RADIO TEST REPORT

Test Report No. : 12278123H-R1

Applicant	:	**Calsonic Kansei Corporation**
Type of Equipment	:	**CONTROLLER ASSY, IMM**
Model No.	:	**I68P0**
FCC ID	:	**KBRI68P0**
Test regulation	:	**FCC Part 15 Subpart C: 2018**
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
8. This report is a revised version of 12278123H. 12278123H is replaced with this report.

Date of test: June 6 and 7, 2018

Representative test engineer:
Tomoki Matsui
Engineer
Consumer Technology Division

Approved by:
Shinichi Miyazono
Engineer
Consumer Technology Division

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☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 12278123H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12278123H	June 20, 2018	-	-
1	12278123H-R1	June 28, 2018	P.5	Correction of FCC Part 15.203 Antenna requirement in Clause 3.2
1	12278123H-R1	June 28, 2018	P.16	Addition of LIMS ID: 148898 in Test instruments of APPENDIX 2.

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SECTION 1: Customer information

Company Name	:	Calsonic Kansei Corporation
Address	:	2-1917 Nisshin-cho,Kita-ku,Saitam-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	:	CONTROLLER ASSY, IMM
Model No.	:	I68P0
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	June 6, 2018
Country of Mass-production	:	Japan and India
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: I68P0 (referred to as the EUT in this report) is the CONTROLLER ASSY.IMM.

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	125 kHz
Modulation	:	ASK
Antenna type	:	Loop Antenna
Operating Temperature	:	-40 deg. C to +85 deg. C
Clock Frequency	:	8 MHz

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 15.207 Conducted limits Section 15.209 Radiated emission limits; general requirements.

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	24.7 dB 125 kHz 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	8.4 dB 78.250 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 EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test.
That 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.

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 to 30 MHz
3 m	3.8 dB
10 m	3.6 dB

*Measurement distance

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

* Measurement distance

Radiated emission test(3 m)
[Electric Field Strength of Fundamental Emission]
The data listed in this test report has enough margin, more than the site margin.

[Electric Field Strength of Spurious Emission]
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

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

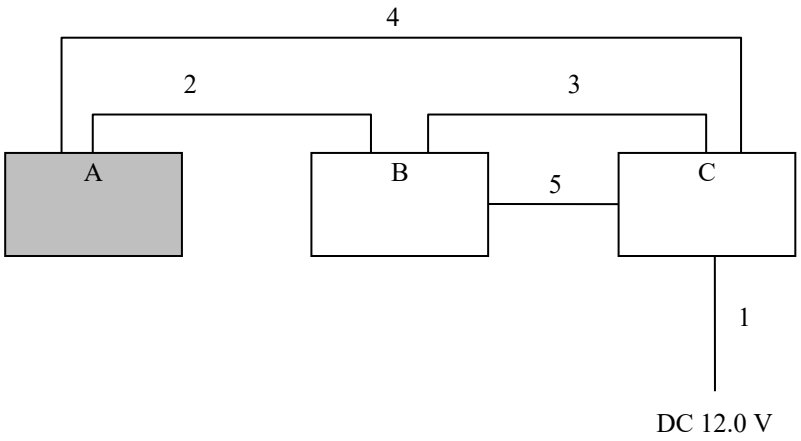
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

Test mode	Remarks
Transmitting mode (Tx) 125 kHz	-

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.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	CONTROLLER ASSY. IMM	I68P0	00083414	Calsonic Kansei Corporation	EUT
B	BCM	K68P4	-	Calsonic Kansei Corporation	-
C	Switch Box	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal Cable	1.2	Unshielded	Unshielded	-
3	Signal Cable	0.5	Unshielded	Unshielded	-
4	DC Cable	1.2	Unshielded	Unshielded	-
5	DC Cable	0.5	Unshielded	Unshielded	

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 x log (3 m / 300 m) = -80 dB
*2) Distance Factor: 40 x log (3 m / 30 m) = -40 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 noise levels was 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 (below 30 MHz) / with transponder key (above 30 MHz) was the worst case. Therefore the test without transponder key (below 30 MHz) / with transponder key (above 30 MHz) was performed only.

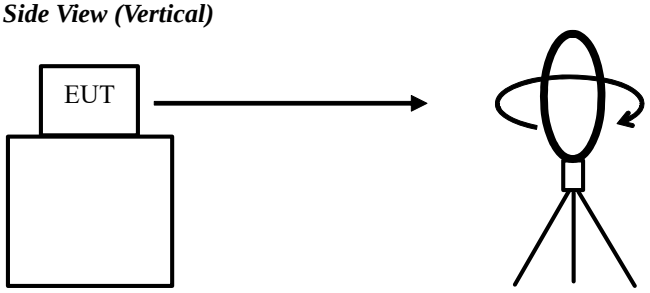
The test results and limit are rounded off to one decimal place, so some differences might be observed.

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

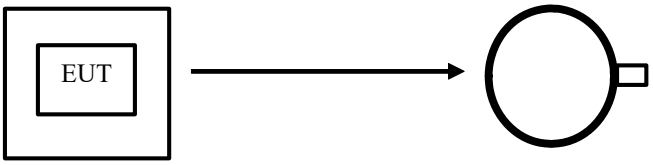
Date: June 6, 2018 Test engineer: Yuta Moriya
June 7, 2018 Tomoki Matsui

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

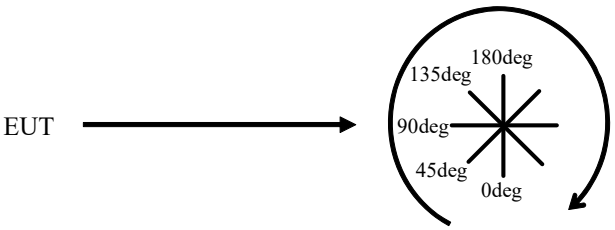


Top View (Horizontal)



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	Max Hold	Spectrum Analyzer
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.	12278123H
Date	06/07/2018
Temperature/ Humidity	23 deg. C / 67 % RH
Engineer	Tomoki Matsui
Mode	Tx 125 kHz

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	87.2	19.8	-73.9	32.2	-	0.9	45.6	44.7	Fundamental
0	0.25000	PK	43.2	19.7	-73.9	32.2	-	-43.2	39.6	82.8	
0	0.37500	PK	50.0	19.7	-73.9	32.2	-	-36.4	36.1	72.5	
0	0.50000	QP	32.3	19.7	-33.8	32.1	-	-13.9	33.6	47.5	
0	0.62500	QP	39.8	19.7	-33.8	32.2	-	-6.5	31.7	38.2	
0	0.75000	QP	31.3	19.7	-33.8	32.2	-	-15.0	30.1	45.1	
0	0.87500	QP	35.9	19.7	-33.8	32.2	-	-10.4	28.7	39.1	
0	1.00000	QP	30.9	19.7	-33.8	32.2	-	-15.4	27.6	43.0	
0	1.12500	QP	33.7	19.7	-33.8	32.2	-	-12.6	26.5	39.1	
0	1.25000	QP	33.8	19.7	-33.8	32.2	-	-12.5	25.6	38.1	

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

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	0.12500	PK	87.2	19.8	-73.9	32.2	0.0	0.9	25.6	24.7	
0	0.25000	PK	43.2	19.7	-73.9	32.2	0.0	-43.2	19.6	62.8	
0	0.37500	PK	50.0	19.7	-73.9	32.2	0.0	-36.4	16.1	52.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *

* 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	87.2	19.8	6.1	32.2	-	80.9	-	-	Fundamental

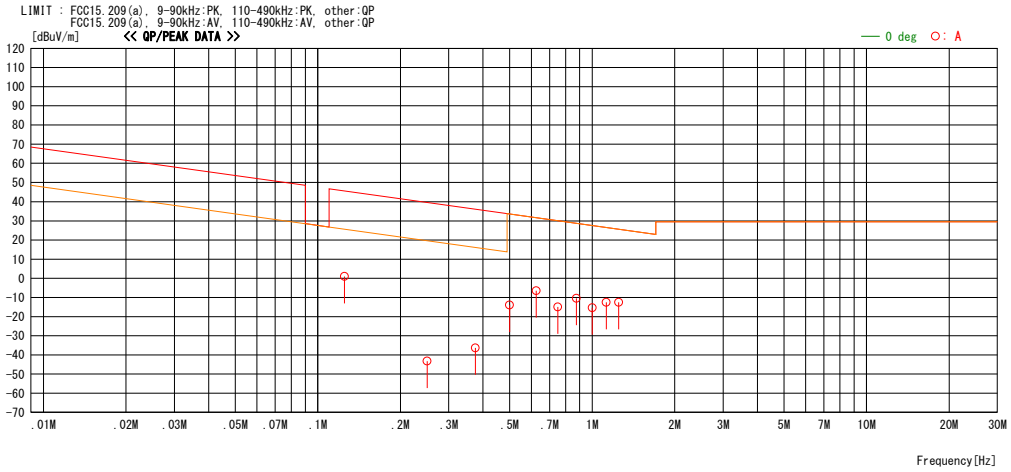
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

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

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

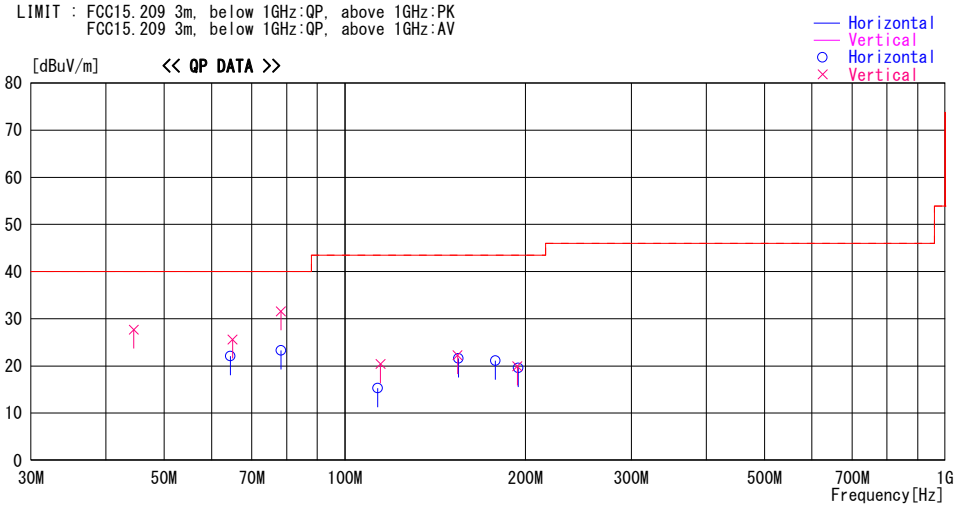
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No.	12278123H
Date	06/07/2018
Temperature/ Humidity	23 deg. C / 67 % RH
Engineer	Tomoki Matsui
Mode	Tx 125 kHz



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

Radiated Emission above 30 MHz (Spurious Emission)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Report No.	12278123H
Date	06/06/2018
Temperature / Humidity	22 deg. C / 68 % RH
Engineer	Yuta Moriya
	(Below 1 GHz)
Mode	Tx 125 kHz



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
44.505	39.6	QP	12.8	-24.7	27.7	138	100	Vert.	40.0	12.3	
64.501	39.6	QP	6.9	-24.4	22.1	190	282	Hori.	40.0	17.9	
65.011	43.2	QP	6.8	-24.4	25.6	168	100	Vert.	40.0	14.4	
78.250	40.8	QP	6.7	-24.2	23.3	362	228	Hori.	40.0	16.7	
78.250	49.1	QP	6.7	-24.2	31.6	131	100	Vert.	40.0	8.4	
113.481	27.1	QP	12.0	-23.8	15.3	164	268	Hori.	43.5	28.2	
114.639	32.0	QP	12.2	-23.8	20.4	237	100	Vert.	43.5	23.1	
154.120	30.3	QP	15.3	-23.3	22.3	210	100	Vert.	43.5	21.2	
154.599	29.6	QP	15.3	-23.3	21.6	55	221	Hori.	43.5	21.9	
178.118	27.9	QP	16.2	-23.0	21.1	212	182	Hori.	43.5	22.4	
193.873	26.5	QP	16.3	-22.9	19.9	251	100	Vert.	43.5	23.6	
194.361	26.2	QP	16.3	-22.9	19.6	63	152	Hori.	43.5	23.9	

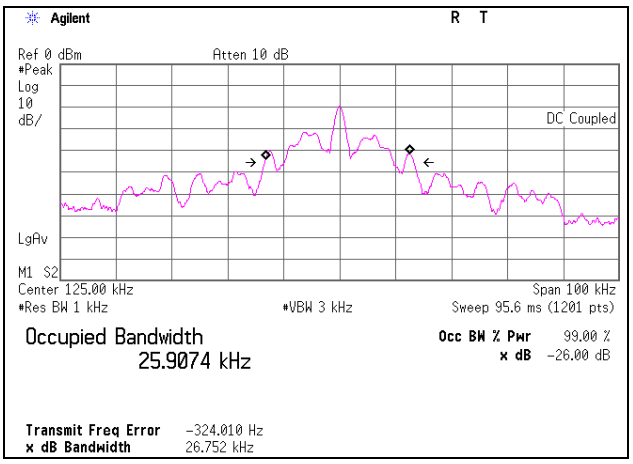
CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

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

-26 dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No.	12278123H
Date	06/07/2018
Temperature/ Humidity	23 deg. C / 67 % RH
Engineer	Tomoki Matsui
Mode	Tx 125 kHz

Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
125	26.752	25.9074



APPENDIX 2: Test instruments

Test Instruments

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	10/30/2017	10/31/2018	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	1/31/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	11/23/2017	11/30/2018	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	12/10/2017	12/31/2018	12
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-180	1501	1/24/2018	1/31/2019	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260833	2/27/2018	2/28/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/9/2018	1/31/2019	12
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141397	Coaxial Cable	UL Japan	-	-	6/22/2017	6/30/2018	12
RE	141217	Coaxial cable	Fujikura/Suhner/ TSJ	5D-2W/SFM141/ 421-010/ sucoform141-P	-/04178	7/27/2017	7/31/2018	12
RE	141413	Coaxial Cable	UL Japan	-	-	6/13/2017	6/30/2018	12
RE	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/11/2017	10/31/2018	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	2017/10/12	2018/10/31	12

***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: Spurious emission