



EMI TEST REPORT

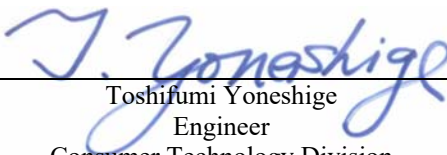
Test Report No. : 12821185H-E-R2

Applicant : CITIZEN SYSTEMS JAPAN CO., LTD.
Type of Equipment : DIGITAL PHOTO PRINTER
Model No. : DP-QW410
Test regulation : FCC Part 15 Subpart C: 2019
FCC ID : TLGH09C0
Test Result : Complied (Refer to SECTION 3.2)


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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with 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.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12821185H-E-R1. 12821185H-E-R1 is replaced with this report.

Date of test: June 28 to November 17, 2019

Representative test engineer:


Toshifumi Yoneshige
Engineer
Consumer Technology Division

Approved by:


Satofumi Matsuyama
Engineer
Consumer Technology Division



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REVISION HISTORY

Original Test Report No.: 12821185H-E

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12821185H-E	July 26, 2019	-	-
1	12821185H-E-R1	November 18, 2019	P.1	Correction of “Date of test” in cover page
1	12821185H-E-R1	November 18, 2019	P.3	Addition of Abbreviations list
1	12821185H-E-R1	November 18, 2019	P.6	Correction of worst margin of “Electric Field Strength of Spurious Emission” test in Clause 3.2 according to data correction; From 3.54 dB, 36.240 MHz, Vertical, QP To 14.39 dB 352.550 MHz, Horizontal, QP
1	12821185H-E-R1	November 18, 2019	P.8	Addition of the Uncertainty table after October 1, 2019 in Clause 3.4.
1	12821185H-E-R1	November 18, 2019	P.20	Replacing Spurious emission data (Above 30 MHz).
1	12821185H-E-R1	November 18, 2019	P.23	Addition of *1) in LIMS ID: 141949, 141901, 141254 and 141530 to Calibration Due Date.
1	12821185H-E-R1	November 18, 2019	P.23	Addition of *1) note sentence below the “Test Instruments” table.
2	12821185H-E-R2	November 20, 2019	P.11	Addition of the following note sentence in Clause 4.2; *As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.
2	12821185H-E-R2	November 20, 2019	P.18	Correction of Limit of “Result of the fundamental emission at 3 m without Distance factor” for Fundamental emission and Spectrum Mask test; From 83.90 dBuV/m to “-“

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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SECTION 1: Customer information

Company Name	: CITIZEN SYSTEMS JAPAN CO., LTD.
Address	: 6-1-12, Tanashi-cho, Nishi-Tokyo-shi, Tokyo 188-8511 Japan
Telephone Number	: +81-42-468-4609
Facsimile Number	: +81-42-468-4644
Contact Person	: Shigeru Obata

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. FCC ID on the cover and other relevant pages
 - Operating/Test Mode(s) (Mode(s)) on all the relevant pages
 - SECTION 1: Customer information
 - SECTION 2: Equipment under test (E.U.T.)
 - SECTION 4: Operation of E.U.T. during testing
- * The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

2.1 Identification of E.U.T.

Type of Equipment	: DIGITAL PHOTO PRINTER
Model No.	: DP-QW410
Serial No.	: Refer to Section 4, Clause 4.2
Rating	: AC 100 V - 240 V, 50 / 60 Hz
Receipt Date of Sample (Information from test lab.)	: June 28, 2019
Country of Mass-production	: China
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: DP-QW410 (referred to as the EUT in this report) is a DIGITAL PHOTO PRINTER.

Tested model: DP-QW410 has variant model: CZ-01.

The differences between variant models are only appearance color and front printing.

These differences cause no influence to radio specification.

These models are electrically identical.

Therefore, tests were performed on DP-QW410 as representative.

Feature of EUT:

Clock frequency(ies) in the system	: 480 MHz (max.)
------------------------------------	------------------

Radio Specification

Radio Type	: Transceiver
Frequency of Operation	: 13.56 MHz
Modulation	: ASK
Antenna type	: Integral
Antenna Gain	: -58.91 dBi
Operating Temperature	: +5 deg. C to +40 deg. C

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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 July 19, 2019 and effective August 19, 2019 except 15.258

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.

* The revisions made after testing date do not affect the test specification applied to the EUT.

* 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 ----- <IC>RSS-Gen 8.8	Section 15.207 ----- <IC>RSS-Gen 8.8	14.71 dB 0.32362 MHz QP, Phase N	Complied a)	-
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	92.03 dB, 13.56000 MHz, QP, 0 deg.	Complied b)	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	45.86 dB, 14.01000 MHz, QP, 0 deg.	Complied b)	Radiated
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied c)	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	14.39 dB 352.550 MHz, Horizontal, QP	Complied d)	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 e)	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422

- a) Refer to APPENDIX 1 (data of Conducted Emission)
b) Refer to APPENDIX 1 (data of Fundamental emission and Spectrum Mask)
c) Refer to APPENDIX 1 (data of 20dB Bandwidth and 99% Occupied Bandwidth)
d) Refer to APPENDIX 1 (data of Spurious emission)
e) Refer to APPENDIX 1 (data of Frequency Tolerance)

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.

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FCC Part 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 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	<IC>RSS-Gen 6.7	-	N/A	-	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

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

3.4 Uncertainty

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

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

Test date: Before September 30, 2019

Conducted emission

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

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.9 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
Frequency Tolerance	0.0154 ppm
20dB Bandwidth / 99 % Occupied Bandwidth	0.96 %

Test date: After October 1, 2019

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.8 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		5.0 dB
3 m	1 GHz to 6 GHz	4.9 dB
	6 GHz to 18 GHz	5.2 dB
1 m	10 GHz to 26.5 GHz	5.5 dB
	26.5 GHz to 40 GHz	5.5 dB

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3.5 Test Location

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*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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Test site	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	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	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	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	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.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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.

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

4.1 Operating Mode(s)

The mode is used :

Mode	Remarks*
1) Transmitting mode (Tx)	The EUT Transmits and Receives at the same time and there is no receiving mode.
The EUT was operated in a manner similar to typical use during the tests. The EUT Transmits and Receives at the same time and there is no receiving mode.	

Test Item	Operating mode*
Conducted emission	Tx Mod on, with Tag
Electric Field Strength of Fundamental Emission	Tx Mod on, with Tag
Spectrum Mask	Tx Mod on, with Tag
20 dB Bandwidth	Tx Mod on, with Tag
99 % Occupied Bandwidth	Tx Mod on, with Tag
Electric Field Strength of Spurious Emission	Tx Mod on, with Tag
Frequency Tolerance	Tx Mod on, with Tag

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

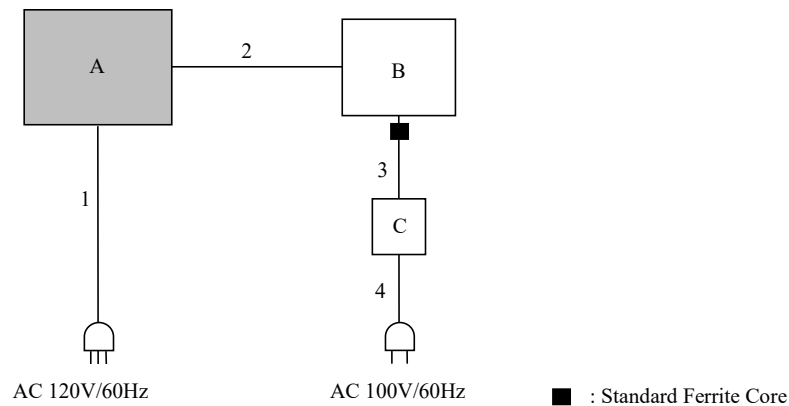
Justification: The system was configured in typical fashion (as a user would normally use it) for testing.

Frequency Tolerance:

Temperature : -20 deg. C to +50 deg. C Step 10 deg. C
Voltage : Normal Voltage AC 120 V
Maximum Voltage AC 102 V,
Minimum Voltage AC 138 V (DC 120 V ±15 %)

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

4.2 Configuration and peripherals



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	DIGITAL PHOTO PRINTER	DP-QW410	CZ-PP021	CITIZEN SYSTEMS JAPAN CO., LTD.	EUT
B	Laptop PC	C18F0715	8HKSA95235	Panasonic Corporation	-
C	AC Adaptor	CF-AA64L2C M1	64L2CM1187160 37A	Panasonic Corporation	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	AC Cable	1.9	Unshielded	Unshielded	-
2	USB Cable	1.8	Shielded	Shielded	-
3	DC Cable	1.0	Unshielded	Unshielded	-
4	AC Cable	0.8	Unshielded	Unshielded	-

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.

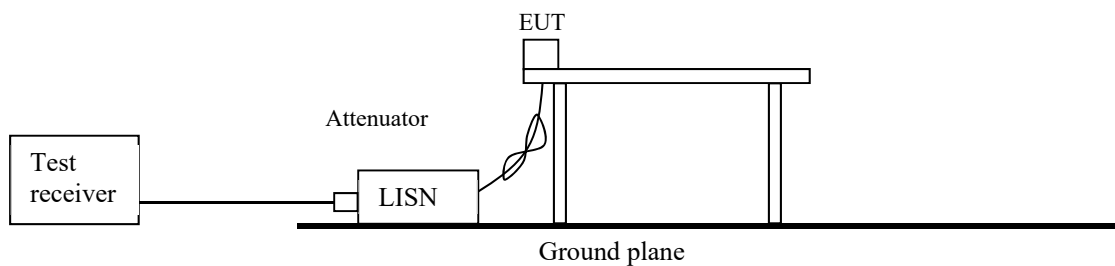
For the tests on EUT with other peripherals (as a whole system)

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.

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

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

Test Antennas are used as below;

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

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

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

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

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.

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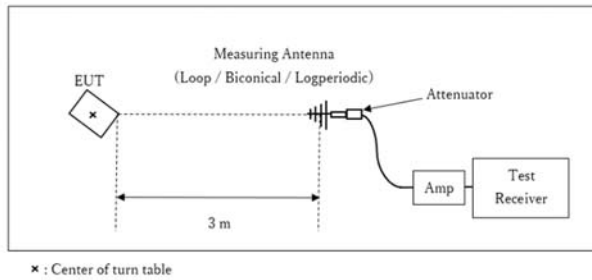
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[Test Setup]
Below 1 GHz



Test Distance: 3 m

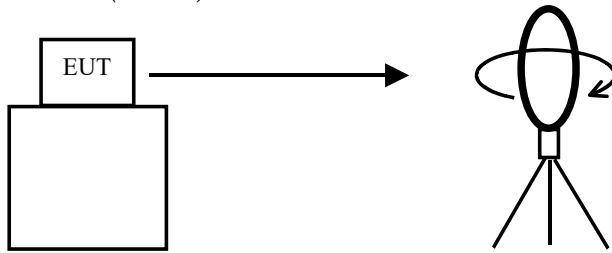
The test was made on EUT at the normal use position.

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

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

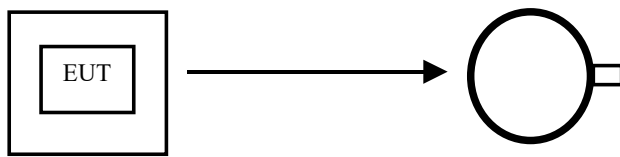
Figure 1: Direction of the Loop Antenna

Side View (Vertical)



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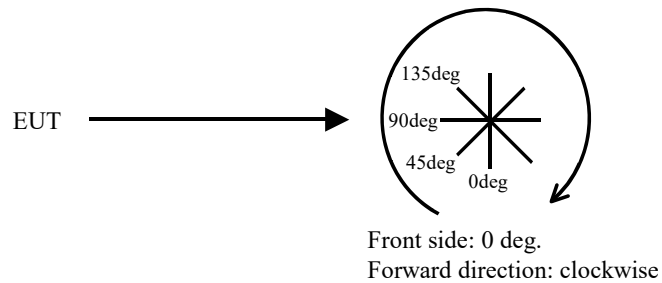
Top View (Horizontal)



Antenna was not rotated.

.....

Top View (Vertical)



SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
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	-	-	-	-	-	-	Spectrum Analyzer *2)
*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.							
*2) The measurement was performed with Marker Frequency Counter Function.							

Test data : APPENDIX

Test result : Pass

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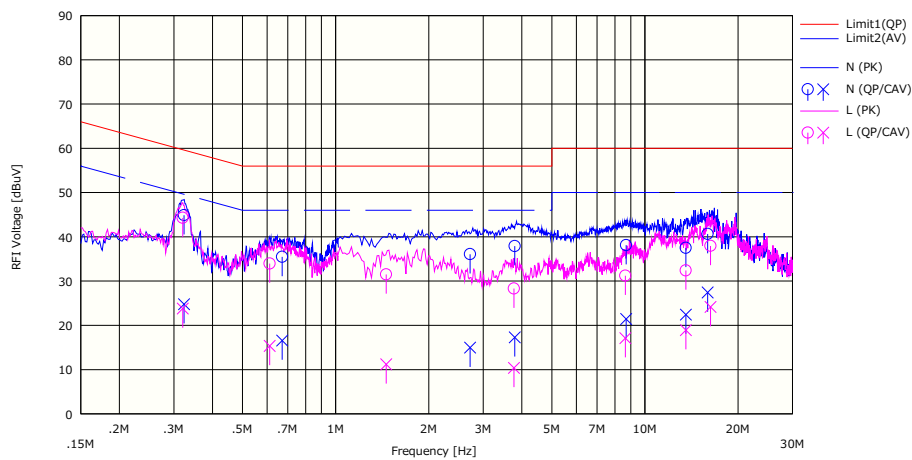
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APPENDIX 1: Test data

Conducted Emission

Report No. 12821185H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date June 28, 2019
Temperature / Humidity 24 deg. C / 52 % RH
Engineer Junki Nagatomi
Mode Mode 1 with Tag

Limit : FCC_Part 15 Subpart C(15.207)



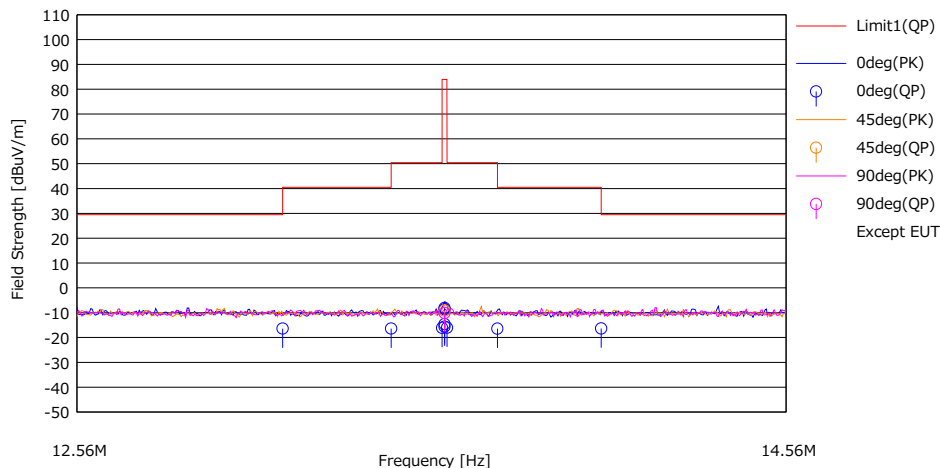
No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]			<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.32362	31.70	11.60	0.05	13.14	44.89	24.79	59.60	49.60	14.71	24.81	N	
2	0.67161	22.20	3.30	0.06	13.21	35.47	16.57	56.00	46.00	20.53	29.43	N	
3	2.72101	22.50	1.40	0.10	13.47	36.07	14.97	56.00	46.00	19.93	31.03	N	
4	3.79441	24.20	3.60	0.13	13.57	37.90	17.30	56.00	46.00	18.10	28.70	N	
5	8.69690	24.00	7.30	0.23	13.89	38.12	21.42	60.00	50.00	21.88	28.58	N	
6	13.56000	23.10	8.00	0.30	14.12	37.52	22.42	60.00	50.00	22.48	27.58	N	
7	15.95002	26.10	12.90	0.32	14.22	40.64	27.44	60.00	50.00	19.36	22.56	N	
8	0.32040	31.10	10.60	0.05	13.14	44.29	23.79	59.70	49.70	15.41	25.91	L	
9	0.61241	20.70	2.10	0.06	13.20	33.96	15.36	56.00	46.00	22.04	30.64	L	
10	1.45741	18.10	-2.20	0.08	13.32	31.50	11.20	56.00	46.00	24.50	34.80	L	
11	3.77356	14.60	-3.30	0.13	13.57	28.30	10.40	56.00	46.00	27.70	35.60	L	
12	8.64880	17.10	3.00	0.23	13.89	31.22	17.12	60.00	50.00	28.78	32.88	L	
13	13.56000	18.00	4.50	0.30	14.12	32.42	18.92	60.00	50.00	27.58	31.08	L	
14	16.29781	23.40	9.60	0.32	14.23	37.95	24.15	60.00	50.00	22.05	25.85	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. 12821185H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date July 7, 2019
Temperature / Humidity 23 deg. C / 50 % RH
Engineer Ken Fujita
Mode Mode 1 with Tag

Limit : FCC15.225(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq. [MHz]	Reading (QP) [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result (QP) [dBuV/m]	Limit (QP) [dBuV/m]	Margin (QP) [dB]	Antenna	Table	Comment
1	13.11 000	29.80	19.29	-33.25	32.23	-16.39	29.50	45.89	0deg	0	
2	13.41 000	29.80	19.26	-33.24	32.23	-16.41	40.50	56.91	0deg	0	
3	13.55 300	30.10	19.24	-33.24	32.23	-16.13	50.40	66.53	0deg	109	
4	13.56 000	31.60	19.24	-33.24	32.23	-14.63	83.90	98.53	0deg	0	without Tag
5	13.56 000	37.60	19.24	-33.24	32.23	-8.63	83.90	92.53	0deg	118	antenna 135deg
6	13.56 000	30.60	19.24	-33.24	32.23	-15.63	83.90	99.53	0deg	0	HOR
7	13.56 000	38.10	19.24	-33.24	32.23	-8.13	83.90	92.03	0deg	109	*
8	13.56 700	30.20	19.24	-33.24	32.23	-16.03	50.40	66.43	0deg	109	
9	13.71 000	29.80	19.23	-33.23	32.23	-16.43	40.50	56.93	0deg	0	
10	14.01 000	29.90	19.20	-33.23	32.23	-16.36	29.50	45.86	0deg	0	
11	13.56 000	37.10	19.24	-33.24	32.23	-9.13	83.90	93.03	45deg	233	
12	13.56 000	36.10	19.24	-33.24	32.23	-10.13	83.90	94.03	90deg	57	

RESULT = READING + ANT FACTOR + LOSS (CABLE + Attenuator + Distance Factor) - GAIN(AMP)

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	13.56	QP	38.10	19.24	6.76	32.23	-	31.87	-	-	Fundamental

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

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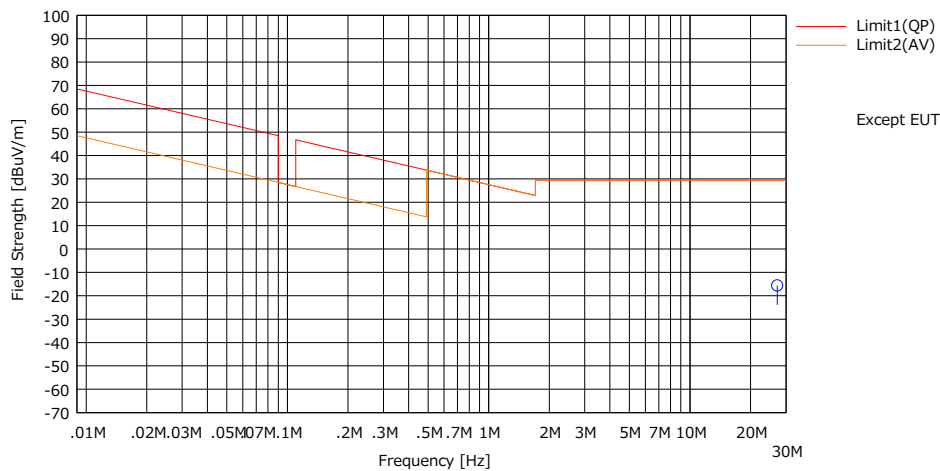
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Spurious emission

Report No. 12821185H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date July 7, 2019
Temperature / Humidity 23 deg. C / 50 % RH
Engineer Ken Fujita
(Below 30 MHz)
Mode Mode 1 with Tag

Limit : FCC15.209(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Antenna [deg]	Table [deg]	Comment
		(QP) [dBuV]	(AV) [dBuV]				(QP) [dBuV/m]	(AV) [dBuV/m]	(QP) [dBuV/m]	(AV) [dBuV/m]	(QP) [dB]	(AV) [dB]			
1	27.12000	29.40	---	20.13	-32.93	32.22	-15.62	---	29.50	29.50	45.12	---	0deg	109	

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(CABLE + ATT) - GAIN(AMP)

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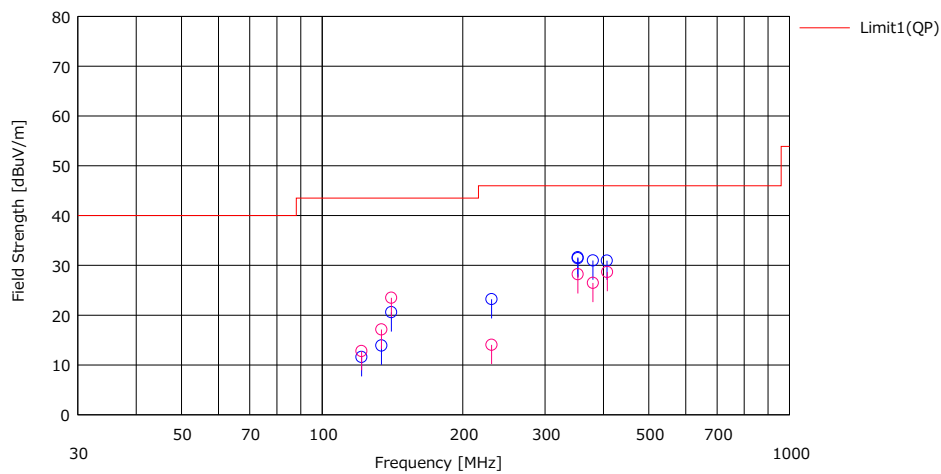
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Spurious emission

Report No. 12821185H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date November 17, 2019
Temperature / Humidity 22 deg. C / 38 % RH
Engineer Junya Okuno
(Above 30 MHz)
Mode Mode 1 with Tag

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



No.	Freq. [MHz]	Reading [QP] [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [QP] [dBuV/m]	Limit [QP] [dBuV/m]	Margi [QP] [dB]	Pola. [H/V]	Height [cm]	Angle [deg.]	Ant. Type	Comment
1	121.457	28.90	12.90	8.87	39.09	11.58	43.50	31.92	Hori.	121	54	BA	
2	133.962	30.00	13.97	9.04	39.10	13.91	43.50	29.59	Hori.	110	12	BA	
3	140.645	36.10	14.46	9.12	39.10	20.58	43.50	22.92	Hori.	115	7	BA	
4	230.516	40.88	11.29	10.08	39.04	23.21	46.00	22.79	Hori.	100	291	LA20	
5	352.550	44.20	15.01	11.15	38.75	31.61	46.00	14.39	Hori.	100	294	LA20	
6	352.550	44.00	15.01	11.15	38.75	31.41	46.00	14.59	Hori.	100	294	LA20	without Tag
7	379.684	43.10	15.19	11.36	38.67	30.98	46.00	15.02	Hori.	100	294	LA20	
8	406.800	42.10	15.88	11.58	38.61	30.95	46.00	15.05	Hori.	100	297	LA20	
9	121.457	30.10	12.90	8.87	39.09	12.78	43.50	30.72	Vert.	133	9	BA	
10	133.962	33.20	13.97	9.04	39.10	17.11	43.50	26.39	Vert.	121	31	BA	
11	140.645	39.00	14.46	9.12	39.10	23.48	43.50	20.02	Vert.	105	29	BA	
12	230.516	31.70	11.29	10.08	39.04	14.03	46.00	31.97	Vert.	134	10	LA20	
13	352.550	40.80	15.01	11.15	38.75	28.21	46.00	17.79	Vert.	100	244	LA20	
14	379.684	38.60	15.19	11.36	38.67	26.48	46.00	19.52	Vert.	129	251	LA20	
15	407.419	39.80	15.89	11.58	38.61	28.66	46.00	17.34	Vert.	100	8	LA20	

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(CABLE + ATT) - GAIN(AMP)

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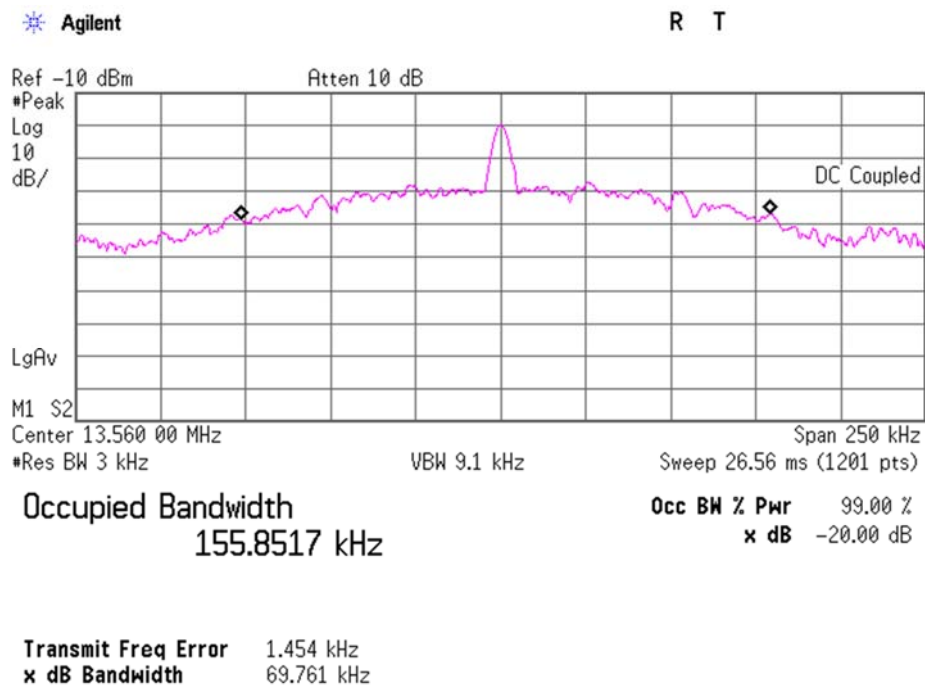
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20dB Bandwidth and 99% Occupied Bandwidth

Report No. 12821185H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.6
Date July 12, 2019
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Junya Okuno
Mode Mode 1 with Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	69.761	155.8517



Frequency Tolerance

Report No. 12821185H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.6
Date July 12, 2019
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Junya Okuno
Mode Mode 1 with Tag

Test condition Temp. [deg. C]	Voltage [V]	Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
					[%]	[ppm]	
50	120	Power on	13.559944	-0.000056	-0.00041	-4.1	0.01
		+ 2 min.	13.559930	-0.000070	-0.00051	-5.1	0.01
		+ 5 min.	13.559928	-0.000072	-0.00053	-5.3	0.01
		+ 10 min.	13.559927	-0.000073	-0.00054	-5.4	0.01
40	120	Power on	13.559951	-0.000049	-0.00036	-3.6	0.01
		+ 2 min.	13.559967	-0.000033	-0.00025	-2.5	0.01
		+ 5 min.	13.559943	-0.000057	-0.00042	-4.2	0.01
		+ 10 min.	13.559943	-0.000057	-0.00042	-4.2	0.01
30	120	Power on	13.559968	-0.000032	-0.00023	-2.3	0.01
		+ 2 min.	13.559968	-0.000032	-0.00024	-2.4	0.01
		+ 5 min.	13.559962	-0.000038	-0.00028	-2.8	0.01
		+ 10 min.	13.559962	-0.000038	-0.00028	-2.8	0.01
20	120	Power on	13.560040	0.000040	0.00029	2.9	0.01
		+ 2 min.	13.560037	0.000037	0.00027	2.7	0.01
		+ 5 min.	13.560059	0.000059	0.00044	4.4	0.01
		+ 10 min.	13.560036	0.000036	0.00027	2.7	0.01
20	102 (120V -15%)	Power on	13.559999	-0.000001	-0.00001	-0.1	0.01
		+ 2 min.	13.559996	-0.000004	-0.00003	-0.3	0.01
		+ 5 min.	13.559957	-0.000043	-0.00031	-3.1	0.01
		+ 10 min.	13.559997	-0.000003	-0.00002	-0.2	0.01
20	138 (120V +15%)	Power on	13.560050	0.000050	0.00037	3.7	0.01
		+ 2 min.	13.560037	0.000037	0.00027	2.7	0.01
		+ 5 min.	13.560028	0.000028	0.00020	2.0	0.01
		+ 10 min.	13.560050	0.000050	0.00037	3.7	0.01
10	120	Power on	13.560051	0.000051	0.00038	3.8	0.01
		+ 2 min.	13.560019	0.000019	0.00014	1.4	0.01
		+ 5 min.	13.560041	0.000041	0.00030	3.0	0.01
		+ 10 min.	13.560050	0.000050	0.00037	3.7	0.01
0	120	Power on	13.560038	0.000038	0.00028	2.8	0.01
		+ 2 min.	13.560051	0.000051	0.00037	3.7	0.01
		+ 5 min.	13.560037	0.000037	0.00027	2.7	0.01
		+ 10 min.	13.560036	0.000036	0.00027	2.7	0.01
-10	120	Power on	13.560057	0.000057	0.00042	4.2	0.01
		+ 2 min.	13.560038	0.000038	0.00028	2.8	0.01
		+ 5 min.	13.560039	0.000039	0.00029	2.9	0.01
		+ 10 min.	13.560045	0.000045	0.00033	3.3	0.01
-20	120	Power on	13.560012	0.000012	0.00009	0.9	0.01
		+ 2 min.	13.560012	0.000012	0.00009	0.9	0.01
		+ 5 min.	13.560032	0.000032	0.00024	2.4	0.01
		+ 10 min.	13.560025	0.000025	0.00018	1.8	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.

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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	141922	Terminator	TME	Termination	-	09/06/2018	09/30/2019	12
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	07/05/2019	07/31/2020	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/05/2019	07/31/2020	12
CE	141247	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/06/2018	12/31/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	06/30/2020	24
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/06/2018	08/31/2019 *1)	12
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/11/2019	01/31/2020	12
RE	141901	Spectrum Analyzer	AGILENT	E4440A	MY48250080	10/04/2018	10/31/2019 *1)	12
RE	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/05/2018	11/30/2019	12
RE	141198	Biconical Antenna	Schwarzbeck	BBA9106	2513	04/12/2019	04/30/2020	12
RE	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	06/27/2019	06/30/2020	12
RE	141264	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-189	03/21/2019	03/30/2020	12
RE	142226	Measure	KOMELON	KMC-36	-	-	-	-
RE	141585	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	02/08/2019	02/29/2020	12
RE	141413	Coaxial Cable	UL Japan	-	-	06/07/2019	06/30/2020	12
RE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/sucoform141-PE/421-010	-/00640	07/02/2019	07/31/2020	12
RE	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/11/2018	10/31/2019 *1)	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/08/2019	02/29/2020	12
RE/CE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE/CE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/27/2019	06/30/2020	12
RE/CE	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	08/21/2018	08/31/2019 *1)	12
RE/CE	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/18/2018	06/30/2020	24
RE/CE	141566	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	01/11/2019	01/31/2020	12
RE/CE	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/RG400u/RFM-E421(SW)	-/01068 (Switcher)	06/27/2019	06/30/2020	12
FT	141492	Electric Field Probe	HOLADAY EMF MEASUREMENT	HI-6005	00035598	09/13/2018	09/30/2019	12
FT	141547	DIGITAL HiTESTER	HIOKI	3805	60500120	02/25/2019	02/29/2020	12
FT	141903	Spectrum Analyzer	AGILENT	E4440A	MY46186390	09/20/2018	09/30/2019	12
FT	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	01/11/2019	01/31/2020	12

*1) This test equipment was used for the tests before the expiration date of the calibration.

*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

UL Japan, Inc.

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