



RADIO TEST REPORT


Test Report No. : 14135330S-A-R2

Applicant : DENSO WAVE INCORPORATED
Type of EUT : High Frequency 13.56 MHz Transceiver
Model Number of EUT : 56RF-TR-4040 (Square Transceiver)
FCC ID : PZWTR-4040
Test regulation : FCC Part 15 Subpart C: 2021
Test Result : Complied (Refer to SECTION 3)


1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 14135330S-A-R1. 14135330S-A-R1 is replaced with this report.

Date of test: December 14, 2021 to January 25, 2022

Representative test engineer:


Hiromasa Sato
Engineer

Approved by:


Kazutaka Takeyama
Leader



CERTIFICATE 1266.03

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

UL Japan, Inc.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

REVISION HISTORY

Original Test Report No.: 14135330S-A

Revision	Test report No.	Date	Page revised	Contents																																																																								
- (Original)	14135330S-A	January 26, 2022	-	-																																																																								
1	14135330S-A-R1	January 27, 2022	P.9	<p>Correction the table in 4.2: from</p> <table border="1"> <thead> <tr> <th colspan="6">Description of EUT and support equipment</th> </tr> <tr> <th>No.</th> <th>Item</th> <th>Model number</th> <th>Serial number</th> <th>Manufacturer</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>High Frequency 13.56 MHz Transceiver</td> <td>56RF-TR-4040</td> <td>13 14 *1)</td> <td>DENSO WAVE INCORPORATED</td> <td>EUT</td> </tr> <tr> <td>B</td> <td>Tag</td> <td>56RF-TG-50</td> <td>5</td> <td>DENSO WAVE INCORPORATED</td> <td>Tag</td> </tr> <tr> <td>C</td> <td>Power Supply(DC)</td> <td>PAN60-10A</td> <td>NL002383</td> <td>KIKUSUI</td> <td>*1)</td> </tr> <tr> <td>D</td> <td>Power Supply(DC)</td> <td>PW18-2ATP</td> <td>19050351</td> <td>TEXIO</td> <td>*2)</td> </tr> </tbody> </table> <p>*1) Used for Conducted Emission (Remarks : Terminated) *2) Used for Radiated Emission *3) Used for Frequency Tolerance and Bandwidth test</p> <p>to</p> <table border="1"> <thead> <tr> <th colspan="6">Description of EUT and support equipment</th> </tr> <tr> <th>No.</th> <th>Item</th> <th>Model number</th> <th>Serial number</th> <th>Manufacturer</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>High Frequency 13.56 MHz Transceiver</td> <td>56RF-TR-4040</td> <td>13 *1) 14 *2)</td> <td>DENSO WAVE INCORPORATED</td> <td>EUT</td> </tr> <tr> <td>B</td> <td>Tag</td> <td>56RF-TG-50</td> <td>5</td> <td>DENSO WAVE INCORPORATED</td> <td>Tag</td> </tr> <tr> <td>C</td> <td>Power Supply(DC)</td> <td>PAN60-10A</td> <td>NL002383</td> <td>KIKUSUI</td> <td>*3)</td> </tr> <tr> <td>D</td> <td>Power Supply(DC)</td> <td>PW18-2ATP</td> <td>19050351</td> <td>TEXIO</td> <td>*4)</td> </tr> </tbody> </table> <p>*1) Used for Conducted Emission and Radiated Emission and Frequency Tolerance and Bandwidth tests *2) Used for Conducted Emission (Antenna terminated) *3) Used for Conducted Emission and Radiated Emission *4) Used for Frequency Tolerance and Bandwidth tests</p>	Description of EUT and support equipment						No.	Item	Model number	Serial number	Manufacturer	Remarks	A	High Frequency 13.56 MHz Transceiver	56RF-TR-4040	13 14 *1)	DENSO WAVE INCORPORATED	EUT	B	Tag	56RF-TG-50	5	DENSO WAVE INCORPORATED	Tag	C	Power Supply(DC)	PAN60-10A	NL002383	KIKUSUI	*1)	D	Power Supply(DC)	PW18-2ATP	19050351	TEXIO	*2)	Description of EUT and support equipment						No.	Item	Model number	Serial number	Manufacturer	Remarks	A	High Frequency 13.56 MHz Transceiver	56RF-TR-4040	13 *1) 14 *2)	DENSO WAVE INCORPORATED	EUT	B	Tag	56RF-TG-50	5	DENSO WAVE INCORPORATED	Tag	C	Power Supply(DC)	PAN60-10A	NL002383	KIKUSUI	*3)	D	Power Supply(DC)	PW18-2ATP	19050351	TEXIO	*4)
Description of EUT and support equipment																																																																												
No.	Item	Model number	Serial number	Manufacturer	Remarks																																																																							
A	High Frequency 13.56 MHz Transceiver	56RF-TR-4040	13 14 *1)	DENSO WAVE INCORPORATED	EUT																																																																							
B	Tag	56RF-TG-50	5	DENSO WAVE INCORPORATED	Tag																																																																							
C	Power Supply(DC)	PAN60-10A	NL002383	KIKUSUI	*1)																																																																							
D	Power Supply(DC)	PW18-2ATP	19050351	TEXIO	*2)																																																																							
Description of EUT and support equipment																																																																												
No.	Item	Model number	Serial number	Manufacturer	Remarks																																																																							
A	High Frequency 13.56 MHz Transceiver	56RF-TR-4040	13 *1) 14 *2)	DENSO WAVE INCORPORATED	EUT																																																																							
B	Tag	56RF-TG-50	5	DENSO WAVE INCORPORATED	Tag																																																																							
C	Power Supply(DC)	PAN60-10A	NL002383	KIKUSUI	*3)																																																																							
D	Power Supply(DC)	PW18-2ATP	19050351	TEXIO	*4)																																																																							
2	14135330S-A-R2	January 28, 2022	P.17 to P.21	<p>Correction of Report No. from: 13981495S-A to: 14135330S-A-R2</p>																																																																								

<u>Contents</u>	<u>Page</u>
SECTION 1: Customer information	4
SECTION 2: Equipment under test (EUT)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of EUT during testing.....	8
SECTION 5: Conducted emission	10
SECTION 6: Radiated emission	11
SECTION 7: Other test	14
APPENDIX 1: Test data	15
APPENDIX 2: Test instruments	22
APPENDIX 3: Photographs of test setup.....	24

SECTION 1: Customer information

Company Name : DENSO WAVE INCORPORATED
Address : 1 Yoshiike, Kusagi, Agui-cho, Chita-gun, Aichi 470-2297 Japan
Telephone Number : +81-569-49-5423
Contact Person : JUN HAMADA

The information provided from the customer is as follows;

- Applicant, Type of EUT, Model Number of EUT, 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 (EUT) other than the Receipt Date
 - SECTION 4: Operation of EUT 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 (EUT)

2.1 Identification of EUT

Type : High Frequency 13.56 MHz Transceiver
Model Number : 56RF-TR-4040
Serial Number : Refer to SECTION 4.2
Condition : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date : December 14, 2021
Modification : No Modification by the test lab

2.2 Product description

Model: 56RF-TR-4040 (referred to as the EUT in this report) is a High Frequency 13.56 MHz Transceiver.

General Specification

Rating : DC 24.0 V

Radio Specification

Radio Type : Transmitter
Frequency of Operation : 13.56 MHz
Modulation : ASK
Antenna type : Loop Coil
Clock frequency (Maximum) : 13.56 MHz

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.215 Additional provisions to the general radiated emission limitations.
Section 15.225 Operation within the band 13.110-14.010 MHz.

* The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

3.2 Procedures & Results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods ----- <ISED>RSS-Gen 8.8	Section 15.207 ----- <ISED>RSS-Gen 8.8	16.5 dB, 17.89554 MHz, AV, L1, without Tag	Complied a)	-
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods ----- <ISED> RSS-Gen 6.4, 6.12	Section 15.225(a) ----- <ISED>RSS-210 B.6	55.40 dB, 13.560 MHz, QP,Vertical, 135 deg. with Tag	Complied b)	Radiated
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods ----- <ISED>RSS-Gen 6.4, 6.13	Section 15.225(b)(c) ----- <ISED> RSS-210 B.6	37.3 dB, 13.567 MHz, QP,Vertical, 135 deg. with Tag	Complied b)	Radiated
20 dB Bandwidth	ANSI C63.10:2013 6 Standard test methods ----- <ISED> -	Section15.215(c) ----- <ISED> -	See data	Complied c)	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods ----- <ISED>RSS-Gen 6.4, 6.13	Section 15.209, Section 15.225 (d) ----- <ISED>RSS-210 B.6	11.3 dB 271.200 MHz, QP,Vertical , without Tag	Complied d)	Radiated
Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods ----- <ISED>RSS-Gen 6.11, 8.11	Section 15.225(e) ----- <ISED> 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 Data of Electric field strength of Fundamental emission and Spurious emission within the band)

c) Refer to APPENDIX 1 (data of 20 dB Bandwidth and 99 % Occupied Bandwidth)

d) Refer to APPENDIX 1 (data of Radiated 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.

UL Japan, Inc.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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	<ISED>RSS-Gen 6.7	-	N/A	-	Radiated

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

3.4 Uncertainty

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

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.9 dB	2.9 dB	3.0 dB	2.9 dB	2.9 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-	-
	200 MHz-1 GHz	6.0 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.2 dB	5.3 dB	5.3 dB	-	-
Radiated emission (Measurement distance: 1 m)	18 GHz-40 GHz	5.4 dB	5.5 dB	5.5 dB	-	-
	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.8 dB	5.8 dB	5.8 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Other test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	1.2 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	2.0 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.3 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.3 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.3 dB
Spurious emission (Conducted) below 1GHz	0.93 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.92 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.3 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.3 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Frequency (Normal condition) Measurement	8.3×10^{-8} .
Frequency (Extreme condition) Measurement	1.1×10^{-7} .

UL Japan, Inc.**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401

A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX 1 to 3.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 4: Operation of EUT during testing

4.1 Operating mode-

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

The mode is used :

Mode	Operating mode	Tested frequency
All items, with tag	Transmitting mode (Tx) Modulated on (Mod on) (with Tag)	13.56 MHz
All items, without tag	Transmitting mode (Tx) Modulated on (Mod on) (without Tag)	13.56 MHz
<p>The EUT was operated in a manner similar to typical use during the tests.</p> <p>* EUT was set by the software as follows; Software: 02000001.mot Version 0A.00.00.01 (Date: 2011.9.14, Storage location: Driven by EUT memory)</p> <p>*This setting of software is the worst case. Any conditions 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.</p>		

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

This setting under the worst case.

Any conditions 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.

The carrier level and noise levels were confirmed with and without Tag, and the test was mode with the condition that has the maximum noise.

Combinations of the worst case:

Conducted emission	Radiated emission (carrier)	Radiated emission (below 30 MHz)	Radiated emission (above 30 MHz)
without tag	with tag	with tag	without tag

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 DC 24 V

Maximum Voltage DC 27.6 V,

Minimum Voltage DC 20.4 V (DC 24 V \pm 15 %)

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

UL Japan, Inc.

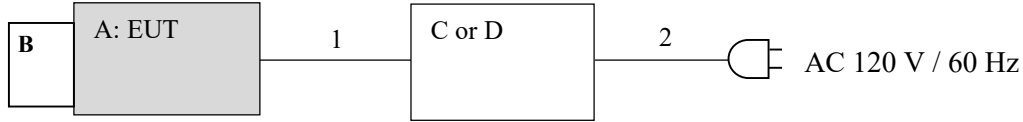
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

4.2 Configuration of tested system



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	High Frequency 13.56 MHz Transceiver	56RF-TR-4040	13 *1) 14 *2)	DENSO WAVE INCORPORATED	EUT
B	Tag	56RF-TG-50	5	DENSO WAVE INCORPORATED	Tag
C	Power Supply(DC)	PAN60-10A	NL002383	KIKUSUI	*3)
D	Power Supply(DC)	PW18-2ATP	19050351	TEXIO	*4)

*1) Used for Conducted Emission and Radiated Emission and Frequency Tolerance and Bandwidth tests

*2) Used for Conducted Emission (Antenna terminated)

*3) Used for Conducted Emission and Radiated Emission

*4) Used for Frequency Tolerance and Bandwidth tests

List of cables used

No.	Cable name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	2.0	Shielded	Shielded	-
2	AC	1.8	Unshielded	Unshielded	-

SECTION 5: Conducted emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 80 cm above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

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.

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.

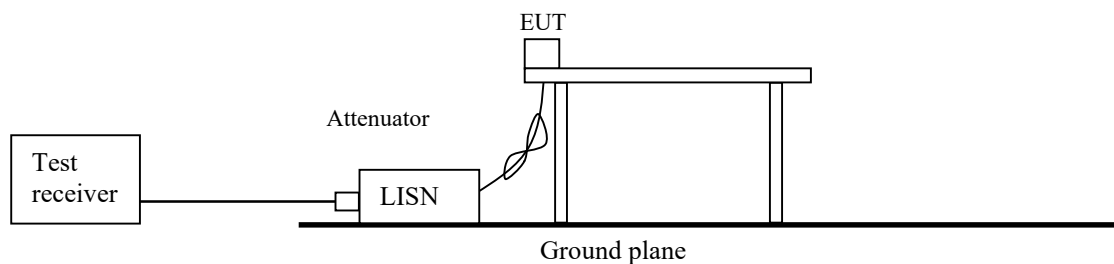
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a The EUT via Power Supply(DC) was connected to LISN(AMN).

An overview sweep with peak detection has been performed.

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

Figure 1: Test Setup



SECTION 6: Radiated emission

6.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

6.2 Test configuration

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m(Below 30 MHz) / 1.0 m by 2.0 m(Above 30 MHz), raised 0.8 m above the conducting ground plane.
The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.
Photographs of the set up are shown in APPENDIX 3.

6.3 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane at a distance of 3m.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are 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.

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3 m.

Frequency: From 9 kHz to 30 MHz at distance 3 m (Refer to Figure 2)

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. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30 MHz to 1 GHz at distance 3 m (Refer to Figure 2).

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 intensity.

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

Measurements were performed with QP, PK, and AV detector.

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

	9 kHz to 90 kHz & 110 kHz to 150 kHz	90 kHz to 110 kHz	150 kHz to 490 kHz	490 kHz to 30 MHz	30 MHz to 1 GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	10 kHz	9 kHz	120 kHz
Distance factor *1)	-80 dB	-80 dB	-80 dB	-40 dB	-
Measuring antenna	Loop antenna				Biconical (30 MHz - 200 MHz) Logperiodic (200 MHz - 1 GHz)

*1) FCC 15.31 (f)(2) (9 kHz-30 MHz)

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

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

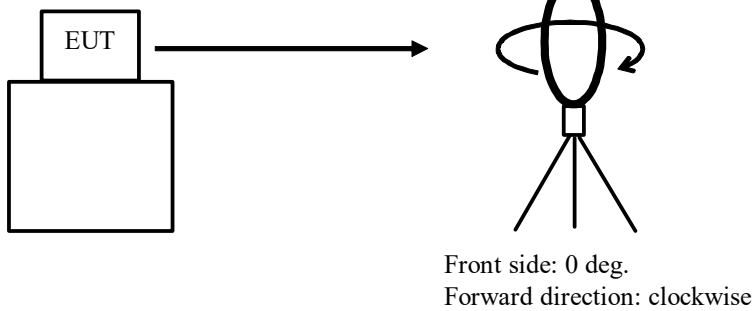
The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Combinations of the worst case

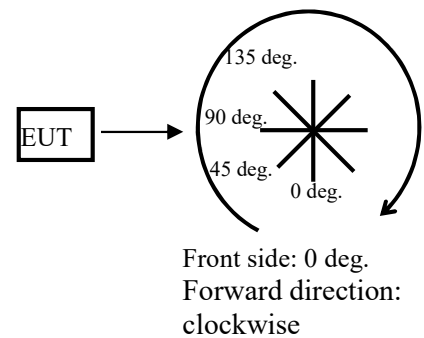
Frequency \ Antenna polarization	Below 30 MHz	Above 30 MHz
Horizontal	Y	X
Vertical	X	X

Figure 1: Direction of the Loop Antenna

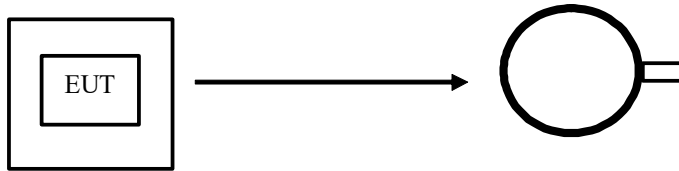
Side View (Vertical)



Top View (Vertical)

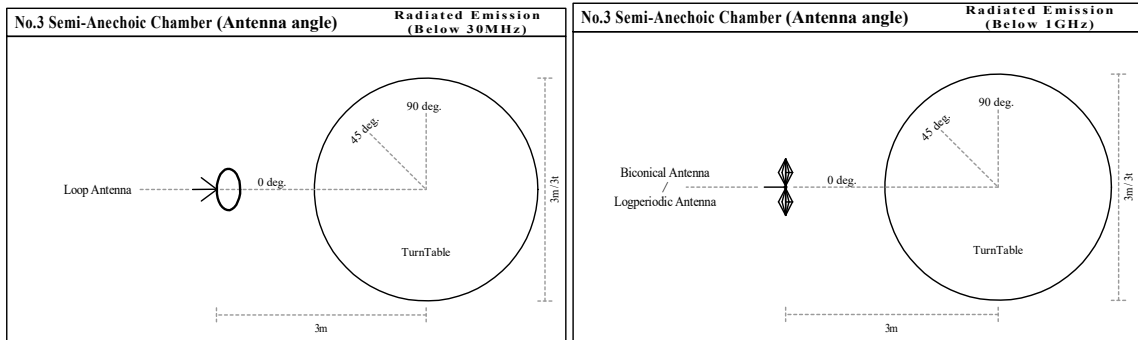


Top View (Horizontal)



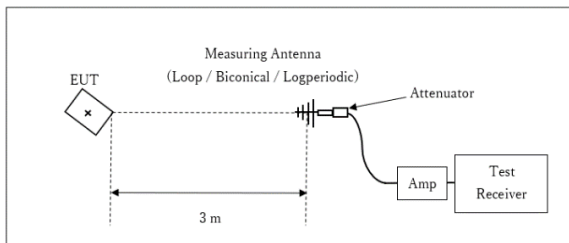
Antenna was not rotated.

Figure 2. Antenna angle



[Test Setup]

Below 1 GHz



Test Distance: 3 m

* : Center of turn table

6.4 Results

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

SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	500 kHz	3 kHz *2)	9.1 kHz *2)	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	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 %.

*2) Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 - 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

Peak hold was applied as Worst-case measurement.

Test data : APPENDIX

Test result : Pass

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

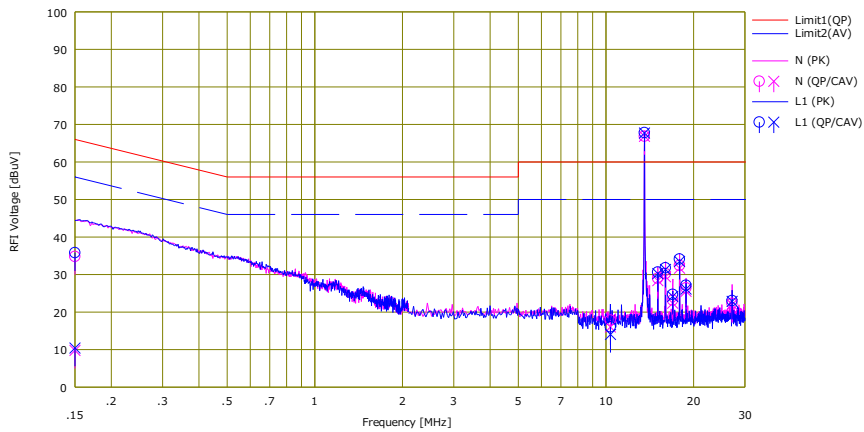
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2022/01/25

Mode : Tx and Mod on
Power : DC 24 V
Temp./Humi. : 20 deg.C / 26 %RH

Remarks : without tag (worst)

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Hiromasa Sato



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	22.40	-2.60	12.39	34.79	9.79	66.00	56.00	31.2	46.2	N	
2	10.35940	5.00	3.20	12.83	17.83	16.03	60.00	50.00	42.1	33.9	N	
3	13.56000	53.90	53.90	12.94	66.84	66.84	60.00	50.00	-6.9	-16.9	N	reference data
4	15.06980	16.00	15.40	12.99	28.99	28.39	60.00	50.00	31.0	21.6	N	
5	16.01160	17.20	16.40	13.02	30.22	29.42	60.00	50.00	29.7	20.5	N	
6	16.95376	10.10	9.30	13.06	23.16	22.36	60.00	50.00	36.8	27.6	N	
7	17.89584	19.30	18.60	13.09	32.39	31.69	60.00	50.00	27.6	18.3	N	
8	18.83710	13.30	12.40	13.13	26.43	25.53	60.00	50.00	33.5	24.4	N	
9	27.12000	8.90	8.60	13.39	22.29	21.99	60.00	50.00	37.7	28.0	N	
10	0.15000	23.40	-2.00	12.40	35.80	10.40	66.00	56.00	30.2	45.6	L1	
11	10.36220	3.30	1.30	12.74	16.04	14.04	60.00	50.00	43.9	35.9	L1	
12	13.56000	55.00	54.90	12.81	67.81	67.71	60.00	50.00	-7.9	-17.8	L1	reference data
13	15.07046	17.80	17.40	12.84	30.64	30.24	60.00	50.00	29.3	19.7	L1	
14	16.01242	18.90	18.50	12.86	31.76	31.36	60.00	50.00	28.2	18.6	L1	
15	16.95490	11.80	11.30	12.88	24.68	24.18	60.00	50.00	35.3	25.8	L1	
16	17.89554	21.20	20.60	12.90	34.10	33.50	60.00	50.00	25.9	16.5	L1	
17	18.83786	14.20	13.20	12.93	27.13	26.13	60.00	50.00	32.8	23.8	L1	
18	27.12000	10.00	9.80	13.03	23.03	22.83	60.00	50.00	36.9	27.1	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac[LISN(AMN)+Cable+ATT][dB]
LISN(AMN): SLS-05

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

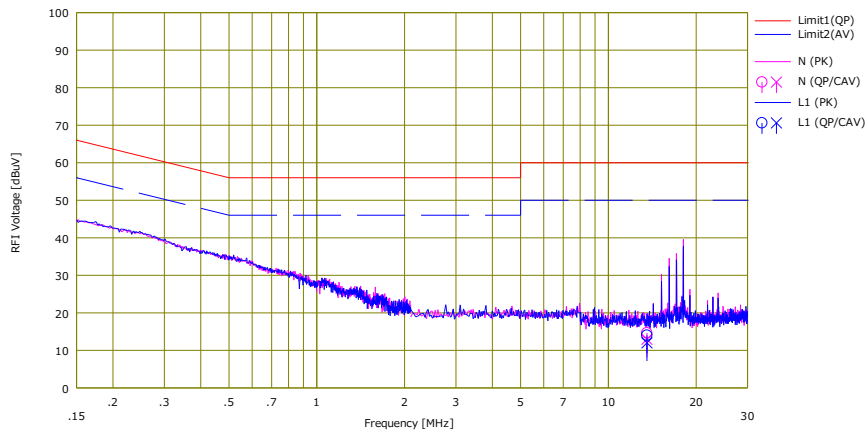
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2022/01/25

Mode : Tx and Mod on
Power : DC 24 V
Temp./Humi. : 20 deg.C / 26 %RH

Remarks : Terminated

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Hiromasa Sato



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]		<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	13.56000	1.70	0.00	12.94	14.64	12.94	60.00	50.00	45.3	37.0	N	
2	13.56000	1.20	-0.80	12.81	14.01	12.01	60.00	50.00	45.9	37.9	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): SLS-05

Data of Electric field strength of Fundamental emission and Spurious emission within the band

Report No. 14135330S-A-R2
Test place Shonan EMC Lab.
Semi Anechoic Chamber No.1
Date January 25, 2022
Temperature / Humidity 21 deg. C / 38 % RH
Engineer Hiromasa Sato
Mode Tx Mod on
with Tag,
Vertical polarization (antenna angle) of the worst case: 135 deg.

Fundamental emission

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	59.4	73.2	20.6	6.6	31.8	-40.0	14.7	28.5	83.9	69.2	55.4

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

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

Limits (30 m)

· 13.553 MHz to 13.567 MHz : 83.9 dBuV/m (FCC 15.225(a))

Spurious emission within the band

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.110	29.6	30.9	20.5	6.6	31.8	-40.0	-15.2	-13.9	29.5	44.7	43.4
2	13.410	29.5	31.0	20.6	6.6	31.8	-40.0	-15.2	-13.7	40.5	55.7	54.2
3	13.524	30.7	42.4	20.6	6.6	31.8	-40.0	-14.0	-2.3	50.4	64.4	52.7
4	13.553	43.4	30.2	20.6	6.6	31.8	-40.0	-1.3	-14.5	50.4	51.7	64.9
5	13.567	42.5	57.8	20.6	6.6	31.8	-40.0	-2.2	13.1	50.4	52.6	37.3
6	13.614	31.2	43.3	20.6	6.6	31.8	-40.0	-13.5	-1.4	50.4	63.9	51.8
7	13.710	29.6	32.3	20.6	6.6	31.8	-40.0	-15.1	-12.33	40.5	55.6	52.8
8	14.010	29.5	30.2	20.6	6.6	31.8	-40.0	-15.2	-14.44	29.5	44.7	43.9

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Outside filed strength frequencies

· $F_c \pm 7 \text{ kHz}$: 13.553 MHz to 13.567 MHz

· $F_c \pm 150 \text{ kHz}$: 13.410 MHz to 13.710 MHz

· $F_c \pm 450 \text{ kHz}$: 13.110 MHz to 14.010 MHz

$F_c = 13.56 \text{ MHz}$

Limits (30 m)

· 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz : 50.4 dBuV/m (FCC 15.225(b))

· 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz : 40.5 dBuV/m (FCC 15.225(c))

· Below 13.110 MHz and Above 14.010 MHz : 29.5 dBuV/m (FCC 15.225(d)and FCC 15.209)

UL Japan, Inc.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious emission

Report No. 14135330S-A-R2
 Test place Shonan EMC Lab.
 Semi Anechoic Chamber No.1 No.2
 Date January 25, 2022 January 24, 2022
 Temperature / Humidity 21 deg. C / 38 % RH 20 deg. C / 26 % RH
 Engineer Hiromasa Sato Miku Ikudome
 Mode Below 30 MHz Above 30 MHz
 Tx Mod on
 [Below 30 MHz]: with Tag,
 Vertical polarization (antenna angle) of the worst case: 135 deg.
 [Above 30 MHz]: without Tag

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	27.12	QP	28.4	21.6	6.9	31.8	-40.0	-14.9	29.5	44.4	-	53	* Limit: 30 m
Hori.	271.200	QP	44.5	13.0	6.2	31.7	0.0	32.1	46.0	13.9	117	105	-
Hori.	298.320	QP	42.1	13.7	6.4	31.7	0.0	30.6	46.0	15.4	109	92	-
Hori.	325.440	QP	35.9	14.6	6.6	31.7	0.0	25.5	46.0	20.5	100	307	-
Hori.	596.640	QP	32.8	19.3	8.2	31.6	0.0	28.8	46.0	17.2	151	284	-
Vert.	27.12	QP	31.4	21.6	6.9	31.8	-40.0	-11.9	29.5	41.4	-	25	* Limit: 30 m
Vert.	94.92	QP	42.7	9.2	8.1	31.9	0.0	28.1	43.5	15.4	100	104	-
Vert.	135.600	QP	38.6	14.1	8.3	31.8	0.0	29.2	43.5	14.3	100	294	-
Vert.	149.160	QP	38.2	14.8	8.6	31.8	0.0	29.7	43.5	13.8	100	273	-
Vert.	271.200	QP	47.1	13.0	6.2	31.7	0.0	34.7	46.0	11.3	100	229	-
Vert.	325.440	QP	42.3	14.6	6.6	31.7	0.0	31.9	46.0	14.1	171	168	-
Vert.	461.04	QP	38.9	17.0	7.5	31.6	0.0	31.8	46.0	14.2	110	267	-
Vert.	488.16	QP	40.0	17.7	7.6	31.6	0.0	33.7	46.0	12.3	100	270	-
Vert.	596.64	QP	35.1	19.3	8.2	31.6	0.0	31.1	46.0	15.0	100	276	-

Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30 MHz)) - Gain(Amplifier) + Distance factor(below 30 MHz)

* Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

* Carrier level (Result at 3 m): Hor= 54.7 dBuV/m, Ver= 68.5 dBuV/m

UL Japan, Inc.

Shonan EMC Lab.

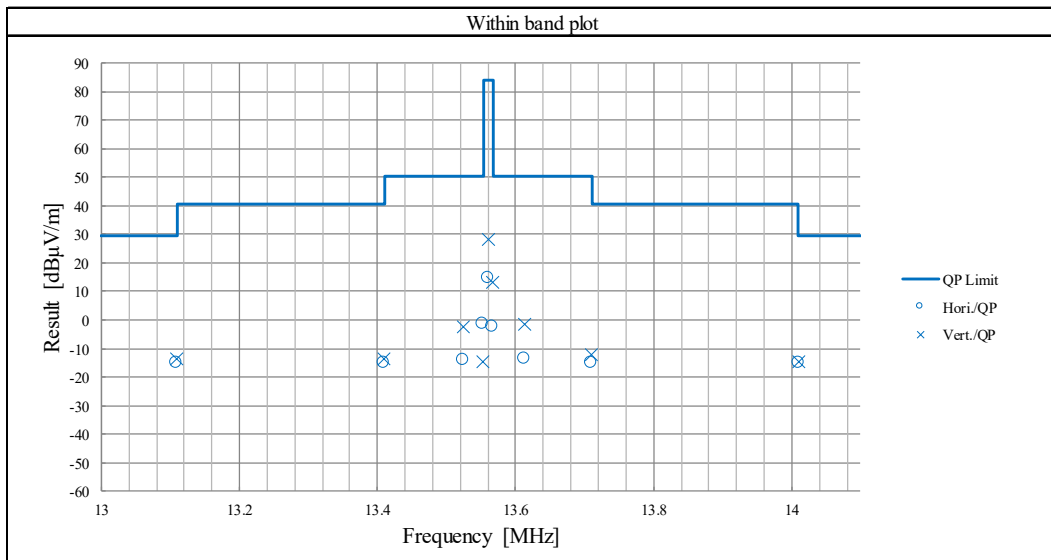
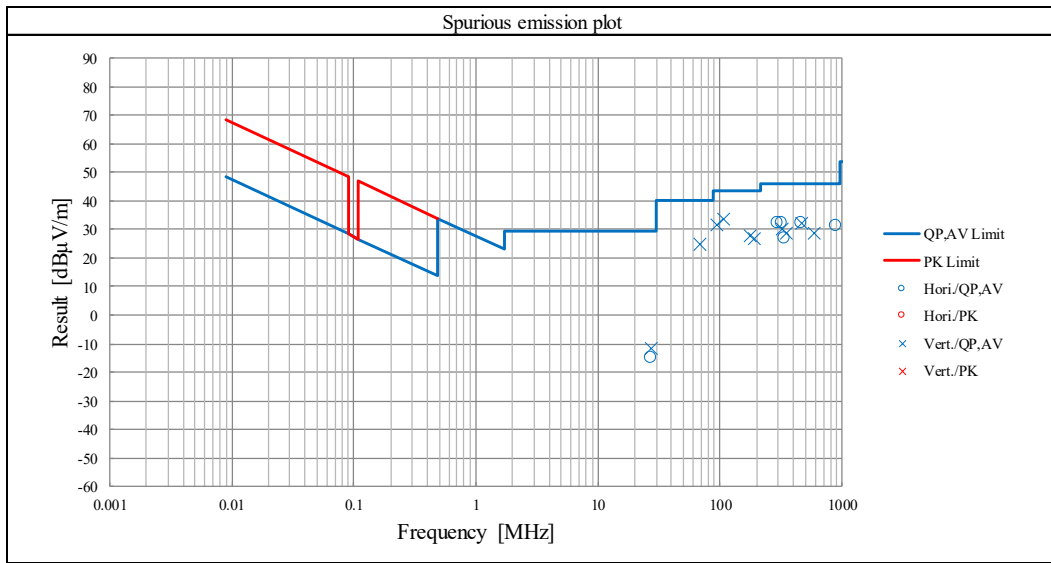
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission Plot data, Worst case

Report No.	14135330S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.1	No.2
Date	January 25, 2022	January 24, 2022
Temperature / Humidity	21 deg. C / 38 % RH	20 deg. C / 26 % RH
Engineer	Hiromasa Sato	Miku Ikudome
	Below 30 MHz	Above 30 MHz
Mode	Tx Mod on	
	[Below 30 MHz]: with Tag,	
	Vertical polarization (antenna angle) of the worst case: 135 deg.	
	[Above 30 MHz]: without Tag	

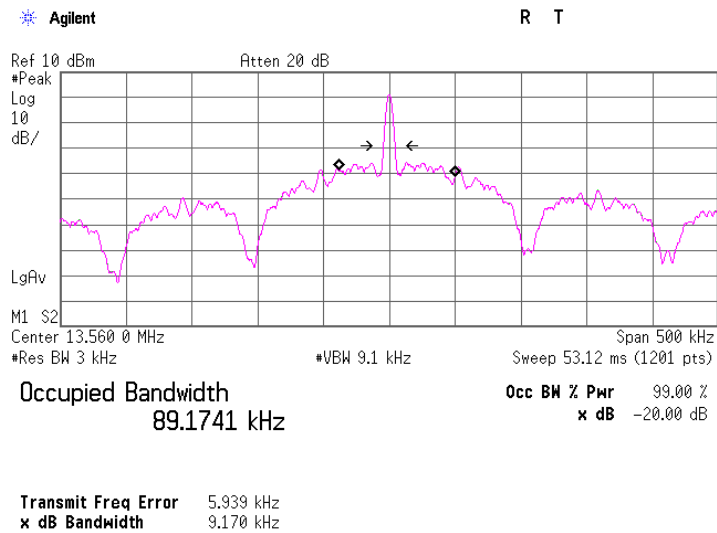


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

20 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 14135330S-A-R2
Test place Shonan EMC Lab.
Shielded room No.5
Date December 14, 2021
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Miku Ikudome
Mode Tx Mod on, with Tag

FREQ [MHz]	20 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
13.56	9.17	89.17



*Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 – 5 % of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

Frequency Tolerance

Report No. 14135330S-A-R2
 Test place Shonan EMC Lab.
 Shielded room No.5
 Date December 14, 2021
 Temperature / Humidity 22 deg. C / 41 % RH
 Engineer Miku Ikudome
 Mode Tx Mod on, without Tag

Test condition Temp. [deg. C]	Voltage [V]	Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
					[%]	[ppm]	
50	24	Power on	13.559883	-0.000117	-0.00086	-8.6	0.01
		+ 2 min.	13.559894	-0.000106	-0.00078	-7.8	0.01
		+ 5 min.	13.559903	-0.000097	-0.00072	-7.2	0.01
		+ 10 min.	13.559909	-0.000091	-0.00067	-6.7	0.01
40	24	Power on	13.559920	-0.000080	-0.00059	-5.9	0.01
		+ 2 min.	13.559888	-0.000112	-0.00083	-8.3	0.01
		+ 5 min.	13.559882	-0.000118	-0.00087	-8.7	0.01
		+ 10 min.	13.559883	-0.000117	-0.00086	-8.6	0.01
30	24	Power on	13.559961	-0.000039	-0.00029	-2.9	0.01
		+ 2 min.	13.559915	-0.000085	-0.00063	-6.3	0.01
		+ 5 min.	13.559896	-0.000104	-0.00077	-7.7	0.01
		+ 10 min.	13.559889	-0.000111	-0.00082	-8.2	0.01
20	24	Power on	13.560003	0.000003	0.00002	0.2	0.01
		+ 2 min.	13.559953	-0.000047	-0.00035	-3.5	0.01
		+ 5 min.	13.559927	-0.000073	-0.00054	-5.4	0.01
		+ 10 min.	13.559913	-0.000087	-0.00064	-6.4	0.01
20	20.4 (24 V -15 %)	Power on	13.559947	-0.000053	-0.00039	-3.9	0.01
		+ 2 min.	13.559922	-0.000078	-0.00058	-5.8	0.01
		+ 5 min.	13.559914	-0.000086	-0.00063	-6.3	0.01
		+ 10 min.	13.559911	-0.000089	-0.00066	-6.6	0.01
20	27.6 (24 V +15 %)	Power on	13.559940	-0.000060	-0.00044	-4.4	0.01
		+ 2 min.	13.559918	-0.000082	-0.00060	-6.0	0.01
		+ 5 min.	13.559912	-0.000088	-0.00065	-6.5	0.01
		+ 10 min.	13.559908	-0.000092	-0.00068	-6.8	0.01
10	24	Power on	13.560044	0.000044	0.00032	3.2	0.01
		+ 2 min.	13.559995	-0.000005	-0.00004	-0.4	0.01
		+ 5 min.	13.559967	-0.000033	-0.00024	-2.4	0.01
		+ 10 min.	13.559950	-0.000050	-0.00037	-3.7	0.01
0	24	Power on	13.560071	0.000071	0.00052	5.2	0.01
		+ 2 min.	13.560037	0.000037	0.00027	2.7	0.01
		+ 5 min.	13.560011	0.000011	0.00008	0.8	0.01
		+ 10 min.	13.559993	-0.000007	-0.00005	-0.5	0.01
-10	24	Power on	13.560076	0.000076	0.00056	5.6	0.01
		+ 2 min.	13.560068	0.000068	0.00050	5.0	0.01
		+ 5 min.	13.560050	0.000050	0.00037	3.7	0.01
		+ 10 min.	13.560035	0.000035	0.00026	2.6	0.01
-20	24	Power on	13.560051	0.000051	0.00038	3.8	0.01
		+ 2 min.	13.560082	0.000082	0.00060	6.0	0.01
		+ 5 min.	13.560076	0.000076	0.00056	5.6	0.01
		+ 10 min.	13.560068	0.000068	0.00050	5.0	0.01

Calculation formula: Frequency error = Measured frequency - Tested frequency

Result [%] = Frequency error / Tested frequency * 100

Tested frequency: 13.56 MHz

Limit (+/-): 0.01 % (+/- 100 ppm)

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

APPENDIX 2: Test instruments**Test equipment (1/2)**

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
BW	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2021/10/13	12
BW,FT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2021/09/14	12
BW,FT	SCH-01	145200	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	2021/04/02	12
BW,FT	SOS-27	191845	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
BW,FT	SSCA-01	146178	Search coil	Langer	RF-R 400-1	02-0634	-	-
FT	SFC-03	183119	Microwave Counter	Keysight Technologies Inc	53151A	US40511493	2021/11/12	12
CE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
CE	SAT3-10	144960	Attenuator	JFW	50HF-003N	-	2021/08/16	12
CE	SCC-C9	145035	Coaxial Cable	Suhner	RG223U	-	2021/04/12	12
CE	SLS-05	145542	LISN	Rohde & Schwarz	ENV216	100516	2021/02/12	12
CE	SOS-06	146294	Humidity Indicator	A&D Company	AD-5681	4062118	-	-
CE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2021/09/14	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(R E,CE,ME,PE)	-	-	-
CE,RE	STR-02	145791	Test Receiver	Rohde & Schwarz	ESCI	100575	2021/06/02	12
RE	SAEC-01 (NSA)	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2021/04/30	12
RE	SAEC-02 (NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2021/03/16	12
RE	SAEC-ALL	145568	Semi Anechoic Chamber(ME)	TDK	Semi Anechoic Chamber 3m/10m	1, 2, 3	2020/12/25	24
RE	SAF-01	145003	Pre Amplifier	SONOMA	310N	290211	2021/02/10	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2021/02/10	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2021/01/26	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2021/02/10	12
RE	SAT6-15	167096	Attenuator	JFW	50HF-006N	-	2021/02/10	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2021/04/10	12
RE	SCC-A2/A4/A6/A7/A8/A13/SRSE-01	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS 4906	-/0901-269(RF Selector)	2021/04/12	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS 4906	-/0901-270(RF Selector)	2021/04/12	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS 4906	-/0901-270(RF Selector)	2021/04/12	12
RE	SCC-M1	194601	Coaxial Cable	Fujikura	5D-2W	-	2021/12/10	12

UL Japan, Inc.**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test equipment (2/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
RE	SJM-21	207278	Measuring Tool, Tape Measure	ASKUL	-	-	-	-
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2021/04/10	12
RE	SLP-02	145536	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	2021/04/06	12
RE	SOS-20	191837	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2021/09/17	12
RE	STS-01	145792	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997812	2021/09/14	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2021/04/28	12

*Hyphens for Last Calibration 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.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:

CE: Conducted Emission
RE: Radiated Emission
FT: Frequency Tolerance
BW: Bandwidth

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401