



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

RFID Module

MODEL NUMBER: RI18C

FCC ID: ACJ9TGRI18C

REPORT NUMBER: 12715065H-A

ISSUE DATE: April 12, 2019

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

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NVLAP LAB CODE: 200572-0

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

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/12/2019	Initial Issue	T. Shimada

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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: RI18C

SERIAL NUMBER: 9BTSC00009 / 9BTSC00022 (Terminate)

DATE TESTED: March 15 to 26, 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.

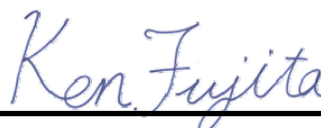
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration 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



Ken Fujita
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	Section 15.207	[QP] 20.7 dB 0.15000 MHz, L <Mode 4, 8>	Complied	-
	<IC>RSS-Gen 8.8	<IC>RSS-Gen 8.8	[AV] 21.1 dB 1.24814 MHz,L <Mode 1> 1.24849 MHz,L <Mode 5> 1.24638 MHz,L <Mode 8>		
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	59.7 dB, 13.56000MHz, QP, 0deg. <Mode 4>	Complied	Radiated
	<IC> RSS-Gen 6.4, 6.12	<IC>RSS-210 B.6			
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods	Section 15.225(b)(c)	40.3 dB, 13.55300 MHz, QP, 0deg. <Mode 4>	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC> RSS-210 B.6			
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods	Section15.215(c)	See data	Complied	Radiated
	<IC> -	<IC> -			
Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.209, Section 15.225 (d)	7.6 dB 40.680 MHz, Vertical, QP	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC>RSS-210 B.6			
Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods	Section 15.225(e)	See data	Complied	Radiated
	<IC>RSS-Gen 6.11, 8.11	<IC> RSS-210 B.6			
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 Tablet PC model CF-33.

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	23.9
13.56	4. Type B Without Tag	24.2
13.56	6. FeliCa 212 kbps Without Tag	24.1
13.56	8. FeliCa 424 kbps Without Tag	24.1

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 9) Type A Terminate 10) Type B Terminate 11) FeliCa 212 kbps Terminate 12) FeliCa 424 kbps Terminate

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
Tablet PC	Panasonic	CF-33	9BTSC00009 (except for Terminate) 9BTSC00022 (Terminate)	-	-
NFC module	Panasonic	ACM1252U-Z5PANAE1A	RM050-000058	EUT	-
AC Adapter	Panasonic	CF-AA5713A-M1	57I3AM113303562B	-	-
Tag	Type A	-	-	-	-
	Type B	-	-	-	-
	FeliCa (212 kbps)	-	-	-	-
	FeliCa (424 kbps)	-	-	-	-

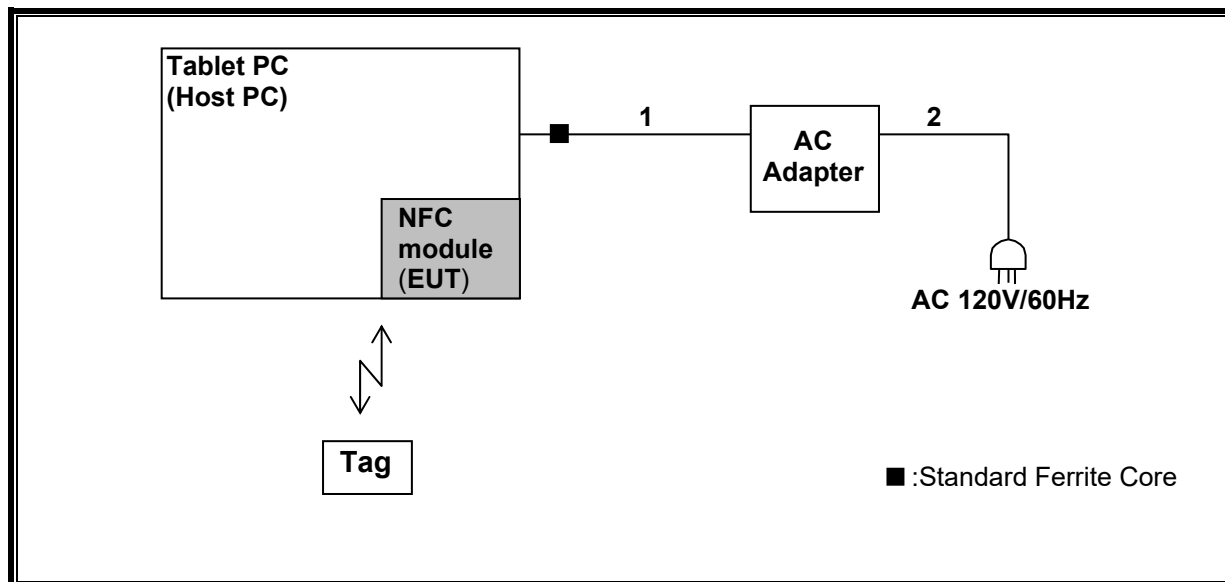
I/O CABLES

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 Tablet PC 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

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
CE	141925	Terminator	TME	CT-01	-	11/7/2018	11/30/2019	12
CE	141927	Terminator	TME	CT-01	-	10/26/2018	10/31/2019	12
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	7/25/2018	7/31/2019	12
CE	141246	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/18/2018	12/31/2019	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	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	1/11/2019	1/31/2020	12
CE/RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	8/6/2018	8/31/2019	12
CE/RE	142008	AC3 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/26/2018	6/30/2020	24
CE/RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
CE/RE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/ SFM14/ sucoform141-PE/ 421-010	-/00640	7/3/2018	7/31/2019	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	2/8/2019	2/29/2020	12
RE	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	3/25/2019	3/31/2020	12
RE	141323	Coaxial cable	UL Japan	-	-	7/3/2018	7/31/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	6/4/2018	6/30/2019	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/20/2018	12/31/2019	12
RE	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/11/2018	10/31/2019	12
RE	141413	Coaxial Cable	UL Japan	-	-	6/12/2018	6/30/2019	12
RE/FT	141899	Spectrum Analyzer	AGILENT	E4448A	MY46180655	8/10/2018	8/31/2019	12
FT	141429	Temperature and Humidity Chamber	TABAI ESPEC	PL-2KP	14015723	8/8/2018	8/31/2019	12
FT	141498	Microwave Counter	ADVANTEST	R5373	120100309	6/28/2018	6/30/2019	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.

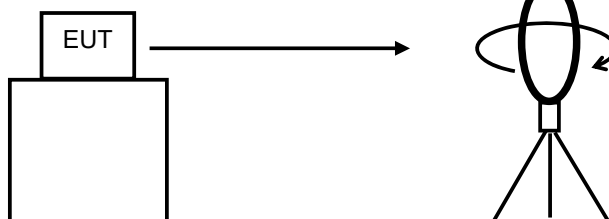
Frequency: From 9 kHz to 30 MHz

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.

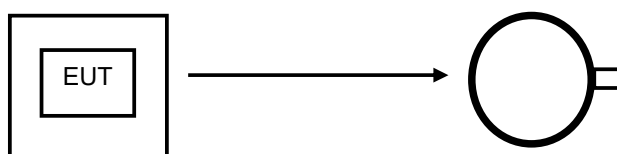
*Refer to Figure 1 about Direction of the Loop Antenna.

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

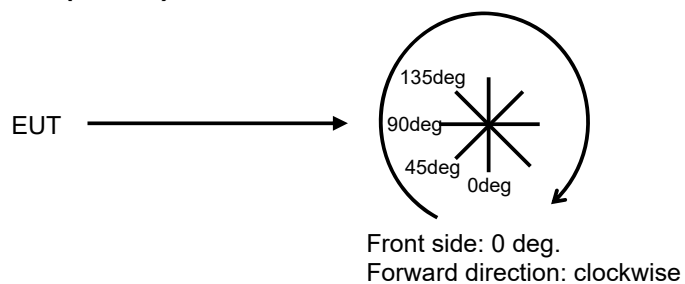


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)

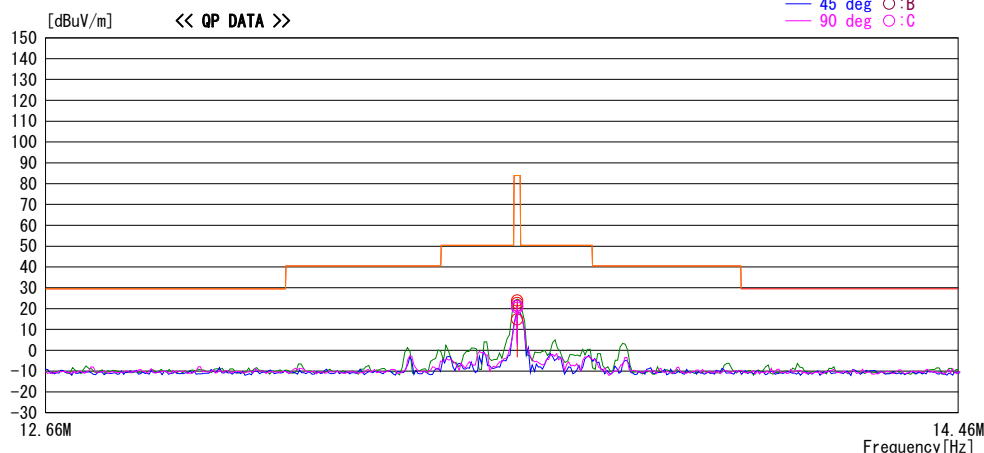


RESULTS

8.2. FUNDAMENTAL EMISSION and Spectrum Mask

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
Mode Mode 2

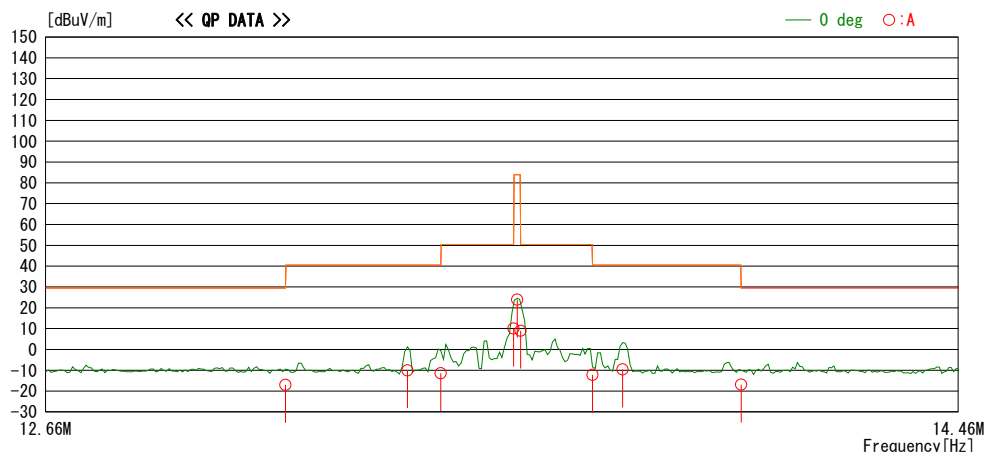
LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



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	70.3	QP	19.2	-33.3	32.3	23.9	83.9	60.0	0	A	351
13.56000	67.8	QP	19.2	-33.3	32.3	21.4	83.9	62.5	45	B	33
13.56000	66.8	QP	19.2	-33.3	32.3	20.4	83.9	63.5	90	C	21
13.56000	67.7	QP	19.2	-33.3	32.3	21.3	83.9	62.6	135	C	134
13.56006	69.1	QP	19.2	-33.3	32.3	22.7	83.9	61.2	0	A	351
13.56006	61.2	QP	19.2	-33.3	32.3	14.8	83.9	69.1	0	A	351

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Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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]	
13.11000	29.3	QP	19.3	-33.3	32.3	-17.0	29.5	46.5	0	A	351
13.34502	36.3	QP	19.3	-33.3	32.3	-10.0	40.5	50.5	0	A	351
13.41000	34.8	QP	19.3	-33.3	32.3	-11.5	40.5	52.0	0	A	351
13.55300	56.4	QP	19.2	-33.3	32.3	10.0	50.4	40.4	0	A	351
13.56000	70.3	QP	19.2	-33.3	32.3	23.9	83.9	60.0	0	A	351
13.56700	55.4	QP	19.2	-33.3	32.3	9.0	50.4	41.4	0	A	351
13.71000	34.2	QP	19.2	-33.3	32.3	-12.2	40.5	52.7	0	A	351
13.77003	36.8	QP	19.2	-33.3	32.3	-9.6	40.5	50.1	0	A	351
14.01000	29.5	QP	19.2	-33.3	32.3	-16.9	29.5	46.4	0	A	351

Result of the fundamental emission at 3 m without Distance factor

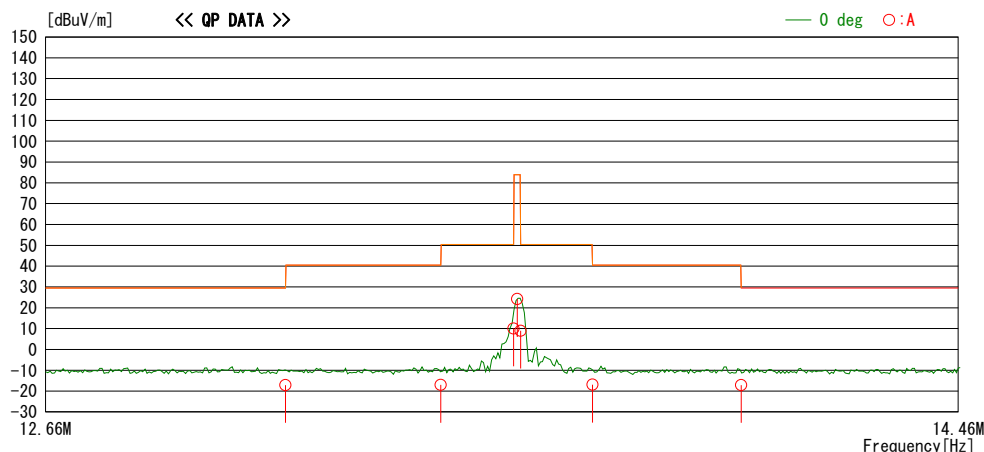
QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]		[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	70.3	19.2	6.7	32.3	-	63.9	-	-	Fundamental

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

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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	29.2	QP	19.3	-33.3	32.3	-17.1	29.5	46.6	0	A	351
13.41000	29.3	QP	19.3	-33.3	32.3	-17.0	40.5	57.5	0	A	351
13.55300	56.5	QP	19.2	-33.3	32.3	10.1	50.4	40.3	0	A	351
13.56000	70.6	QP	19.2	-33.3	32.3	24.2	83.9	59.7	0	A	351
13.56700	55.4	QP	19.2	-33.3	32.3	9.0	50.4	41.4	0	A	351
13.71000	29.5	QP	19.2	-33.3	32.3	-16.9	40.5	57.4	0	A	351
14.01000	29.3	QP	19.2	-33.3	32.3	-17.1	29.5	46.6	0	A	351

Result of the fundamental emission at 3 m without Distance factor

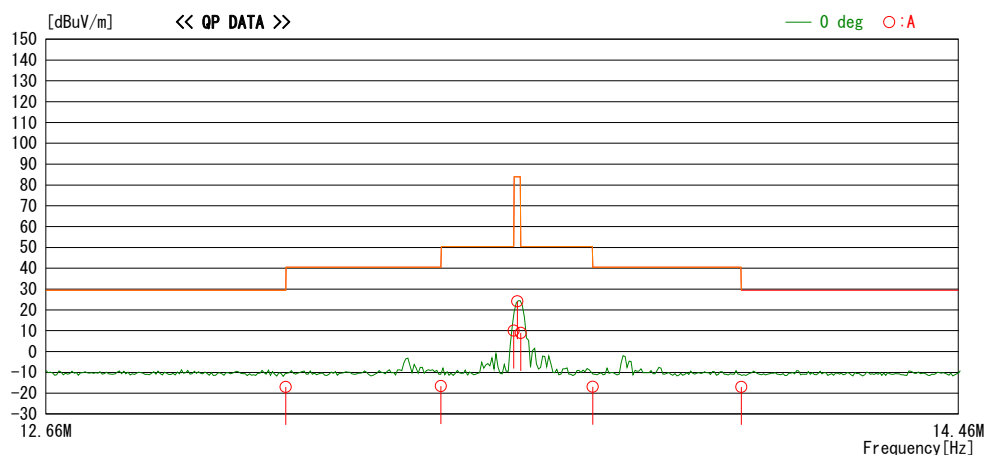
QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]		[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	70.6	19.2	6.7	32.3	-	64.2	-	-	Fundamental

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

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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	29.3	QP	19.3	-33.3	32.3	-17.0	29.5	46.5	0	A	27
13.41000	29.7	QP	19.3	-33.3	32.3	-16.6	40.5	57.1	0	A	27
13.55300	56.4	QP	19.2	-33.3	32.3	10.0	50.4	40.4	0	A	27
13.56000	70.5	QP	19.2	-33.3	32.3	24.1	83.9	59.8	0	A	27
13.56700	55.3	QP	19.2	-33.3	32.3	8.9	50.4	41.5	0	A	27
13.71000	29.5	QP	19.2	-33.3	32.3	-16.9	40.5	57.4	0	A	27
14.01000	29.4	QP	19.2	-33.3	32.3	-17.0	29.5	46.5	0	A	27

Result of the fundamental emission at 3 m without Distance factor

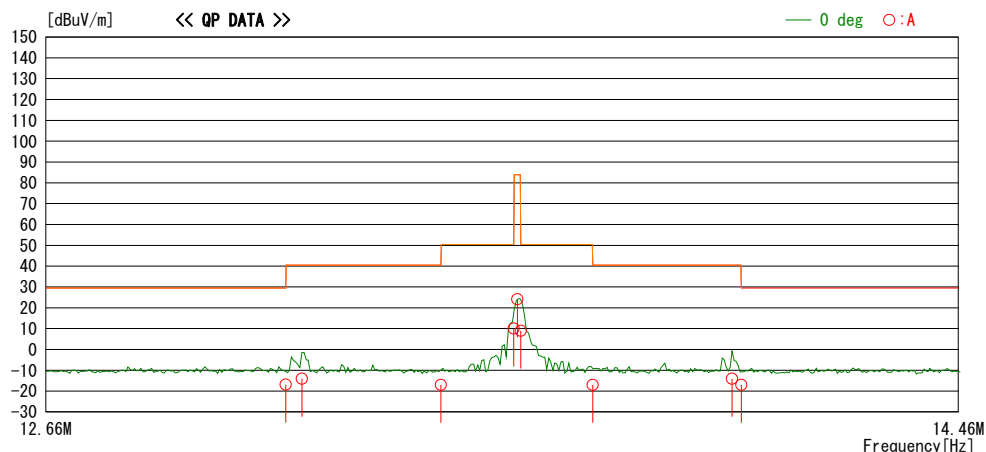
QP

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	70.5	19.2	6.7	32.3	-	64.1	-	-	- Fundamental

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

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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	29.4	QP	19.3	-33.3	32.3	-16.9	29.5	46.4	0	A	36
13.14120	32.2	QP	19.3	-33.3	32.3	-14.1	40.5	54.6	0	A	36
13.41000	29.3	QP	19.3	-33.3	32.3	-17.0	40.5	57.5	0	A	36
13.55300	56.4	QP	19.2	-33.3	32.3	10.0	50.4	40.4	0	A	36
13.56000	70.5	QP	19.2	-33.3	32.3	24.1	83.9	59.8	0	A	36
13.56700	55.4	QP	19.2	-33.3	32.3	9.0	50.4	41.4	0	A	36
13.71000	29.4	QP	19.2	-33.3	32.3	-17.0	40.5	57.5	0	A	36
13.99096	32.3	QP	19.2	-33.3	32.3	-14.1	40.5	54.6	0	A	36
14.01000	29.4	QP	19.2	-33.3	32.3	-17.0	29.5	46.5	0	A	36

Result of the fundamental emission at 3 m without Distance factor

QP

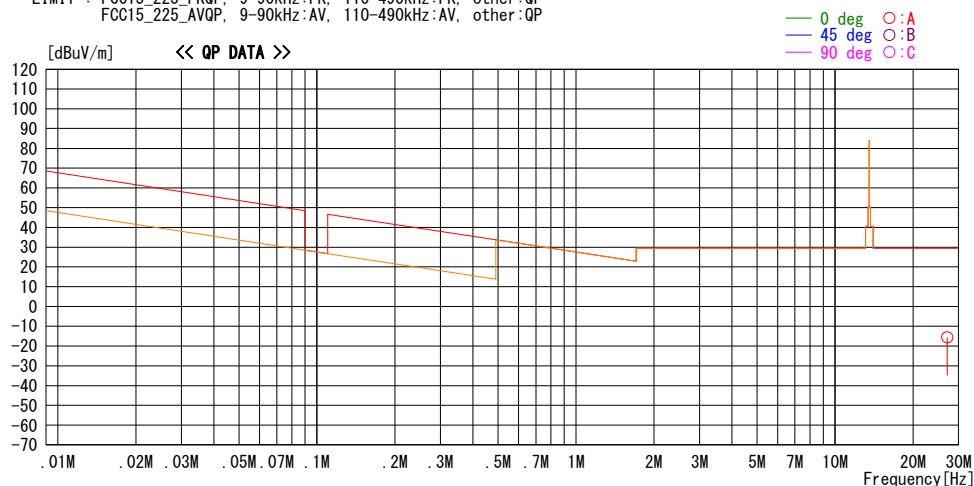
Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	70.5	19.2	6.7	32.3	-	64.1	-	-	Fundamental

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

8.3. SPURIOUS EMISSIONS (0.009 - 30 MHz)

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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]	
27.12000	29.6	QP	20.1	-33.1	32.3	-15.7	29.5	45.2	0	A	351

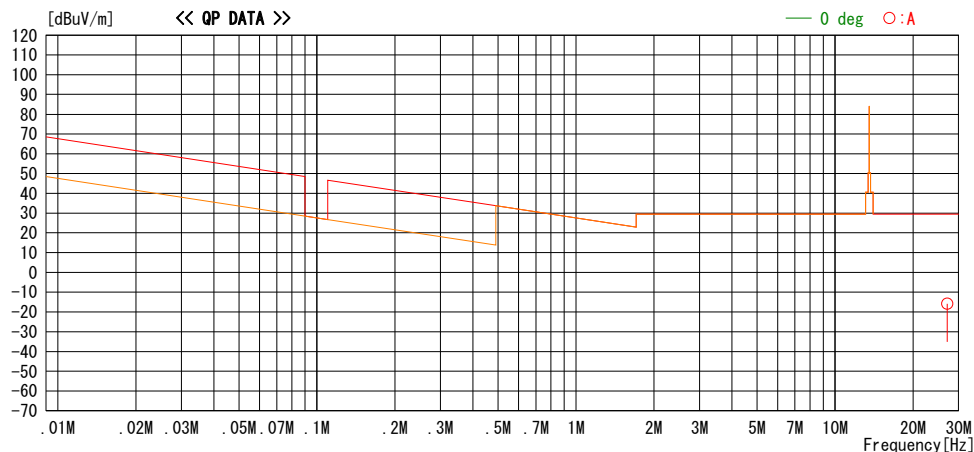
CHART: WITH FACTOR

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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



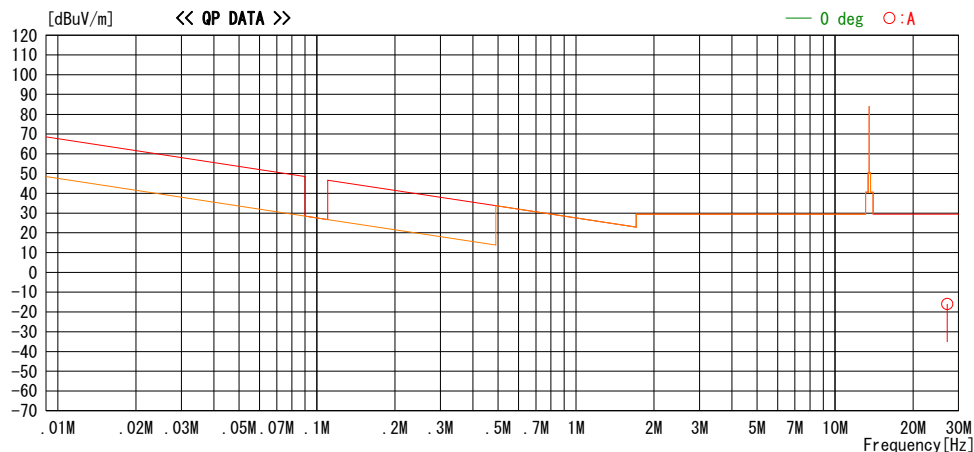
Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.4	QP	20.1	-33.1	32.3	-15.9	29.5	45.4	0	A	355

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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



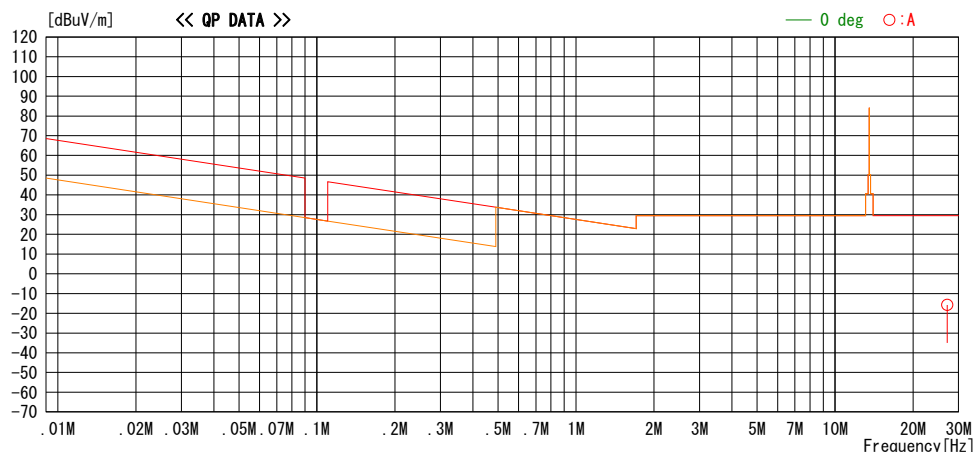
Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.3	QP	20.1	-33.1	32.3	-16.0	29.5	45.5	0	A	359

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25(Day), 2019
Temperature / Humidity 24 deg. C / 32 % RH
Engineer Ken Fujita
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	29.5	QP	20.1	-33.1	32.3	-15.8	29.5	45.3	0	A	359

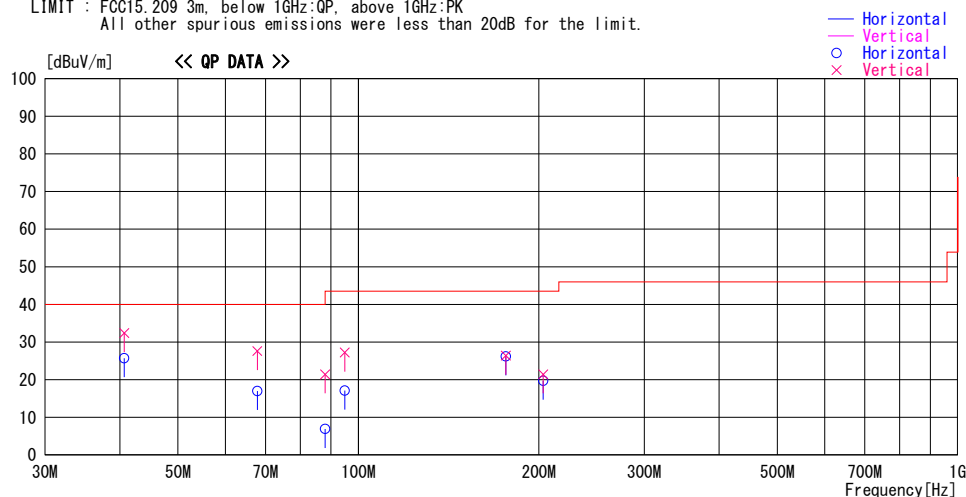
CHART: WITH FACTOR

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
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 Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	36.0	QP	14.6	-24.9	25.7	207	400	Hori.	40.0	14.3	
40.680	42.7	QP	14.6	-24.9	32.4	115	100	Vert.	40.0	7.6	
67.800	34.9	QP	6.5	-24.4	17.0	221	250	Hori.	40.0	23.0	
67.800	45.5	QP	6.5	-24.4	27.6	125	100	Vert.	40.0	12.4	
88.000	23.0	QP	8.1	-24.2	6.9	0	400	Hori.	40.0	33.1	
88.000	37.5	QP	8.1	-24.2	21.4	186	100	Vert.	40.0	18.6	
94.920	31.9	QP	9.3	-24.1	17.1	21	144	Hori.	43.5	26.4	
94.920	42.0	QP	9.3	-24.1	27.2	123	100	Vert.	43.5	16.3	
176.280	32.9	QP	16.4	-23.1	26.2	359	400	Hori.	43.5	17.3	
176.280	33.1	QP	16.4	-23.1	26.4	116	100	Vert.	43.5	17.1	
203.400	30.9	QP	11.5	-22.7	19.7	107	157	Hori.	43.5	23.8	
203.400	32.6	QP	11.5	-22.7	21.4	117	219	Vert.	43.5	22.1	

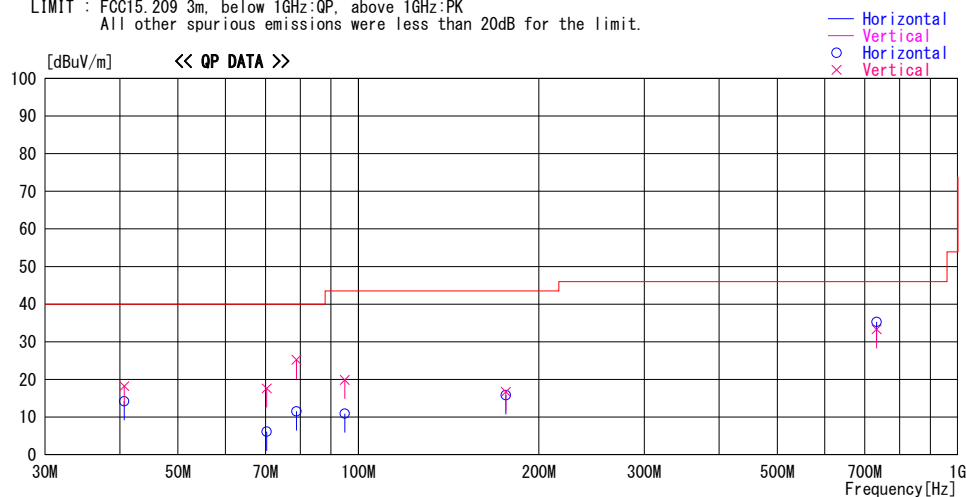
CHART: WITH FACTOR

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))

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 3

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



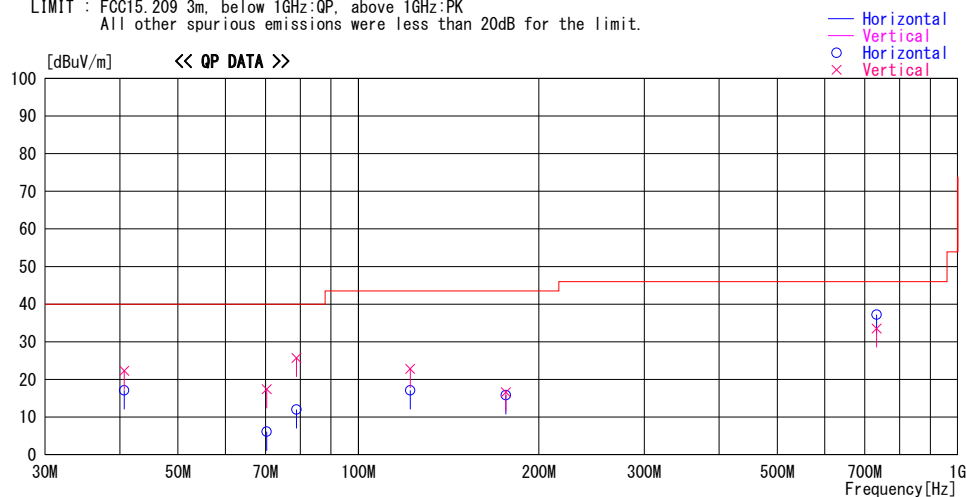
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
40.680	24.5	QP	14.6	-24.9	14.2	209	400	Hori.	40.0	25.8	
40.680	28.5	QP	14.6	-24.9	18.2	118	100	Vert.	40.0	21.8	
70.296	24.1	QP	6.4	-24.4	6.1	281	400	Hori.	40.0	33.9	
70.296	35.6	QP	6.4	-24.4	17.6	359	100	Vert.	40.0	22.4	
78.856	29.0	QP	6.8	-24.3	11.5	302	207	Hori.	40.0	28.5	
78.856	42.7	QP	6.8	-24.3	25.2	215	100	Vert.	40.0	14.8	
94.920	25.7	QP	9.3	-24.1	10.9	25	144	Hori.	43.5	32.6	
94.920	34.7	QP	9.3	-24.1	19.9	121	100	Vert.	43.5	23.6	
176.280	22.5	QP	16.4	-23.1	15.8	359	400	Hori.	43.5	27.7	
176.280	23.4	QP	16.4	-23.1	16.7	116	100	Vert.	43.5	26.8	
732.240	33.9	QP	20.3	-18.9	35.3	217	100	Hori.	46.0	10.7	
732.240	31.9	QP	20.3	-18.9	33.3	178	121	Vert.	46.0	12.7	

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 5

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



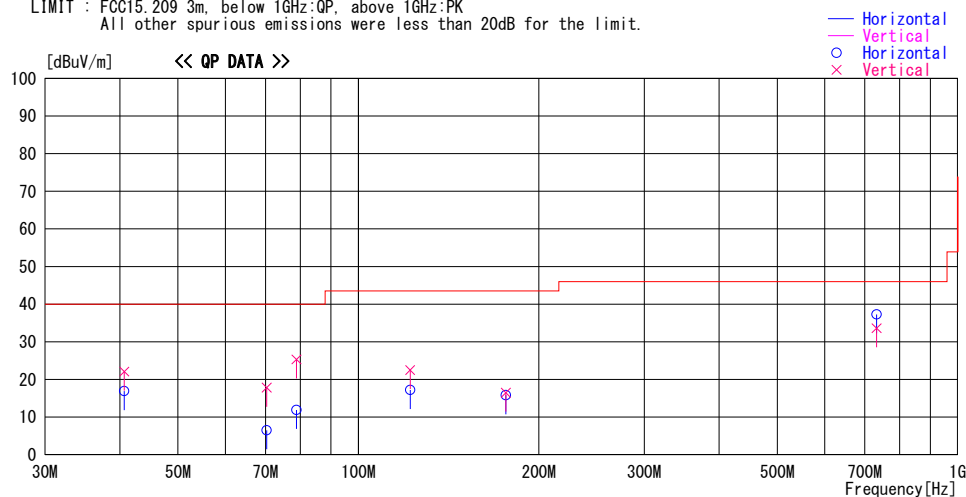
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
40.680	27.4	QP	14.6	-24.9	17.1	210	400	Hori.	40.0	22.9	
40.680	32.6	QP	14.6	-24.9	22.3	117	100	Vert.	40.0	17.7	
70.304	24.1	QP	6.4	-24.4	6.1	280	400	Hori.	40.0	33.9	
70.304	35.4	QP	6.4	-24.4	17.4	359	100	Vert.	40.0	22.6	
78.857	29.5	QP	6.8	-24.3	12.0	300	207	Hori.	40.0	28.0	
78.857	43.2	QP	6.8	-24.3	25.7	220	100	Vert.	40.0	14.3	
122.040	27.5	QP	13.2	-23.6	17.1	209	146	Hori.	43.5	26.4	
122.040	33.2	QP	13.2	-23.6	22.8	131	100	Vert.	43.5	20.7	
176.280	22.5	QP	16.4	-23.1	15.8	359	400	Hori.	43.5	27.7	
176.280	23.3	QP	16.4	-23.1	16.6	118	100	Vert.	43.5	26.9	
732.240	35.8	QP	20.3	-18.9	37.2	150	100	Hori.	46.0	8.8	
732.240	32.1	QP	20.3	-18.9	33.5	322	100	Vert.	46.0	12.5	

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
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 [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
40.680	27.2	QP	14.6	-24.9	16.9	209	400	Hori.	40.0	23.1	
40.680	32.4	QP	14.6	-24.9	22.1	114	100	Vert.	40.0	17.9	
70.311	24.5	QP	6.4	-24.4	6.5	279	400	Hori.	40.0	33.5	
70.311	35.8	QP	6.4	-24.4	17.8	0	100	Vert.	40.0	22.2	
78.855	29.4	QP	6.8	-24.3	11.9	289	209	Hori.	40.0	28.1	
78.855	42.8	QP	6.8	-24.3	25.3	222	100	Vert.	40.0	14.7	
122.040	27.6	QP	13.2	-23.6	17.2	208	145	Hori.	43.5	26.3	
122.040	32.9	QP	13.2	-23.6	22.5	130	100	Vert.	43.5	21.0	
176.280	22.5	QP	16.4	-23.1	15.8	0	400	Hori.	43.5	27.7	
176.280	23.2	QP	16.4	-23.1	16.5	0	100	Vert.	43.5	27.0	
732.240	35.9	QP	20.3	-18.9	37.3	150	100	Hori.	46.0	8.7	
732.240	32.2	QP	20.3	-18.9	33.6	321	100	Vert.	46.0	12.4	

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 + 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.

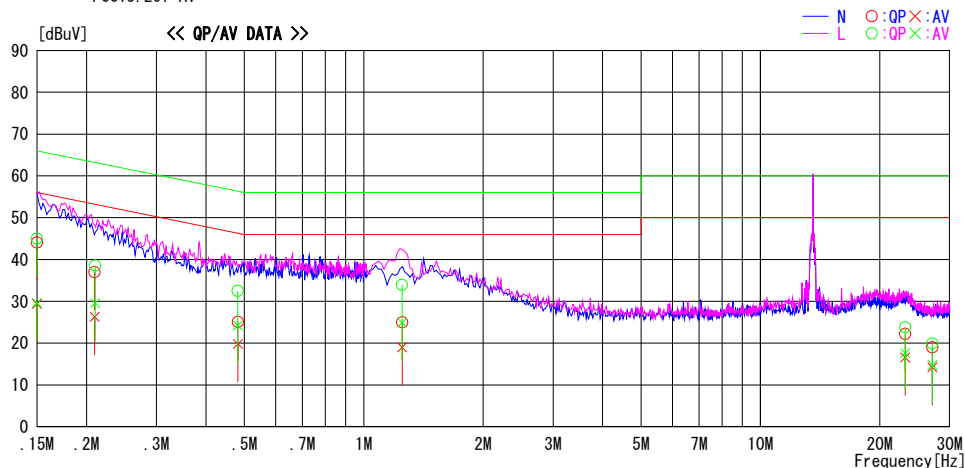
TEST PROCEDURE

ANSI C63.10-2013

RESULTS

Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 1

LIMIT : FCC15.207 QP
FCC15.207 AV

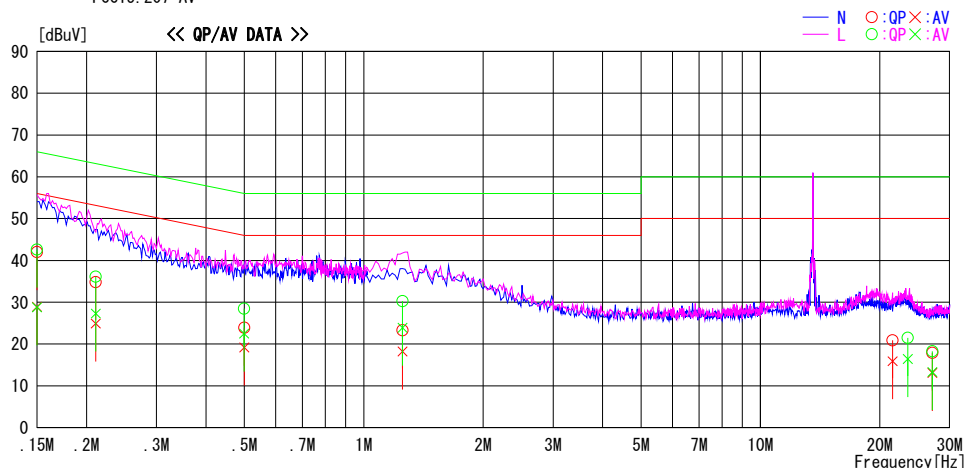


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	30.8	16.1	13.3	44.1	29.4	66.0	56.0	21.9	26.6	N	
0.15000	31.7	16.3	13.3	45.0	29.6	66.0	56.0	21.0	26.4	L	
0.20966	23.7	13.0	13.3	37.0	26.3	63.2	53.2	26.2	26.9	N	
0.21030	25.3	16.3	13.3	38.6	29.6	63.2	53.2	24.6	23.6	L	
0.48120	19.2	10.9	13.3	32.5	24.2	56.3	46.3	23.8	22.1	L	
0.48158	11.8	6.5	13.3	25.1	19.8	56.3	46.3	31.2	26.5	N	
1.24814	20.5	11.5	13.4	33.9	24.9	56.0	46.0	22.1	21.1	L	
1.24956	11.6	5.6	13.4	25.0	19.0	56.0	46.0	31.0	27.0	N	
23.17318	7.7	2.1	14.5	22.2	16.6	60.0	50.0	37.8	33.4	N	
23.17518	9.3	3.1	14.5	23.8	17.6	60.0	50.0	36.2	32.4	L	
27.12000	4.4	-0.4	14.6	19.0	14.2	60.0	50.0	41.0	35.8	N	
27.12000	5.3	0.2	14.6	19.9	14.8	60.0	50.0	40.1	35.2	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 2

LIMIT : FCC15. 207 QP
FCC15. 207 AV

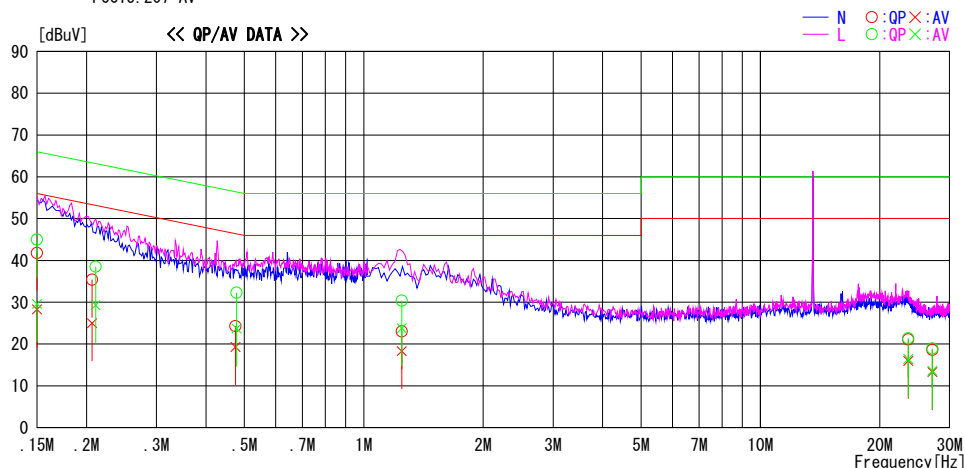


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	28.7	15.6	13.3	42.0	28.9	66.0	56.0	24.0	27.1	N	
0.21086	21.5	11.6	13.3	34.8	24.9	63.2	53.2	28.4	28.3	N	
0.49992	10.6	5.9	13.3	23.9	19.2	56.0	46.0	32.1	26.8	N	
1.25183	9.9	4.8	13.4	23.3	18.2	56.0	46.0	32.7	27.8	N	
21.51973	6.5	1.5	14.4	20.9	15.9	60.0	50.0	39.1	34.1	N	
27.12000	3.3	-1.5	14.6	17.9	13.1	60.0	50.0	42.1	36.9	N	
0.15000	29.3	15.5	13.3	42.6	28.8	66.0	56.0	23.4	27.2	L	
0.21100	22.8	14.0	13.3	36.1	27.3	63.2	53.2	27.1	25.9	L	
0.49920	15.2	9.2	13.3	28.5	22.5	56.0	46.0	27.5	23.5	L	
1.25212	16.9	10.5	13.4	30.3	23.9	56.0	46.0	25.7	22.1	L	
23.51987	7.0	1.9	14.5	21.5	16.4	60.0	50.0	38.5	33.6	L	
27.12000	3.7	-1.3	14.6	18.3	13.3	60.0	50.0	41.7	36.7	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 3

LIMIT : FCC15. 207 QP
FCC15. 207 AV

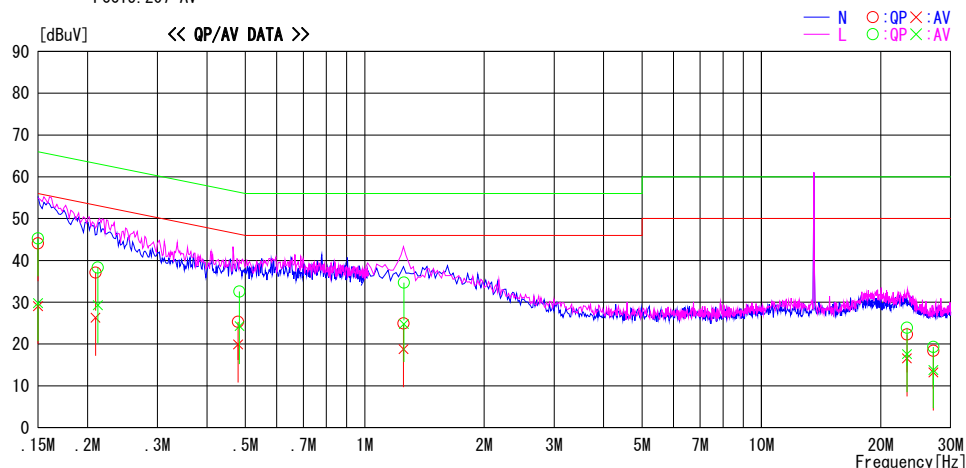


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	28.5	15.0	13.3	41.8	28.3	66.0	56.0	24.2	27.7	N	
0.20645	22.1	11.7	13.3	35.4	25.0	63.3	53.3	27.9	28.3	N	
0.47486	11.0	6.0	13.3	24.3	19.3	56.4	46.4	32.1	27.1	N	
1.24606	9.6	4.9	13.4	23.0	18.3	56.0	46.0	33.0	27.7	N	
23.58664	6.6	1.5	14.5	21.1	16.0	60.0	50.0	38.9	34.0	N	
27.12000	4.0	-1.3	14.6	18.6	13.3	60.0	50.0	41.4	36.7	N	
0.15000	31.7	16.3	13.3	45.0	29.6	66.0	56.0	21.0	26.4	L	
0.21076	25.2	16.0	13.3	38.5	29.3	63.2	53.2	24.7	23.9	L	
0.47806	19.0	10.4	13.3	32.3	23.7	56.4	46.4	24.1	22.7	L	
1.24670	17.0	10.4	13.4	30.4	23.8	56.0	46.0	25.6	22.2	L	
23.58600	6.9	1.9	14.5	21.4	16.4	60.0	50.0	38.6	33.6	L	
27.12000	4.3	-1.0	14.6	18.9	13.6	60.0	50.0	41.1	36.4	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 4

LIMIT : FCC15. 207 QP
FCC15. 207 AV

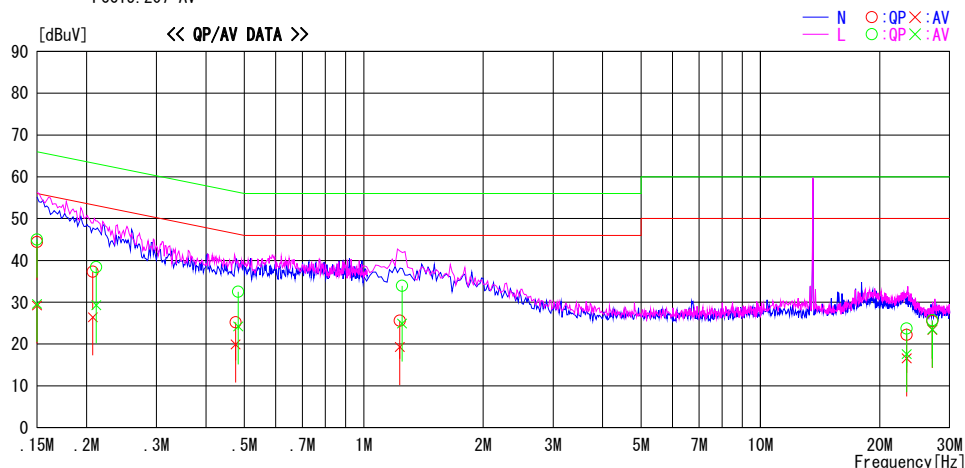


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	30.8	15.8	13.3	44.1	29.1	66.0	56.0	21.9	26.9	N	
0.20940	23.8	13.0	13.3	37.1	26.3	63.2	53.2	26.1	26.9	N	
0.47889	12.0	6.6	13.3	25.3	19.9	56.4	46.4	31.1	26.5	N	
1.25222	11.5	5.4	13.4	24.9	18.8	56.0	46.0	31.1	27.2	N	
23.26416	7.8	2.1	14.5	22.3	16.6	60.0	50.0	37.7	33.4	N	
27.12000	3.8	-1.4	14.6	18.4	13.2	60.0	50.0	41.6	36.8	N	
0.15000	32.0	16.5	13.3	45.3	29.8	66.0	56.0	20.7	26.2	L	
0.21230	25.0	16.0	13.3	38.3	29.3	63.1	53.1	24.8	23.8	L	
0.48337	19.3	11.0	13.3	32.6	24.3	56.3	46.3	23.7	22.0	L	
1.25464	21.3	11.4	13.4	34.7	24.8	56.0	46.0	21.3	21.2	L	
23.26936	9.4	3.1	14.5	23.9	17.6	60.0	50.0	36.1	32.4	L	
27.12000	4.7	-0.8	14.6	19.3	13.8	60.0	50.0	40.7	36.2	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 5

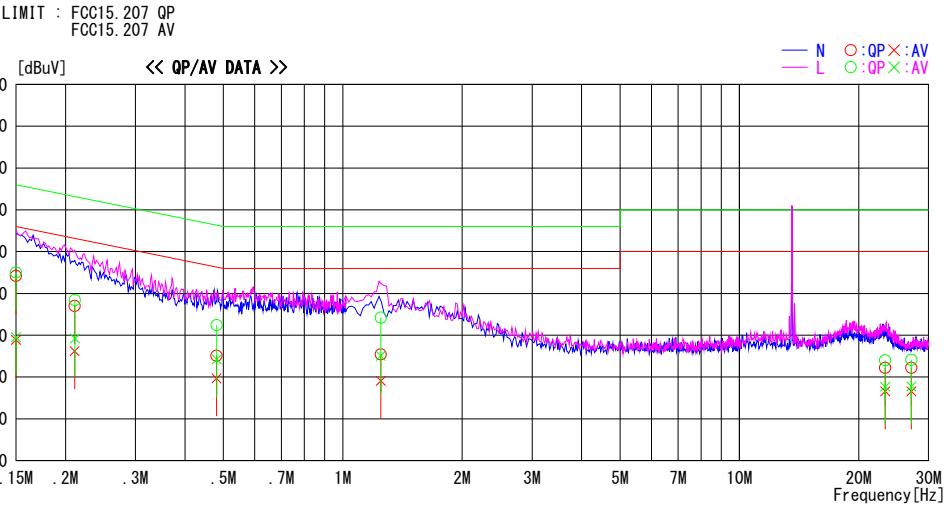
LIMIT : FCC15.207 QP
FCC15.207 AV



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]		
0.15000	31.1	15.9	13.3	44.4	29.2	66.0	56.0	21.6	26.8	N	
0.20744	24.0	13.1	13.3	37.3	26.4	63.3	53.3	26.0	26.9	N	
0.47516	11.9	6.6	13.3	25.2	19.9	56.4	46.4	31.2	26.5	N	
1.23219	12.2	5.9	13.4	25.6	19.3	56.0	46.0	30.4	26.7	N	
23.36128	7.7	2.1	14.5	22.2	16.6	60.0	50.0	37.8	33.4	N	
27.12000	10.9	8.8	14.6	25.5	23.4	60.0	50.0	34.5	26.6	N	
0.15000	31.7	16.3	13.3	45.0	29.6	66.0	56.0	21.0	26.4	L	
0.21166	25.1	16.0	13.3	38.4	29.3	63.1	53.1	24.7	23.8	L	
0.48206	19.2	10.9	13.3	32.5	24.2	56.3	46.3	23.8	22.1	L	
1.24849	20.5	11.5	13.4	33.9	24.9	56.0	46.0	22.1	21.1	L	
23.36638	9.2	3.1	14.5	23.7	17.6	60.0	50.0	36.3	32.4	L	
27.12000	11.1	8.9	14.6	25.7	23.5	60.0	50.0	34.3	26.5	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.

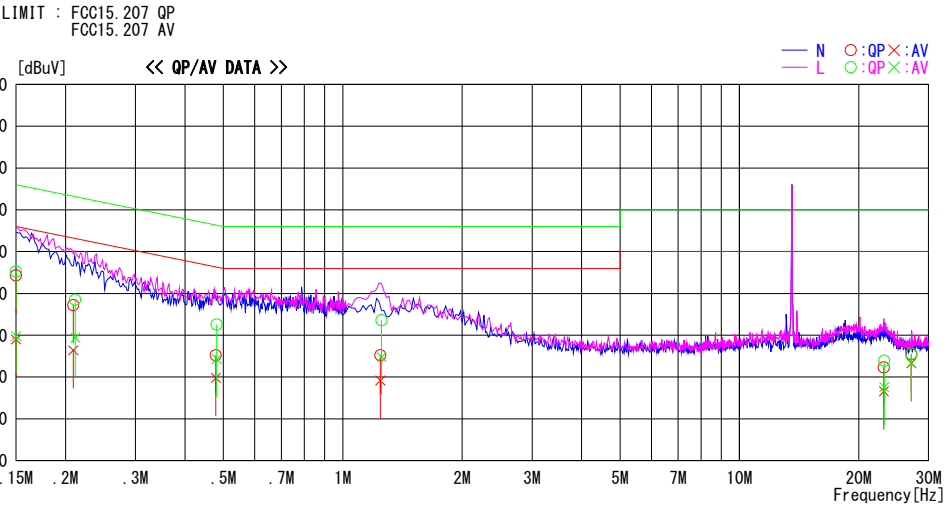
Report No. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 6



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	30.9	15.6	13.3	44.2	28.9	66.0	56.0	21.8	27.1	N	
0.21083	23.7	12.9	13.3	37.0	26.2	63.2	53.2	26.2	27.0	N	
0.48046	11.8	6.4	13.3	25.1	19.7	56.3	46.3	31.2	26.6	N	
1.24712	12.0	5.7	13.4	25.4	19.1	56.0	46.0	30.6	26.9	N	
23.31306	7.7	2.1	14.5	22.2	16.6	60.0	50.0	37.8	33.4	N	
27.12000	7.6	2.0	14.6	22.2	16.6	60.0	50.0	37.8	33.4	N	
0.15000	31.7	16.2	13.3	45.0	29.5	66.0	56.0	21.0	26.5	L	
0.21122	25.1	15.9	13.3	38.4	29.2	63.2	53.2	24.8	24.0	L	
0.48112	19.1	10.9	13.3	32.4	24.2	56.3	46.3	23.9	22.1	L	
1.24646	20.8	11.7	13.4	34.2	25.1	56.0	46.0	21.8	20.9	L	
23.31372	9.5	3.2	14.5	24.0	17.7	60.0	50.0	36.0	32.3	L	
27.12000	9.5	3.2	14.6	24.1	17.8	60.0	50.0	35.9	32.2	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 7

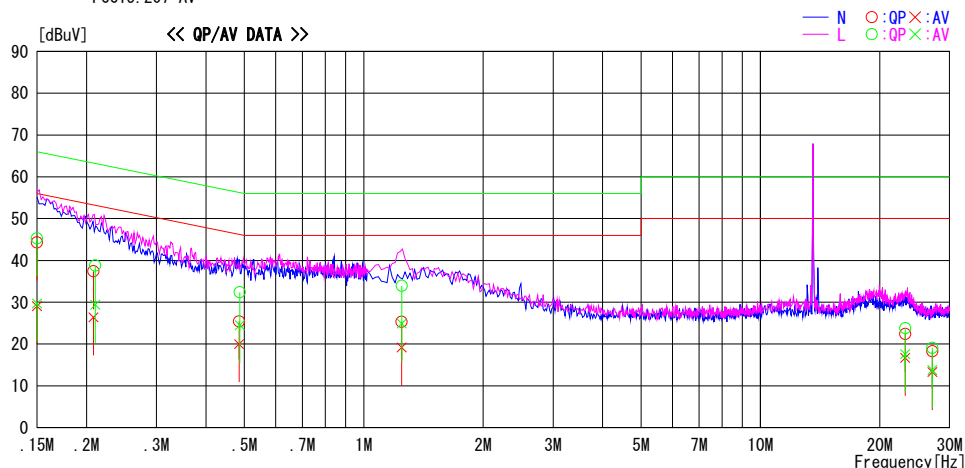


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP	AV		QP	AV	QP	AV	QP	AV		
	[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0. 15000	31.0	15.7	13.3	44.3	29.0	66.0	56.0	21.7	27.0	N	
0. 20922	23.9	13.1	13.3	37.2	26.4	63.2	53.2	26.0	26.8	N	
0. 47866	11.9	6.5	13.3	25.2	19.8	56.4	46.4	31.2	26.6	N	
1. 24367	11.8	5.8	13.4	25.2	19.2	56.0	46.0	30.8	26.8	N	
23. 14004	7.8	2.1	14.5	22.3	16.6	60.0	50.0	37.7	33.4	N	
27. 12000	10.8	8.7	14.6	25.4	23.3	60.0	50.0	34.6	26.7	N	
0. 15000	31.9	16.5	13.3	45.2	29.8	66.0	56.0	20.8	26.2	L	
0. 21166	25.2	16.1	13.3	38.5	29.4	63.1	53.1	24.6	23.7	L	
0. 48084	19.3	11.0	13.3	32.6	24.3	56.3	46.3	23.7	22.0	L	
1. 25167	20.2	11.4	13.4	33.6	24.8	56.0	46.0	22.4	21.2	L	
23. 17424	9.4	3.1	14.5	23.9	17.6	60.0	50.0	36.1	32.4	L	
27. 12000	11.0	8.8	14.6	25.6	23.4	60.0	50.0	34.4	26.6	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 8

LIMIT : FCC15. 207 QP
FCC15. 207 AV

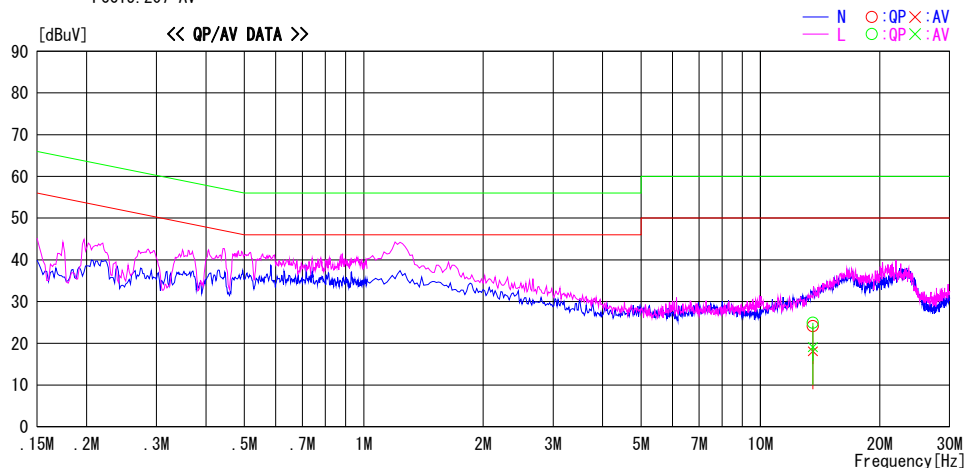


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	31.0	15.8	13.3	44.3	29.1	66.0	56.0	21.7	26.9	N	
0.20818	24.1	13.1	13.3	37.4	26.4	63.3	53.3	25.9	26.9	N	
0.48446	12.1	6.7	13.3	25.4	20.0	56.3	46.3	30.9	26.3	N	
1.24495	11.9	5.8	13.4	25.3	19.2	56.0	46.0	30.7	26.8	N	
23.17457	7.9	2.2	14.5	22.4	16.7	60.0	50.0	37.6	33.3	N	
27.12000	3.7	-1.3	14.6	18.3	13.3	60.0	50.0	41.7	36.7	N	
0.15000	32.0	16.4	13.3	45.3	29.7	66.0	56.0	20.7	26.3	L	
0.21036	25.5	16.1	13.3	38.8	29.4	63.2	53.2	24.4	23.8	L	
0.48688	19.1	11.2	13.3	32.4	24.5	56.2	46.2	23.8	21.7	L	
1.24638	20.5	11.5	13.4	33.9	24.9	56.0	46.0	22.1	21.1	L	
23.17428	9.3	3.1	14.5	23.8	17.6	60.0	50.0	36.2	32.4	L	
27.12000	4.5	-0.8	14.6	19.1	13.8	60.0	50.0	40.9	36.2	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 9

LIMIT : FCC15.207 QP
FCC15.207 AV

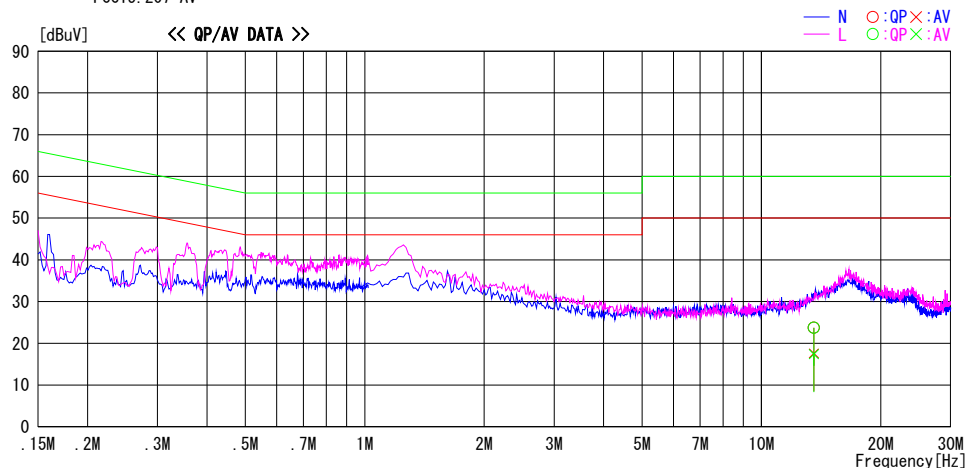


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	10.0	4.0	14.1	24.1	18.1	60.0	50.0	35.9	31.9	N	
13.56000	10.8	5.0	14.1	24.9	19.1	60.0	50.0	35.1	30.9	L	

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 10

LIMIT : FCC15.207 QP
FCC15.207 AV

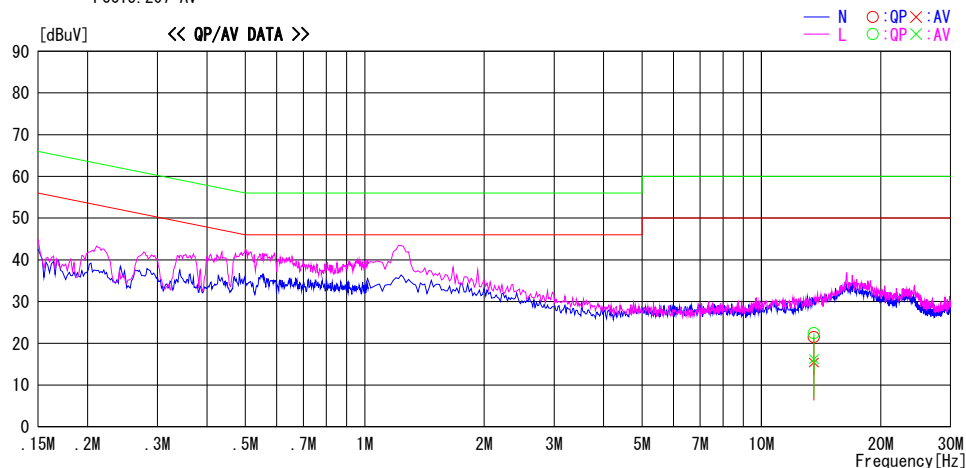


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	9.6	3.5	14.1	23.7	17.6	60.0	50.0	36.3	32.4	N	
13.56000	9.6	3.3	14.1	23.7	17.4	60.0	50.0	36.3	32.6	L	

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 11

LIMIT : FCC15.207 QP
FCC15.207 AV

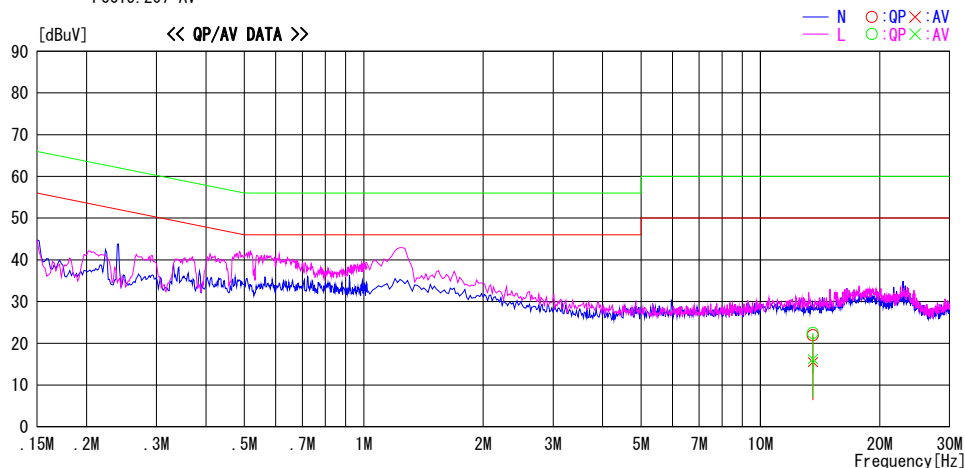


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	7.4	1.3	14.1	21.5	15.4	60.0	50.0	38.5	34.6	N	
13.56000	8.3	2.1	14.1	22.4	16.2	60.0	50.0	37.6	33.8	L	

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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 25, 2019
Temperature / Humidity 24 deg. C / 30 % RH
Engineer Takafumi Noguchi
Mode Mode 12

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	7.8	1.4	14.1	21.9	15.5	60.0	50.0	38.1	34.5	N	
13.56000	8.4	2.1	14.1	22.5	16.2	60.0	50.0	37.5	33.8	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. 12715065H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.6
Date March 26(Day), 2019
Temperature / Humidity 23 deg. C / 33 % RH
Engineer Ken Fujita
Mode Tx 13.56 MHz

Test condition Temp. [deg. C]	Voltage [V]	Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
					[%]	[ppm]	
50	120	Power on	13.559820	-0.000180	-0.00133	-13.3	0.01
		+ 2 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
		+ 5 min.	13.559813	-0.000187	-0.00138	-13.8	0.01
		+ 10 min.	13.559811	-0.000189	-0.00139	-13.9	0.01
40	120	Power on	13.559843	-0.000157	-0.00116	-11.6	0.01
		+ 2 min.	13.559836	-0.000164	-0.00121	-12.1	0.01
		+ 5 min.	13.559830	-0.000170	-0.00125	-12.5	0.01
		+ 10 min.	13.559825	-0.000175	-0.00129	-12.9	0.01
30	120	Power on	13.559863	-0.000137	-0.00101	-10.1	0.01
		+ 2 min.	13.559858	-0.000142	-0.00105	-10.5	0.01
		+ 5 min.	13.559853	-0.000147	-0.00108	-10.8	0.01
		+ 10 min.	13.559847	-0.000153	-0.00113	-11.3	0.01
20	120	Power on	13.559860	-0.000140	-0.00103	-10.3	0.01
		+ 2 min.	13.559860	-0.000140	-0.00103	-10.3	0.01
		+ 5 min.	13.559863	-0.000137	-0.00101	-10.1	0.01
		+ 10 min.	13.559865	-0.000135	-0.00100	-10.0	0.01
20	102 (120V -15%)	Power on	13.559877	-0.000123	-0.00091	-9.1	0.01
		+ 2 min.	13.559854	-0.000146	-0.00108	-10.8	0.01
		+ 5 min.	13.559842	-0.000158	-0.00117	-11.7	0.01
		+ 10 min.	13.559861	-0.000139	-0.00103	-10.3	0.01
20	138 (120V +15%)	Power on	13.559858	-0.000142	-0.00105	-10.5	0.01
		+ 2 min.	13.559859	-0.000141	-0.00104	-10.4	0.01
		+ 5 min.	13.559857	-0.000143	-0.00105	-10.5	0.01
		+ 10 min.	13.559848	-0.000152	-0.00112	-11.2	0.01
10	120	Power on	13.559832	-0.000168	-0.00124	-12.4	0.01
		+ 2 min.	13.559844	-0.000156	-0.00115	-11.5	0.01
		+ 5 min.	13.559863	-0.000137	-0.00101	-10.1	0.01
		+ 10 min.	13.559876	-0.000124	-0.00091	-9.1	0.01
0	120	Power on	13.559906	-0.000094	-0.00069	-6.9	0.01
		+ 2 min.	13.559905	-0.000095	-0.00070	-7.0	0.01
		+ 5 min.	13.559906	-0.000094	-0.00069	-6.9	0.01
		+ 10 min.	13.559906	-0.000094	-0.00069	-6.9	0.01
-10	120	Power on	13.559907	-0.000093	-0.00069	-6.9	0.01
		+ 2 min.	13.559907	-0.000093	-0.00069	-6.9	0.01
		+ 5 min.	13.559907	-0.000093	-0.00069	-6.9	0.01
		+ 10 min.	13.559905	-0.000095	-0.00070	-7.0	0.01
-20	120	Power on	13.559902	-0.000098	-0.00072	-7.2	0.01
		+ 2 min.	13.559900	-0.000100	-0.00074	-7.4	0.01
		+ 5 min.	13.559894	-0.000106	-0.00078	-7.8	0.01
		+ 10 min.	13.559888	-0.000112	-0.00083	-8.3	0.01
-30	120	Power on	13.559872	-0.000128	-0.00094	-9.4	0.01
		+ 2 min.	13.559862	-0.000138	-0.00102	-10.2	0.01
		+ 5 min.	13.559852	-0.000148	-0.00109	-10.9	0.01
		+ 10 min.	13.559840	-0.000160	-0.00118	-11.8	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.	12715065H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.6
Date	March 26(Day), 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Ken Fujita
Mode	Tx 13.56 MHz (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	13.559891	-0.000109	-0.00080	-8.0	0.01
		+ 2 min.	13.559892	-0.000108	-0.00079	-7.9	0.01
		+ 5 min.	13.559893	-0.000107	-0.00079	-7.9	0.01
		+ 10 min.	13.559893	-0.000107	-0.00079	-7.9	0.01
20	9.18 (10.8V -15%)	Power on	13.559896	-0.000104	-0.00077	-7.7	0.01
		+ 2 min.	13.559911	-0.000089	-0.00065	-6.5	0.01
		+ 5 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 10 min.	13.559922	-0.000078	-0.00057	-5.7	0.01
20	12.42 (10.8V +15%)	Power on	13.559890	-0.000110	-0.00081	-8.1	0.01
		+ 2 min.	13.559899	-0.000101	-0.00074	-7.4	0.01
		+ 5 min.	13.559901	-0.000099	-0.00073	-7.3	0.01
		+ 10 min.	13.559914	-0.000086	-0.00063	-6.3	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: 20 kHz, VBW: 62 kHz.

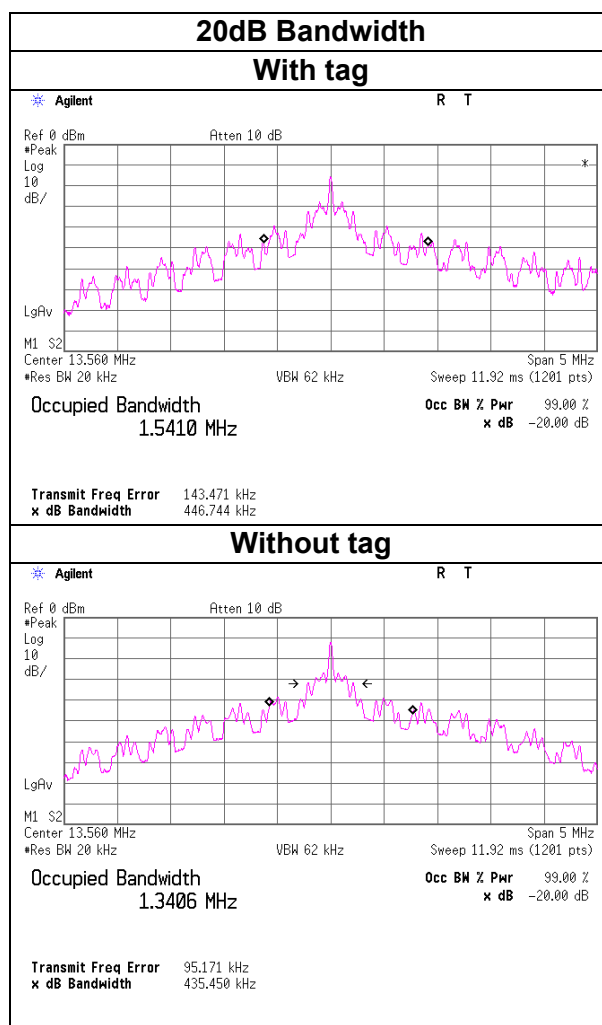
The sweep time is coupled. The spectrum analyzer internal 20dB bandwidth and 99 % Occupied Bandwidth function is utilized.

RESULTS

Frequency (MHz)	20dB Bandwidth (KHz)
13.56, Type A with Tag	446.744
13.56, Type A without Tag	435.450
13.56, Type B with Tag	108.323
13.56, Type B without Tag	101.224
13.56, FeliCa (212 kbps) with Tag	107.845
13.56, FeliCa (212 kbps) without Tag	102.804
13.56, FeliCa (424 kbps) with Tag	855.448
13.56, FeliCa (424 kbps) without Tag	97.600

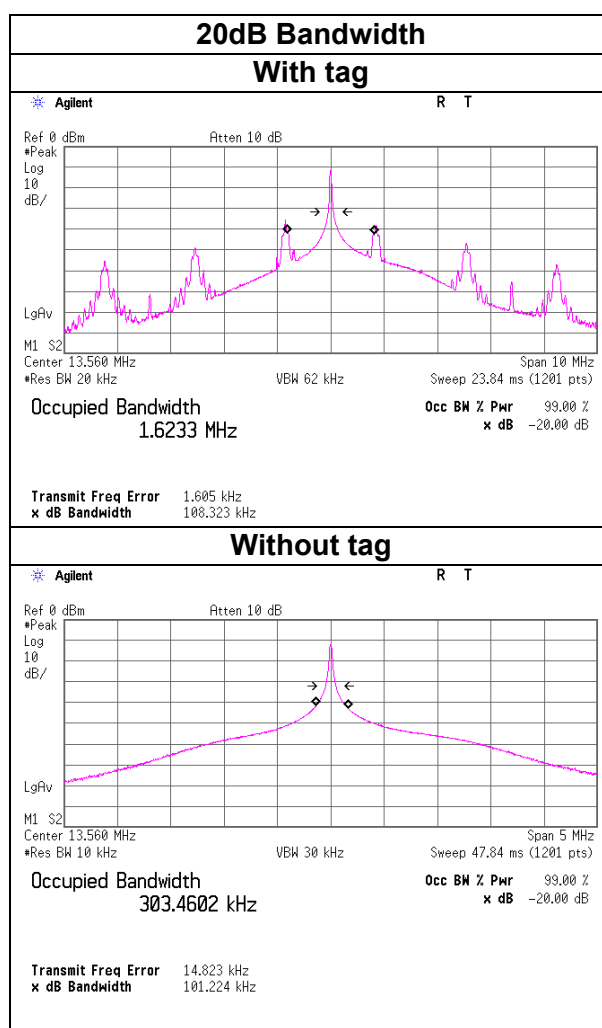
Report No.	12715065H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.6
Date	March 26(Day), 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Ken Fujita
Mode	Mode 1 , 2

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	446.744	1541.0000
	Without Tag	435.450	1340.6000



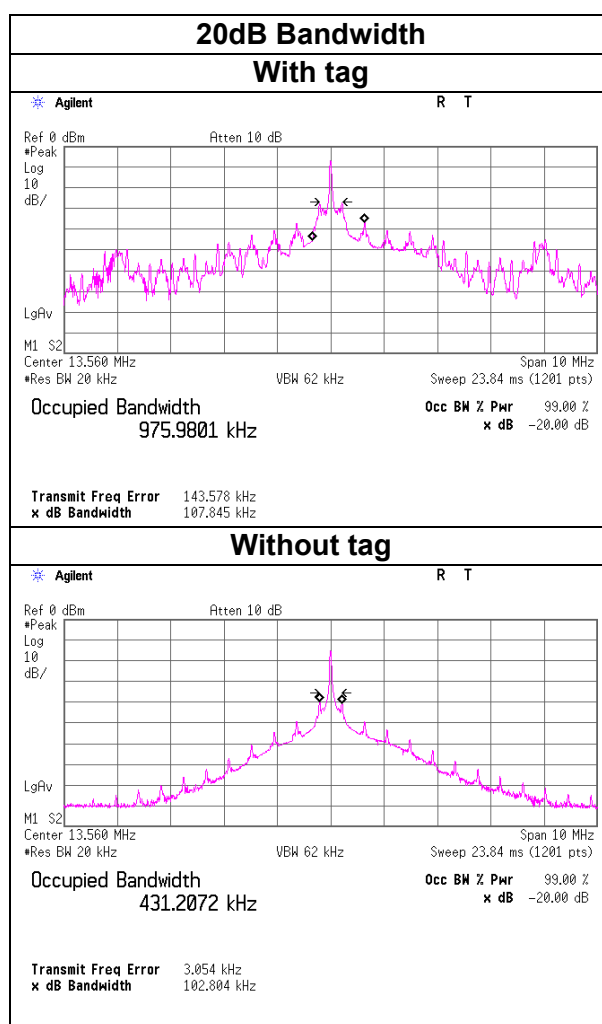
Report No.	12715065H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.6
Date	March 26(Day), 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Ken Fujita
Mode	Mode 3 , 4

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	108.323	1623.3000
	Without Tag	101.224	303.4602



Report No.	12715065H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.6
Date	March 26(Day), 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Ken Fujita
Mode	Mode 5 , 6

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	107.845	975.9801
	Without Tag	102.804	431.2072



Report No.	12715065H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.6
Date	March 26(Day), 2019
Temperature / Humidity	23 deg. C / 33 % RH
Engineer	Ken Fujita
Mode	Mode 7 , 8

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	855.448	1102.8000
	Without Tag	97.600	827.9877

