4.5	34.6	-	46.6	46.8	80.8	34.2	34.0	Outside
3037.440	PK	46.2	45.3	28.0	4.7	34.6	-	44.3	43.4	80.8	36.5	37.4	Outside
3471.360	PK	46.2	48.0	28.4	4.9	34.2	-	45.3	47.1	80.8	35.5	33.7	Outside
3905.280	PK	48.4	47.5	29.4	5.1	33.8	-	49.1	48.2	73.9	24.8	25.7	Inside
4339.200	PK	51.3	50.5	30.3	5.3	33.8	-	53.1	52.3	73.9	20.8	21.6	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Distance factor(above 1 GHz)) - Gain(Amplifier)

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	
433.920	PK	81.9	81.6	16.4	9.4	27.9	0.0	79.8	79.5	80.8	1.0	1.3	Carrier
867.840	PK	31.2	30.4	21.7	11.1	26.9	0.0	37.1	36.3	60.8	23.7	24.5	Outside
1301.760	PK	48.4	47.3	24.9	3.7	35.4	0.0	41.6	40.5	53.9	12.3	13.4	Inside
1735.680	PK	53.1	56.0	26.6	3.9	35.0	0.0	48.6	51.5	60.8	12.2	9.3	Outside
2169.600	PK	46.8	46.2	27.2	4.2	34.7	0.0	43.5	42.9	60.8	17.3	17.9	Outside
2603.520	PK	49.5	49.7	27.2	4.5	34.6	0.0	46.6	46.8	60.8	14.2	14.0	Outside
3037.440	PK	46.2	45.3	28.0	4.7	34.6	0.0	44.3	43.4	60.8	16.5	17.4	Outside
3471.360	PK	46.2	48.0	28.4	4.9	34.2	0.0	45.3	47.1	60.8	15.5	13.7	Outside
3905.280	PK	48.4	47.5	29.4	5.1	33.8	0.0	49.1	48.2	53.9	4.8	5.7	Inside
4339.200	PK	51.3	50.5	30.3	5.3	33.8	0.0	53.1	52.3	53.9	0.8	1.6	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

For above 1 GHz: Distance Factor: 20 x log(4.45 m / 3.0m) = 3.42 dB

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

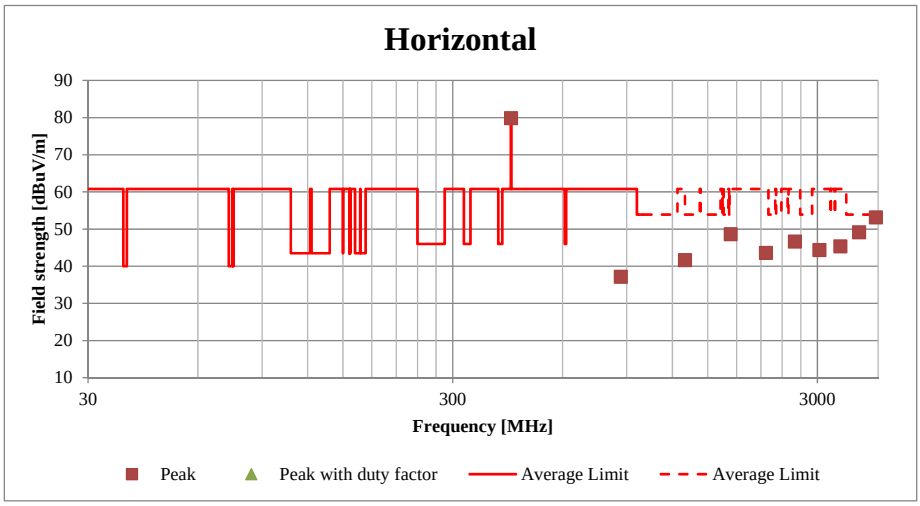
Sample calculation:
Result of PK = Reading + Ant Factor + Loss (Cable + Attenuator + Distance factor) - Gain (Amplifier)
Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator + Distance factor) - Gain (Amplifier) + Duty factor

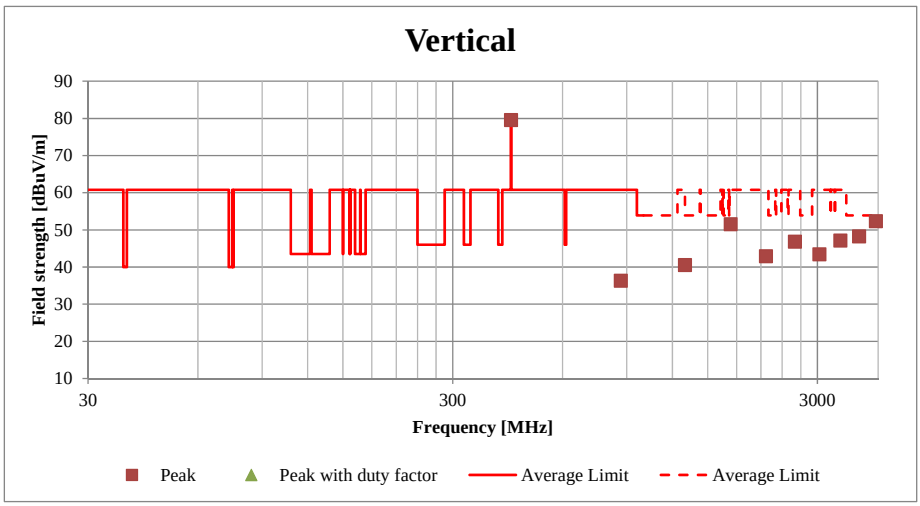
For above 1GHz : Distance Factor: 20 x log (3.75 m/3.0 m) = 1.94 dB
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Since the peak emission result satisfied the average limit, duty factor was omitted.
The result of AV (PK with Duty factor) was calculated by applying Duty 100%.

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Report No.	11840080H
Date	07/03/2017
Temperature/ Humidity	22 deg. C / 68 % RH
Engineer	Ken Fujita
	(Below 1 GHz / Above 1 GHz)
Mode	Transmitting mode (Tx), 433.92 MHz





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

-20dB and 99% Occupied Bandwidth

433.92 MHz

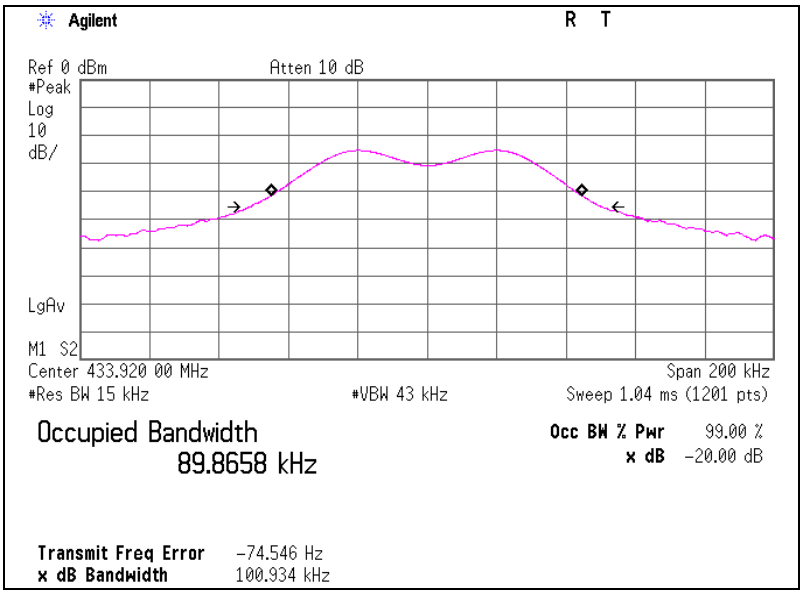
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Report No.	11840080H
Date	07/03/2017
Temperature/ Humidity	22 deg. C / 68 % RH
Engineer	Ken Fujita
	(Below 1 GHz / Above 1 GHz)
Mode	Transmitting mode (Tx), 433.92 MHz

Bandwidth Limit : Fundamental Frequency **433.920** MHz x 0.25% = 1084.80 kHz

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

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
100.93	1084.80	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
89.87	1084.80	Pass



APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/12/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-130	Spectrum Analyzer	Agilent	E4440A	MY46187750	RE	2017/06/20 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2016/10/21 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/01/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2017/02/24 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2016/11/28 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2017/02/24 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2016/08/29 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	RE	Pre Check

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, -20dB bandwidth, and Automatically deactivate tests