



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

RFID Module

MODEL NUMBER: RI18A

FCC ID: ACJ9TGRI18A

REPORT NUMBER: 12486444H-A-R1

ISSUE DATE: February 27, 2019

Prepared for
PANASONIC CORPORATION OF NORTH AMERICA
Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490

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



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".

Revision History

Rev.	Issue Date	Revisions	Revised By
--	02/15/2019	Initial Issue	T. Shimada
1	02/27/2019	Addition of test Procedure sentence (below 30 MHz) in Section 8.1 Addition of Loop Antenna figure in Section 8.1 Addition of FUNDAMENTAL EMISSION test data in Section 8.2 Addition of sentences to TEST PROCEDURE in Section 11	T. Shimada

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY.....	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY	5
4.1. MEASURING INSTRUMENT CALIBRATION.....	5
4.2. SAMPLE CALCULATION	5
4.3. MEASUREMENT UNCERTAINTY	6
5. TEST PROCEDURE AND RESULTS.....	7
6. EQUIPMENT UNDER TEST	8
6.1. DESCRIPTION OF EUT	8
6.2. MAXIMUM TRANSMITTER FIELD STRENGTH	8
6.3. DESCRIPTION OF AVAILABLE ANTENNAS	8
6.4. SOFTWARE AND FIRMWARE	8
6.5. WORST-CASE CONFIGURATION AND MODE	8
6.6. MODIFICATIONS	8
6.7. DESCRIPTION OF TEST SETUP	9
7. TEST AND MEASUREMENT EQUIPMENT	11
8. RADIATED EMISSION TEST RESULTS	13
8.1. LIMITS AND PROCEDURE.....	13
8.2. FUNDAMENTAL EMISSION and Spectrum Mask	16
8.3. SPURIOUS EMISSIONS (0.009 – 30 MHz)	21
8.4. SPURIOUS EMISSION 30 TO 1000 MHz	25
9. AC MAINS LINE CONDUCTED EMISSIONS.....	29
10. FREQUENCY STABILITY	42
11. 20dB BANDWIDTH and 99 % Occupied Bandwidth	45
12. SETUP PHOTOS	50

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PANASONIC CORPORATION OF NORTH AMERICA
Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490

EUT DESCRIPTION: RFID Module

MODEL: RI18A

SERIAL NUMBER: No.8 / No.25 (Terminate)

DATE TESTED: January 21 to 29, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Pass

UL Japan, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Japan, Inc. By:

Tested By:



Takayuki Shimada
Leader
Consumer Technology Division



Takumi Shimada
Engineer
Consumer Technology Division

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0 / FCC Test Firm Registration Number: 199967

The full scope of accreditation can be viewed at http://japan.ul.com/resources/emc_accredited/

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\quad \text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m}\end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

EMI

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

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz to 0.15 MHz	3.8 dB
0.15 MHz to 30 MHz	3.4 dB

Test distance	Radiated emission (+/-)
	9 kHz to 30 MHz
3 m	3.3 dB
10 m	3.2 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

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz to 6 GHz	6 GHz to 18 GHz	10 GHz to 26.5 GHz	26.5 GHz to 40 GHz	1 GHz to 18 GHz
5.0 dB	5.3 dB	5.8 dB	5.8 dB	5.2 dB

* Measurement distance

Antenna terminal test	Uncertainty (+/-)
Frequency error	
13.56 MHz	0.01541 ppm

5. TEST PROCEDURE AND RESULTS

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 8.8	Section 15.207 ----- <IC>RSS-Gen 8.8	[QP] 10.9 dB 13.56000 MHz, N <Mode 7> [AV] 1.1 dB 13.56000 MHz, N <Mode 7>	Complied#	-
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods ----- <IC> RSS-Gen 6.4, 6.12	Section 15.225(a) ----- <IC>RSS-210 B.6	55.5 dB, 13.56000MHz, QP, 0deg. <Mode 2>	Complied	Radiated
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 6.4, 6.13	Section 15.225(b)(c) ----- <IC> RSS-210 B.6	36.5 dB, 13.55300 MHz, QP, 0deg. <Mode 2, 4, 6, 8>	Complied	Radiated
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 6.4, 6.13	Section 15.209, Section 15.225 (d) ----- <IC>RSS-210 B.6	3.9 dB 40.680 MHz, Vertical, QP	Complied#	Radiated
Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 6.11, 8.11	Section 15.225(e) ----- <IC> RSS-210 B.6	See data	Complied	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					
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.					

Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	<IC>RSS-Gen 6.7	-	See data	Complied	Radiated
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.					

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a RFID module that is embedded inside Panasonic Gadget pack (RFID Reader) model FZ-VNF551U.

6.2. MAXIMUM TRANSMITTER FIELD STRENGTH

The field strength of the transmitter is as follows:

Frequency Range (MHz)	Mode	Output Power (dBuV/m @ 30m)
13.56	2. Type A Without Tag	28.4
13.56	4. Type B Without Tag	28.3
13.56	6. FeliCa 212 kbps Without Tag	28.3
13.56	8. FeliCa 424 kbps Without Tag	28.3

The mode is used

Mode	Remarks
Transmitting mode (Tx)	1) Type A With Tag 2) Type A Without Tag 3) Type B With Tag 4) Type B Without Tag 5) FeliCa 212 kbps With Tag 6) FeliCa 212 kbps Without Tag 7) FeliCa 424 kbps With Tag 8) FeliCa 424 kbps Without Tag

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Loop antenna.

It is impossible for end users to replace the antenna, because the antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

6.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was ACM 12.52 MIC Test Tool Version 1.02.

6.5. WORST-CASE CONFIGURATION AND MODE

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of PC to see the position of maximum noise, and the test was made at the position that has the maximum noise.

6.6. MODIFICATIONS

No modifications were made during testing.

6.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST					
Description	Manufacturer	Model	Serial Number	Remarks	FCC ID
Laptop PC	Panasonic	FM182	8LTS00036	-	-
Gadget pack (RFID Reader)	Panasonic	FZ-VNF551U	No.8 (except for Terminate) No.25 (Terminate)	-	-
NFC module	Panasonic	PVT2	No.8 (except for Terminate) No.25 (Terminate)	EUT	-
AC Adapter	Panasonic	CP-AA57 13A	5713AM618X00006SWXO	-	-
Tag	Type A	-	-	-	-
	Type B	-	-	-	-
	FeliCa (212 kbps)	-	-	-	-
	FeliCa (424 kbps)	-	-	-	-

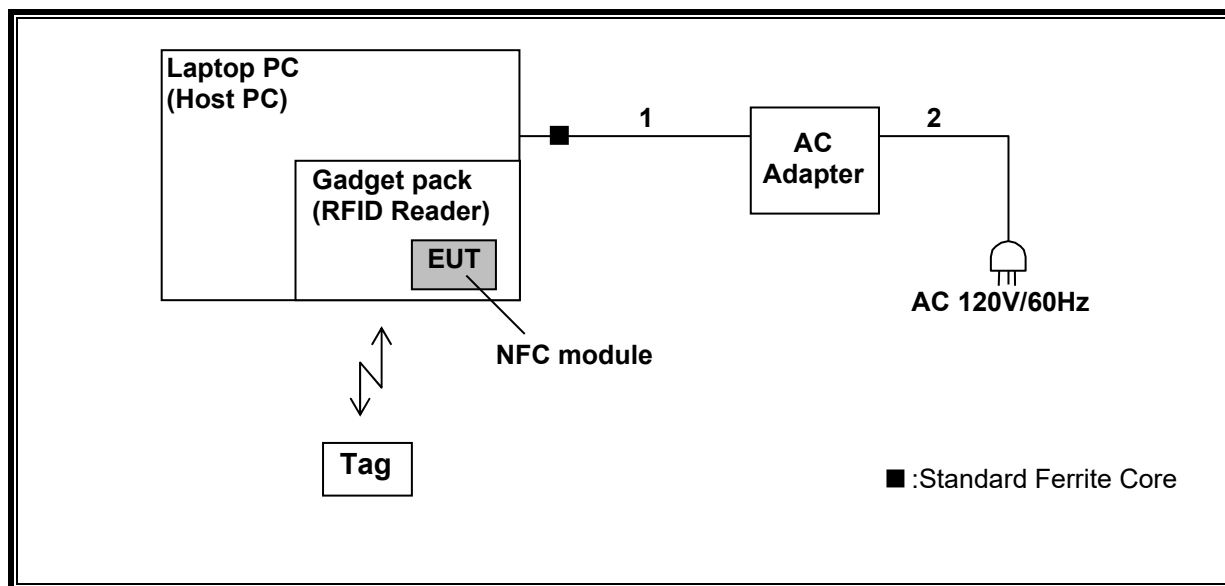
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connectoer Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Un-Shielded	1.4 m	-
2	DC	1	DC		1.8 m	-

TEST SETUP

The EUT is installed in a host Gadget pack (RFID Reader) and Inserted in a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Instruments (1/2)

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/6/2018	12/31/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	7/24/2018	7/31/2019	12
CE	141247	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/6/2018	12/31/2019	12
CE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ suoform141- PE/421-010	-/00640	7/3/2018	7/31/2019	12
CE/RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	1/31/2019	12
CE/RE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421- 010/suoform141-P	-/04178	6/13/2018	6/30/2019	12
CE/RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/28/2018	6/30/2020	24
CE/RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/29/2019	1/31/2020	12
CE/RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
CE/RE	141562	Thermo- Hygrometer	CUSTOM	CTH-201	0010	1/11/2019	1/31/2020	12
CE/RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
CE/RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	1/29/2019	1/31/2020	12
CE/RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	6/15/2018	6/30/2019	12
CE/RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
CE/RE	141554	Thermo- Hygrometer	CUSTOM	CTH-180	1301	1/11/2019	1/31/2020	12
CE/RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/26/2018	6/30/2020	24
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	2/27/2018	2/28/2019	12
RE	141901	Spectrum Analyzer	AGILENT	E4440A	MY48250080	10/4/2018	10/31/2019	12
RE	141413	Coaxial Cable	UL Japan	-	-	6/12/2018	6/30/2019	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/3/2018	10/31/2019	12
RE	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/11/2018	10/31/2019	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	2/27/2018	2/28/2019	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/20/2018	12/31/2019	12
RE	141266	Logperiodic Antenna(200- 1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	6/4/2018	6/30/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	6/4/2018	6/30/2019	12
RE	141323	Coaxial cable	UL Japan	-	-	7/3/2018	7/31/2019	12

Test Instruments (2/2)

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
FT	141547	DIGITAL HiTESTER	HIOKI	3805	60500120	2/7/2018	2/28/2019	12
FT	141430	Temperature and Humidity Chamber	TABAI ESPEC	PL-1KT	14007630	4/10/2018	4/30/2019	12
FT	141171	Attenuator(20dB)_DC-1GHz_N	Weinschel Corp	MODEL 1	BG0143	12/17/2018	12/31/2019	12
FT	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/15/2018	11/30/2019	12
FT	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	1/11/2019	1/31/2020	12

*Hyphens for Last Calibration Date, 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:

CE: Conducted Emission

RE: Radiated Emission

FT: Frequency Tolerance

8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in § 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

TEST PROCEDURE

ANSI C63.10-2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 9 kHz to 1000 MHz.

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.

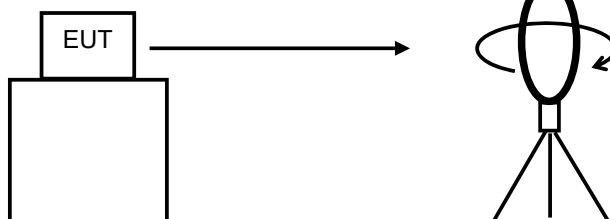
Frequency: From 9 kHz to 30 MHz

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.

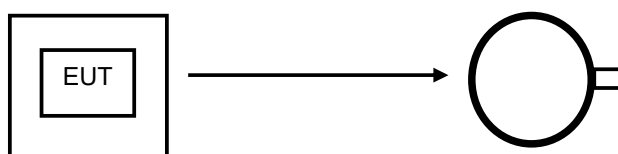
*Refer to Figure 1 about Direction of the Loop Antenna.

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

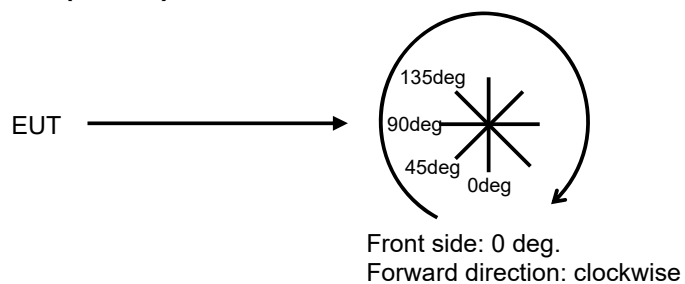


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)

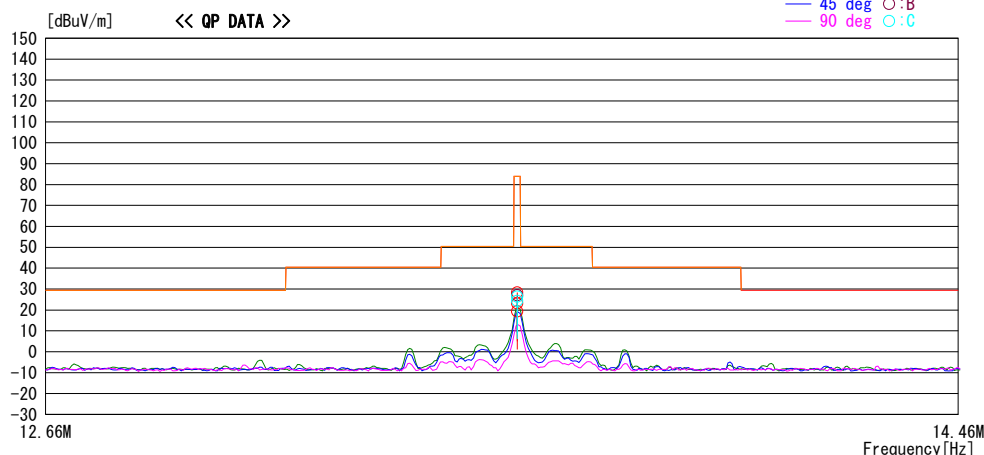


RESULTS

8.2. FUNDAMENTAL EMISSION and Spectrum Mask

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 2

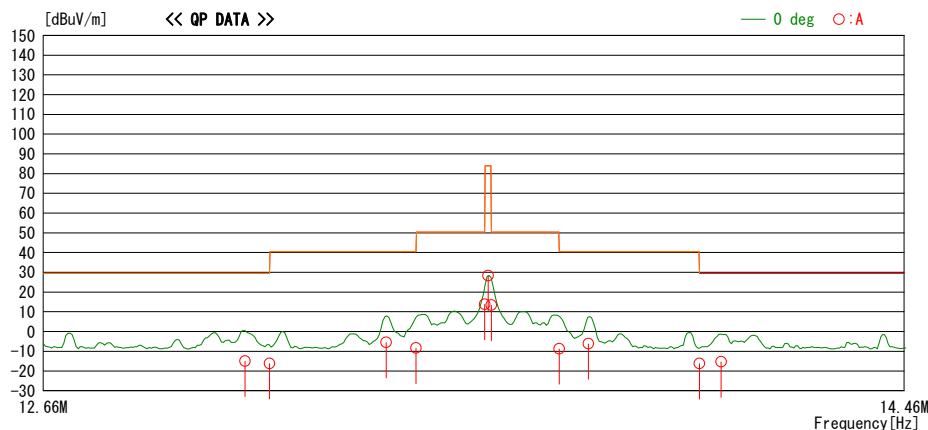
LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.56000	74.4	QP	19.2	-33.1	32.1	28.4	83.9	55.5	0	A	169
13.56000	73.1	QP	19.2	-33.1	32.1	27.1	83.9	56.8	45	B	138
13.56000	70.3	QP	19.2	-33.1	32.1	24.3	83.9	59.6	90	C	77
13.56000	72.4	QP	19.2	-33.1	32.1	26.4	83.9	57.5	135	C	40
13.56000	65.3	QP	19.2	-33.1	32.1	19.3	83.9	64.6	0	A	180
13.56000	69.2	QP	19.2	-33.1	32.1	23.2	83.9	60.7	0	A	169

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 2

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.06089	31.0	QP	19.3	-33.1	32.1	-14.9	29.5	44.4	0	A	169
13.11000	29.8	QP	19.3	-33.1	32.1	-16.1	29.5	45.6	0	A	169
13.34821	40.4	QP	19.3	-33.1	32.1	-5.5	40.5	46.0	0	A	169
13.41000	37.6	QP	19.3	-33.1	32.1	-8.3	40.5	48.8	0	A	169
13.55300	59.9	QP	19.2	-33.1	32.1	13.9	50.4	36.5	0	A	169
13.56000	74.4	QP	19.2	-33.1	32.1	28.4	83.9	55.5	0	A	169
13.56700	59.4	QP	19.2	-33.1	32.1	13.4	50.4	37.0	0	A	169
13.71000	37.3	QP	19.2	-33.1	32.1	-8.7	40.5	49.2	0	A	169
13.77160	39.9	QP	19.2	-33.1	32.1	-6.1	40.5	46.6	0	A	169
14.01000	29.8	QP	19.2	-33.1	32.1	-16.2	29.5	45.7	0	A	169
14.05671	30.7	QP	19.2	-33.1	32.1	-15.3	29.5	44.8	0	A	169

Result of the fundamental emission at 3 m without Distance factor

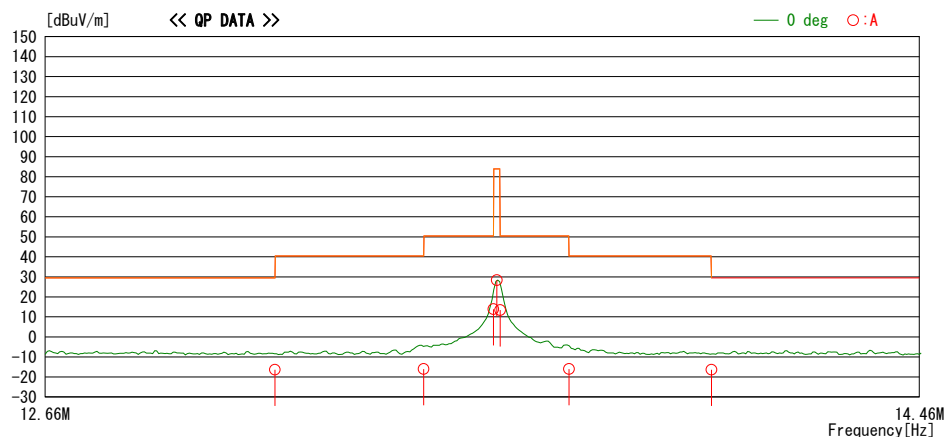
QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	74.4	19.2	6.9	32.1	-	68.4	-	-	Fundamental

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

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 4

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.6	QP	19.3	-33.1	32.1	-16.3	29.5	45.8	0	A	170
13.41000	29.9	QP	19.3	-33.1	32.1	-16.0	40.5	56.5	0	A	170
13.55300	59.9	QP	19.2	-33.1	32.1	13.9	50.4	36.5	0	A	170
13.56000	74.3	QP	19.2	-33.1	32.1	28.3	83.9	55.6	0	A	170
13.56700	59.4	QP	19.2	-33.1	32.1	13.4	50.4	37.0	0	A	170
13.71000	30.0	QP	19.2	-33.1	32.1	-16.0	40.5	56.5	0	A	170
14.01000	29.7	QP	19.2	-33.1	32.1	-16.3	29.5	45.8	0	A	170

Result of the fundamental emission at 3 m without Distance factor

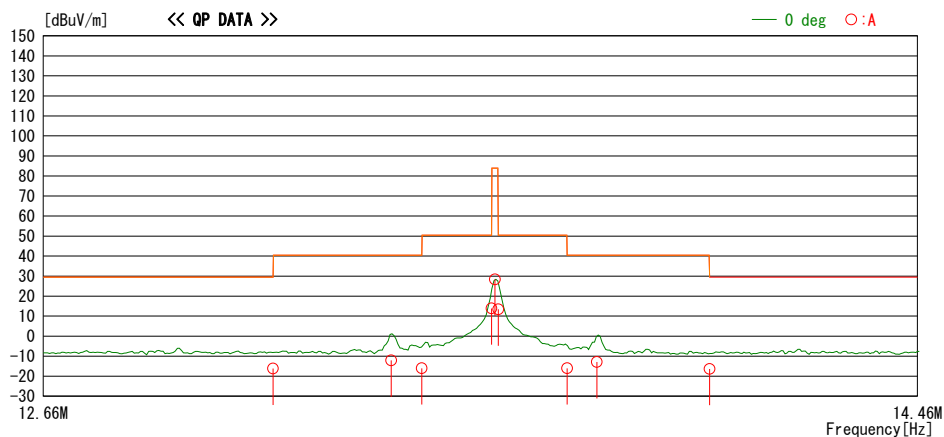
QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	74.3	19.2	6.9	32.1	-	68.3	-	-	Fundamental

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

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 6

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.7	QP	19.3	-33.1	32.1	-16.2	29.5	45.7	0	A	170
13.34800	33.8	QP	19.3	-33.1	32.1	-12.1	40.5	52.6	0	A	170
13.41000	29.9	QP	19.3	-33.1	32.1	-16.0	40.5	56.5	0	A	170
13.55300	59.9	QP	19.2	-33.1	32.1	13.9	50.4	36.5	0	A	170
13.56000	74.3	QP	19.2	-33.1	32.1	28.3	83.9	55.6	0	A	170
13.56700	59.4	QP	19.2	-33.1	32.1	13.4	50.4	37.0	0	A	170
13.71000	30.0	QP	19.2	-33.1	32.1	-16.0	40.5	56.5	0	A	170
13.77181	33.1	QP	19.2	-33.1	32.1	-12.9	40.5	53.4	0	A	170
14.01000	29.7	QP	19.2	-33.1	32.1	-16.3	29.5	45.8	0	A	170

Result of the fundamental emission at 3 m without Distance factor

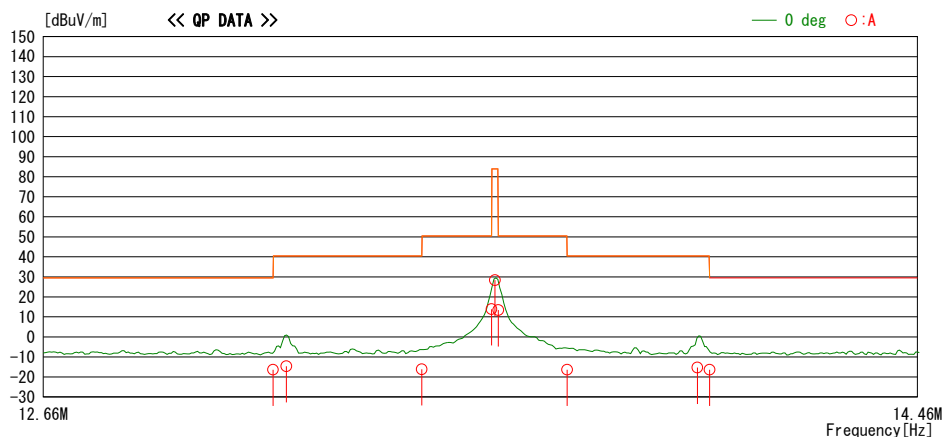
QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	74.3	19.2	6.9	32.1	-	68.3	-	-	Fundamental

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

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 8

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.6	QP	19.3	-33.1	32.1	-16.3	29.5	45.8	0	A	170
13.13660	31.3	QP	19.3	-33.1	32.1	-14.6	40.5	55.1	0	A	170
13.41000	29.8	QP	19.3	-33.1	32.1	-16.1	40.5	56.6	0	A	170
13.55300	59.9	QP	19.2	-33.1	32.1	13.9	50.4	36.5	0	A	170
13.56000	74.3	QP	19.2	-33.1	32.1	28.3	83.9	55.6	0	A	170
13.56700	59.4	QP	19.2	-33.1	32.1	13.4	50.4	37.0	0	A	170
13.71000	29.7	QP	19.2	-33.1	32.1	-16.3	40.5	56.8	0	A	170
13.98361	30.7	QP	19.2	-33.1	32.1	-15.3	40.5	55.8	0	A	170
14.01000	29.7	QP	19.2	-33.1	32.1	-16.3	29.5	45.8	0	A	170

Result of the fundamental emission at 3 m without Distance factor

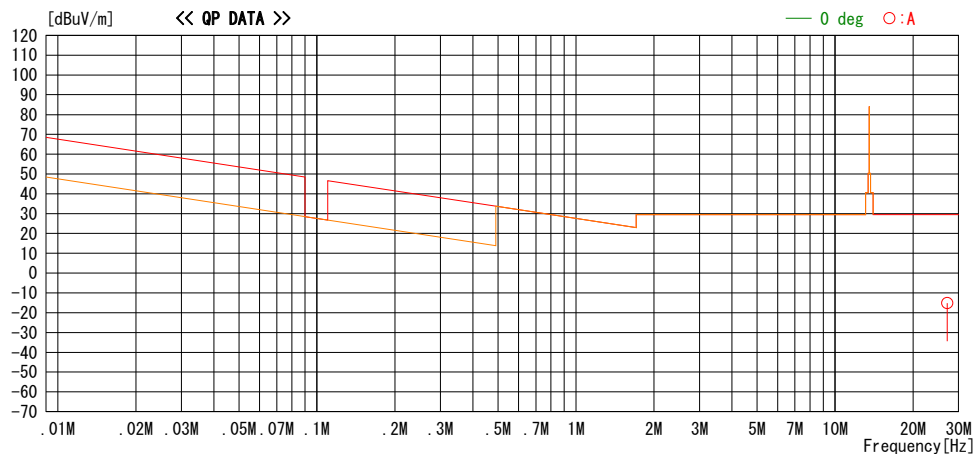
QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	74.3	19.2	6.9	32.1	-	68.3	-	-	Fundamental

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

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 4

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



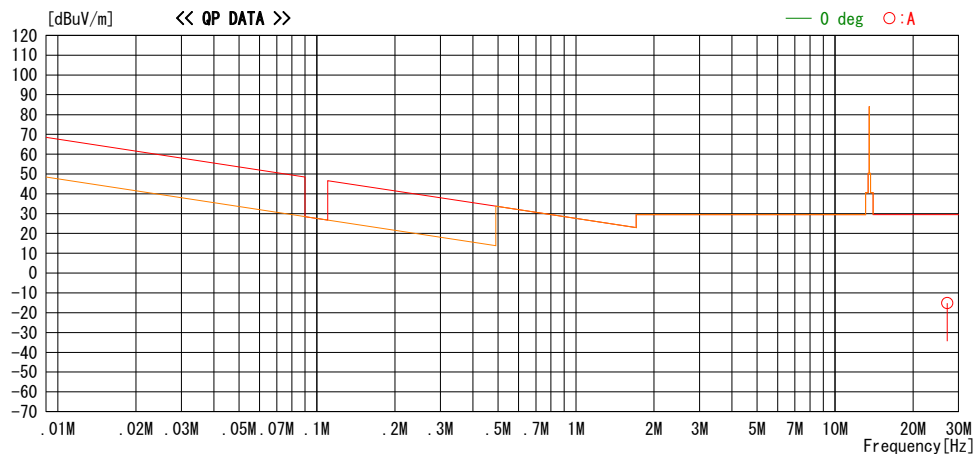
Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.6	QP	20.1	-32.8	32.1	-15.2	29.5	44.7	0	A	0

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))

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 6

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



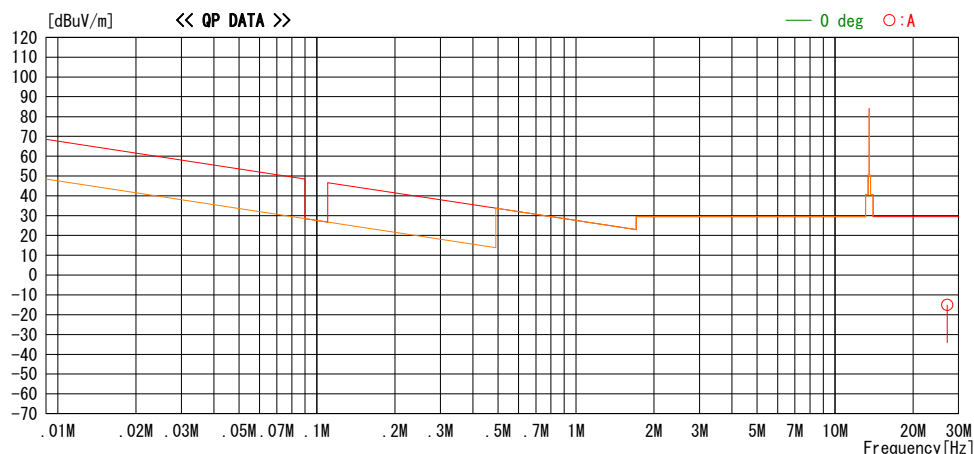
Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.6	QP	20.1	-32.8	32.1	-15.2	29.5	44.7	0	A	0

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))

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 8

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.7	QP	20.1	-32.8	32.1	-15.1	29.5	44.6	0	A	0

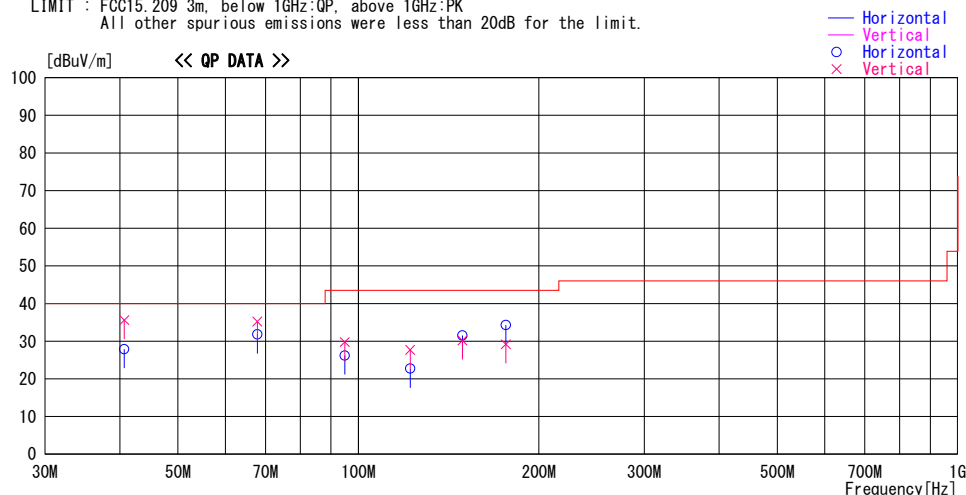
CHART: WITH FACTOR

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))

8.4. SPURIOUS EMISSION 30 TO 1000 MHz

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 1

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	38.3	QP	14.6	-25.0	27.9	159	341	Hori.	40.0	12.1	
40.680	46.0	QP	14.6	-25.0	35.6	271	102	Vert.	40.0	4.4	
67.800	49.7	QP	6.5	-24.4	31.8	160	249	Hori.	40.0	8.2	
67.800	53.1	QP	6.5	-24.4	35.2	264	100	Vert.	40.0	4.8	
94.920	41.0	QP	9.3	-24.1	26.2	165	202	Hori.	43.5	17.3	
94.920	44.6	QP	9.3	-24.1	29.8	90	113	Vert.	43.5	13.7	
122.040	33.2	QP	13.2	-23.7	22.7	9	150	Hori.	43.5	20.8	
122.040	38.2	QP	13.2	-23.7	27.7	81	100	Vert.	43.5	15.8	
149.160	39.9	QP	15.1	-23.5	31.5	350	221	Hori.	43.5	12.0	
149.160	38.6	QP	15.1	-23.5	30.2	359	100	Vert.	43.5	13.3	
176.280	41.0	QP	16.4	-23.1	34.3	0	174	Hori.	43.5	9.2	
176.280	35.9	QP	16.4	-23.1	29.2	62	100	Vert.	43.5	14.3	

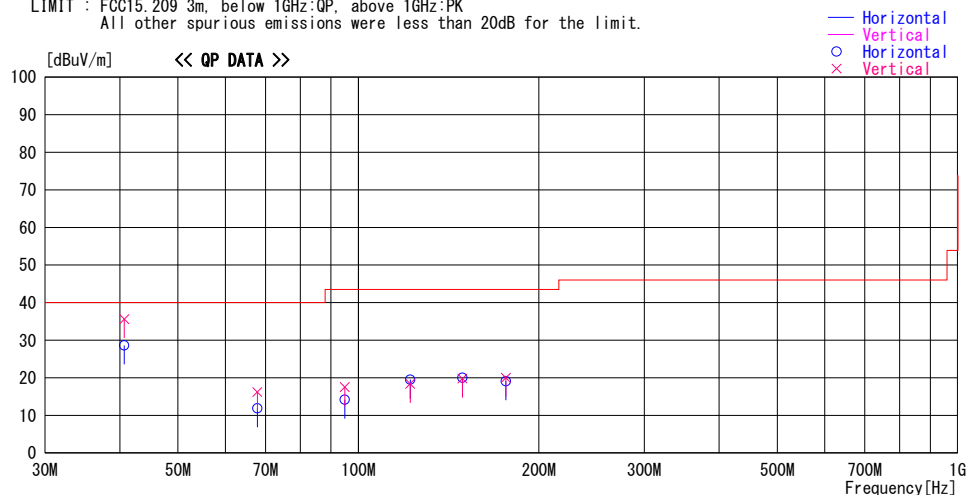
CHART: WITH FACTOR

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))

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 3

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



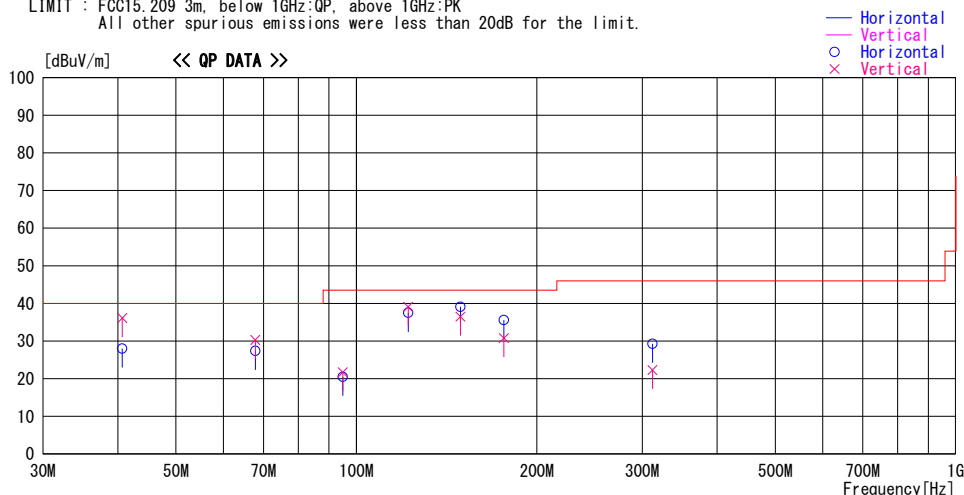
Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	39.0	QP	14.6	-25.0	28.6	141	381	Hori.	40.0	11.4	
40.680	46.0	QP	14.6	-25.0	35.6	241	102	Vert.	40.0	4.4	
67.800	29.8	QP	6.5	-24.4	11.9	145	224	Hori.	40.0	28.1	
67.800	34.1	QP	6.5	-24.4	16.2	256	100	Vert.	40.0	23.8	
94.920	29.0	QP	9.3	-24.1	14.2	181	190	Hori.	43.5	29.3	
94.920	32.3	QP	9.3	-24.1	17.5	65	102	Vert.	43.5	26.0	
122.040	30.0	QP	13.2	-23.7	19.5	3	150	Hori.	43.5	24.0	
122.040	28.9	QP	13.2	-23.7	18.4	93	100	Vert.	43.5	25.1	
149.160	28.4	QP	15.1	-23.5	20.0	155	203	Hori.	43.5	23.5	
149.160	28.2	QP	15.1	-23.5	19.8	359	100	Vert.	43.5	23.7	
176.280	25.8	QP	16.4	-23.1	19.1	0	144	Hori.	43.5	24.4	
176.280	26.7	QP	16.4	-23.1	20.0	62	100	Vert.	43.5	23.5	

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))

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 5

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	38.4	QP	14.6	-25.0	28.0	177	282	Hori.	40.0	12.0	
40.680	46.5	QP	14.6	-25.0	36.1	251	102	Vert.	40.0	3.9	
67.800	45.3	QP	6.5	-24.4	27.4	148	314	Hori.	40.0	12.6	
67.800	48.2	QP	6.5	-24.4	30.3	238	100	Vert.	40.0	9.7	
94.920	35.3	QP	9.3	-24.1	20.5	161	181	Hori.	43.5	23.0	
94.920	36.5	QP	9.3	-24.1	21.7	114	102	Vert.	43.5	21.8	
122.040	48.0	QP	13.2	-23.7	37.5	154	141	Hori.	43.5	6.0	
122.040	49.6	QP	13.2	-23.7	39.1	272	100	Vert.	43.5	4.4	
149.160	47.5	QP	15.1	-23.5	39.1	345	123	Hori.	43.5	4.4	
149.160	44.9	QP	15.1	-23.5	36.5	260	100	Vert.	43.5	7.0	
176.280	42.3	QP	16.4	-23.1	35.6	339	100	Hori.	43.5	7.9	
176.280	37.5	QP	16.4	-23.1	30.8	86	100	Vert.	43.5	12.7	
311.880	37.3	QP	13.9	-21.9	29.3	350	100	Hori.	46.0	16.7	
311.880	30.3	QP	13.9	-21.9	22.3	222	151	Vert.	46.0	23.7	

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))

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 7

LIMIT : FCC15.209 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]	
40.680	38.3	QP	14.6	-25.0	27.9	177	280	Hori.	40.0	12.1	
40.680	45.6	QP	14.6	-25.0	35.2	252	102	Vert.	40.0	4.8	
67.800	45.3	QP	6.5	-24.4	27.4	148	310	Hori.	40.0	12.6	
67.800	47.9	QP	6.5	-24.4	30.0	238	100	Vert.	40.0	10.0	
94.920	35.2	QP	9.3	-24.1	20.4	161	181	Hori.	43.5	23.1	
94.920	36.3	QP	9.3	-24.1	21.5	114	102	Vert.	43.5	22.0	
122.040	48.0	QP	13.2	-23.7	37.5	152	141	Hori.	43.5	6.0	
122.040	48.9	QP	13.2	-23.7	38.4	272	100	Vert.	43.5	5.1	
149.160	47.9	QP	15.1	-23.5	39.5	341	120	Hori.	43.5	4.0	
149.160	44.5	QP	15.1	-23.5	36.1	260	100	Vert.	43.5	7.4	
176.280	42.2	QP	16.4	-23.1	35.5	339	100	Hori.	43.5	8.0	
176.280	37.1	QP	16.4	-23.1	30.4	86	100	Vert.	43.5	13.1	
311.880	34.8	QP	13.9	-21.9	26.8	351	100	Hori.	46.0	19.2	
311.880	28.9	QP	13.9	-21.9	20.9	212	152	Vert.	46.0	25.1	

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))

9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Notes:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

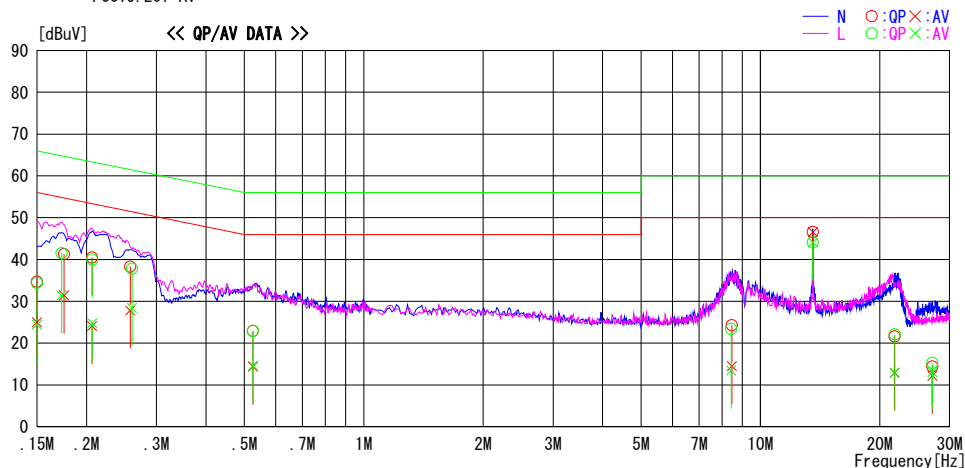
TEST PROCEDURE

ANSI C63.10-2013

RESULTS

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 1

LIMIT : FCC15.207 QP
FCC15.207 AV

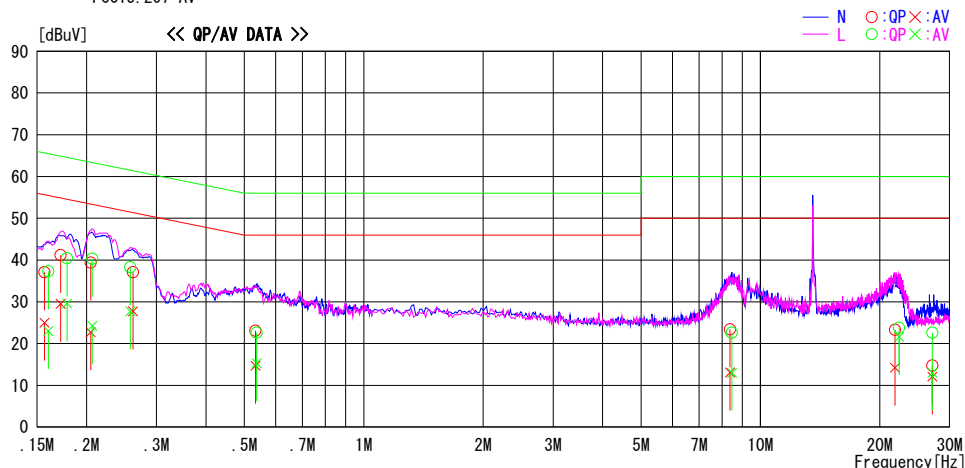


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	21.3	11.6	13.4	34.7	25.0	66.0	56.0	31.3	31.0	N	
0.17550	27.9	18.0	13.4	41.3	31.4	64.7	54.7	23.4	23.3	N	
0.20658	27.1	10.7	13.4	40.5	24.1	63.3	53.3	22.8	29.2	N	
0.25771	24.9	14.4	13.4	38.3	27.8	61.5	51.5	23.2	23.7	N	
0.52573	9.5	1.0	13.4	22.9	14.4	56.0	46.0	33.1	31.6	N	
8.47110	10.4	0.6	13.9	24.3	14.5	60.0	50.0	35.7	35.5	N	
13.56000	32.4	32.4	14.2	46.6	46.6	60.0	50.0	13.4	3.4	N	
21.77251	7.1	-1.6	14.5	21.6	12.9	60.0	50.0	38.4	37.1	N	
27.12000	-0.3	-2.5	14.7	14.4	12.2	60.0	50.0	45.6	37.8	N	
0.15000	21.0	11.0	13.4	34.4	24.4	66.0	56.0	31.6	31.6	L	
0.17303	28.1	18.0	13.4	41.5	31.4	64.8	54.8	23.3	23.4	L	
0.20679	26.6	11.4	13.4	40.0	24.8	63.3	53.3	23.3	28.5	L	
0.26040	24.4	15.0	13.4	37.8	28.4	61.4	51.4	23.6	23.0	L	
0.52558	9.5	1.2	13.4	22.9	14.6	56.0	46.0	33.1	31.4	L	
8.44244	9.5	-0.5	13.9	23.4	13.4	60.0	50.0	36.6	36.6	L	
13.56000	29.9	29.9	14.2	44.1	44.1	60.0	50.0	15.9	5.9	L	
21.82472	7.6	-1.5	14.5	22.1	13.0	60.0	50.0	37.9	37.0	L	
27.12000	0.6	-1.6	14.7	15.3	13.1	60.0	50.0	44.7	36.9	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 2

LIMIT : FCC15. 207 QP
FCC15. 207 AV

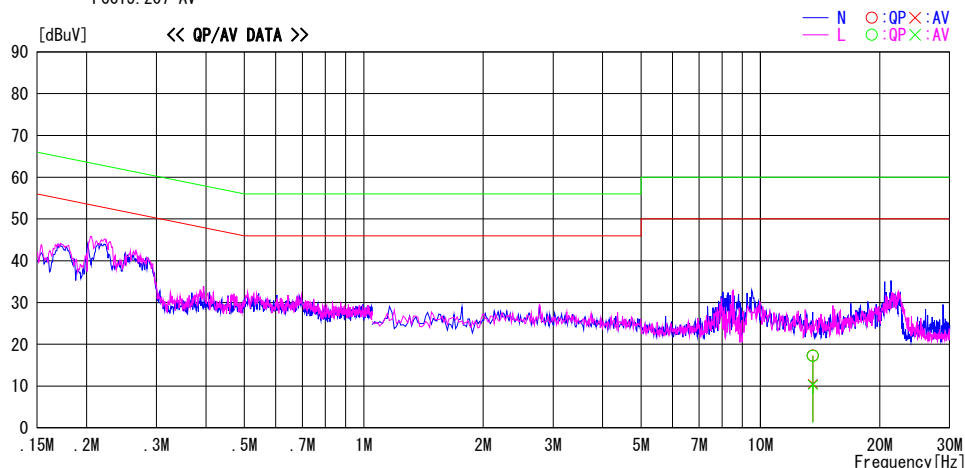


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15670	23.7	11.6	13.4	37.1	25.0	65.6	55.6	28.5	30.6	N	
0.16017	23.9	9.6	13.4	37.3	23.0	65.5	55.5	28.2	32.5	L	
0.17206	27.8	16.1	13.4	41.2	29.5	64.9	54.9	23.7	25.4	N	
0.17853	27.0	16.2	13.4	40.4	29.6	64.6	54.6	24.2	25.0	L	
0.20495	26.0	9.3	13.4	39.4	22.7	63.4	53.4	24.0	30.7	N	
0.20681	26.9	10.8	13.4	40.3	24.2	63.3	53.3	23.0	29.1	L	
0.25795	24.9	14.3	13.4	38.3	27.7	61.5	51.5	23.2	23.8	L	
0.26184	23.7	14.3	13.4	37.1	27.7	61.4	51.4	24.3	23.7	N	
0.53353	9.7	1.3	13.4	23.1	14.7	56.0	46.0	32.9	31.3	N	
0.53725	9.2	1.9	13.4	22.6	15.3	56.0	46.0	33.4	30.7	L	
8.38426	9.5	-0.8	13.9	23.4	13.1	60.0	50.0	36.6	36.9	N	
8.47704	8.7	-0.9	13.9	22.6	13.0	60.0	50.0	37.4	37.0	L	
21.84359	8.8	-0.3	14.5	23.3	14.2	60.0	50.0	36.7	35.8	N	
22.38229	9.3	7.1	14.5	23.8	21.6	60.0	50.0	36.2	28.4	L	
27.12000	0.0	-2.6	14.7	14.7	12.1	60.0	50.0	45.3	37.9	N	
27.12000	7.9	-1.7	14.7	22.6	13.0	60.0	50.0	37.4	37.0	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 2 Terminate

LIMIT : FCC15.207 QP
FCC15.207 AV

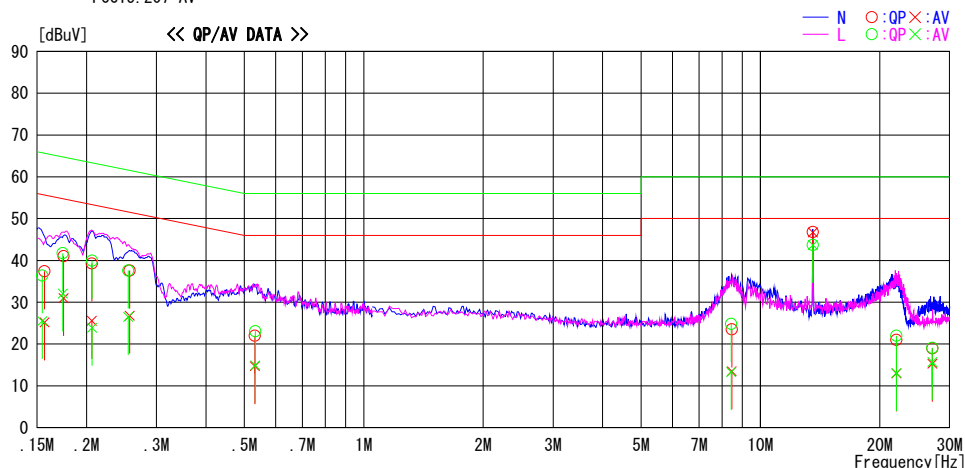


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	3.3	-3.5	14.0	17.3	10.5	60.0	50.0	42.7	39.5	N	
13.56000	3.2	-3.7	14.0	17.2	10.3	60.0	50.0	42.8	39.7	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 3

LIMIT : FCC15. 207 QP
FCC15. 207 AV

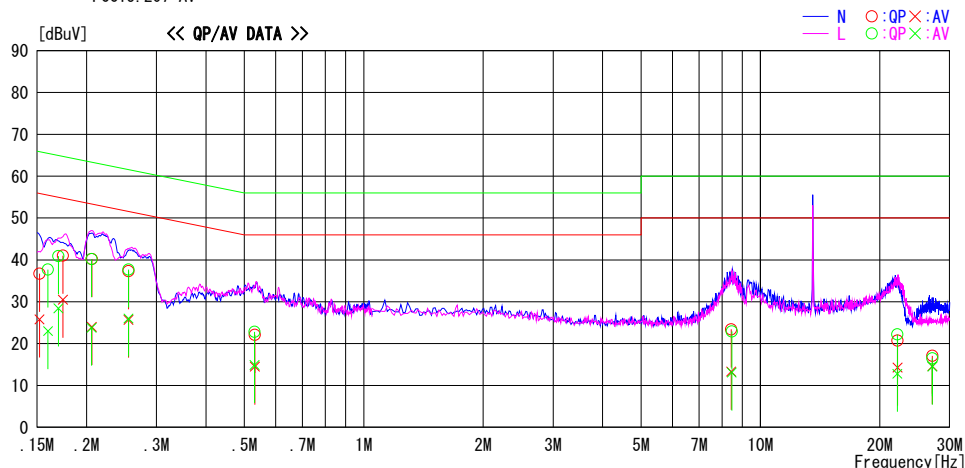


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15672	24.0	11.8	13.4	37.4	25.2	65.6	55.6	28.2	30.4	N	
0.17496	27.6	17.6	13.4	41.0	31.0	64.7	54.7	23.7	23.7	N	
0.20632	25.9	12.2	13.4	39.3	25.6	63.4	53.4	24.1	27.8	N	
0.25681	24.2	13.4	13.4	37.6	26.8	61.5	51.5	23.9	24.7	N	
0.53119	8.6	1.3	13.4	22.0	14.7	56.0	46.0	34.0	31.3	N	
8.46471	9.6	-0.4	13.9	23.5	13.5	60.0	50.0	36.5	36.5	N	
13.56000	32.6	32.5	14.2	46.8	46.7	60.0	50.0	13.2	3.3	N	
22.02046	6.5	-1.5	14.5	21.0	13.0	60.0	50.0	39.0	37.0	N	
27.12000	4.3	0.6	14.7	19.0	15.3	60.0	50.0	41.0	34.7	N	
0.15465	23.0	12.1	13.4	36.4	25.5	65.7	55.7	29.3	30.2	L	
0.17425	28.3	18.7	13.4	41.7	32.1	64.8	54.8	23.1	22.7	L	
0.20638	26.5	10.5	13.4	39.9	23.9	63.3	53.3	23.4	29.4	L	
0.25473	24.2	13.1	13.4	37.6	26.5	61.6	51.6	24.0	25.1	L	
0.53228	9.7	1.5	13.4	23.1	14.9	56.0	46.0	32.9	31.1	L	
8.43615	10.9	-0.6	13.9	24.8	13.3	60.0	50.0	35.2	36.7	L	
13.56000	29.5	29.5	14.2	43.7	43.7	60.0	50.0	16.3	6.3	L	
22.02964	7.5	-1.4	14.5	22.0	13.1	60.0	50.0	38.0	36.9	L	
27.12000	4.4	1.0	14.7	19.1	15.7	60.0	50.0	40.9	34.3	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 4

LIMIT : FCC15. 207 QP
FCC15. 207 AV

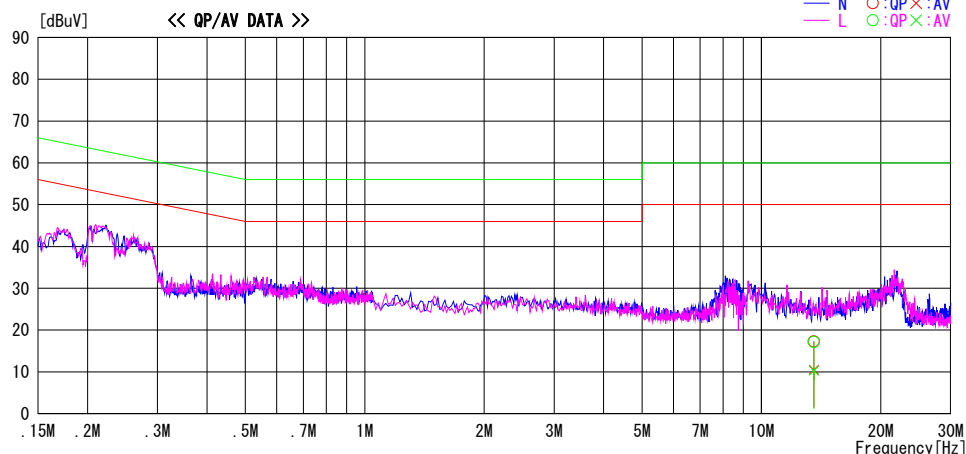


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15221	23.3	12.4	13.4	36.7	25.8	65.9	55.9	29.2	30.1	N	
0.15989	24.3	9.6	13.4	37.7	23.0	65.5	55.5	27.8	32.5	L	
0.16988	27.5	15.0	13.4	40.9	28.4	65.0	55.0	24.1	26.6	L	
0.17434	27.6	17.1	13.4	41.0	30.5	64.8	54.8	23.8	24.3	N	
0.20599	26.8	10.4	13.4	40.2	23.8	63.4	53.4	23.2	29.6	L	
0.20615	26.8	10.6	13.4	40.2	24.0	63.4	53.4	23.2	29.4	N	
0.25513	23.9	12.3	13.4	37.3	25.7	61.6	51.6	24.3	25.9	N	
0.25515	24.3	12.6	13.4	37.7	26.0	61.6	51.6	23.9	25.6	L	
0.53074	9.4	1.5	13.4	22.8	14.9	56.0	46.0	33.2	31.1	L	
0.53134	8.7	1.1	13.4	22.1	14.5	56.0	46.0	33.9	31.5	N	
8.43770	9.5	-0.6	13.9	23.4	13.3	60.0	50.0	36.6	36.7	N	
8.46488	9.0	-0.8	13.9	22.9	13.1	60.0	50.0	37.1	36.9	L	
22.14350	7.7	-1.7	14.5	22.2	12.8	60.0	50.0	37.8	37.2	L	
22.16560	6.2	-0.2	14.5	20.7	14.3	60.0	50.0	39.3	35.7	N	
27.12000	2.4	-0.1	14.7	17.1	14.6	60.0	50.0	42.9	35.4	N	
27.12000	1.8	-0.2	14.7	16.5	14.5	60.0	50.0	43.5	35.5	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 4 Terminate

LIMIT : FCC15.207 QP
FCC15.207 AV

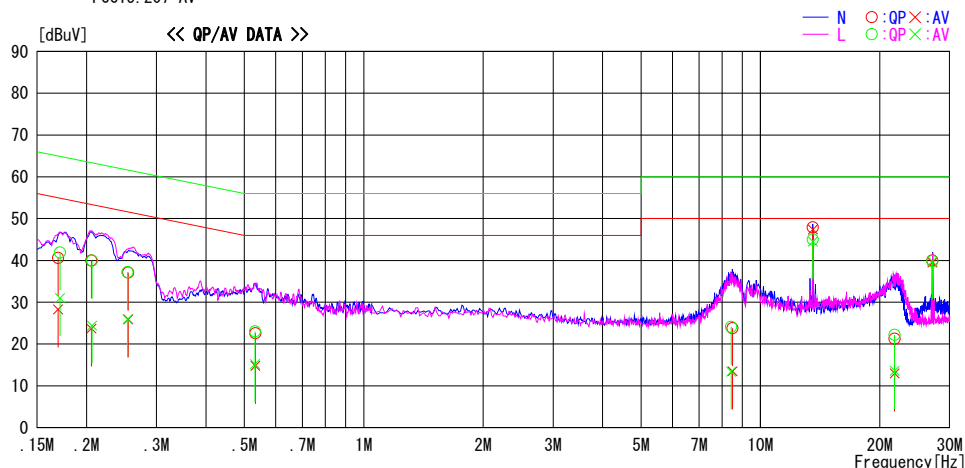


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	3.3	-3.5	14.0	17.3	10.5	60.0	50.0	42.7	39.5	N	
13.56000	3.2	-3.7	14.0	17.2	10.3	60.0	50.0	42.8	39.7	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 5

LIMIT : FCC15.207 QP
FCC15.207 AV

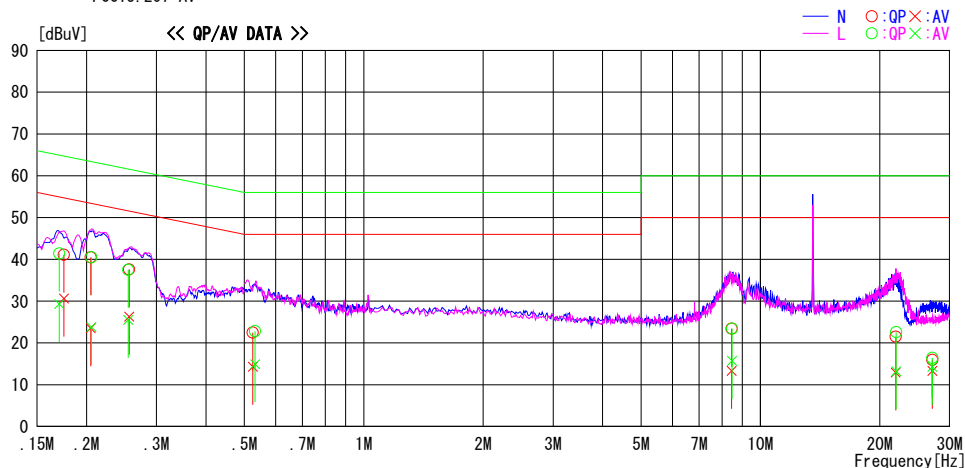


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.16954	27.2	14.9	13.4	40.6	28.3	65.0	55.0	24.4	26.7	N	
0.20575	26.6	10.3	13.4	40.0	23.7	63.4	53.4	23.4	29.7	N	
0.25471	23.7	12.5	13.4	37.1	25.9	61.6	51.6	24.5	25.7	N	
0.53297	9.2	1.4	13.4	22.6	14.8	56.0	46.0	33.4	31.2	N	
8.50901	9.9	-0.4	13.9	23.8	13.5	60.0	50.0	36.2	36.5	N	
13.56000	33.7	33.2	14.2	47.9	47.4	60.0	50.0	12.1	2.6	N	
21.80400	6.8	-1.5	14.5	21.3	13.0	60.0	50.0	38.7	37.0	N	
27.12000	25.3	24.8	14.7	40.0	39.5	60.0	50.0	20.0	10.5	N	
0.17135	28.5	17.6	13.4	41.9	31.0	64.9	54.9	23.0	23.9	L	
0.20643	26.5	11.0	13.4	39.9	24.4	63.3	53.3	23.4	28.9	L	
0.25372	23.8	12.5	13.4	37.2	25.9	61.6	51.6	24.4	25.7	L	
0.53170	9.6	1.8	13.4	23.0	15.2	56.0	46.0	33.0	30.8	L	
8.43610	10.2	-0.5	13.9	24.1	13.4	60.0	50.0	35.9	36.6	L	
13.56000	30.8	30.3	14.2	45.0	44.5	60.0	50.0	15.0	5.5	L	
21.79764	7.7	-0.9	14.5	22.2	13.6	60.0	50.0	37.8	36.4	L	
27.12000	25.1	25.1	14.7	39.8	39.8	60.0	50.0	20.2	10.2	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 6

LIMIT : FCC15.207 QP
FCC15.207 AV

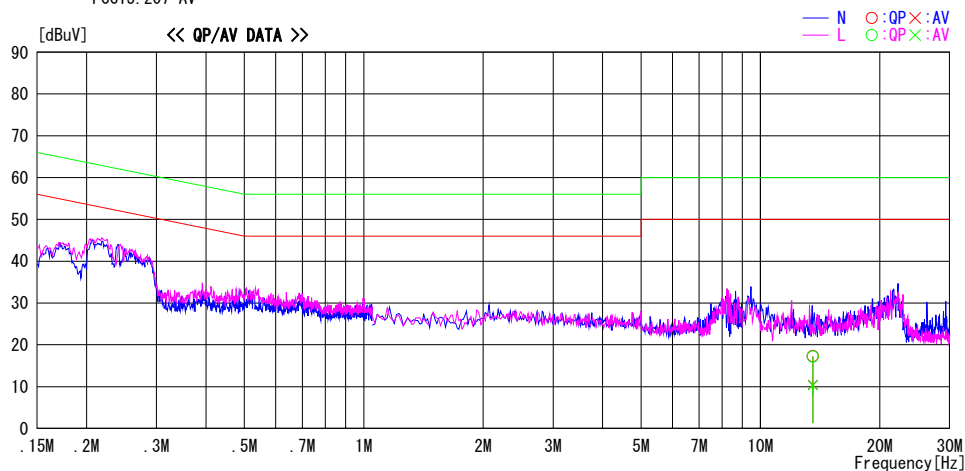


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17075	28.0	15.9	13.4	41.4	29.3	64.9	54.9	23.5	25.6	L	
0.17542	27.7	17.2	13.4	41.1	30.6	64.7	54.7	23.6	24.1	N	
0.20488	27.1	10.1	13.4	40.5	23.5	63.4	53.4	22.9	29.9	N	
0.20570	27.1	10.4	13.4	40.5	23.8	63.4	53.4	22.9	29.6	L	
0.25491	24.1	12.1	13.4	37.5	25.5	61.6	51.6	24.1	26.1	L	
0.25608	24.2	12.9	13.4	37.6	26.3	61.6	51.6	24.0	25.3	N	
0.52519	9.1	0.9	13.4	22.5	14.3	56.0	46.0	33.5	31.7	N	
0.53208	9.4	1.5	13.4	22.8	14.9	56.0	46.0	33.2	31.1	L	
8.46221	9.5	-0.6	13.9	23.4	13.3	60.0	50.0	36.6	36.7	N	
8.47815	9.5	1.8	13.9	23.4	15.7	60.0	50.0	36.6	34.3	L	
21.92038	7.0	-1.6	14.5	21.5	12.9	60.0	50.0	38.5	37.1	N	
22.00318	8.1	-1.3	14.5	22.6	13.2	60.0	50.0	37.4	36.8	L	
27.12000	1.2	-1.4	14.7	15.9	13.3	60.0	50.0	44.1	36.7	N	
27.12000	1.7	-0.4	14.7	16.4	14.3	60.0	50.0	43.6	35.7	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 6 Terminate

LIMIT : FCC15.207 QP
FCC15.207 AV

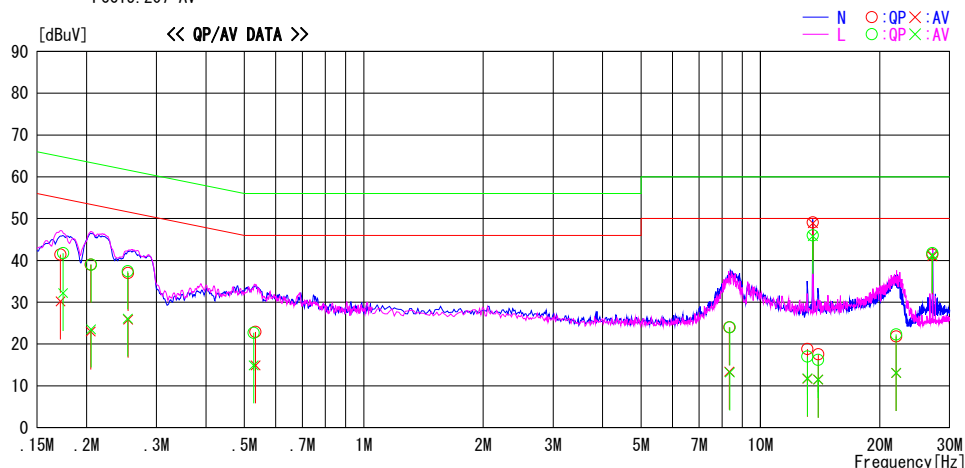


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	3.3	-3.6	14.0	17.3	10.4	60.0	50.0	42.7	39.6	N	
13.56000	3.2	-3.7	14.0	17.2	10.3	60.0	50.0	42.8	39.7	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 7

LIMIT : FCC15.207 QP
FCC15.207 AV

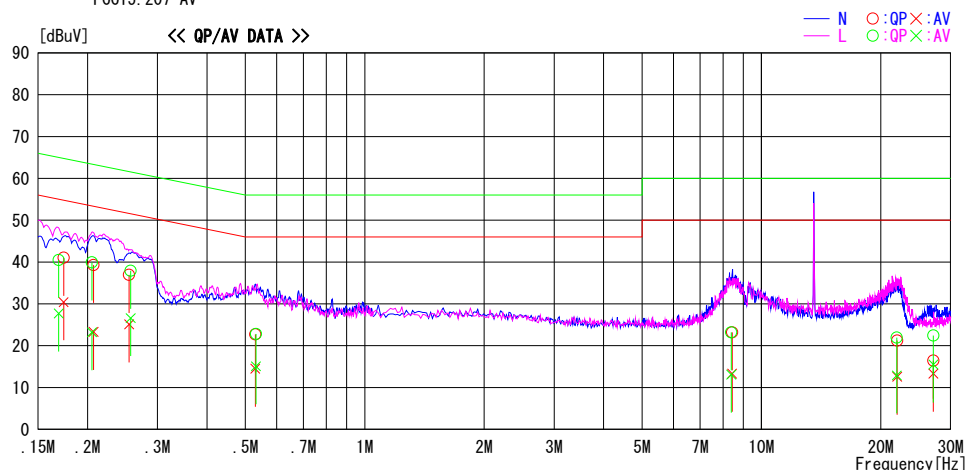


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17195	28.0	16.8	13.4	41.4	30.2	64.9	54.9	23.5	24.7	N	
0.20495	25.6	9.6	13.4	39.0	23.0	63.4	53.4	24.4	30.4	N	
0.25467	23.6	12.4	13.4	37.0	25.8	61.6	51.6	24.6	25.8	N	
0.53359	9.5	1.5	13.4	22.9	14.9	56.0	46.0	33.1	31.1	N	
8.35043	10.1	-0.5	13.9	24.0	13.4	60.0	50.0	36.0	36.6	N	
13.13640	4.6	-2.5	14.2	18.8	11.7	60.0	50.0	41.2	38.3	N	
13.56000	34.9	34.7	14.2	49.1	48.9	60.0	50.0	10.9	1.1	N	
13.98382	3.4	-2.7	14.2	17.6	11.5	60.0	50.0	42.4	38.5	N	
21.99331	7.3	-1.4	14.5	21.8	13.1	60.0	50.0	38.2	36.9	N	
27.12000	26.7	26.3	14.7	41.4	41.0	60.0	50.0	18.6	9.0	N	
0.17452	28.3	18.8	13.4	41.7	32.2	64.7	54.7	23.0	22.5	L	
0.20533	25.6	10.1	13.4	39.0	23.5	63.4	53.4	24.4	29.9	L	
0.25402	24.0	12.7	13.4	37.4	26.1	61.6	51.6	24.2	25.5	L	
0.52751	9.3	1.5	13.4	22.7	14.9	56.0	46.0	33.3	31.1	L	
8.37319	10.1	-0.7	13.9	24.0	13.2	60.0	50.0	36.0	36.8	L	
13.13551	2.8	-2.4	14.2	17.0	11.8	60.0	50.0	43.0	38.2	L	
13.56000	31.8	31.6	14.2	46.0	45.8	60.0	50.0	14.0	4.2	L	
13.98221	2.0	-2.7	14.2	16.2	11.5	60.0	50.0	43.8	38.5	L	
21.99558	7.8	-1.4	14.5	22.3	13.1	60.0	50.0	37.7	36.9	L	
27.12000	27.0	26.6	14.7	41.7	41.3	60.0	50.0	18.3	8.7	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21 (Night), 2019
Temperature / Humidity 22 deg. C / 36 % RH
Engineer Junki Nagatomi
Mode Mode 8

LIMIT : FCC15.207 QP
FCC15.207 AV

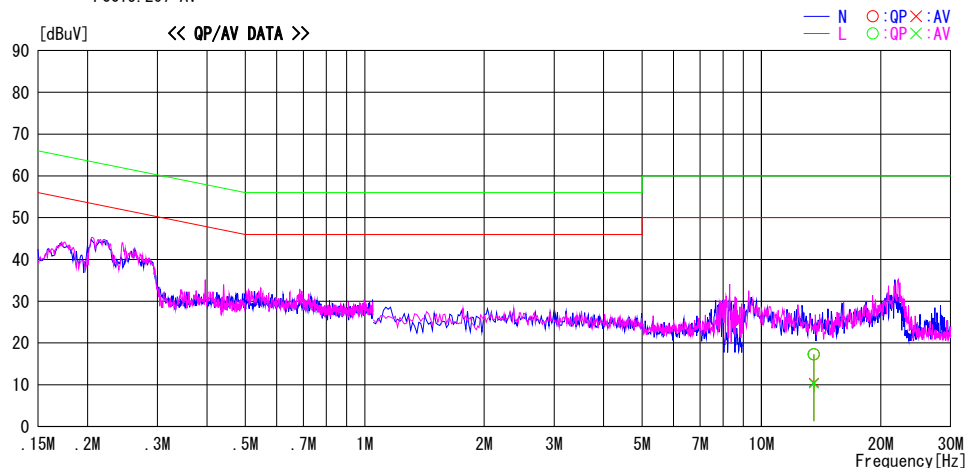


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.16919	27.1	14.3	13.4	40.5	27.7	65.0	55.0	24.5	27.3	L	
0.17404	27.6	17.0	13.4	41.0	30.4	64.8	54.8	23.8	24.4	N	
0.20515	26.5	9.8	13.4	39.9	23.2	63.4	53.4	23.5	30.2	L	
0.20707	25.9	9.9	13.4	39.3	23.3	63.3	53.3	24.0	30.0	N	
0.25463	23.5	11.7	13.4	36.9	25.1	61.6	51.6	24.7	26.5	N	
0.25673	24.5	13.2	13.4	37.9	26.6	61.5	51.5	23.6	24.9	L	
0.52936	9.3	1.1	13.4	22.7	14.5	56.0	46.0	33.3	31.5	N	
0.53156	9.4	1.7	13.4	22.8	15.1	56.0	46.0	33.2	30.9	L	
8.39461	9.3	-0.8	13.9	23.2	13.1	60.0	50.0	36.8	36.9	L	
8.43405	9.3	-0.6	13.9	23.2	13.3	60.0	50.0	36.8	36.7	N	
21.94890	7.4	-1.6	14.5	21.9	12.9	60.0	50.0	38.1	37.1	L	
21.98922	6.7	-1.9	14.5	21.2	12.6	60.0	50.0	38.8	37.4	N	
27.12000	1.7	-1.4	14.7	16.4	13.3	60.0	50.0	43.6	36.7	N	
27.12000	7.7	0.8	14.7	22.4	15.5	60.0	50.0	37.6	34.5	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 29, 2019
Temperature / Humidity 23 deg. C / 38 % RH
Engineer Yuta Moriya
Mode Mode 8 Terminate

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	3.3	-3.5	14.0	17.3	10.5	60.0	50.0	42.7	39.5	N	
13.56000	3.3	-3.7	14.0	17.3	10.3	60.0	50.0	42.7	39.7	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + CABLE + ATT)
Except for the above table: adequate margin data below the limits.

10. FREQUENCY STABILITY

LIMIT

§15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST PROCEDURE

ANSI C63.10-2013

RESULTS

Report No. 12486444H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 22, 2019
Temperature / Humidity 23 deg. C / 36 % RH
Engineer Takumi Shimada
Mode Tx 13.56MHz

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
50	120	Power on	13.559926	-0.000074	-0.00055	-5.5	0.01
		+ 2 min.	13.559929	-0.000071	-0.00052	-5.2	0.01
		+ 5 min.	13.559916	-0.000084	-0.00062	-6.2	0.01
		+ 10 min.	13.559924	-0.000076	-0.00056	-5.6	0.01
40	120	Power on	13.559919	-0.000081	-0.00060	-6.0	0.01
		+ 2 min.	13.559929	-0.000071	-0.00053	-5.3	0.01
		+ 5 min.	13.559919	-0.000081	-0.00060	-6.0	0.01
		+ 10 min.	13.559919	-0.000081	-0.00060	-6.0	0.01
30	120	Power on	13.559935	-0.000065	-0.00048	-4.8	0.01
		+ 2 min.	13.559925	-0.000075	-0.00055	-5.5	0.01
		+ 5 min.	13.559925	-0.000075	-0.00055	-5.5	0.01
		+ 10 min.	13.559924	-0.000076	-0.00056	-5.6	0.01
20	120	Power on	13.559952	-0.000048	-0.00035	-3.5	0.01
		+ 2 min.	13.559962	-0.000038	-0.00028	-2.8	0.01
		+ 5 min.	13.559952	-0.000048	-0.00035	-3.5	0.01
		+ 10 min.	13.559962	-0.000038	-0.00028	-2.8	0.01
20	102 (120V -15%)	Power on	13.559968	-0.000032	-0.00023	-2.3	0.01
		+ 2 min.	13.559954	-0.000046	-0.00034	-3.4	0.01
		+ 5 min.	13.559943	-0.000057	-0.00042	-4.2	0.01
		+ 10 min.	13.559960	-0.000040	-0.00029	-2.9	0.01
20	138 (120V +15%)	Power on	13.559951	-0.000049	-0.00036	-3.6	0.01
		+ 2 min.	13.559951	-0.000049	-0.00036	-3.6	0.01
		+ 5 min.	13.559951	-0.000049	-0.00036	-3.6	0.01
		+ 10 min.	13.559941	-0.000059	-0.00044	-4.4	0.01
10	120	Power on	13.559973	-0.000027	-0.00020	-2.0	0.01
		+ 2 min.	13.559960	-0.000040	-0.00029	-2.9	0.01
		+ 5 min.	13.559963	-0.000037	-0.00027	-2.7	0.01
		+ 10 min.	13.559973	-0.000027	-0.00020	-2.0	0.01
0	120	Power on	13.559983	-0.000017	-0.00012	-1.2	0.01
		+ 2 min.	13.559990	-0.000010	-0.00007	-0.7	0.01
		+ 5 min.	13.559990	-0.000010	-0.00007	-0.7	0.01
		+ 10 min.	13.559990	-0.000010	-0.00007	-0.7	0.01
-10	120	Power on	13.559989	-0.000011	-0.00008	-0.8	0.01
		+ 2 min.	13.559997	-0.000003	-0.00002	-0.2	0.01
		+ 5 min.	13.559997	-0.000003	-0.00002	-0.2	0.01
		+ 10 min.	13.559997	-0.000003	-0.00002	-0.2	0.01
-20	120	Power on	13.559995	-0.000005	-0.00004	-0.4	0.01
		+ 2 min.	13.559998	-0.000002	-0.00001	-0.1	0.01
		+ 5 min.	13.559998	-0.000002	-0.00002	-0.2	0.01
		+ 10 min.	13.560004	0.000004	0.00003	0.3	0.01
-30	120	Power on	13.559982	-0.000018	-0.00013	-1.3	0.01
		+ 2 min.	13.559990	-0.000010	-0.00007	-0.7	0.01
		+ 5 min.	13.559998	-0.000002	-0.00002	-0.2	0.01
		+ 10 min.	13.559998	-0.000002	-0.00002	-0.2	0.01

Calculation formula: Frequency error = Measured frequency - Tested frequency
Result [%] = Frequency error / Tested frequency * 100

Tested frequency: 13.56 MHz
Limit (+/-): 0.01 % (+/- 100ppm)

*The test was begun from 50 deg.C and the temperature was lowered each 10 deg.C.

Report No. 12486444H
Test place Ise EMC Lab. No.4 Measurement Room
Date January 22, 2019
Temperature / Humidity 23 deg. C / 36 % RH
Engineer Takumi Shimada
Mode Tx 13.56MHz (Battery Voltage operation)

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
20	10.8	Power on	13.559955	-0.000045	-0.00033	-3.3	0.01
		+ 2 min.	13.559955	-0.000045	-0.00033	-3.3	0.01
		+ 5 min.	13.559946	-0.000054	-0.00040	-4.0	0.01
		+ 10 min.	13.559963	-0.000037	-0.00028	-2.8	0.01
20	9.18 (10.8V -15%)	Power on	13.559946	-0.000054	-0.00040	-4.0	0.01
		+ 2 min.	13.559956	-0.000044	-0.00032	-3.2	0.01
		+ 5 min.	13.559956	-0.000044	-0.00032	-3.2	0.01
		+ 10 min.	13.559955	-0.000045	-0.00034	-3.4	0.01
20	12.42 (10.8V +15%)	Power on	13.559957	-0.000043	-0.00032	-3.2	0.01
		+ 2 min.	13.559945	-0.000055	-0.00040	-4.0	0.01
		+ 5 min.	13.559955	-0.000045	-0.00033	-3.3	0.01
		+ 10 min.	13.559945	-0.000055	-0.00040	-4.0	0.01

Calculation formula: Frequency error = Measured frequency - Tested frequency
Result [%] = Frequency error / Tested frequency * 100

Tested frequency: 13.56 MHz
Limit (+/-): 0.01 % (+/- 100ppm)

11. 20dB BANDWIDTH and 99 % Occupied Bandwidth

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1 % to 5 % of the 20dB bandwidth and 99 % Occupied Bandwidth. The VBW is set to 3 times the RBW.

Because ASK modulation signal is CW-like signal that the RBW cannot be adjusting to meet 1% to 5% of OBW requirements. Therefore, the test was performed with RBW: 3 kHz, VBW: 10 kHz.

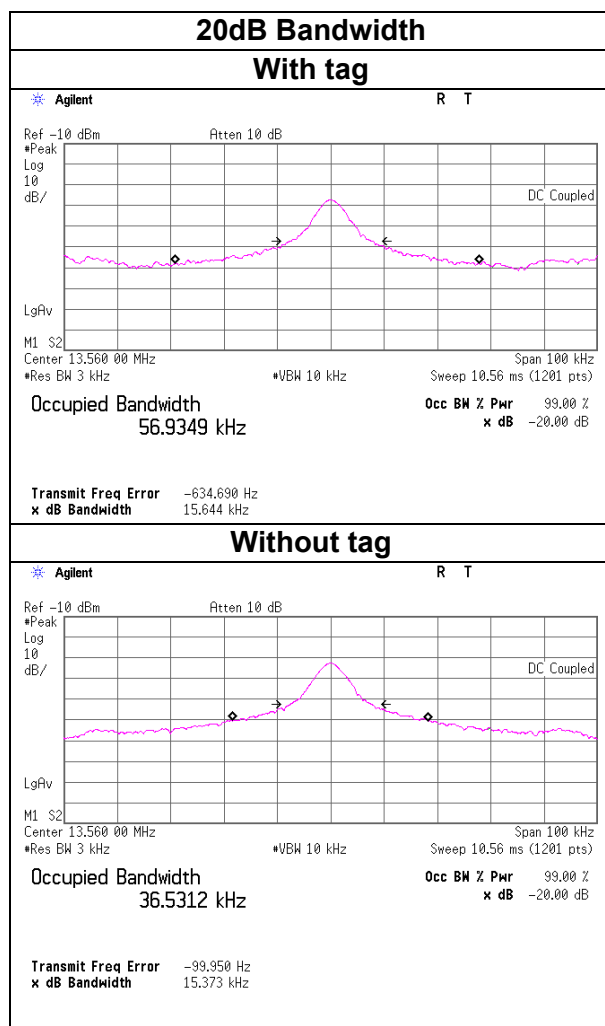
The sweep time is coupled. The spectrum analyzer internal 20dB bandwidth and 99 % Occupied Bandwidth function is utilized.

RESULTS

Frequency (MHz)	20dB Bandwidth (KHz)
13.56, Type A with Tag	15.644
13.56, Type A without Tag	15.373
13.56, Type B with Tag	14.878
13.56, Type B without Tag	15.286
13.56, FeliCa (212 kbps) with Tag	14.063
13.56, FeliCa (212 kbps) without Tag	14.994
13.56, FeliCa (424 kbps) with Tag	17.229
13.56, FeliCa (424 kbps) without Tag	19.081

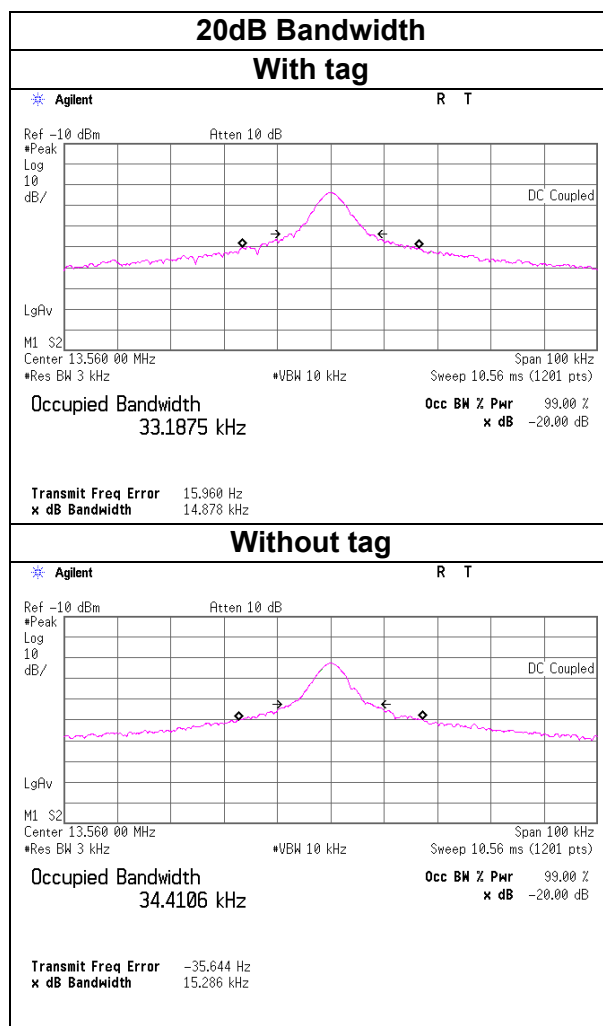
Report No.	12486444H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	January 21(Day), 2019
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Takumi Shimada
Mode	Mode 1,2

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	15.644	56.9349
	Without Tag	15.373	36.5312



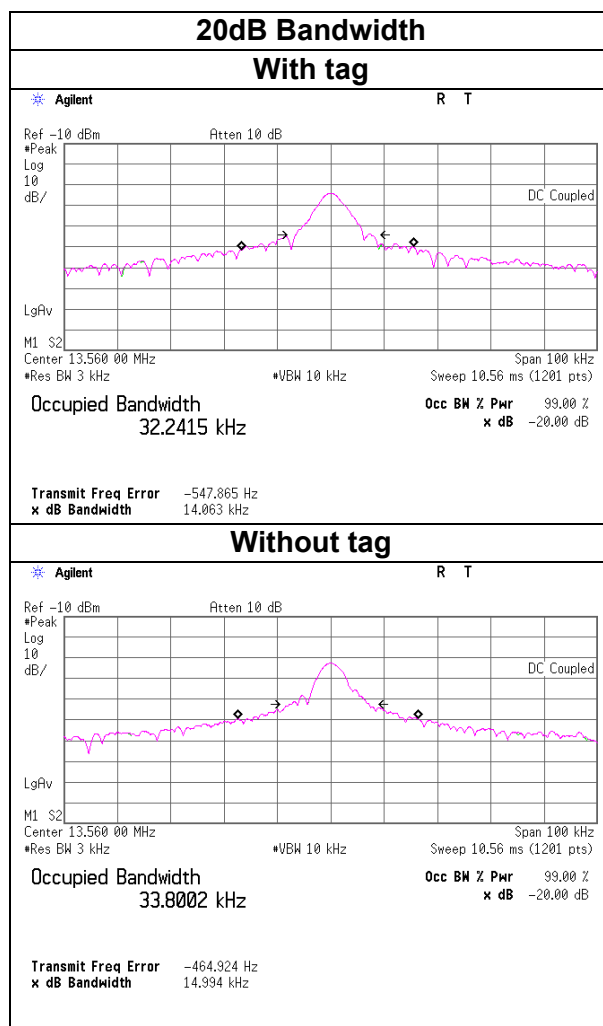
Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 3,4

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	14.878	33.1875
	Without Tag	15.286	34.4106



Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 5,6

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	14.063	32.2415
	Without Tag	14.994	33.8002



Report No. 12486444H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 21(Day), 2019
Temperature / Humidity 23 deg. C / 39 % RH
Engineer Takumi Shimada
Mode Mode 7,8

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	17.229	36.6326
	Without Tag	19.081	35.7514

