RADIO TEST REPORT

Test Report No. : 12221487H-R1

Applicant	:	**Calsonic Kansei Corporation**
Type of Equipment	:	**CONTROLLER ASSY. IMM**
Model No.	:	**I76M0**
FCC ID	:	**KBRI76M0**
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.
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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 12221487H. 12221487H is replaced with this report.

Date of test: April 9 and 10, 2018

Representative test engineer:
Masafumi Niwa
Engineer
Consumer Technology Division

Approved by:
Shinichi Miyazono
Engineer
Consumer Technology Division

NVLAP TESTING
NVLAP LAB CODE: 200572-0

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☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

REVISION HISTORY

Original Test Report No.: 12221487H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12221487H	April 20, 2018	-	-
1	12221487H-R1	May 25, 2018	P.1	Addition of note 6
1	12221487H-R1	May 25, 2018	P.1, 4, 8	Correction of Appricant name; From “Calsonic Kansei Corp.” to “Calsonic Kansei Corporation”
1	12221487H-R1	May 25, 2018	P.15	Correction of 99 % Occupied Bandwidth value in table; From 40.1650 to 43.7898
1	12221487H-R1	May 25, 2018	P.16	Correction of Test instruments

CONTENTS **PAGE**

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.	:	I76M0
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	March 26, 2018
Country of Mass-production	:	Thailand, India
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: I76M0 (referred to as the EUT in this report) is the CONTROLLER ASSY.IMM.

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	125 kHz
Modulation	:	ASK
Antenna type	:	Loop Antenna
Clock frequency(ies) in the system	:	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.

* The revision on March 12, 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	21.1 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	17.8 dB 34.980 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 vehicle. 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.

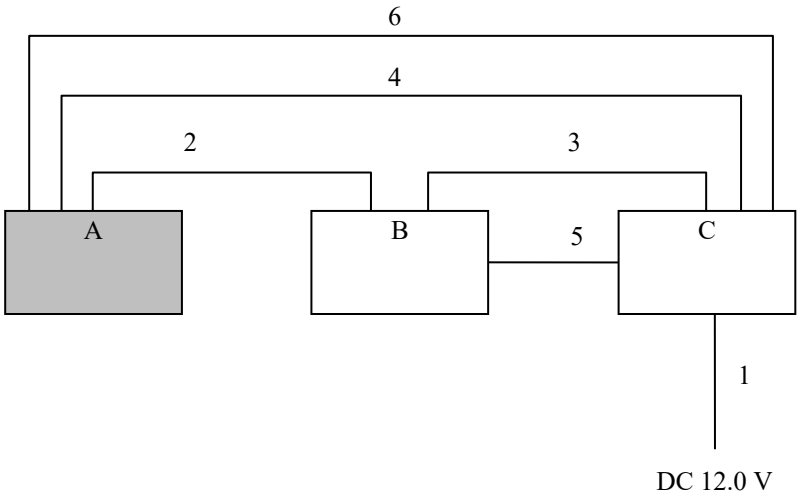
SECTION 4: Operation of E.U.T. during testing

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	I76M0	0094882	Calsonic Kansei Corporation	EUT
B	BCM	FLN002	44819	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	3.0	Unshielded	Unshielded	-
3	Signal Cable	1.0	Unshielded	Unshielded	-
4	Signal Cable	4.5	Unshielded	Unshielded	-
5	DC Cable	0.3	Unshielded	Unshielded	-
6	DC Cable	4.5	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 was the worst case. Therefore the test without transponder key was performed only.

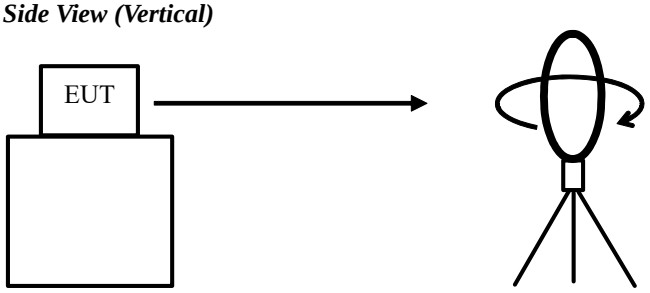
The test results and limit are rounded off to one decimal place, so some differences might be observed.

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

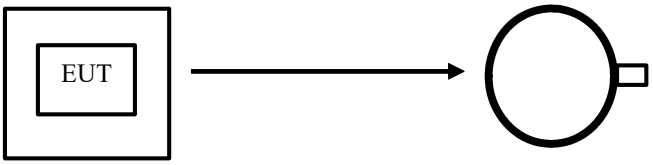
Date: April 9, 2018 Test engineer: Ryota Yamanaka
April 10, 2018 Masafumi Niwa

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

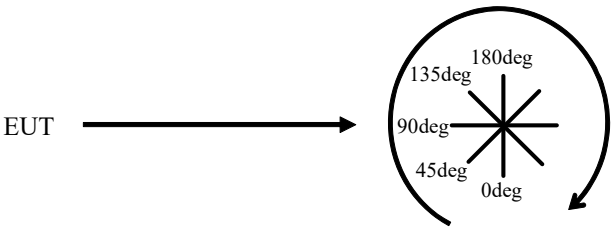


Top View (Horizontal)



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.1 Semi Anechoic Chamber
Order No.	12221487H
Date	04/10/2018
Temperature/ Humidity	23 deg. C / 40 % RH
Engineer	Masafumi Niwa
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	90.9	19.8	-74.0	32.2	-	4.5	45.6	41.1	Fundamental
0	0.25000	PK	48.2	19.7	-74.0	32.2	-	-38.3	39.6	77.9	
0	0.37500	PK	53.9	19.7	-73.9	32.2	-	-32.5	36.1	68.6	
0	0.50000	QP	36.3	19.7	-33.9	32.1	-	-10.0	33.6	43.6	
0	0.62500	QP	43.3	19.7	-33.9	32.2	-	-3.1	31.7	34.8	
0	0.75000	QP	36.7	19.7	-33.9	32.2	-	-9.7	30.1	39.8	
0	0.87500	QP	39.2	19.7	-33.9	32.2	-	-7.2	28.7	35.9	
0	1.00000	QP	35.5	19.7	-33.8	32.2	-	-10.8	27.6	38.4	
0	1.12500	QP	38.0	19.7	-33.8	32.2	-	-8.3	26.5	34.8	
0	1.25000	QP	33.9	19.7	-33.8	32.2	-	-12.4	25.6	38.0	

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	90.9	19.8	-74.0	32.2	0.0	4.5	25.6	21.1	
0	0.25000	PK	48.2	19.7	-74.0	32.2	0.0	-38.3	19.6	57.9	
0	0.37500	PK	53.9	19.7	-73.9	32.2	0.0	-32.5	16.1	48.6	

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	90.9	19.8	6.0	32.2	-	84.5	-	-	Fundamental

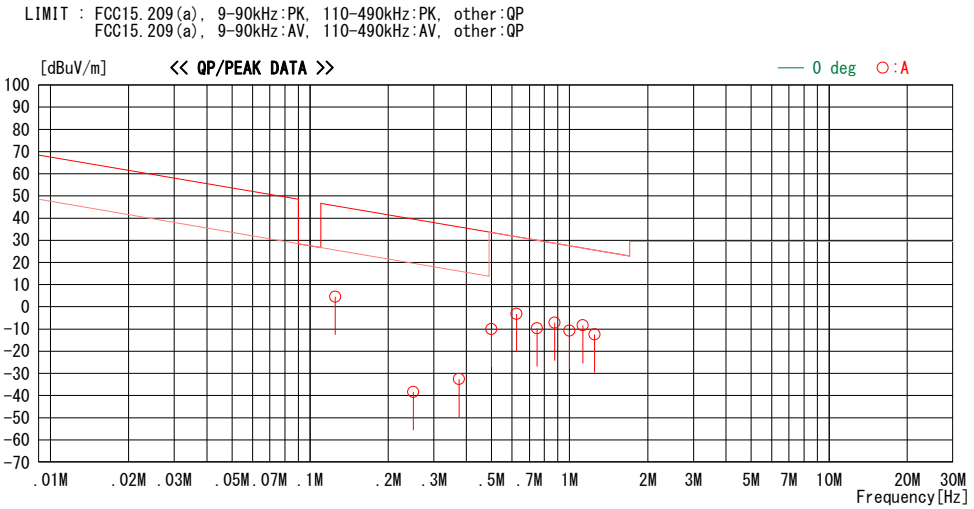
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* 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)

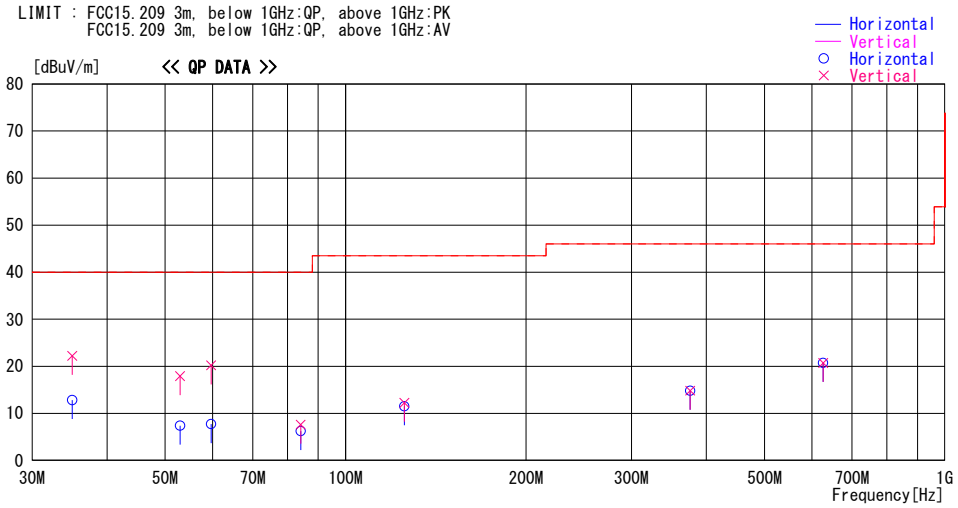
Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Order No.	12221487H
Date	04/10/2018
Temperature/ Humidity	23 deg. C / 40 % RH
Engineer	Masafumi Niwa
Mode	Tx 125 kHz



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

Radiated Emission above 30 MHz (Spurious Emission)

Report No.	12221487H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	04/09/2018
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Ryota Yamanaka
	(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]	
34.980	31.6	QP	15.7	-25.1	22.2	260	100	Vert.	40.0	17.8	
34.980	22.2	QP	15.7	-25.1	12.8	0	100	Hori.	40.0	27.2	
52.950	22.5	QP	9.6	-24.7	7.4	0	100	Hori.	40.0	32.6	
52.950	33.0	QP	9.6	-24.7	17.9	120	100	Vert.	40.0	22.1	
59.674	24.8	QP	7.5	-24.6	7.7	188	100	Hori.	40.0	32.3	
59.674	37.3	QP	7.5	-24.6	20.2	245	100	Vert.	40.0	19.8	
84.158	23.0	QP	7.4	-24.2	6.2	306	100	Hori.	40.0	33.8	
84.158	24.4	QP	7.4	-24.2	7.6	178	100	Vert.	40.0	32.4	
125.330	22.0	QP	13.2	-23.7	11.5	0	100	Hori.	43.5	32.0	
125.330	22.7	QP	13.2	-23.7	12.2	0	100	Vert.	43.5	31.3	
375.990	21.4	QP	15.0	-21.6	14.8	144	100	Hori.	46.0	31.2	
375.990	21.4	QP	15.0	-21.6	14.8	0	100	Vert.	46.0	31.2	
626.650	21.5	QP	19.2	-20.0	20.7	0	100	Vert.	46.0	25.3	
626.650	21.5	QP	19.2	-20.0	20.7	0	100	Hori.	46.0	25.3	

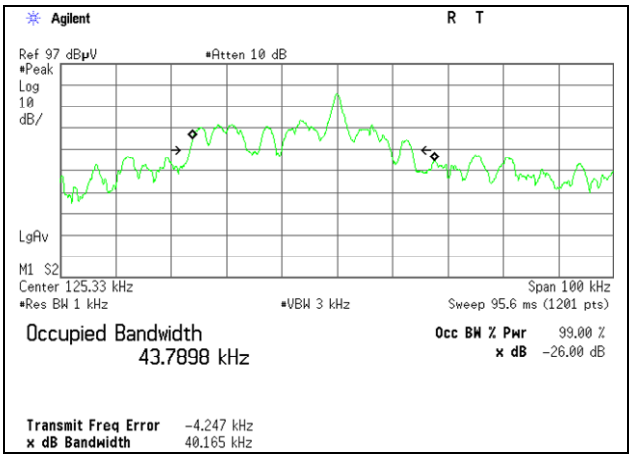
CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

*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

Report No.	12221487H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	04/09/2018
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Ryota Yamanaka
Mode	Tx 125 kHz

Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
125	40.165	43.7898



APPENDIX 2: Test instruments

Test Instruments

Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	142226	Measure	KOMELON	KMC-36	-	-	-	-
RE	141566	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	1/24/2018	1/31/2019	12
RE	141998	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	9/30/2017	9/30/2018	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260834	2/27/2018	2/28/2019	12
RE	141254	Loop Antenna	ROHDE & SCHWARZ	HFH2-Z2	100017	10/11/2017	10/31/2018	12
RE	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/14/2017	11/30/2018	12
RE	141950	EMI Test Receiver	ROHDE & SCHWARZ	ESU26	100412	6/27/2017	6/30/2018	12
RE	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	8/7/2017	8/31/2018	12
RE	141215	Coaxial Cable	Fujikura/Suhner/ TSJ	5D-2W/ 3D-2W/ RG400u/ RFM-E421(SW)	-/01068 (Switcher)	6/26/2017	6/30/2018	12
RE	141413	Coaxial Cable	UL Japan	-	-	6/12/2017	6/30/2018	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/18/2017	12/31/2018	12
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	1/24/2018	1/31/2019	12
RE	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	1/30/2018	1/31/2019	12
RE	141323	Coaxial cable	UL Japan	-	-	7/12/2017	7/31/2018	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	10/2/2017	10/31/2018	12
RE	141884	Spectrum Analyzer	AGILENT	E4448A	MY44020357	11/7/2017	11/30/2018	12
RE	141216	Coaxial cable	Fujikura/Suhner/ TSJ	5D-2W/SFM14/ sucoform141-PE/421-010	-/00640	7/12/2017	7/31/2018	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	1/9/2018	1/31/2019	12
RE	142008	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	10/31/2017	10/31/2018	12
RE	141949	Test Receiver	ROHDE & SCHWARZ	ESCI	100767	8/22/2017	8/31/2018	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