




RADIO TEST REPORT


Test Report No.: 11826557S-A-R2

Applicant : Alpine Electronics, Inc.
Type of Equipment : Display Unit
Model No. : GABI01
FCC ID : A269ZUA152
Test regulation : FCC Part15 Subpart C: 2017
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 limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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. This report is a revised version of 11826557S-A-R1. 11826557S-A-R1 is replaced with this report.

Date of test: July 7 to 27, 2017

Representative test engineer: 
Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by : 
Akio Hayashi
Leader
Consumer Technology Division



- 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.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : ALPINE Electronics, Inc.
Address : 20-1 Yoshima-Industrial Park, Iwaki, Fukushima 970-1192, Japan
Telephone Number : +81-246-36-4111
Facsimile Number : +81-246-36-6492
Contact Person : Mitsuru Yoshida

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

2.1 Identification of E.U.T.

Type of Equipment : Display Unit
Model No. : GABI01
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 13.5 V
Receipt Date of Sample : July 3, 2017
Country of Mass-production : China, Mexico
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: GABI01 (referred to as the EUT in this report) is a Display Unit.

General Specification

Clock frequency(ies) in the system : ucom: 8 MHz/ Image: 62.09 MHz/ NFC:13.56 MHz/
Power supply IC: 2 MHz

Radio Specification

NFC

Radio Type : Transceiver
Frequency of Operation : 13.56 MHz
Modulation : ASK
Antenna type : Loop
Operating Temperature : -40 deg.C to +85 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 November 14, 2016 and effective December 14, 2016
Title : FCC 47 CFR Part 15 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 bands 13.110 - 14.010 MHz.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 8.8	FCC 15.207 <IC> RSS-Gen 8.8	-	N/A *1)	-	-
Electric field strength of Fundamental emission	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.12	FCC 15.225 (a) <IC> RSS-210 B.6	Radiated	N/A	71.9 dB (Vertical)	Complied
Electric field strength of Spurious emission (within the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.13	FCC 15.225 (b)(c) <IC> RSS-210 B.6	Radiated	N/A	45.7 dB (13.110 MHz, Horizontal & Vertical)	Complied
Electric field strength of Spurious emission (outside of the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.13	FCC 15.209 FCC 15.225 (d) <IC> RSS-210 B.6	Radiated	N/A	2.8 dB (40.68 MHz, Vertical)	Complied
20dB bandwidth	ANSI C63.10:2013 6 Standard test methods <IC> -	FCC 15.215 (c) <IC> -	Radiated	N/A	-	-
Frequency tolerance	ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.11, 8.11	FCC 15.225 (e) <IC> RSS-210 B.6	Radiated	N/A	-	Complied

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

*1) The test is not applicable since the EUT has no AC mains.

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3 V/ 5 V) constantly to RF part regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result. Therefore, this EUT complies with the requirement.

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 requirement.

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99 %)	ANSI C63.10:2013 6.Standard test methods RSS-Gen 6.6	RSS-Gen 4.6.1	Conducted	-	-

Note: UL Japan'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

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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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	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.91 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test location

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Telephone number : +81 463 50 6400

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JAB Accreditation No. : RTL02610

	IC Registration No.	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 setup, Data of EMI & Test instruments

Refer to APPENDIX.

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

4.1 Operating mode

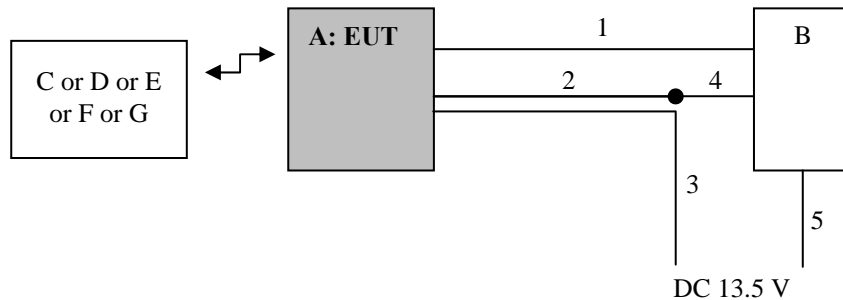
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Operation: 1) Transmitting (13.56 MHz)

Power settings	Fixed
Firmware Version	Ver.0900

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

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	Display Unit	GABI01	110	Alpine Electronics, Inc.	EUT
B	CAN BOX	-	2	Alpine Electronics, Inc.	-
C	Tag	NFC Forum Type1	T5-C1-L11004344	orange Tags	-
D	Tag	NFC Forum Type2	-	orange Tags	-
E	Tag	NFC Forum Type3	-	orange Tags	-
F	Tag	NFC Forum Type4	-	NXP	-
G	Tag	ISO15693 Tag	-	NXP	-

List of cables used

No.	Name	Length (m)	Shield (Cable)	Shield (Connector)	Remark
1	Signal	5.0	Unshielded	Unshielded	-
2	Signal	5.0	Unshielded	Unshielded	-
3	DC	5.0	Unshielded	Unshielded	-
4	Signal	0.3	Unshielded	Unshielded	-
5	DC	0.3	Unshielded	Unshielded	-

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SECTION 5: Radiated emission

5.1 Operating environment

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

5.2 Test configuration

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 80 cm above the conducting ground plane. That has very low permittivity.

Photographs of the set up are shown in APPENDIX 3.

5.3 Test procedure

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

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area 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 - 199.99 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 EUT was set at 48.6 degree (on the condition that the horizontal plane is set to 0 deg.) as normal position according to the EUT's specification.

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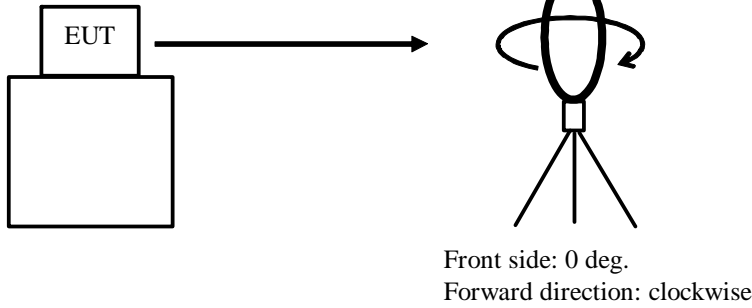
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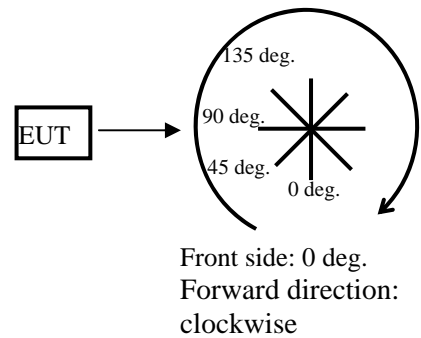
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Figure 1. Direction of the Loop Antenna

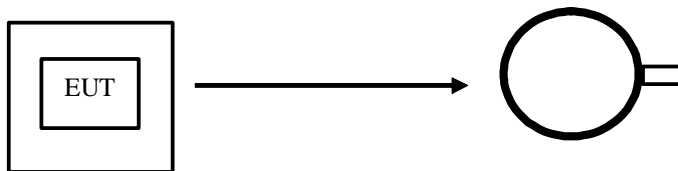
Side View (Vertical)



Top View (Vertical)

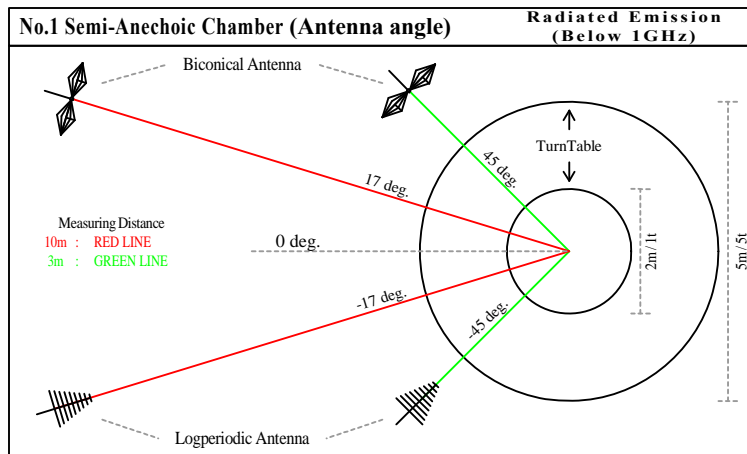


Top View (Horizontal)



Antenna was not rotated.

Figure 2. Antenna angle



5.4 Results

Summary of the test results : Pass

Refer to APPENDIX 1

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SECTION 6: 20 dB bandwidth & Occupied bandwidth (99 %)

Test procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	2 to 5 times of OBW	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display measured Bandwidth	1 to 5 % of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer

Summary of the test results: Pass

Refer to APPENDIX 1

SECTION 7: Frequency Tolerance

Test procedure

The test was measured with a frequency counter using a test fixture.

The temperature test was started after the temperature stabilization time of 30 minutes.

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

Summary of the test results: Pass

Refer to APPENDIX 1

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APPENDIX 1: Data of Radio tests**Data of Electric field strength of Fundamental emission
and Spurious emission within the band: FCC15.225(a)(b)(c)**

UL Japan, Inc.
Shonan EMC Lab., No.1 Semi Anechoic Chamber

Company:	Alpine Electronics, Inc.	Regulation:	FCC Part15 Subpart C 15.225
Equipment:	Display Unit	Test Distance:	3m
Model:	GABI01	Date:	July 7, 2017
Sample No.:	110	Temperature:	22 deg.C
Power:	DC13.5V	Humidity:	65 %RH
Mode:	Transmitting 13.56MHz	ENGINEER:	Hiroyuki Morikawa

Remarks: : NFC Forum Type2, 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	57.4	58.3	18.9	6.7	31.8	-40.0	11.1	12.0	83.9	72.8	71.9

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

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

Limits (30m)

•13.553MHz to 13.567MHz : 83.9dBuV/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	30.0	30.0	19.0	6.7	31.8	-40.0	-16.2	-16.2	29.5	45.7	45.7
2	13.349	33.3	34.4	18.9	6.7	31.8	-40.0	-13.0	-11.8	40.5	53.5	52.3
3	13.410	30.2	30.5	18.9	6.7	31.8	-40.0	-16.0	-15.8	40.5	56.5	56.3
4	13.456	32.2	33.3	18.9	6.7	31.8	-40.0	-14.1	-13.0	50.4	64.5	63.4
5	13.553	42.4	43.3	18.9	6.7	31.8	-40.0	-3.9	-3.0	50.4	54.3	53.4
6	13.567	45.0	45.9	18.9	6.7	31.8	-40.0	-1.3	-0.4	50.4	51.7	50.8
7	13.668	32.4	32.8	18.8	6.7	31.8	-40.0	-14.0	-13.6	50.4	64.4	64.0
8	13.710	30.4	30.7	18.8	6.7	31.8	-40.0	-15.9	-15.7	40.5	56.4	56.2
9	13.772	34.5	35.2	18.8	6.7	31.8	-40.0	-11.8	-11.2	40.5	52.3	51.7
10	14.010	30.1	30.0	18.8	6.7	31.8	-40.0	-16.3	-16.4	29.5	45.8	45.9

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

Outside filed strength frequencies

- Fc±7kHz:13.553MHz to 13.567MHz
- Fc±150kHz:13.410MHz to 13.710MHz
- Fc±450kHz:13.110MHz to 14.010MHz

Fc = 13.56MHz

Limits (30m)

- 13.410MHz to 13.553MHz and 13.567MHz to 13.710MHz : 50.4dBuV/m (FCC 15.225(b))
- 13.110MHz to 13.410MHz and 13.710MHz to 14.010MHz : 40.5dBuV/m (FCC 15.225(c))
- Below 13.110MHz and Above 14.010MHz : 29.5dBuV/m (FCC 15.225(d)and FCC 15.209)

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Radiated Emission

UL Japan, Inc.
Shonan EMC Lab. No.1 Semi Anechoic Chamber

Company: Alpine Electronics, Inc.	Regulation: FCC Part15 Subpart C 15.225
Equipment: Display Unit	Test Distance: 3m
Model: GABI01	Date: July 7, 2017 July 8, 2017
Sample No.: 110	Temperature: 22 deg.C 24 deg.C
Power: DC13.5V	Humidity: 65 %RH 50 %RH
Mode: Transmitting 13.56MHz	ENGINEER: Hiroyuki Morikawa
Remarks: Below 30MHz, NFC Forum Type2, with Tag , Vertical polarization (antenna angle) of the worst case: 135 deg	
Above 30MHz, NFC Forum Type2, with 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	30.0	18.6	7.0	31.8	-40.0	-16.3	29.5	45.8	-	349	* Limit: 30m
Hori.	40.68	QP	41.0	14.2	7.3	31.8	0.0	30.6	40.0	9.4	266	235	
Hori.	195.29	QP	38.0	16.4	9.2	31.8	0.0	31.8	43.5	11.7	166	34	
Hori.	257.64	QP	44.5	12.0	6.4	31.7	0.0	31.1	46.0	14.9	123	53	
Hori.	881.42	QP	32.5	21.8	9.9	31.4	0.0	32.8	46.0	13.2	100	236	
Vert.	27.12	QP	30.3	18.6	7.0	31.8	-40.0	-16.0	29.5	45.5	-	350	* Limit: 30m
Vert.	40.68	QP	47.6	14.2	7.3	31.8	0.0	37.2	40.0	2.8	100	296	
Vert.	67.80	QP	46.8	6.7	7.7	31.8	0.0	29.4	40.0	10.6	100	315	
Vert.	94.92	QP	48.9	9.1	8.1	31.8	0.0	34.4	43.5	9.1	118	4	
Vert.	153.93	QP	37.5	15.1	8.8	31.8	0.0	29.5	43.5	14.0	100	143	
Vert.	176.28	QP	42.8	16.1	9.0	31.8	0.0	36.1	43.5	7.4	100	137	
Vert.	257.64	QP	42.1	12.0	6.4	31.7	0.0	28.7	46.0	17.3	101	7	
Vert.	865.66	QP	29.1	21.6	9.8	31.5	0.0	29.0	46.0	17.0	131	102	

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

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

* Carrier level (Result at 3m): Hor= 51.1dBuV/m, Ver= 52 dBuV/m

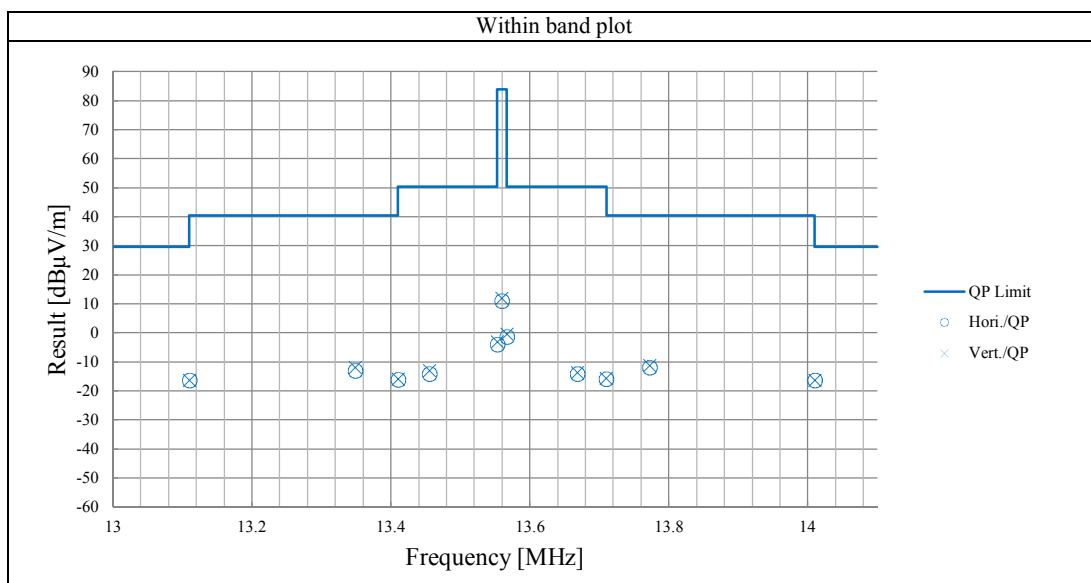
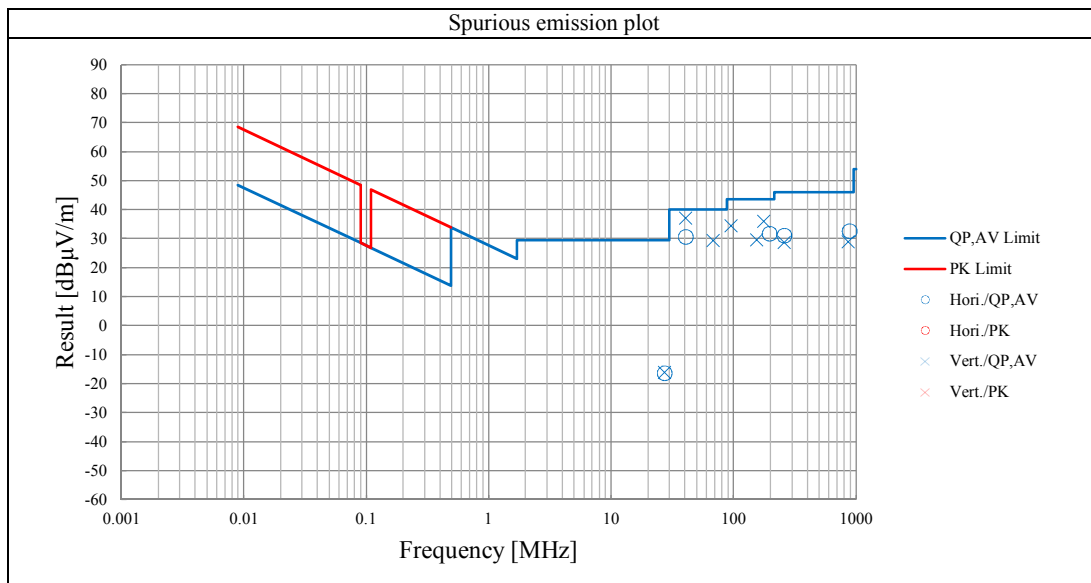
Radiated Emission (Worst mode plot)

UL Japan, Inc.
Shonan EMC Lab. No.1 Semi Anechoic Chamber

Company: Alpine Electronics, Inc
 Equipment: Display Unit
 Model: GABI01
 Sample No.: 110
 Power: DC13.5V
 Mode: Transmitting 13.56MHz
 Remarks: Below 30MHz, NFC Forum Type2, with Tag , Vertical polarization (antenna angle) of the worst case: 135 deg
 Above 30MHz, NFC Forum Type2, with Tag

Regulation: FCC Part15 Subpart C 15.225
 Test Distance: 3m
 Date: July 7, 2017 July 8, 2017
 Temperature: 22 deg.C 24 deg.C
 Humidity: 65 %RH 50 %RH
 ENGINEER: Hiroyuki Morikawa

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



Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Company Alpine Electronics, Inc.
 Equipment Display Unit
 Model GABI01
 Serial No. 110
 Power DC 13.5V
 Mode Transmitting 13.56 MHz

Regulation FCC Part15 Subpart C 15.225 (e)
 Date July 27, 2017
 Temperature 27 deg.C
 Humidity 52 %RH
 ENGINEER Yosuke Ishikawa

Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560350	0.000350	0.00258	0.010
after 2minutes	13.56	13.560364	0.000364	0.00268	0.010
after 5minutes	13.56	13.560363	0.000362	0.00267	0.010
after 10minutes	13.56	13.560368	0.000367	0.00271	0.010

Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560409	0.000409	0.00301	0.010
after 2minutes	13.56	13.560408	0.000407	0.00301	0.010
after 5minutes	13.56	13.560413	0.000412	0.00304	0.010
after 10minutes	13.56	13.560413	0.000412	0.00304	0.010

Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560413	0.000412	0.00304	0.010
after 2minutes	13.56	13.560431	0.000431	0.00318	0.010
after 5minutes	13.56	13.560430	0.000430	0.00317	0.010
after 10minutes	13.56	13.560447	0.000447	0.00329	0.010

Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560421	0.000421	0.00310	0.010
after 2minutes	13.56	13.560430	0.000430	0.00317	0.010
after 5minutes	13.56	13.560427	0.000426	0.00315	0.010
after 10minutes	13.56	13.560428	0.000427	0.00315	0.010

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560415	0.000415	0.00306	0.010
after 2minutes	13.56	13.560415	0.000415	0.00306	0.010
after 5minutes	13.56	13.560408	0.000407	0.00301	0.010
after 10minutes	13.56	13.560411	0.000411	0.00303	0.010

UL Japan, Inc.

Shonan EMC Lab.

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Data of Frequency Tolerance

Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560379	0.000379	0.00279	0.010
after 2minutes	13.56	13.560378	0.000378	0.00278	0.010
after 5minutes	13.56	13.560380	0.000380	0.00280	0.010
after 10minutes	13.56	13.561095	0.001095	0.00808	0.010

Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560348	0.000347	0.00256	0.010
after 2minutes	13.56	13.560346	0.000346	0.00255	0.010
after 5minutes	13.56	13.560350	0.000350	0.00258	0.010
after 10minutes	13.56	13.560346	0.000346	0.00255	0.010

Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560332	0.000331	0.00244	0.010
after 2minutes	13.56	13.560329	0.000329	0.00242	0.010
after 5minutes	13.56	13.560334	0.000334	0.00246	0.010
after 10minutes	13.56	13.560337	0.000336	0.00248	0.010

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Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Company Alpine Electronics, Inc.
 Equipment Display Unit
 Model GABI01
 Serial No. 110
 Power DC 13.5V
 Mode Transmitting 13.56 MHz

Regulation FCC Part15 Subpart C 15.225 (e)
 Date July 27, 2017
 Temperature 27 deg.C
 Humidity 52 %RH
 ENGINEER Yosuke Ishikawa

Voltage Variation: DC 11.475 V

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560410	0.000410	0.00302	0.010
after 2minutes	13.56	13.560409	0.000409	0.00301	0.010
after 5minutes	13.56	13.560414	0.000414	0.00305	0.010
after 10minutes	13.56	13.560408	0.000407	0.00301	0.010

Voltage Variation: DC 15.525 V

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560410	0.000410	0.00302	0.010
after 2minutes	13.56	13.560404	0.000403	0.00298	0.010
after 5minutes	13.56	13.560403	0.000402	0.00297	0.010
after 10minutes	13.56	13.560436	0.000436	0.00322	0.010

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20dB bandwidth & 99% Occupied bandwidth: FCC 15.215 / RSS-Gen

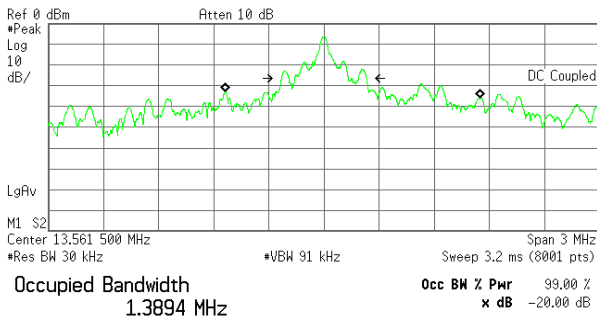
UL Japan, Inc.
 Shonan EMC Lab. No.5 Shielded Room

Company: Alpine Electronics, Inc.
 Equipment: Display Unit
 Model: GABI01
 Sample No.: 110
 Power: DC13.5V
 Mode: Transmitting 13.56MHz

Regulation: FCC Part15 Subpart C 15.215
 Date: July 27, 2017
 Temperature: 27 deg.C
 Humidity: 52 %RH
 ENGINEER: Yosuke Ishikawa

Tag: Type1

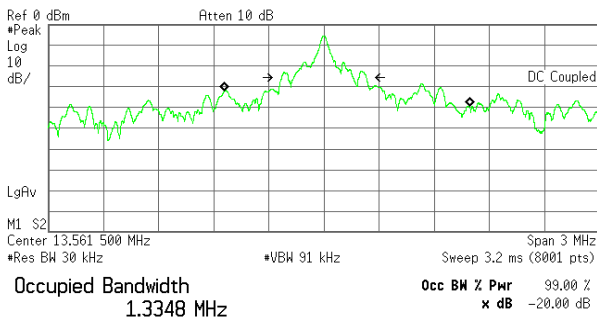
20dB Bandwidth: 461.073 kHz
99% Occupied Bandwidth: 1.3894 MHz
 * Agilent R L



Transmit Freq Error 155.270 kHz
 x dB Bandwidth 461.073 kHz

Tag: Type2

20dB Bandwidth: 459.890 kHz
99% Occupied Bandwidth: 1.3348 MHz
 * Agilent R L



Transmit Freq Error 126.266 kHz
 x dB Bandwidth 459.890 kHz

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20dB bandwidth & 99% Occupied bandwidth: FCC 15.215 / RSS-Gen

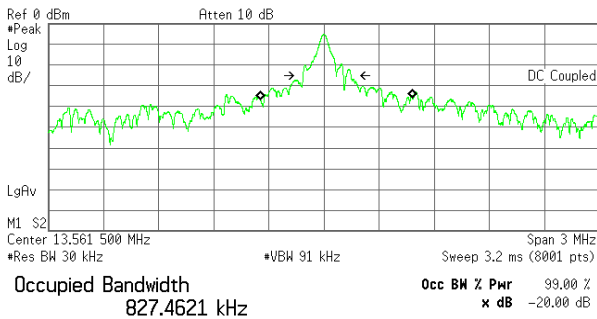
UL Japan, Inc.
 Shonan EMC Lab. No.5 Shielded Room

Company: Alpine Electronics, Inc.
 Equipment: Display Unit
 Model: GABI01
 Sample No.: 110
 Power: DC13.5V
 Mode: Transmitting 13.56MHz

Regulation: FCC Part15 Subpart C 15.215
 Date: July 27, 2017
 Temperature: 27 deg.C
 Humidity: 52 %RH
 ENGINEER: Yosuke Ishikawa

Tag: Type3

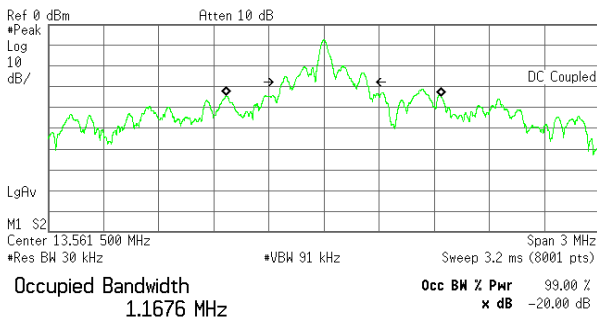
20dB Bandwidth: 260.717 kHz
99% Occupied Bandwidth: 0.8275 MHz
 * Agilent R L



Transmit Freq Error 69.305 kHz
 x dB Bandwidth 260.717 kHz

Tag: Type4

20dB Bandwidth: 456.166 kHz
99% Occupied Bandwidth: 1.1676 MHz
 * Agilent R L



Transmit Freq Error 54.478 kHz
 x dB Bandwidth 456.166 kHz

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20dB bandwidth & 99% Occupied bandwidth: FCC 15.215 / RSS-Gen

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded Room

Company: Alpine Electronics, Inc.
 Equipment: Display Unit
 Model: GABI01
 Sample No.: 110
 Power: DC13.5V
 Mode: Transmitting 13.56MHz

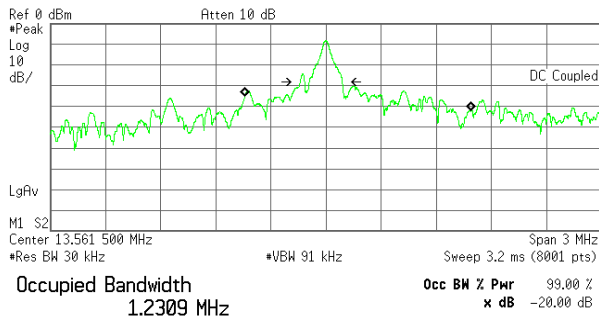
Regulation: FCC Part15 Subpart C 15.215
 Date: July 27, 2017
 Temperature: 27 deg.C
 Humidity: 52 %RH
 ENGINEER: Yosuke Ishikawa

Tag: ISO15693

20dB Bandwidth: 229.736 kHz

99% Occupied Bandwidth: 1.2309 MHz

* Agilent R L



Transmit Freq Error 175.700 kHz
 x dB Bandwidth 229.736 kHz

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APPENDIX 2 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2017/02/09 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2016/12/15 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2016/08/04 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2016/10/15 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2017/04/07 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2017/01/05 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2016/10/12 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2017/04/12 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2017/06/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2016/10/17 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2016/10/28 * 12
SAT6-12	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	FT/BW	2016/10/17 * 12
SRENT-10	Spectrum Analyzer	Agilent	E4440A	US41421511	FT/BW	2016/12/05 * 12
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	FT	2017/04/17 * 12
SSCA-01	Search coil	LANGER	RF-R 400-1	02-0634	FT/BW	Pre Check
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	FT/BW	2016/12/13 * 12

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 :

RE: Radiated emission,
FT: Frequency Tolerance,
BW: Bandwidth