EMI TEST REPORT

Test Report No. : 12720226H-C-R1

Applicant	:	**DENSO TEN Limited**
Type of Equipment	:	**Car Audio**
Model No.	:	**FT0106B**
FCC ID	:	**BABFT0106B**
Test regulation	:	**FCC Part 15 Subpart B: 2018 Class B** **ICES-003 Issue 6: 2016 + Amendment 1: 2017 Class B**
Test Result	:	**Complied (Refer to SECTION 3.2)**

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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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. 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.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12720226H-C. 12720226H-C is replaced with this report.

Date of test: February 1 and 19, 2019

Representative test engineer:
Yuta Moriya
Engineer
Consumer Technology Division

Approved by:
Tsubasa Takayama
Leader
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,
http://japan.ul.com/resources/emc_accredited/

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

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

Original Test Report No.: 12720226H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12720226H-C	February 20, 2019	-	-
1	12720226H-C-R1	February 25, 2019	P.5	Addition of Broadcast Receiver Specification
1	12720226H-C-R1	February 25, 2019	P.9	Correction of Configuration and peripherals
1	12720226H-C-R1	February 25, 2019	P.11	Section 5.4: Addition of sentence of test procedure for FM Receiving mode (Mode 3)
1	12720226H-C-R1	February 25, 2019	P.12	Correction of calculation for distance factor (1 GHz - 10 GHz)

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	DENSO TEN Limited
Address	:	2-28, Gosho-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 JAPAN
Telephone Number	:	+81-78-682-2159
Facsimile Number	:	+81-78-671-7160
Contact Person	:	FUKII DAISUKE

The information provided from the customer is as follows;
- Applicant, Type of Equipment, Model No. on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	:	Car Audio
Model No.	:	FT0106B
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample (Information from test lab.)	:	January 30, 2019
Country of Mass-production	:	Mexico
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: FT0106B (referred to as the EUT in this report) is a Car Audio.

General Specification

Clock frequency(ies) in the system	:	1495.780 MHz (Main), 48.75 MHz (WLAN), 2.955 MHz (BT)
Operating Temperature	:	-20 deg. C- +65 deg. C

Radio Specification

WLAN (IEEE802.11b/g/n-20)

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS/OFDM
Antenna type	:	Inverted F Antenna
Antenna Gain	:	0.47 dBi

Bluetooth (Ver.4.1 + EDR)

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480MHz
Type of Modulation	:	FHSS, GFSK, π/4 DQPSK, 8 DPSK
Antenna Type	:	Inverted F Antenna
Antenna Gain	:	0.47 dBi

GPS Receiver

Type of Receiver	:	GPS Receiver
Frequency of Operation	:	1575.42 MHz
Modulation	:	DSSS
Antenna type	:	GPS Antenna
Antenna Gain	:	29 dBi

Broadcast Receiver

Radio Type	:	Receiver
Frequency of Operation	:	AM/HD_AM: 530 kHz - 1710 kHz FM/RBDS/HD_FM: 87.75 MHz - 107.9 MHz XM: 2332.25 MHz - 2345 MHz
Channel spacing	:	AM/HD_AM: 10 kHz FM/RBDS/HD_FM: 0.02 MHz
Antenna connector type	:	HFC III

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart B FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators
Test specification	:	ICES-003 Issue 6: 2016 + Amendment 1: 2017
Title	:	Spectrum Management and Telecommunications Interference-Causing Equipment Standard Information Technology Equipment (Including Digital Apparatus) – Limits and Methods of Measurement

*Also the EUT complies with FCC Part 15 Subpart C / RSS-Gen and RSS-247.

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	**FCC:** ANSI C63.4: 2014 7. AC power - line conducted emission measurements IEEE 187: 2003	Class B	N/A	N/A	N/A	*1)
	IC: ICES-003 Issue 6: 2016 + Amendment 1: 2017					
Radiated emission	**FCC:** ANSI C63.4: 2014 8. Radiated emission measurements IEEE 187: 2003	Class B	N/A	8.4 dB 658.630 MHz, Vertical	Complied a)	-
	IC: ICES-003 Issue 6: 2016 + Amendment 1: 2017					
Antenna Terminal	**FCC:** ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE IEEE 187: 20030	Class B	N/A	12.53 dB 2399.833 MHz	Complied b)	-
	IC: ICES-003 Issue 6: 2016					

*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.
*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.

a) Refer to APPENDIX 1 (data of Radiated Emission)
b) Refer to APPENDIX 1 (data of Antenna Terminal Conducted Emission)

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.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

Radiated emission

Measurement distance	Frequency range		Uncertainty (+/-)
3 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	5.0 dB
	200 MHz to 1000 MHz	(Horizontal)	5.2 dB
		(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	4.9 dB
	200 MHz to 1000 MHz	(Horizontal)	5.0 dB
		(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz		5.0 dB
	6 GHz to 18 GHz		5.3 dB
1 m	10 GHz to 26.5 GHz		5.8 dB
	26.5 GHz to 40 GHz		5.8 dB
10 m	1 GHz to 18 GHz		5.2 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
Antenna terminal conducted emission / Power density / Burst power	2.7 dB

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	3.1 x 5.0	-	-
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

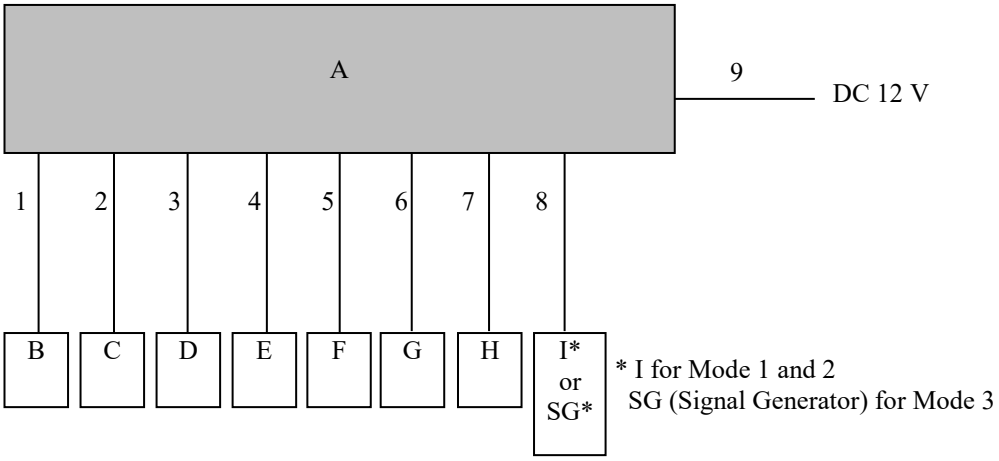
Refer to APPENDIX.

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

4.1 Operating Mode(s)

The mode(s) :
1. USB Play mode: Radiated Emission test only
2. CD Play mode: Radiated Emission test only
3. FM Receiving mode: Radiated Emission test only (Local, Other)
4. FM Tuning mode (Antenna port A / B): Antenna terminal conducted test only

4.2 Configuration and peripherals



* Cabling and setup(s) 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	Remarks
A	Car Audio	FT0106B	MR100128	DENSO TEN Limited	EUT
B	USB Memory	VAM4GR	-	SONY	-
C	Termination	-	-	-	-
D	ANT-AMP	-	863C0-06010	-	-
E	GPS Antenna	-	86860-78010	-	-
F	Dummy Load	-	-	-	-
G	Microphone	-	21	-	-
H	Camera	-	6	-	-
I	Steering switch	84250-53201	6	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	2.0	Shielded	Shielded	-
2	FM Antenna Cable	2.6	Shielded	Shielded	-
3	Signal Cable	2.4	Unshielded	Unshielded	-
4	Signal Cable	0.5	Unshielded	Unshielded	-
5	Signal Cable	3.4	Unshielded	Unshielded	-
6	Signal Cable	3.4	Unshielded	Unshielded	-
7	Signal Cable	15.4	Unshielded	Unshielded	-
8	Signal Cable	4.1	Unshielded	Unshielded	-
9	DC Cable	6.0	Unshielded	Unshielded	-

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 and 4 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

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 rear of EUT and peripherals was aligned and flushed with rear of tabletop.
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.

5.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 26500 MHz (Horn antenna)
Test distance : 3 m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

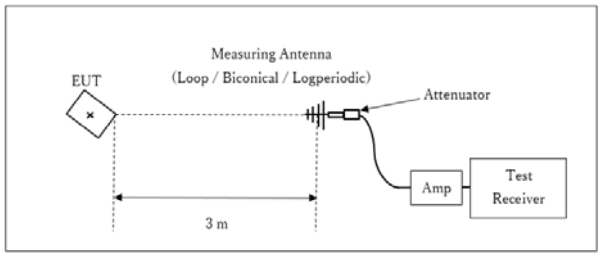
The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The radiated emission measurements were made with the following detector function of the Test Receiver and the Spectrum Analyzer.
For Mode 3, test was performed under the condition that signal of FM 98 MHz from Signal Generator was input to the EUT.
The test of Local oscillator spurious has been measured up to appropriate frequency based on the result of the antenna terminal test.

Frequency	Below 1 GHz	Above 1 GHz *1)
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	PK: RBW: 1 MHz / VBW: 3 MHz AV *2): RBW: 1 MHz / VBW: 10 Hz

*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.
Distance Factor: 20 x log (3.8 m / 3 m) = 2.05 dB
*2) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Figure 1: Test Setup

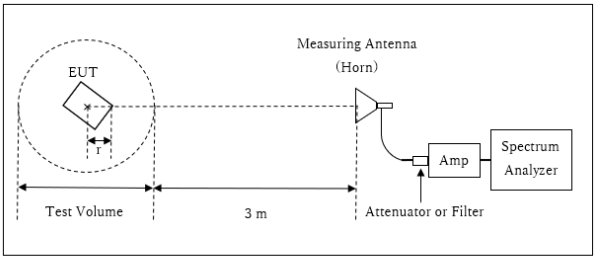
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

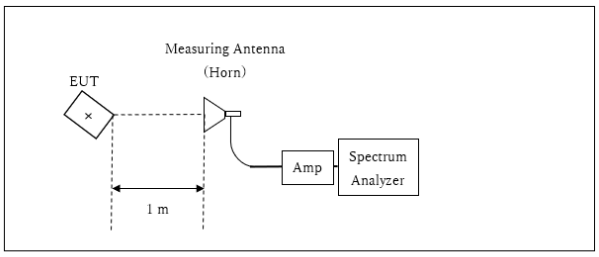


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.8 m / 3.0 m) = 2.05 dB
* Test Distance: (3 + Test Volume /2) - r = 3.8 m

Test Volume : 3.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.7 m

10 GHz – 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The test was made on EUT at the normal use position.

5.5 Test result

Summary of the test results: Pass

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

Date: February 1, 2019
February 19, 2019

Test engineer: Yuta Moriya
Koji Yamamoto

SECTION 6: Antenna Terminal

6.1 Operating environment

Test place : No.3 semi anechoic chamber
Temperature : See data
Humidity : See data

6.2 Test configuration

EUT was placed on a wooden table of nominal size, 1.0 m by 1.5 m, raised 0.8 m from the ground.
Photographs of the set up are shown in APPENDIX 3.

6.3 Test conditions

Frequency range : 30 MHz - 1000 MHz / 1000 MHz - 2000 MHz, 2000 MHz - 10000 MHz
10 GHz - 26.5 GHz
Test distance : N / A
EUT position : Table top
EUT operation mode : See Clause 4.1

6.4 Test procedure

The Antenna Terminal was measured with a spectrum analyzer connected to the antenna port.

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer
IF Bandwidth	PK: RBW: 100 kHz / VBW: 300 kHz	PK: RBW: 1 MHz / VBW: 3 MHz

6.5 Test result

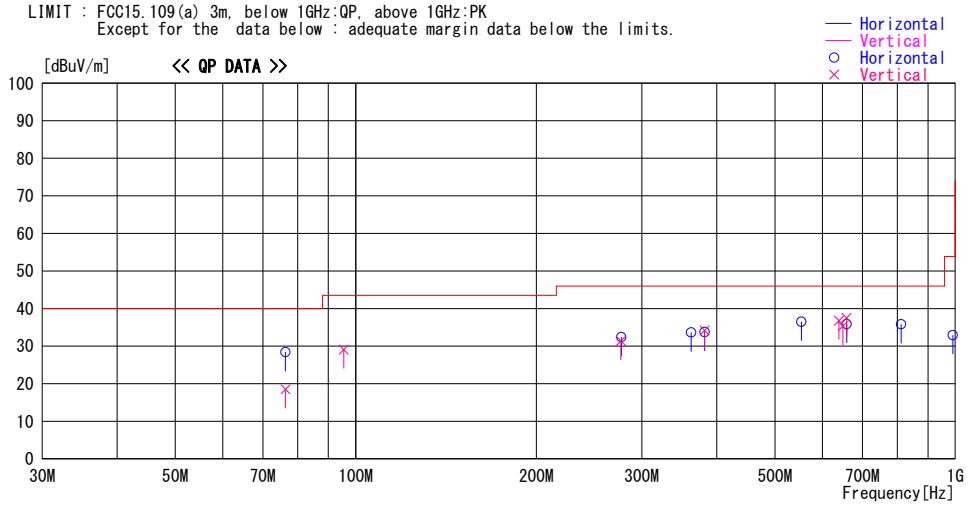
Summary of the test results: Pass

Date: February 19, 2019 Test engineer: Takumi Shimada

APPENDIX 1: Test data

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 1, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Yuta Moriya
	(Below 1 GHz)
Mode	Mode 1

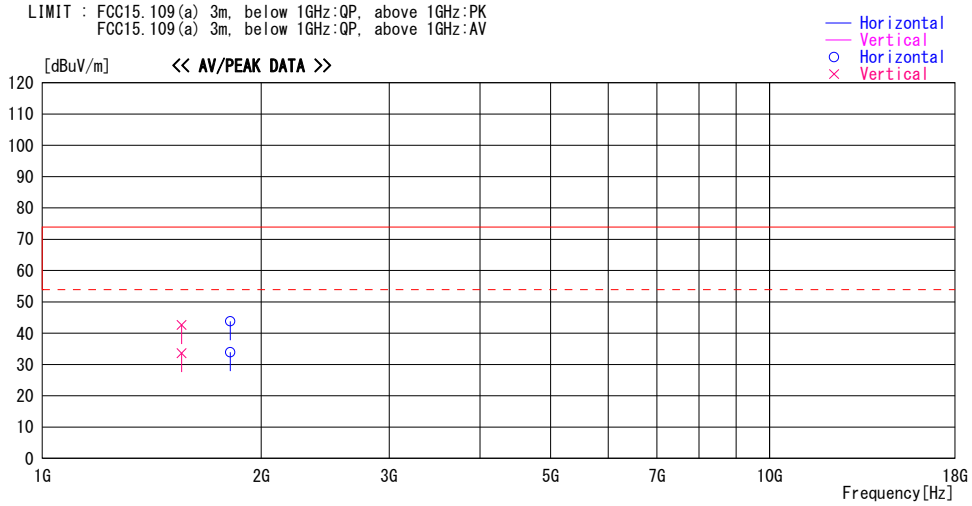


Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
76.361	46.1	QP	6.5	-24.2	28.4	182	255	Hori.	40.0	11.6	
76.361	36.2	QP	6.5	-24.2	18.5	62	100	Vert.	40.0	21.5	
95.450	43.7	QP	9.3	-23.9	29.1	63	100	Vert.	43.5	14.4	
276.824	40.5	QP	13.1	-22.2	31.4	113	100	Vert.	46.0	14.6	
277.333	41.5	QP	13.1	-22.2	32.4	204	100	Hori.	46.0	13.6	
362.770	40.1	QP	15.1	-21.6	33.6	175	102	Hori.	46.0	12.4	
381.820	40.5	QP	15.2	-21.5	34.2	71	125	Vert.	46.0	11.8	
381.826	40.1	QP	15.2	-21.5	33.8	160	100	Hori.	46.0	12.2	
553.648	38.9	QP	18.1	-20.5	36.5	262	100	Hori.	46.0	9.5	
658.632	36.6	QP	19.4	-20.1	35.9	262	100	Hori.	46.0	10.1	
639.546	37.8	QP	19.2	-20.2	36.8	251	129	Vert.	46.0	9.2	
649.091	36.3	QP	19.2	-20.2	35.3	236	139	Vert.	46.0	10.7	
658.630	38.2	QP	19.4	-20.1	37.5	231	133	Vert.	46.0	8.5	
811.997	33.6	QP	21.0	-18.8	35.8	166	224	Hori.	46.0	10.2	
990.661	27.6	QP	22.5	-17.2	32.9	107	213	Hori.	53.9	21.0	

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))

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 1, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Yuta Moriya
	(Above 1 GHz)
Mode	Mode 1

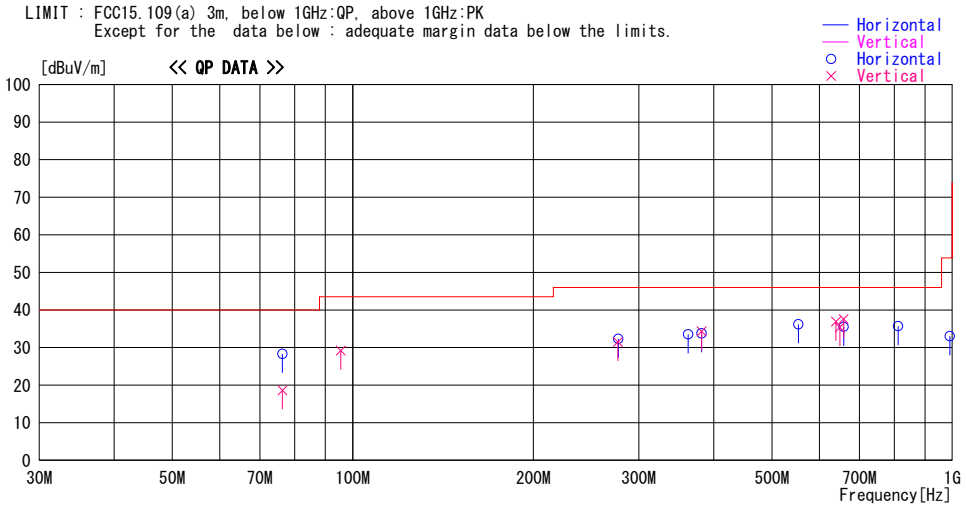


Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
1554.334	45.5	PK	25.2	-28.1	42.6	4	105	Vert.	73.9	31.3	
1554.334	36.5	AV	25.2	-28.1	33.6	4	105	Vert.	53.9	20.3	
1813.333	45.7	PK	25.6	-27.5	43.8	191	100	Hori.	73.9	30.1	
1813.333	35.8	AV	25.6	-27.5	33.9	191	100	Hori.	53.9	20.0	

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 - GAIN(AMP) + D-factor)
* No signal was detected above 18 GHz.

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 1, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Yuta Moriya
	(Below 1 GHz)
Mode	Mode 2



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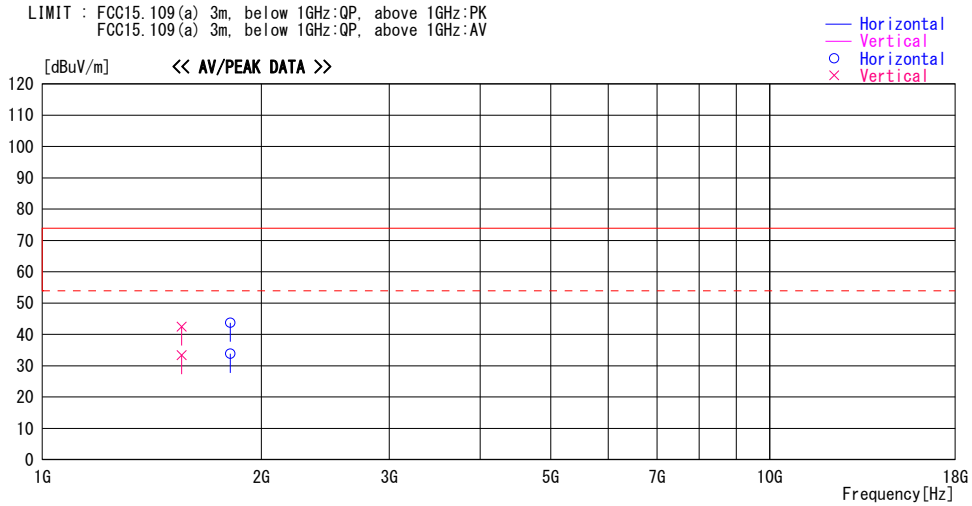
276.824	40.6	QP	13.1	-22.2	31.5	115	100	Vert.	46.0	14.5	
277.333	41.4	QP	13.1	-22.2	32.3	206	100	Hori.	46.0	13.7	
362.770	40.0	QP	15.1	-21.6	33.5	172	102	Hori.	46.0	12.5	
381.820	40.6	QP	15.2	-21.5	34.3	70	125	Vert.	46.0	11.7	
381.826	40.1	QP	15.2	-21.5	33.8	160	100	Hori.	46.0	12.2	
553.648	38.6	QP	18.1	-20.5	36.2	261	100	Hori.	46.0	9.8	
658.632	36.2	QP	19.4	-20.1	35.5	261	100	Hori.	46.0	10.5	
639.546	37.9	QP	19.2	-20.2	36.9	251	128	Vert.	46.0	9.1	
649.091	36.4	QP	19.2	-20.2	35.4	236	139	Vert.	46.0	10.6	
658.630	38.3	QP	19.4	-20.1	37.6	230	132	Vert.	46.0	8.4	
811.997	33.5	QP	21.0	-18.8	35.7	169	224	Hori.	46.0	10.3	
990.661	27.7	QP	22.5	-17.2	33.0	107	213	Hori.	53.9	20.9	

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))

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 1, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Yuta Moriya
	(Above 1 GHz)
Mode	Mode 2



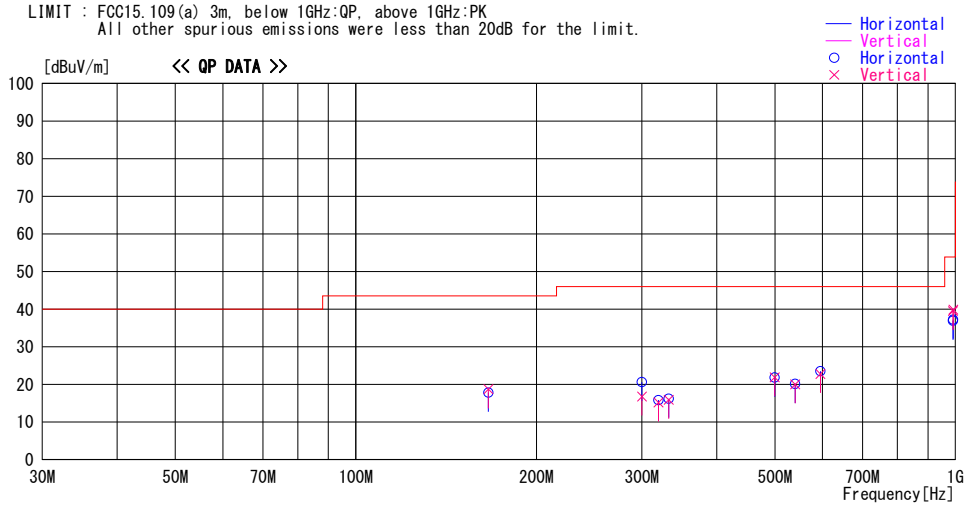
Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
1554.334	45.4	PK	25.2	-28.1	42.5	3	102	Vert.	73.9	31.4	
1554.334	36.3	AV	25.2	-28.1	33.4	3	102	Vert.	53.9	20.5	
1813.333	45.6	PK	25.6	-27.5	43.7	188	100	Hori.	73.9	30.2	
1813.333	35.7	AV	25.6	-27.5	33.8	188	100	Hori.	53.9	20.1	

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 - GAIN(AMP) + D-factor)
* No signal was detected above 18 GHz.

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Koji Yamamoto
	(Below 1 GHz)
Mode	Mode 3 Local

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.

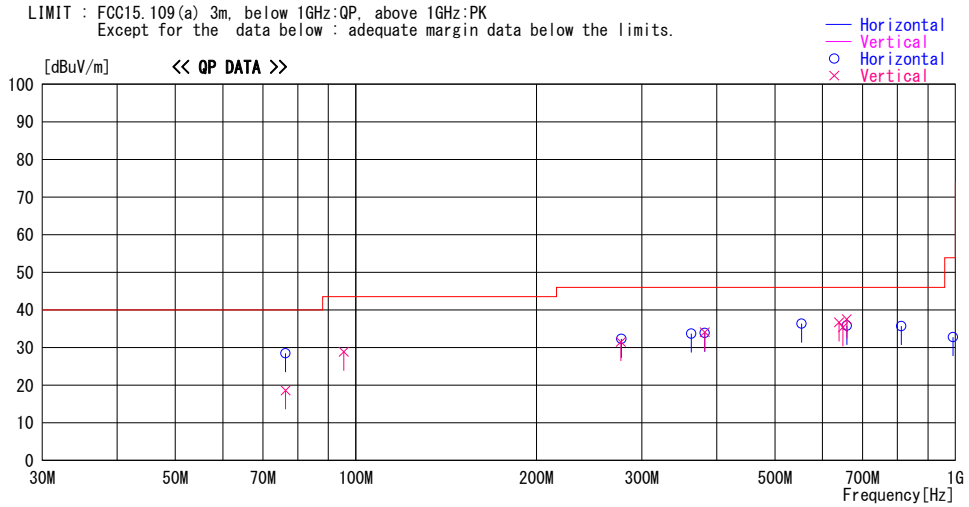


Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
166.350	26.2	QP	15.7	-23.2	18.7	22	100	Vert.	43.5	24.8	
166.350	25.3	QP	15.7	-23.2	17.8	90	100	Hori.	43.5	25.7	
300.000	28.7	QP	13.7	-21.8	20.6	349	150	Hori.	46.0	25.4	
300.000	24.9	QP	13.7	-21.8	16.8	123	100	Vert.	46.0	29.2	
319.833	22.7	QP	14.2	-21.7	15.2	0	100	Vert.	46.0	30.8	
319.833	23.3	QP	14.2	-21.7	15.8	44	100	Hori.	46.0	30.2	
332.667	22.7	QP	14.8	-21.6	15.9	0	100	Vert.	46.0	30.1	
332.667	23.0	QP	14.8	-21.6	16.2	0	100	Hori.	46.0	29.8	
499.500	24.8	QP	17.7	-20.6	21.9	162	100	Vert.	46.0	24.1	
499.500	24.7	QP	17.7	-20.6	21.8	129	121	Hori.	46.0	24.2	
540.333	22.7	QP	17.6	-20.3	20.0	0	100	Vert.	46.0	26.0	
540.333	22.8	QP	17.6	-20.3	20.1	0	100	Hori.	46.0	25.9	
595.167	23.7	QP	19.1	-20.0	22.8	0	100	Vert.	46.0	23.2	
595.167	24.4	QP	19.1	-20.0	23.5	129	100	Hori.	46.0	22.5	
990.667	33.4	QP	22.4	-16.3	39.5	12	100	Vert.	53.9	14.4	
990.667	30.8	QP	22.4	-16.3	36.9	140	100	Hori.	53.9	17.0	
991.833	33.7	QP	22.4	-16.2	39.9	14	100	Vert.	53.9	14.0	
991.833	31.0	QP	22.4	-16.2	37.2	138	100	Hori.	53.9	16.7	

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))

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 1, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Yuta Moriya
	(Below 1 GHz)
Mode	Mode 3 Other

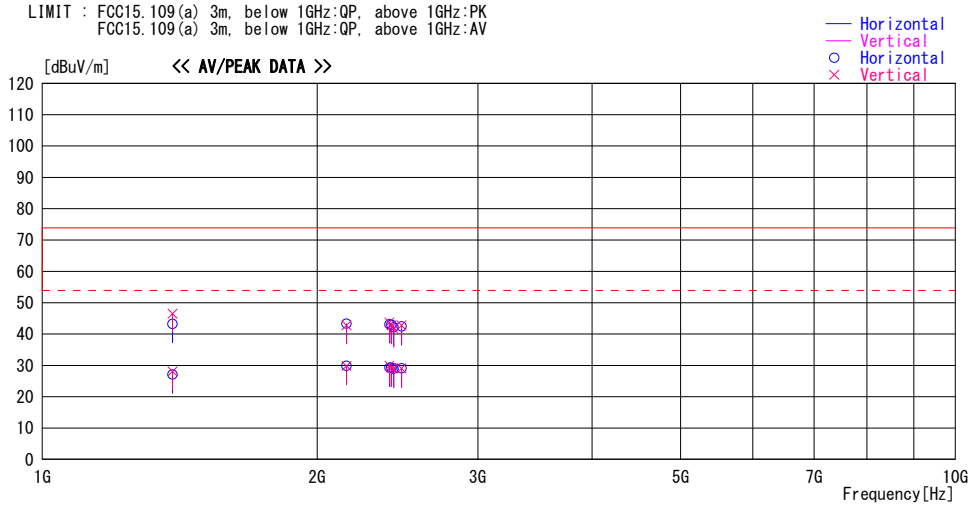


Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
76.361	46.2	QP	6.5	-24.2	28.5	182	255	Hori.	40.0	11.5	
76.361	36.3	QP	6.5	-24.2	18.6	62	100	Vert.	40.0	21.4	
95.450	43.5	QP	9.3	-23.9	28.9	63	100	Vert.	43.5	14.6	
276.824	40.6	QP	13.1	-22.2	31.5	113	100	Vert.	46.0	14.5	
277.333	41.4	QP	13.1	-22.2	32.3	204	100	Hori.	46.0	13.7	
362.770	40.2	QP	15.1	-21.6	33.7	175	102	Hori.	46.0	12.3	
381.820	40.4	QP	15.2	-21.5	34.1	71	125	Vert.	46.0	11.9	
381.826	40.2	QP	15.2	-21.5	33.9	160	100	Hori.	46.0	12.1	
553.648	38.8	QP	18.1	-20.5	36.4	262	100	Hori.	46.0	9.6	
639.546	37.7	QP	19.2	-20.2	36.7	251	129	Vert.	46.0	9.3	
649.091	36.4	QP	19.2	-20.2	35.4	236	139	Vert.	46.0	10.6	
658.630	38.2	QP	19.4	-20.1	37.5	231	133	Vert.	46.0	8.5	
658.632	36.5	QP	19.4	-20.1	35.8	262	100	Hori.	46.0	10.2	
811.997	33.5	QP	21.0	-18.8	35.7	166	224	Hori.	46.0	10.3	
990.661	27.5	QP	22.5	-17.2	32.8	107	213	Hori.	53.9	21.1	

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))

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Koji Yamamoto
	(1 GHz - 10 GHz)
Mode	Mode 3 Local

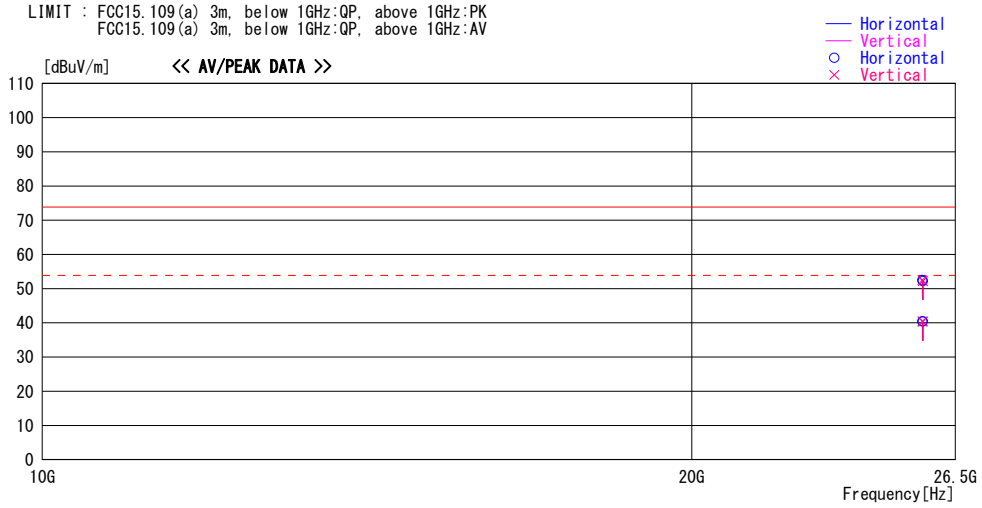


Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1388.500	47.9	PK	25.5	-30.2	43.2	70	100	Hori.	73.9	30.7	
1388.500	51.2	PK	25.5	-30.2	46.5	155	326	Vert.	73.9	27.4	
1388.500	31.8	AV	25.5	-30.2	27.1	70	100	Hori.	53.9	26.8	
1388.500	32.8	AV	25.5	-30.2	28.1	155	326	Vert.	53.9	25.8	
2153.167	43.0	PK	28.8	-28.5	43.3	0	100	Hori.	73.9	30.6	
2153.167	42.5	PK	28.8	-28.5	42.8	0	100	Vert.	73.9	31.1	
2153.167	29.5	AV	28.8	-28.5	29.8	0	100	Hori.	53.9	24.1	
2153.167	29.5	AV	28.8	-28.5	29.8	0	100	Vert.	53.9	24.1	
2399.833	43.5	PK	27.8	-28.2	43.1	0	100	Hori.	73.9	30.8	
2399.833	44.1	PK	27.8	-28.2	43.7	0	100	Vert.	73.9	30.2	
2399.833	29.6	AV	27.8	-28.2	29.2	0	100	Hori.	53.9	24.7	
2399.833	30.3	AV	27.8	-28.2	29.9	0	100	Vert.	53.9	24.0	
2412.167	43.4	PK	27.7	-28.2	42.9	0	100	Hori.	73.9	31.0	
2412.167	43.3	PK	27.7	-28.2	42.8	0	100	Vert.	73.9	31.1	
2412.167	29.7	AV	27.7	-28.2	29.2	0	100	Hori.	53.9	24.7	
2412.167	29.7	AV	27.7	-28.2	29.2	0	100	Vert.	53.9	24.7	
2424.500	42.6	PK	27.6	-28.1	42.1	0	100	Hori.	73.9	31.8	
2424.500	42.2	PK	27.6	-28.1	41.7	0	100	Vert.	73.9	32.2	
2424.500	29.4	AV	27.6	-28.1	28.9	0	100	Hori.	53.9	25.0	
2424.500	29.5	AV	27.6	-28.1	29.0	0	100	Vert.	53.9	24.9	
2473.833	43.0	PK	27.5	-28.1	42.4	0	100	Hori.	73.9	31.5	
2473.833	43.4	PK	27.5	-28.1	42.8	0	100	Vert.	73.9	31.1	
2473.833	29.6	AV	27.5	-28.1	29.0	0	100	Hori.	53.9	24.9	
2473.833	29.6	AV	27.5	-28.1	29.0	0	100	Vert.	53.9	24.9	

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 - GAIN(AMP) + D-factor)

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 19, 2019
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Koji Yamamoto
	(10 GHz - 26.5 GHz)
Mode	Mode 3 Local

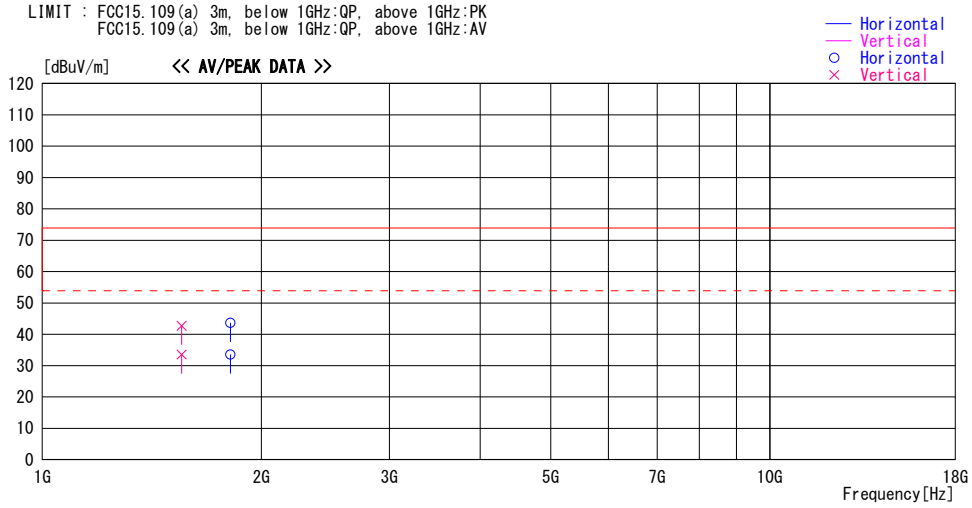


Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
25579.170	46.5	PK	37.7	-31.7	52.5	0	100	Hori.	73.9	21.4	
25579.170	46.5	PK	37.7	-31.7	52.5	0	100	Vert.	73.9	21.4	
25579.170	34.4	AV	37.7	-31.7	40.4	0	100	Hori.	53.9	13.5	
25579.170	34.4	AV	37.7	-31.7	40.4	0	100	Vert.	53.9	13.5	
25593.330	46.2	PK	37.7	-31.7	52.2	0	100	Hori.	73.9	21.7	
25593.330	46.2	PK	37.7	-31.7	52.2	0	100	Vert.	73.9	21.7	
25593.330	34.4	AV	37.7	-31.7	40.4	0	100	Hori.	53.9	13.5	
25593.330	34.4	AV	37.7	-31.7	40.4	0	100	Vert.	53.9	13.5	

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 - GAIN(AMP) + D-factor)

Radiated Emission

Report No.	12720226H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	February 1, 2019
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Yuta Moriya
	(Above 1 GHz)
Mode	Mode 3 Other



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
1554.334	36.4	AV	25.2	-28.1	33.5	5	102	Vert.	53.9	20.4	
1554.334	45.6	PK	25.2	-28.1	42.7	5	102	Vert.	73.9	31.2	
1813.333	45.5	PK	25.6	-27.5	43.6	188	100	Hori.	73.9	30.3	
1813.333	35.4	AV	25.6	-27.5	33.5	188	100	Hori.	53.9	20.4	

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 - GAIN(AMP) + D-factor)
* No signal was detected above 18 GHz.

Antenna Terminal Conducted Emission
(Antenna Port A)

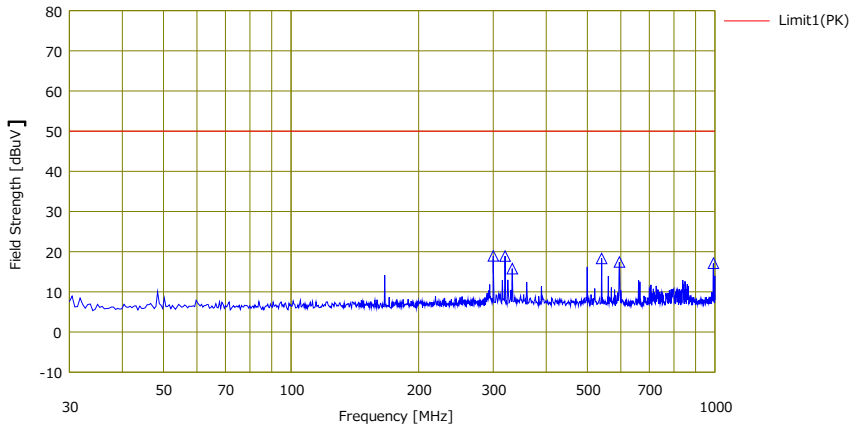
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 12720226H

Temp/Humi : 23 deg. C / 47 % RH
Engineer : Takumi Shimada

MODE : Mode 4

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading ⟨PK⟩	Ant.Fac	Loss	Gain	Result ⟨PK⟩	Limit *1) ⟨PK⟩	Margin ⟨PK⟩	Pola.	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV]	[dBuV]	[dB]	[H/V]		
1	300.000	40.07	0.00	6.55	27.69	18.93	50.00	31.07	–	–	
2	319.833	40.12	0.00	6.60	27.82	18.90	50.00	31.10	–	–	
3	332.667	37.02	0.00	6.64	27.91	15.75	50.00	34.25	–	–	
4	540.333	40.61	0.00	6.88	29.19	18.30	50.00	31.70	–	–	
5	595.167	39.81	0.00	6.86	29.26	17.41	50.00	32.59	–	–	
6	991.833	38.48	0.00	7.18	28.53	17.13	50.00	32.87	–	–	

*1) 2nW = -57dBm = 50dBuV

CALCULATION:RESULT = READING + LOSS (CABLE + ATTEN.) – GAIN(AMP)

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

Antenna Terminal Conducted Emission

(Antenna Port A)

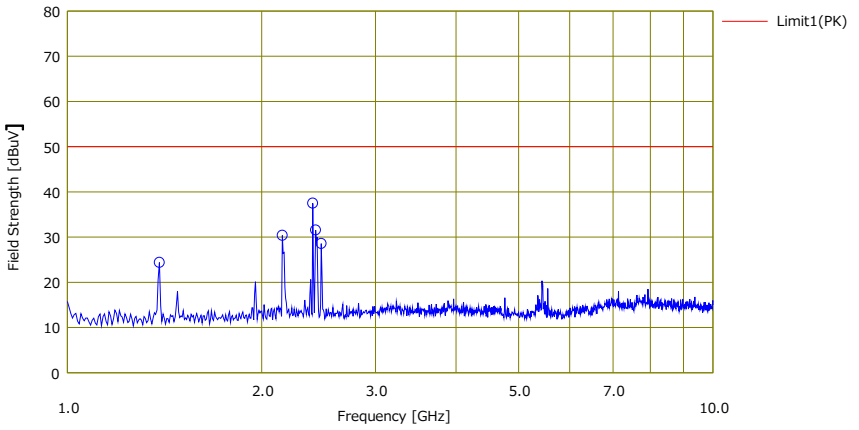
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 12720226H

Temp/Humi : 23 deg. C / 47 % RH
Engineer : Takumi Shimada

MODE : Mode 4

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV]	Limit *1) ⟨PK⟩ [dBuV]	Margin ⟨PK⟩ [dB]	Pola. [H/V]	Ant. Type	Comment
1	1388.500	55.52	0.00	1.92	33.08	24.36	50.00	25.64	-	-	
2	2153.167	59.36	0.00	2.45	31.45	30.36	50.00	19.64	-	-	
3	2399.833	66.22	0.00	2.59	31.34	37.47	50.00	12.53	-	-	
4	2424.500	60.27	0.00	2.60	31.33	31.54	50.00	18.46	-	-	
5	2473.833	57.25	0.00	2.63	31.31	28.57	50.00	21.43	-	-	

*1) 2nW = -57dBm = 50dBuV

CALCULATION:RESULT = READING + LOSS (CABLE + ATTEN.) – GAIN(AMP)

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

Antenna Terminal Conducted Emission
(Antenna Port A)

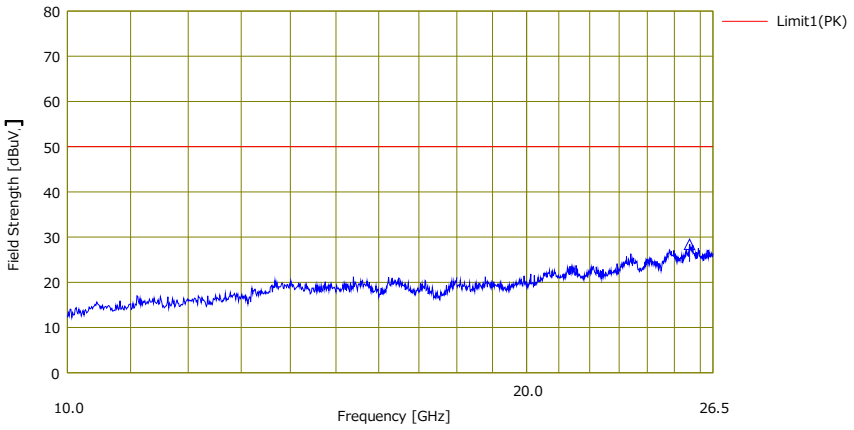
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 12720226H

Temp/Humi : 23 deg. C / 47 % RH
Engineer : Takumi Shimada

MODE : Mode 4

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading (PK)	Ant.Fac	Loss	Gain	Result (PK)	Limit *1) (PK)	Margin (PK)	Pola.	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV]	[dBuV]	[dB]	[H/V]		
1	25579.170	50.72	0.00	9.35	31.68	28.39	50.00	21.61	-	-	

*1) 2nW = -57dBm = 50dBuV

CALCULATION:RESULT = READING + LOSS (CABLE + ATTEN.) – GAIN(AMP)

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

Antenna Terminal Conducted Emission
(Antenna Port B)

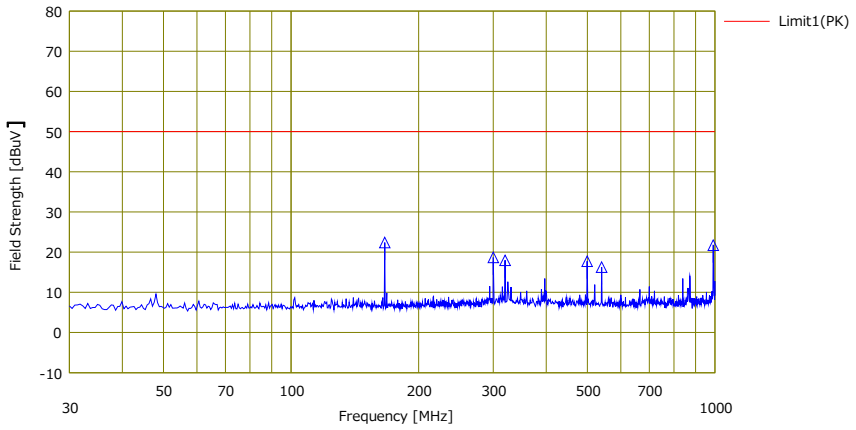
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 12720226H

Temp/Humi : 23 deg. C / 47 % RH
Engineer : Takumi Shimada

MODE : Mode 4

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading (PK)	Ant.Fac	Loss	Gain	Result (PK)	Limit *1) (PK)	Margin (PK)	Pola.	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV]	[dBuV]	[dB]	[H/V]		
1	166.350	44.19	0.00	6.31	28.11	22.39	50.00	27.61	-	-	
2	300.000	39.83	0.00	6.55	27.69	18.69	50.00	31.31	-	-	
3	319.833	39.17	0.00	6.60	27.82	17.95	50.00	32.05	-	-	
4	499.500	39.93	0.00	6.91	29.09	17.75	50.00	32.25	-	-	
5	540.333	38.57	0.00	6.88	29.19	16.26	50.00	33.74	-	-	
6	990.667	43.09	0.00	7.17	28.53	21.73	50.00	28.27	-	-	

*1) 2nW = -57dBm = 50dBuV

CALCULATION:RESULT = READING + LOSS (CABLE + ATTEN.) – GAIN(AMP)

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

Antenna Terminal Conducted Emission
(Antenna Port B)

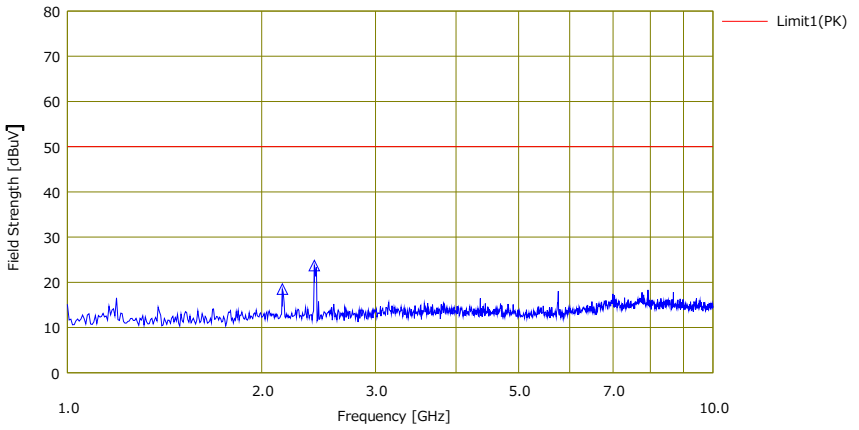
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 12720226H

Temp/Humi : 23 deg. C / 47 % RH
Engineer : Takumi Shimada

MODE : Mode 4

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading (PK)	Ant.Fac	Loss	Gain	Result (PK)	Limit *1) (PK)	Margin (PK)	Pola.	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV]	[dBuV]	[dB]	[H/V]		
1	2153.167	47.49	0.00	2.45	31.45	18.49	50.00	31.51	-	-	
2	2412.167	52.44	0.00	2.59	31.34	23.69	50.00	26.31	-	-	

*1) 2nW = -57dBm = 50dBuV

CALCULATION:RESULT = READING + LOSS (CABLE + ATTEN.) – GAIN(AMP)

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

Antenna Terminal Conducted Emission
(Antenna Port B)

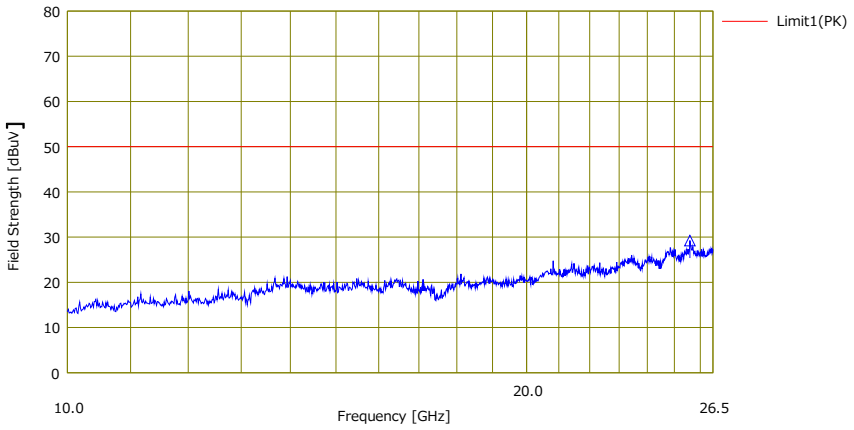
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 12720226H

Temp/Humi : 23 deg. C / 47 % RH
Engineer : Takumi Shimada

MODE : Mode 4

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading (PK)	Ant.Fac	Loss	Gain	Result (PK)	Limit *1) (PK)	Margin (PK)	Pola.	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV]	[dBuV]	[dB]	[H/V]		
1	25593.330	51.54	0.00	9.35	31.67	29.22	50.00	20.78	-	-	

*1) 2nW = -57dBm = 50dBuV

CALCULATION:RESULT = READING + LOSS (CABLE + ATTEN.) – GAIN(AMP)

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

APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	06/14/2018	06/30/2019	12
RE	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/07/2018	04/20/2019	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	06/01/2018	06/30/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	08/08/2018	08/31/2019	12
RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/29/2019	01/31/2020	12
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141397	Coaxial Cable	UL Japan	-	-	06/13/2018	06/30/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	06/01/2018	06/30/2019	12
RE/AT	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/04/2018	10/31/2019	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	06/08/2018	06/30/2019	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/08/2019	02/29/2020	12
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	01/11/2019	01/31/2020	12
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
RE	141855	Spectrum Analyzer	AGILENT	E4440A	MY46187750	11/09/2018	11/30/2019	12
RE/AT	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/03/2018	10/31/2019	12
AT	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	08/10/2018	08/31/2019	12
AT	141594	Pre Amplifier	AGILENT	8447D	2944A10150	02/12/2019	02/29/2020	12
AT	141395	Coaxial Cable	UL Japan	-	-	11/13/2018	11/30/2019	12
AT	141327	Coaxial Cable	UL Japan	-	-	02/07/2019	02/29/2020	12
AT	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	08/08/2018	08/31/2019	12
AT	141564	Thermo-Hygrometer	CUSTOM	CTH-201	0004	12/05/2018	12/31/2019	12
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	141513	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	06/07/2018	06/30/2019	12
RE	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	03/13/2018	03/31/2019	12
RE	141393	Microwave Cable	Junkosha	MWX221	1604S254(1 m) / 1608S088(5 m)	08/08/2018	08/31/2019	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	06/07/2018	06/30/2019	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/29/2019	01/31/2020	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/08/2019	02/29/2020	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/20/2018	12/31/2019	12
RE	141323	Coaxial cable	UL Japan	-	-	07/03/2018	07/31/2019	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	06/04/2018	06/30/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	06/04/2018	06/30/2019	12
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/15/2018	06/30/2019	12
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/11/2019	01/31/2020	12
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/06/2018	04/30/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	06/30/2020	24
RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/07/2018	11/30/2019	12

***Hyphens for Last Calibration Date, Calibration Due Date and Cal Int 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
AT: Antenna terminal conducted