



# EMI TEST REPORT

Test Report No. : 12478809H-A-R2

**Applicant** : Mitsubishi Electric Corporation Kyoto Works  
**Type of Equipment** : Digital Color Printer  
**Model No.** : CP-M1E  
**Test regulation** : FCC Part 15 Subpart C: 2018  
**FCC ID** : 2APT9KSPCP-M1  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
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8. This report is a revised version of 12478809H-A-R1. 12478809H-A-R1 is replaced with this report.

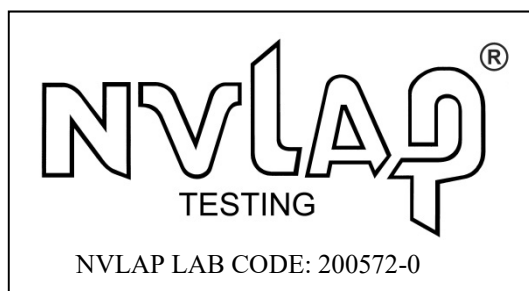
**Date of test:** October 31, 2018 to January 11, 2019

**Representative test engineer:**

T. Noguchi  
Takafumi Noguchi  
Engineer  
Consumer Technology Division

**Approved by:**

S. Matsuyama  
Satofumi Matsuyama  
Engineer  
Consumer Technology Division



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## **SECTION 1: Customer information**

Company Name : Mitsubishi Electric Corporation Kyoto Works  
Address : 1 Zusho Baba Nagaokakyo-city Kyoto, 617-8550 Japan  
Telephone Number : +81-75-958-3249  
Facsimile Number : +81-75-958-3709  
Contact Person : Terauchi Shuhei

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Digital Color Printer  
Model No. : CP-M1E  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : AC 100 V to 240 V, 50 / 60 Hz  
Receipt Date of Sample : October 25, 2018  
Country of Mass-production : Malaysia  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model: CP-M1E (referred to as the EUT in this report) is a Digital Color Printer.

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 13.56 MHz  
Modulation : ASK  
Antenna type : Pattern Antenna  
Clock frequency : CPU core: 600 MHz (Internal PLL 2.0 GHz (max)), DDR3: 400 MHz,  
RFID: 13.56 MHz, FPGA: 60 MHz / 120 MHz

<Variant model>

Model: CP-M1E has variant model: CP-M1A.

The difference of the these models is power code (shape of plug for destination) only.

These differences cause no influence to radio specification.

There was no degradation of EMC characteristic.

They are identical in electronic characteristics.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.225 Operation within the band 13.110-14.010 MHz.

\* Also the EUT complies with FCC Part 15 Subpart B.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods	Section 15.207	[QP] 16.3 dB 22.92472 MHz, N	Complied	-
	<IC>RSS-Gen 8.8	<IC>RSS-Gen 8.8	[AV] 13.3 dB 0.89481 MHz, L		
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	80.1 dB, 13.56000 MHz, QP, 45 deg.	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)	45.9 dB, 14.0100 MHz, QP, 45 deg.	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)	5.1 dB 188.109 MHz, Horizontal, 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.

#### **FCC 15.31 (e)**

This EUT provides stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

However, the supply voltage was varied and tested at 85 % and 115 % of the nominal rated supply voltage during frequency tolerance test according to Section 15.225(e).

#### **FCC Part 15.203/212 Antenna requirement**

It is impossible for end users to replace the antenna, because it is printed on the circuit board. Therefore the equipment complies with the requirement of 15.203.

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### 3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99 % Occupied Band Width	RSS-Gen 6.6	-	Radiated	N/A	N/A	Complied

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.

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

#### EMI

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

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

### 3.5 Test Location

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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

### **4.1 Operating Mode(s)**

The mode is used :

<b>Mode</b>	<b>Remarks*</b>
1) Transmitting mode (Tx) 13.56 MHz	The EUT Transmits and Receives at the same time and there is no receiving mode.
Any condition under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

<b>Test Item</b>	<b>Operating mode*</b>
Conducted Emission	Tx with Tag
Electric Field Strength of Fundamental Emission	Tx with Tag
Spectrum Mask	Tx with Tag
20dB Bandwidth and 99% Occupied Bandwidth	Tx with Tag, without Tag
Electric Field Strength of Spurious Emission	Tx with Tag
Frequency Tolerance	Tx Mod off

\* After the comparison of the test data between with Tag and without Tag, the tests were performed with Tag which was the worst case.

Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -20 deg.C to +50 deg.C Step 10deg.C (-30deg.C: Reference)  
Voltage : Normal Voltage AC 120 V  
Maximum Voltage AC 138 V  
Minimum Voltage AC 102 V  
(AC 120 V  $\pm$ 15 %)

\*This EUT provides stable voltage constantly to RF Part regardless of input voltage

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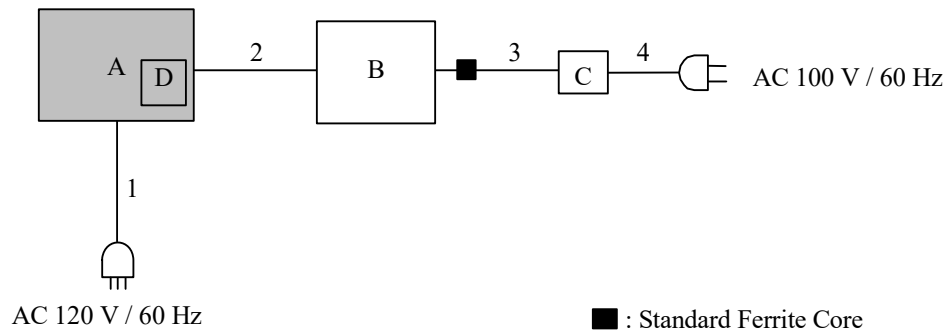
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## 4.2 Configuration and peripherals



\* Cabling and setup were taken into consideration and test data was taken under worse case conditions.  
\*Item No. A includes Receiver Antenna.

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Digital Color Printer	CP-M1E	M007	Mitsubishi Electric Corporation Kyoto Works	EUT
B	Laptop PC	CF-N8	0CKSA09265	Panasonic	-
C	AC Adapter	CF-AA6372BM6	6372BM610X10953E	Panasonic	-
D	Cartridge Tag	INK-M68S	No.001	Mitsubishi Electric Corporation Kyoto Works	EUT

### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	AC Cable	1.8	Unshielded	Unshielded	-
2	USB Cable	1.5	Shielded	Shielded	-
3	DC Cable	1.0	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

#### **For the tests on EUT with other peripherals (as a whole system)**

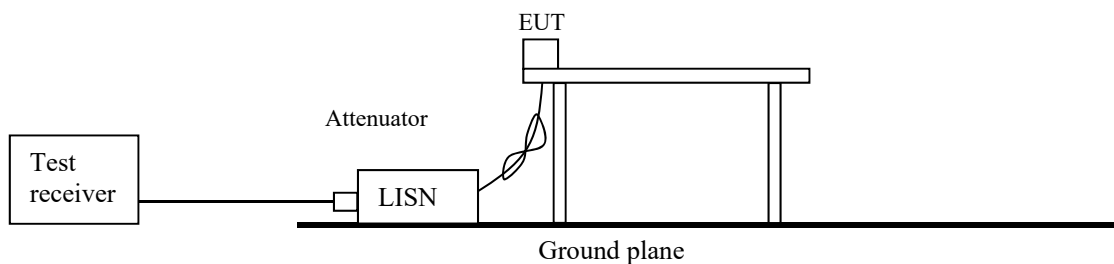
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

[Test Setup]



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

**Detector** : QP and CISPR AV  
**Measurement range** : 0.15 MHz - 30 MHz  
**Test data** : APPENDIX  
**Test result** : Pass

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**SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask)**

Test Procedure

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

Frequency: From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

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

Frequency: From 30 MHz to 1 GHz

The measuring antenna height varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

For above 1 GHz

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

**Test Antennas are used as below;**

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz	
Instrument used	Test Receiver					Spectrum Analyzer	
Detector	PK / AV	QP	PK / AV	QP	QP	PK	AV
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m	3 m	3 m

\*1) Distance Factor:  $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

\*2) Distance Factor:  $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

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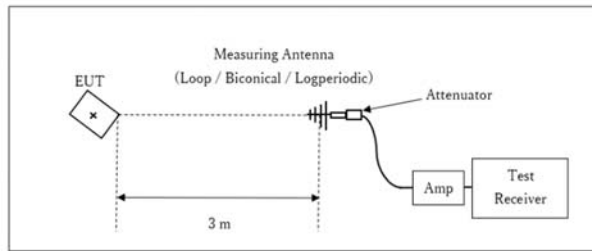
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Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.  
However test results were confirmed to pass against standard limit.

[Test Setup]

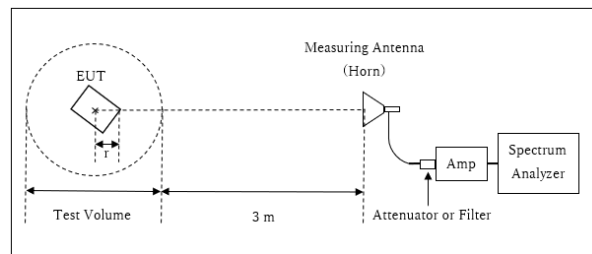
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



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

Distance Factor:  $20 \times \log(3.8 \text{ m} / 3.0 \text{ m}) = 2.05 \text{ dB}$   
\* Test Distance:  $(3 + \text{Test Volume} / 2) - r = 3.8 \text{ m}$

Test Volume : 2.0 m  
(Test Volume has been calibrated based on CISPR 16-1-4.)  
r = 0.2 m

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

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

**Measurement range** : 9 kHz - 10 GHz  
**Test data** : APPENDIX 1  
**Test result** : Pass

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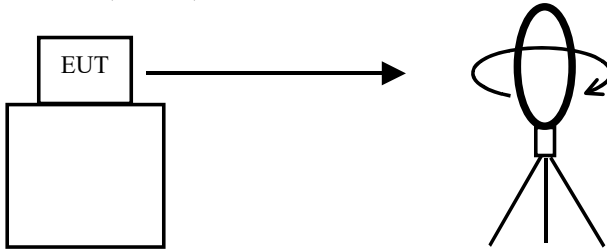
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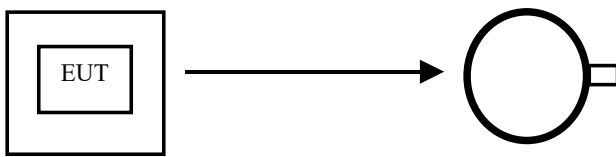
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**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



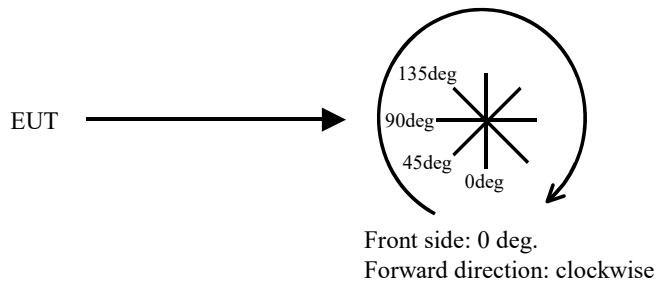
*Top View (Horizontal)*



Antenna was not rotated.

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*Top View (Vertical)*



## **SECTION 7: Other test**

<b>Test</b>	<b>Span</b>	<b>RBW</b>	<b>VBW</b>	<b>Sweep</b>	<b>Detector</b>	<b>Trace</b>	<b>Instrument used</b>
20 dB Bandwidth	Between 2.0 times and 5.0 times of the OBW	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Between 1.5 times and 5.0 times of the OBW	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.  
Peak hold was applied as Worst-case measurement.

**Test data** : APPENDIX  
**Test result** : Pass

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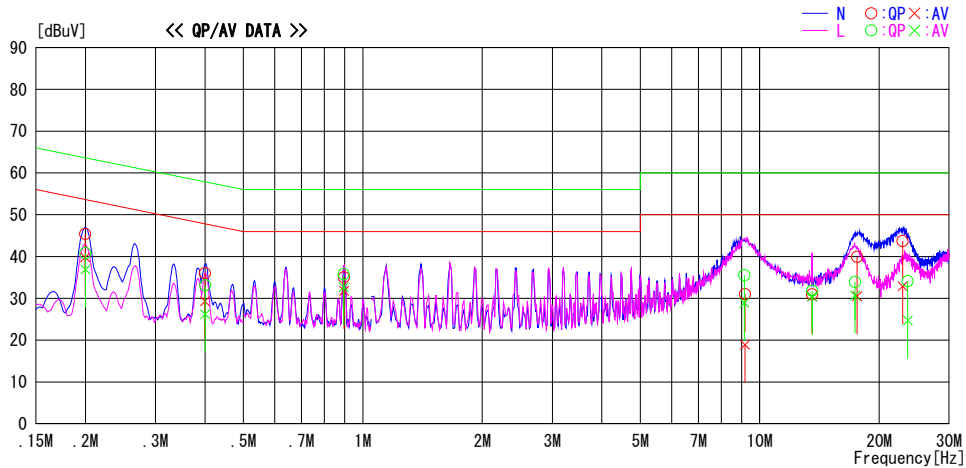
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**APPENDIX 1: Test data**

**Conducted Emission**

Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date January 11, 2019  
Temperature / Humidity 21 deg. C / 39 % RH  
Engineer Ken Fujita  
Mode Tx 13.56MHz with Tag

LIMIT : FCC15.207 QP  
FCC15.207 AV



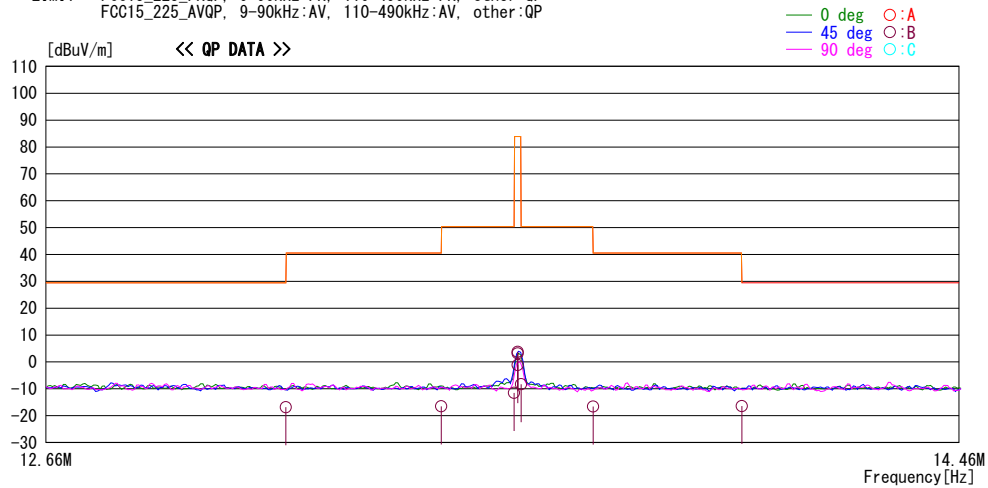
Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.19980	32.1	26.5	13.3	45.4	39.8	63.6	53.6	18.2	13.8	N	
0.40002	22.6	15.9	13.4	36.0	29.3	57.9	47.9	21.9	18.6	N	
0.89662	21.5	18.3	13.5	35.0	31.8	56.0	46.0	21.0	14.2	N	
9.17961	17.0	4.9	14.0	31.0	18.9	60.0	50.0	29.0	31.1	N	
13.56000	16.7	16.2	14.2	30.9	30.4	60.0	50.0	29.1	19.6	N	
17.59417	25.5	16.1	14.4	39.9	30.5	60.0	50.0	20.1	19.5	N	
22.92472	29.2	18.4	14.5	43.7	32.9	60.0	50.0	16.3	17.1	N	
0.20010	27.5	23.6	13.3	40.8	36.9	63.6	53.6	22.8	16.7	L	
0.40080	19.7	12.8	13.4	33.1	26.2	57.8	47.8	24.7	21.6	L	
0.89481	22.3	19.2	13.5	35.8	32.7	56.0	46.0	20.2	13.3	L	
9.14773	21.5	14.9	14.0	35.5	28.9	60.0	50.0	24.5	21.1	L	
13.56000	17.6	16.2	14.2	31.8	30.4	60.0	50.0	28.2	19.6	L	
17.37466	19.5	16.3	14.4	33.9	30.7	60.0	50.0	26.1	19.3	L	
23.59820	19.6	10.2	14.5	34.1	24.7	60.0	50.0	25.9	25.3	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.

## Fundamental emission and Spectrum Mask

Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 31, 2018  
Temperature / Humidity 22 deg. C / 37 % RH  
Engineer Takafumi Noguchi  
(Below 30 MHz)  
Mode Tx 13.56MHz with Tag

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	29.0	QP	19.3	-33.1	32.1	-16.9	29.5	46.4	45	B	55
13.41000	29.4	QP	19.3	-33.1	32.1	-16.5	40.5	57.0	45	B	55
13.55300	34.5	QP	19.2	-33.1	32.1	-11.5	50.4	61.9	45	B	55
13.56000	49.8	QP	19.2	-33.1	32.1	3.8	83.9	80.1	45	B	55 *
13.56000	49.2	QP	19.2	-33.1	32.1	3.2	83.9	80.7	45	B	55 without TAG
13.56000	44.8	QP	19.2	-33.1	32.1	-1.2	83.9	85.1	45	B	55 HOR
13.56700	37.7	QP	19.2	-33.1	32.1	-8.3	50.4	58.7	45	B	55
13.71000	29.4	QP	19.2	-33.1	32.1	-16.6	40.5	57.1	45	B	55
14.01000	29.6	QP	19.2	-33.1	32.1	-16.4	29.5	45.9	45	B	55

### Result of the fundamental emission at 3 m without Distance factor

QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
45	13.56000	QP	49.8	19.2	6.9	32.1	-	43.8	-	-	Fundamental

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

\* Gain 0.0 dB shows that the pre amplifier was not used to avoid the influence of carrier power.  
The pre amplifier used for carrier frequency measurement was not saturated.

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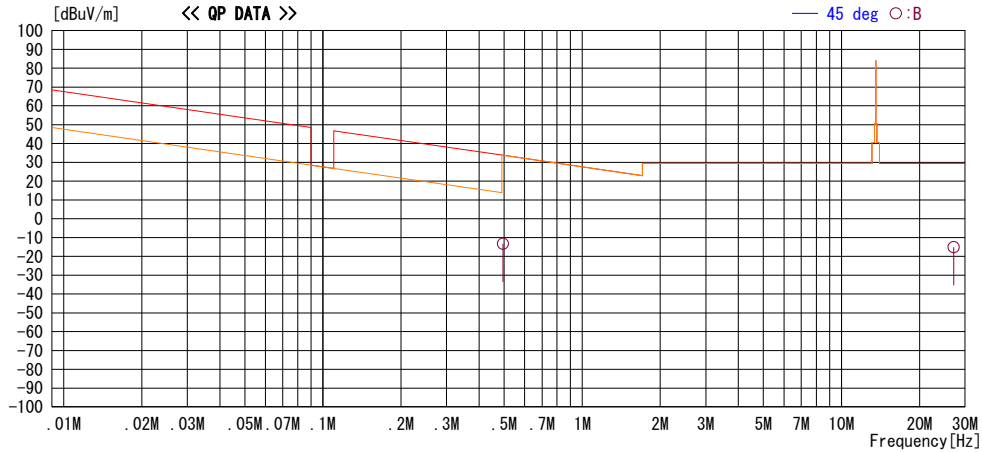
Facsimile : +81 596 24 8124



## Spurious emission

Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 31, 2018  
Temperature / Humidity 22 deg. C / 37 % RH  
Engineer Takafumi Noguchi  
(Below 30 MHz)  
Mode Tx 13.56MHz with Tag

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



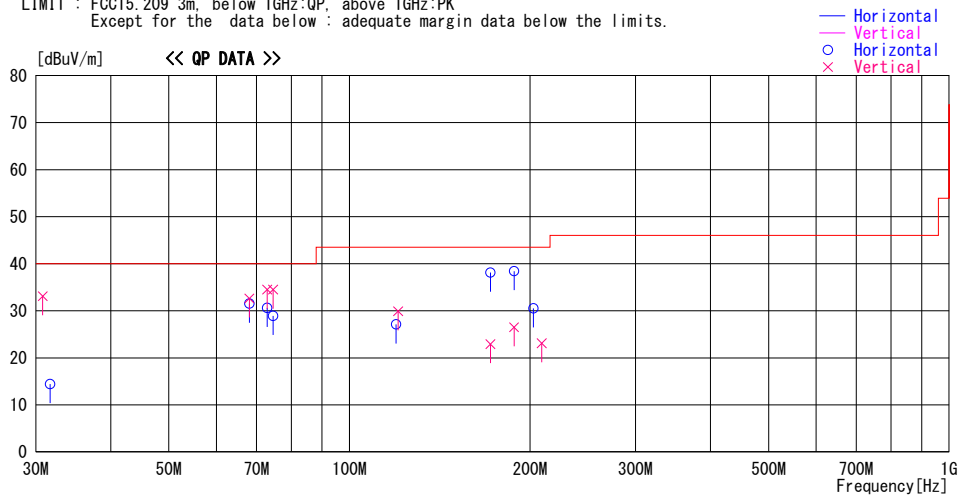
Freq. [MHz]	Reading [dBuV]	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	
			[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
0.49509	32.9	QP	19.6	-33.8	32.1	-13.4	33.7	47.1	45	B	359
27.12000	29.6	QP	20.1	-32.8	32.1	-15.2	29.5	44.7	45	B	359

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))

## Spurious emission

Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date November 1, 2018  
Temperature / Humidity 23 deg. C / 37 % RH  
Engineer Takafumi Noguchi  
(30 MHz - 1 GHz)  
Mode Tx 13.56MHz with Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



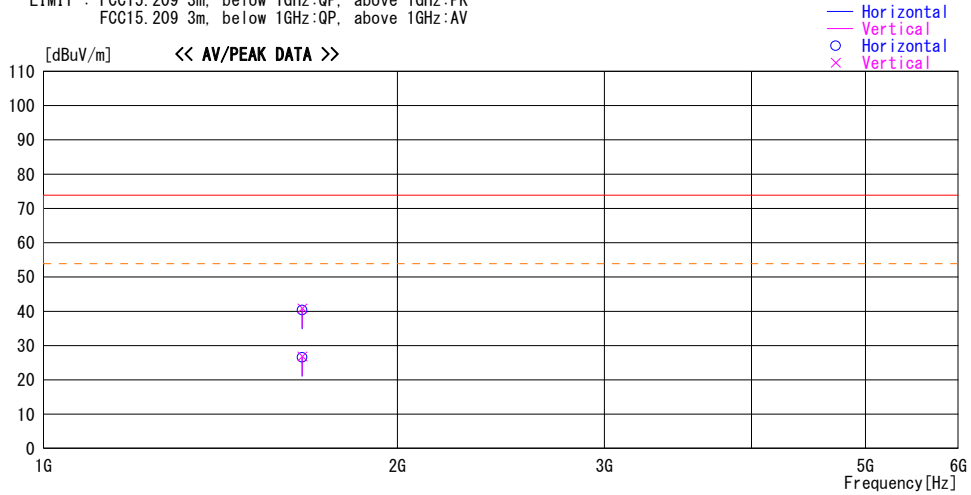
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin
			Factor	Gain					[dBuV/m]	[dB]
30.810	40.0	QP	18.0	-24.9	33.1	10	100	Vert.	40.0	6.9
31.703	21.6	QP	17.7	-24.9	14.4	25	400	Hori.	40.0	25.6
68.110	50.5	QP	6.4	-24.3	32.6	349	100	Vert.	40.0	7.4
68.156	49.4	QP	6.4	-24.3	31.5	36	393	Hori.	40.0	8.5
72.926	48.6	QP	6.2	-24.2	30.6	314	393	Hori.	40.0	9.4
72.926	52.5	QP	6.2	-24.2	34.5	233	100	Vert.	40.0	5.5
74.629	46.8	QP	6.3	-24.2	28.9	336	396	Hori.	40.0	11.1
74.629	52.4	QP	6.3	-24.2	34.5	356	100	Vert.	40.0	5.5
119.600	38.1	QP	12.7	-23.7	27.1	265	305	Hori.	43.5	16.4
120.622	40.6	QP	12.9	-23.6	29.9	189	100	Vert.	43.5	13.6
171.901	45.2	QP	16.0	-23.1	38.1	63	169	Hori.	43.5	5.4
171.901	30.0	QP	16.0	-23.1	22.9	274	100	Vert.	43.5	20.6
188.109	45.0	QP	16.3	-22.9	38.4	108	178	Hori.	43.5	5.1
188.109	33.1	QP	16.3	-22.9	26.5	122	100	Vert.	43.5	17.0
202.702	41.9	QP	11.4	-22.8	30.5	56	121	Hori.	43.5	13.0
209.188	34.6	QP	11.2	-22.7	23.1	315	207	Vert.	43.5	20.4

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

## Spurious emission

Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.1  
Date December 9, 2018  
Temperature / Humidity 21 deg. C / 39 % RH  
Engineer Ken Fujita  
(Above 1 GHz)  
Mode Tx 13.56MHz with Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1660.000	33.8	AV	25.4	-32.6	26.6	46	100	Hori.	53.9	27.3	
1660.000	34.0	AV	25.4	-32.6	26.8	188	100	Vert.	53.9	27.1	
1660.000	47.6	PK	25.4	-32.6	40.4	46	100	Hori.	73.9	33.5	
1660.000	48.0	PK	25.4	-32.6	40.8	188	100	Vert.	73.9	33.1	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC,  
1000 MHz -: HORN

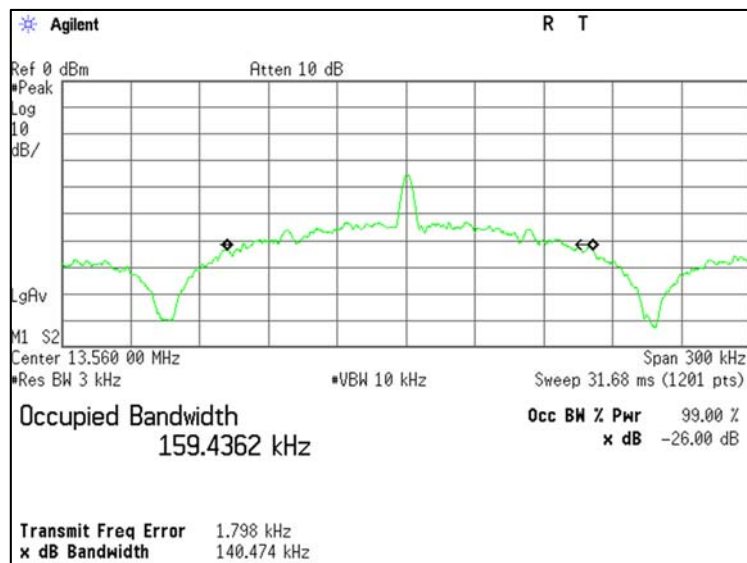
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN(AMP) + D-factor)

## 20dB Bandwidth and 99% Occupied Bandwidth

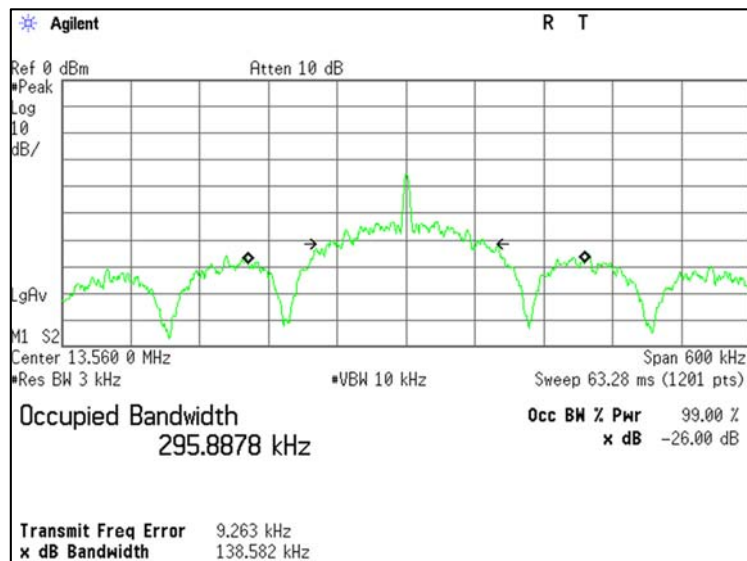
Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.6  
Date November 5, 2018  
Temperature / Humidity 25 deg. C / 36 % RH  
Engineer Ryota Yamanaka  
Mode Tx 13.56MHz with Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	140.474	295.8878

### 20dB Band Width



### 99% Occupied Bandwidth



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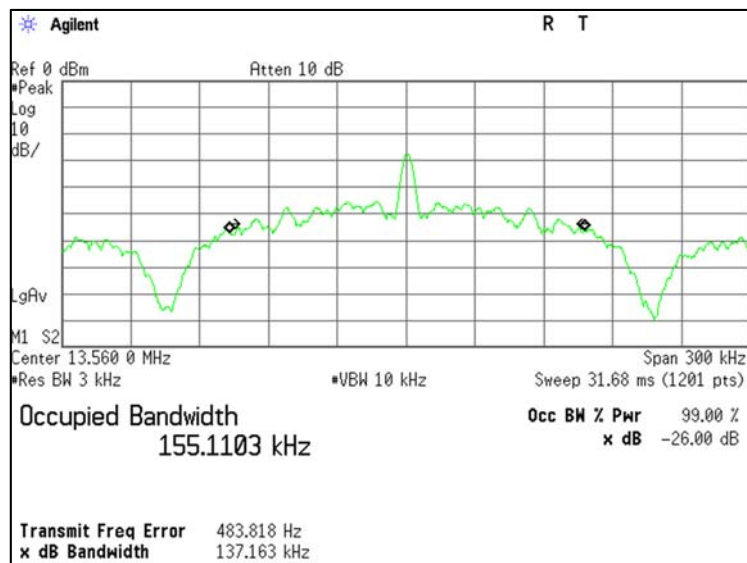
Facsimile : +81 596 24 8124

## 20dB Bandwidth and 99% Occupied Bandwidth

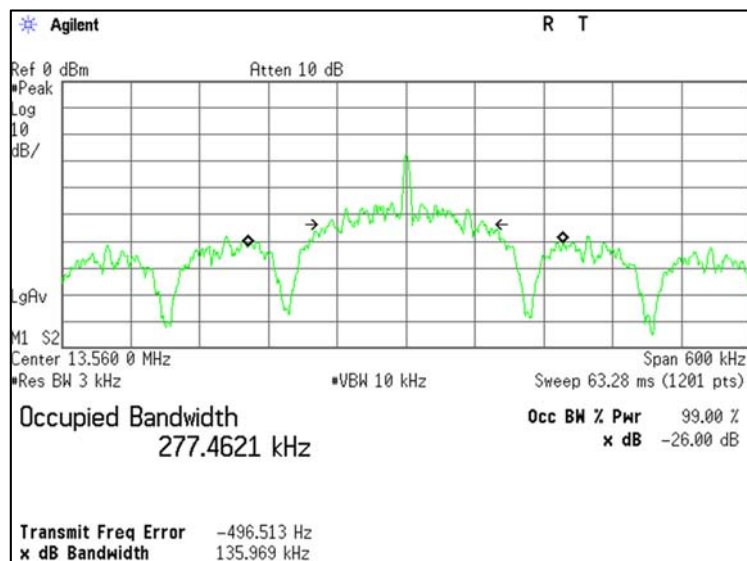
Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.6  
Date November 5, 2018  
Temperature / Humidity 25 deg. C / 36 % RH  
Engineer Ryota Yamanaka  
Mode Tx 13.56MHZ without TAG

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	137.163	277.4621

### 20dB Band Width



### 99% Occupied Bandwidth



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## Frequency Tolerance

Report No. 12478809H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.6  
Date November 5, 2018  
Temperature / Humidity 25 deg. C / 36 % RH  
Engineer Ryota Yamanaka  
Mode Tx Mod off

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
50	120	Power on	13.560540	0.000540	0.00398	39.8	0.01
		+ 2 min.	13.560535	0.000535	0.00395	39.5	0.01
		+ 5 min.	13.560537	0.000537	0.00396	39.6	0.01
		+ 10 min.	13.560560	0.000560	0.00413	41.3	0.01
40	120	Power on	13.560558	0.000558	0.00412	41.2	0.01
		+ 2 min.	13.560544	0.000544	0.00401	40.1	0.01
		+ 5 min.	13.560540	0.000540	0.00398	39.8	0.01
		+ 10 min.	13.560538	0.000538	0.00397	39.7	0.01
30	120	Power on	13.560597	0.000597	0.00440	44.0	0.01
		+ 2 min.	13.560578	0.000578	0.00426	42.6	0.01
		+ 5 min.	13.560566	0.000566	0.00417	41.7	0.01
		+ 10 min.	13.560557	0.000557	0.00411	41.1	0.01
20	120	Power on	13.560551	0.000551	0.00406	40.6	0.01
		+ 2 min.	13.560551	0.000551	0.00406	40.6	0.01
		+ 5 min.	13.560550	0.000550	0.00406	40.6	0.01
		+ 10 min.	13.560550	0.000550	0.00406	40.6	0.01
20	102 (120V -15%)	Power on	13.560554	0.000554	0.00409	40.9	0.01
		+ 2 min.	13.560553	0.000553	0.00408	40.8	0.01
		+ 5 min.	13.560552	0.000552	0.00407	40.7	0.01
		+ 10 min.	13.560551	0.000551	0.00406	40.6	0.01
20	138 (120V +15%)	Power on	13.560556	0.000556	0.00410	41.0	0.01
		+ 2 min.	13.560554	0.000554	0.00409	40.9	0.01
		+ 5 min.	13.560551	0.000551	0.00406	40.6	0.01
		+ 10 min.	13.560551	0.000551	0.00406	40.6	0.01
10	120	Power on	13.560629	0.000629	0.00464	46.4	0.01
		+ 2 min.	13.560622	0.000622	0.00459	45.9	0.01
		+ 5 min.	13.560616	0.000616	0.00454	45.4	0.01
		+ 10 min.	13.560611	0.000611	0.00451	45.1	0.01
0	120	Power on	13.560626	0.000626	0.00462	46.2	0.01
		+ 2 min.	13.560630	0.000630	0.00465	46.5	0.01
		+ 5 min.	13.560628	0.000628	0.00463	46.3	0.01
		+ 10 min.	13.560627	0.000627	0.00462	46.2	0.01
-10	120	Power on	13.560612	0.000612	0.00451	45.1	0.01
		+ 2 min.	13.560629	0.000629	0.00464	46.4	0.01
		+ 5 min.	13.560630	0.000630	0.00465	46.5	0.01
		+ 10 min.	13.560631	0.000631	0.00465	46.5	0.01
-20	120	Power on	13.560614	0.000614	0.00453	45.3	0.01
		+ 2 min.	13.560626	0.000626	0.00462	46.2	0.01
		+ 5 min.	13.560628	0.000628	0.00463	46.3	0.01
		+ 10 min.	13.560629	0.000629	0.00464	46.4	0.01
-30	120	Power on	13.560624	0.000624	0.00460	46.0	0.01
		+ 2 min.	13.560630	0.000630	0.00465	46.5	0.01
		+ 5 min.	13.560630	0.000630	0.00465	46.5	0.01
		+ 10 min.	13.560631	0.000631	0.00465	46.5	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.

\*As for the range of specification operating temperature, the test was performed with required temperature range on Frequency Tolerance.

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## **APPENDIX 2: Test instruments**

### **Test Instruments**

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	07/25/2018	07/31/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/24/2018	07/31/2019	12
CE	141935	Terminator	TME	CT-01BP	-	-	-	-
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/06/2018	12/31/2019	12
RE/CE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/27/2018	02/28/2019	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	06/01/2018	06/30/2019	12
RE	141413	Coaxial Cable	UL Japan	-	-	06/12/2018	06/30/2019	12
RE/CE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/09/2018	01/31/2019	12
RE/CE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	01/30/2018	01/31/2019	12
RE/CE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/11/2018	10/31/2019	12
RE/CE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/03/2018	10/31/2019	12
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/15/2018	06/30/2019	12
FT	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/07/2018	11/30/2019	12
FT	142750	Power Supply	NF	ES1000S	9071787	-	-	-
FT	141429	Temperature and Humidity Chamber	TABAI ESPEC	PL-2KP	14015723	08/08/2018	08/31/2019	12
FT	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	01/24/2018	01/31/2019	12
FT	141547	DIGITAL HiTESTER	HIOKI	3805	60500120	02/07/2018	02/28/2019	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**

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