



RADIO TEST REPORT

Test Report No. : 11990774H-R1

Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : Push Start Switch
Model No. : P55R0
FCC ID : OUCP55R0
Test regulation : FCC Part 15 Subpart C: 2018
Test Result : Complied

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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. This report is a revised version of 11990774H. 11990774H is replaced with this report.

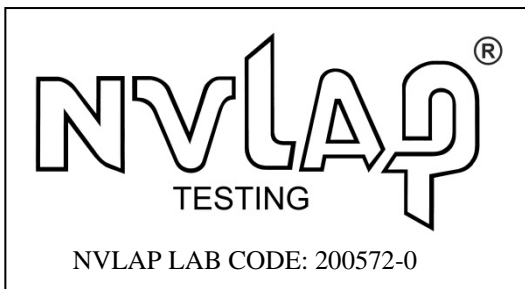
Date of test: October 14, 2017

Representative test engineer:

Hiroyuki Furutaka
Engineer
Consumer Technology Division

Approved by:

Shinichi Miyazono
Engineer
Consumer Technology Division



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/

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Ise EMC Lab.

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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 : Push Start Switch
Model No. : P55R0
Serial No. : Refer to Clause 4.2
Rating : DC 12.0 V
Receipt Date of Sample : October 5, 2017
Country of Mass-production : Japan and India
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: P55R0 (referred to as the EUT in this report) is the Push Start Switch

General Specification

Clock frequency(ies) in the system : 8 MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 125 kHz
Modulation : ASK
Power Supply (inner) : DC 12.0 V
Antenna type : Coil Antenna (built-in)

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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 January 2, 2018 and effective February 1, 2018

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits; general requirements.

* The revision on January 2, 2018, does not affect the test specification applied to the EUT.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 8.8	<FCC> Section 15.207 <IC> RSS-Gen 8.8	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.4, 6.12	<FCC> Section 15.209 <IC> RSS-210 4.4 RSS-Gen 8.9	Radiated	N/A	18.9 dB 0.12500 MHz 0 deg., PK with Duty factor	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.4, 6.13	<FCC> Section 15.209 <IC> RSS-210 4.4 RSS-Gen 8.9	Radiated	N/A	13.4 dB 73.975 MHz, Vertical, QP	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

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 is not the device that is designed to be connected to the public utility (AC) power line.

FCC 15.31 (e)

The battery voltage (DC 12V) is provided to the EUT. Input voltage to RF part doesn't go through the regulator. So the test was performed with the supply voltage varied between 85 % and 115% of the nominal rated supply voltage (DC 12 V) and the variation of the input power does not affect the test result, 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

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99 % Occupied Band Width	RSS-Gen 6.6	-	Radiated	N/A	N/A	N/A

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.

Test distance	Radiated emission (+/-)
	9 kHz - 30 MHz
3 m	3.8 dB
10 m	3.7 dB

*Measurement distance

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission test(3 m)

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

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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 2.0m 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.

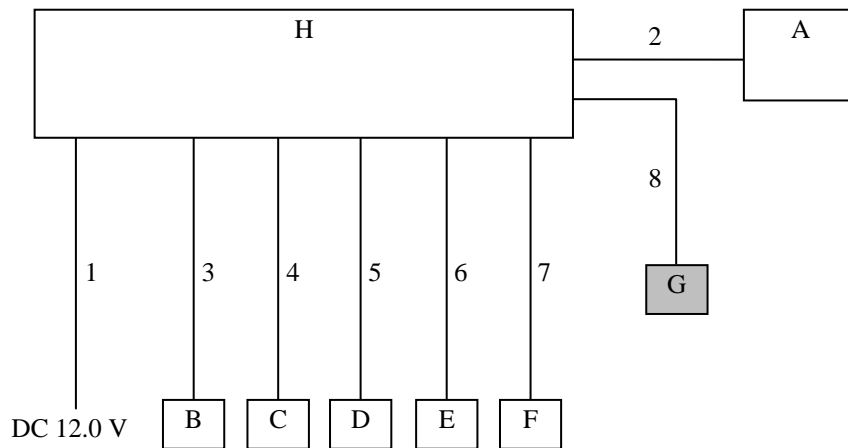
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

Test mode	Remarks
Transmitting mode	-

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

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.
*The input voltage was confirmed at the connection point of Item G and Cable No. 8.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Immobilizer and Alarm system	K56R0	No.008	OMRON Automotive Electronics Co. Ltd.	-
B	LF Antenna-1 (INF)	CGF-S002-D01	1	OMRON Automotive Electronics Co. Ltd.	-
C	LF Antenna-1 (INR)	CGF-S002-D01	2	OMRON Automotive Electronics Co. Ltd.	-
D	LF Antenna-1 (T/G)	CGF-S002-D01	3	OMRON Automotive Electronics Co. Ltd.	-
E	LF Antenna-2 (Dr)	CGF-S002-D02	261	OMRON Automotive Electronics Co. Ltd.	-
F	LF Antenna-2 (As)	CGF-S002-D02	267	OMRON Automotive Electronics Co. Ltd.	-
G	Push Start Switch	P55R0	012	OMRON Automotive Electronics Co. Ltd.	EUT
H	Switch BOX	RV494	No.002	OMRON Automotive Electronics Co. Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal & DC Cable	2.0	Unshielded	Unshielded	-
3	Antenna Cable	2.4	Unshielded	Unshielded	-
4	Antenna Cable	2.4	Unshielded	Unshielded	-
5	Antenna Cable	2.4	Unshielded	Unshielded	-
6	Antenna Cable	2.4	Unshielded	Unshielded	-
7	Antenna Cable	2.4	Unshielded	Unshielded	-
8	Signal & DC Cable	2.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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.

Frequency : From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

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

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

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.

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	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
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

*1) Distance Factor: $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

*2) Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

- 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.

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

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

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Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX 1
Test result : Pass

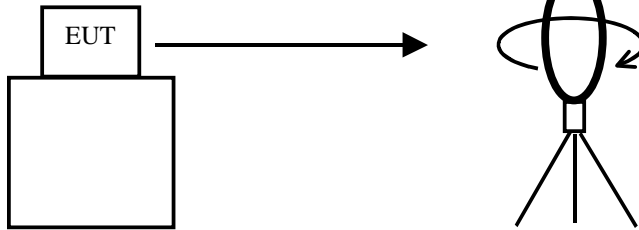
Date: October 14, 2017

Test engineer:

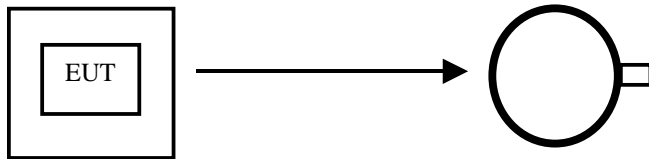
Hiroyuki Furutaka, Takafumi Noguchi

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

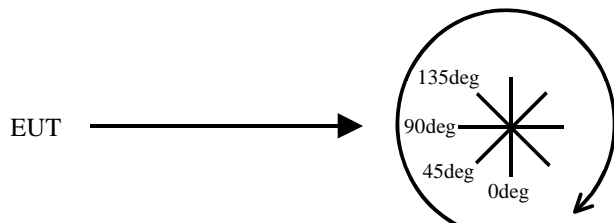


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26dB Bandwidth

Test Procedure

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

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	100 kHz	1 kHz	3 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 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
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 1
Test result : Pass

APPENDIX 1: Test data

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No. : 11990774H
Date : 10/14/2017
Temperature/ Humidity : 25 deg. C / 56 % RH
Engineer : Hiroyuki Furutaka
Mode : Tx 125kHz

PK or QP

Ant Deg [deg]	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
0	0.12500	PK	93.1	19.7	-73.9	32.2	-	6.7	45.6	38.9	Fundamental (DC 10.2V)
0	0.12500	PK	93.1	19.7	-73.9	32.2	-	6.7	45.6	38.9	Fundamental (DC 12.0V)
0	0.12500	PK	93.1	19.7	-73.9	32.2	-	6.7	45.6	38.9	Fundamental (DC 13.8V)
0	0.25000	PK	47.8	19.6	-73.9	32.2	-	-38.7	39.6	78.3	
0	0.37500	PK	53.6	19.6	-73.9	32.2	-	-32.9	36.1	69.0	
0	0.50000	QP	32.7	19.5	-33.8	32.1	-	-13.7	33.6	47.3	
0	0.62500	QP	43.0	19.5	-33.8	32.2	-	-3.5	31.7	35.2	
0	0.75000	QP	31.5	19.5	-33.8	32.2	-	-15.0	30.1	45.1	
0	0.87500	QP	38.2	19.5	-33.8	32.2	-	-8.3	28.7	37.0	
0	1.00000	QP	31.1	19.5	-33.8	32.2	-	-15.4	27.6	43.0	
0	1.12500	QP	35.4	19.5	-33.8	32.2	-	-11.1	26.5	37.6	
0	1.25000	QP	31.0	19.5	-33.8	32.2	-	-15.5	25.6	41.1	

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

PK with Duty factor

Ant Deg [deg]	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
0	0.125	PK	93.1	19.7	-73.9	32.2	0.0	6.7	25.6	18.9	DC 10.2V
0	0.125	PK	93.1	19.7	-73.9	32.2	0.0	6.7	25.6	18.9	DC 12.0V
0	0.125	PK	93.1	19.7	-73.9	32.2	0.0	6.7	25.6	18.9	DC 13.8V
0	0.250	PK	47.8	19.6	-73.9	32.2	0.0	-38.7	19.6	58.3	
0	0.375	PK	53.6	19.6	-73.9	32.2	0.0	-32.9	16.1	49.0	

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	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
0	0.12500	PK	93.1	19.7	6.1	32.2	-	86.7	-	-	Fundamental

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

* All spurious emissions lower than this result.

*It was confirmed that there was no difference by the input voltage in the spurious emission.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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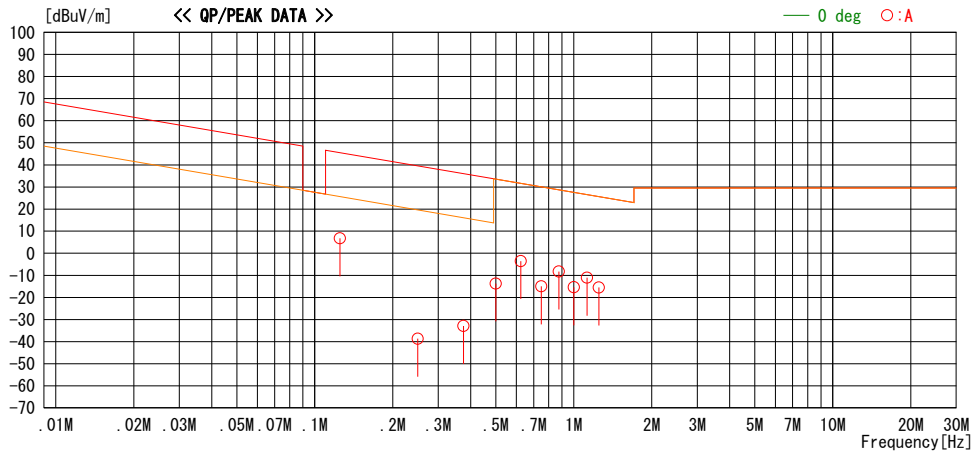
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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)
(Plot data, Worst case)

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No. : 11990774H
Date : 10/14/2017
Temperature/ Humidity : 25 deg. C / 56 % RH
Engineer : Hiroyuki Furutaka
Mode : Tx 125kHz

LIMIT : FCC15. 209 (a), 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15. 209 (a), 9-90kHz:AV, 110-490kHz:AV, other:QP

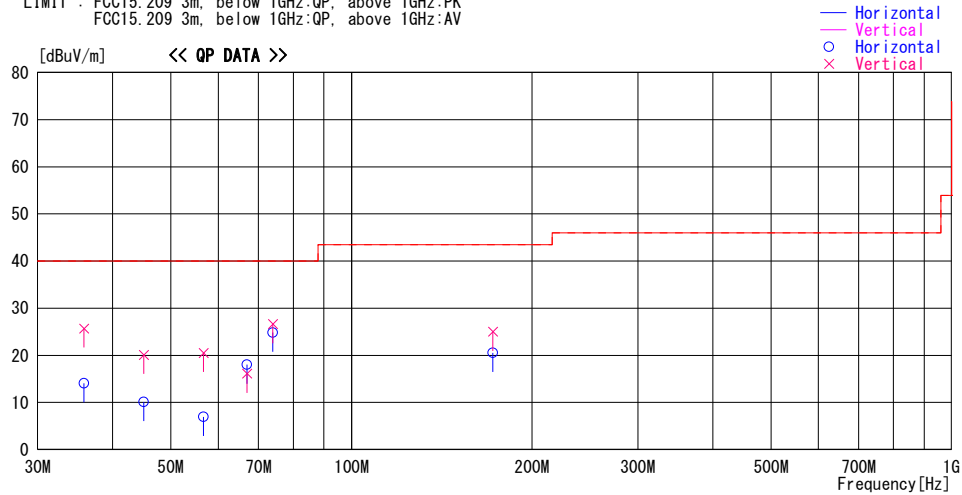


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Emission above 30MHz (Spurious Emission)

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No. : 11990774H
Date : 10/14/2017
Temperature/ Humidity : 22 deg. C / 69 % RH
Engineer : Takafumi Noguchi
Mode : Tx 125kHz

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
FCC15.209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
35.863	34.9	QP	15.6	-24.8	25.7	72	100	Vert.	40.0	14.3	
35.863	23.3	QP	15.6	-24.8	14.1	327	300	Hori.	40.0	25.9	
45.110	22.3	QP	12.5	-24.7	10.1	293	400	Hori.	40.0	29.9	
45.110	32.3	QP	12.5	-24.7	20.1	124	100	Vert.	40.0	19.9	
56.731	23.0	QP	8.5	-24.5	7.0	120	300	Hori.	40.0	33.0	
56.731	36.5	QP	8.5	-24.5	20.5	164	100	Vert.	40.0	19.5	
66.976	36.0	QP	6.4	-24.4	18.0	196	300	Hori.	40.0	22.0	
66.976	34.1	QP	6.4	-24.4	16.1	101	100	Vert.	40.0	23.9	
73.975	44.6	QP	6.3	-24.3	26.6	83	100	Vert.	40.0	13.4	
73.975	42.8	QP	6.3	-24.3	24.8	191	400	Hori.	40.0	15.2	
172.069	27.6	QP	16.0	-23.1	20.5	40	196	Hori.	43.5	23.0	
172.069	32.1	QP	16.0	-23.1	25.0	80	100	Vert.	43.5	18.5	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

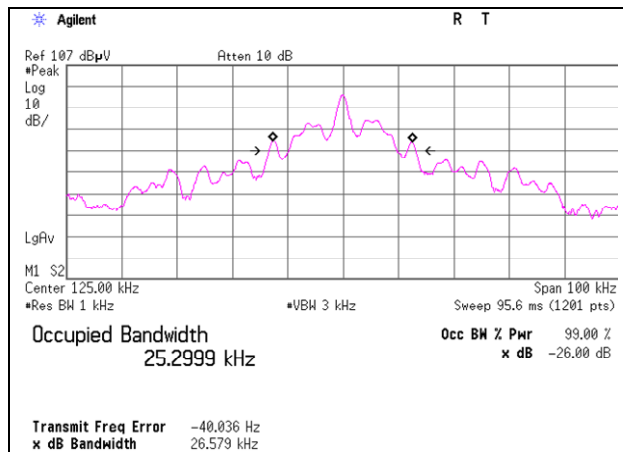
*It was confirmed that there was no difference by the input voltage in the spurious emission.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

-26dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No.	11990774H
Date	10/14/2017
Temperature/ Humidity	25 deg. C / 56 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx 125kHz

Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
125	26.579	25.2999



*It was confirmed that there was no difference by the input voltage.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/19 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2017/01/20 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2017/01/12 * 12
MLPA-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	836553/009	RE	2016/11/02 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ suoform141-PE(1m)/ RFM-E121(Switcher)	-/04178	RE	2017/07/26 * 12
MCC-219	Coaxial Cable	UL Japan	-	-	RE	2016/11/10 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2017/03/27 * 12
MAT-97	Attenuator	KEYSIGHT	8491A	MY52462282	RE	2017/10/12 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2017/01/19 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2017/05/29 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2016/11/23 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2017/01/26 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2017/06/26 * 12

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: Spurious emission

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