



RADIO TEST REPORT

Test Report No. : 11439195H-B-R1

Applicant : FALTEC CO., LTD.
Type of Equipment : Remote engine starter unit
Model No. : PZ170-22011
FCC ID : WKE-722011
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

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 above regulation.
4. The test results in this 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 NVLAP, NIST, or any agency of the Federal Government.
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 11439195H-B. 11439195H-B is replaced with this report.

Date of test: October 28 and November 1, 2016

Representative test engineer:

Shinya Watanabe
Engineer
Consumer Technology Division

Approved by:

Motoya Imura
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.

*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

UL Japan, Inc.
Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	8
SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)	9
SECTION 6: 20 dB Bandwidth and Duty Cycle	10
APPENDIX 1: Test data	11
Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)	11
20 dB Bandwidth	13
Duty Cycle	14
99% Occupied Bandwidth	15
APPENDIX 2: Test Instruments	16
APPENDIX 3: Photographs of test setup	17
Radiated Emission	17
Worst Case Position	19

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 1: Customer information

Company Name : FALTEC CO., LTD.
Address : Solid Square West Tower 19th Floor 580 Horikawa-cho, Saiwai-ku,
Kawasaki-city Kanagawa, 212- 0013 Japan
Telephone Number : +81- 44-520-0019
Facsimile Number : +81- 44-520-0018
Contact Person : Hiroshi Kurumagawa

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

2.1 Identification of E.U.T.

Type of Equipment : Remote engine starter unit
Model No. : PZ170-22011
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12 V
Receipt Date of Sample : October 28, 2016
Country of Mass-production : Japan
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 No: PZ170-22011 (referred to as the EUT in this report) is the Remote engine starter unit.

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 923.4 MHz
Modulation : FSK
Power Supply (radio part input) : DC 3.3 V
Antenna type : Sleeve Antenna
Antenna Gain : -1.5 dBi
Clock frequency (Maximum) : 8.000 MHz(CPU), 12.8 MHz (RF Tranceiver)

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 2016.

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.249 Operation within the bands 902 MHz - 928 MHz,
2400 MHz - 2483.5 MHz, 5725 MHz - 5875 MHz and
24.0 - 24.25 GHz

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

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Conducted Emission	ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.207(a) IC: RSS-Gen 8.8	N/A	N/A	N/A *1)
2	Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.249(a)(e) IC: RSS-210 B.10	N/A	0.6 dB (923.400 MHz, Horizontal, QP)	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.205(a)(b) Section 15.209(a) Section 15.249(a)(d)(e) IC: RSS-210 B.10 RSS-Gen 8.9	N/A	0.7 dB (2770.200 MHz, Vertical, PK(PK with Duty factor))	Complied
4	20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods	FCC: FCC 15.215 IC: Reference data	N/A	N/A	N/A
5	Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.249(b) IC: RSS-210 Annex I	N/A	N/A	N/A *2)

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

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

*2) The test is not required since this EUT does not operate with 24.05 GHz to 24.25 GHz.

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3 V) constantly to RF Module regardless of input voltage. 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.3 Addition to standard

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	99 % Occupied Band Width	IC: RSS-Gen 6.6	IC: RSS-210 A1.3	N/A	N/A	N/A

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

3.4 Uncertainty

EMI

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

Test distance	Radiated emission (+/-)
	9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

*Measurement distance

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

* Measurement distance

Power meter (+dB)	
Below 1 GHz	Above 1 GHz
0.9 dB	1.0 dB

Radiated emission test(3 m)

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

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

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

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

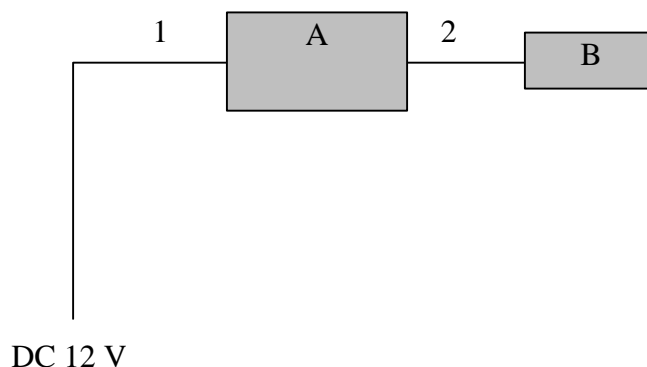
Refer to APPENDIX.

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

4.1 Operating Modes

Test Item	Mode	Tested frequency
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission 20 dB Bandwidth 99 % Occupied Band Width	Transmitting mode (Tx)	923.4 MHz
<p>The system was configured in typical fashion (as a customer would normally use it) for testing.</p> <p>*EUT has the power settings by the software as follows; Power settings: 101 Software: DN6220 V00.04</p> <p>*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting.</p>		

4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Remote engine starter unit	PZ170-22011	003	FALTEC CO., LTD.	EUT
B	Antenna	PZ121-04211	003	FALTEC CO.,LTD.	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.0	Unshielded	Unshielded	-
2	Antenna Cable	1.4	Unshielded	Unshielded	-

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The EUT was set on the center of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
Photographs of the set up are shown in Appendix 1.

The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3 m.
The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization.
The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

Test Antennas are used as below;

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

	Below or equal to 1 GHz *1)	Above 1 GHz	
Detector Type	QP	Peak	AV
IF Bandwidth	120 kHz	PK: S/A:RBW 1 MHz, VBW:3 MHz	*2), *3)

- *1) The test below 1 GHz was performed with QP detect.
Because it was generated at the repetition cycle of 20 Hz or more the pulse emission.
*2) For Pulse emission: The Average value was calculated by reducing Duty factor from PK (PK value – Duty factor).
For Duty factor, please refer to Page 23.
*3) For Non-Pulse emission: Average Detector (RBW: 1 MHz, VBW: 10 Hz)

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

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 30 MHz - 10 GHz
Test data : APPENDIX 1
Test result : Pass

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 6: 20 dB Bandwidth and Duty Cycle

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	3 MHz	6.8 kHz	20 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Duty Cycle	zero span	1MHz	3MHz	100 msec	Peak	Single	Spectrum Analyzer

Test data : APPENDIX 1

Test result : Pass

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 1: Test data

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	Ise EMC Lab.
Report No.	No.2 Semi Anechoic Chamber 11439195H	No.3 Semi Anechoic Chamber
Date	10/04/2016	10/07/2016
Temperature/ Humidity	20 deg.C / 71 % RH	23 deg.C / 56 % RH
Engineer	Shinya Watanabe (Below 1 GHz)	Shinya Watanabe (Above 1 GHz)
Mode	Transmitting mode, 923.4 MHz	

QP or PK

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
		Hor	Ver					Hor	Ver		Hor	Ver
923.400	QP	86.8	85.0	22.0	11.2	26.6	-	93.4	91.6	93.9	0.6	2.3
1846.800	PK	45.3	45.6	26.0	6.3	33.2	-	44.4	44.7	73.9	29.5	29.2
2770.200	PK	51.7	51.8	27.3	6.6	32.5	-	53.1	53.2	73.9	20.8	20.7
3693.600	PK	43.6	42.9	28.7	7.5	32.1	-	47.7	47.0	73.9	26.2	26.9
4617.000	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
5540.400	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
6463.800	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
7387.200	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
8310.600	PK	NS	NS	-	-	-	-	-	-	73.9	-	-
9234.000	PK	NS	NS	-	-	-	-	-	-	73.9	-	-

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

PK with Duty factor

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]	
		Hor	Ver					Hor	Ver		Hor	Ver
1846.800	PK	45.3	45.6	26.0	6.3	33.2	0.0	44.4	44.7	53.9	9.5	9.2
2770.200	PK	51.7	51.8	27.3	6.6	32.5	0.0	53.1	53.2	53.9	0.8	0.7
3693.600	PK	43.6	42.9	28.7	7.5	32.1	0.0	47.7	47.0	53.9	6.2	6.9
4617.000	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-
5540.400	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-
6463.800	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-
7387.200	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-
8310.600	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-
9234.000	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

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

*NS: No Signal

* The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and Duty cycle factor.

* Duty Factor was calculated with the assumption of the worst condition in 100msec.

* The noise measured with PK detect was pulse emission.

UL Japan, Inc.

Ise EMC Lab.

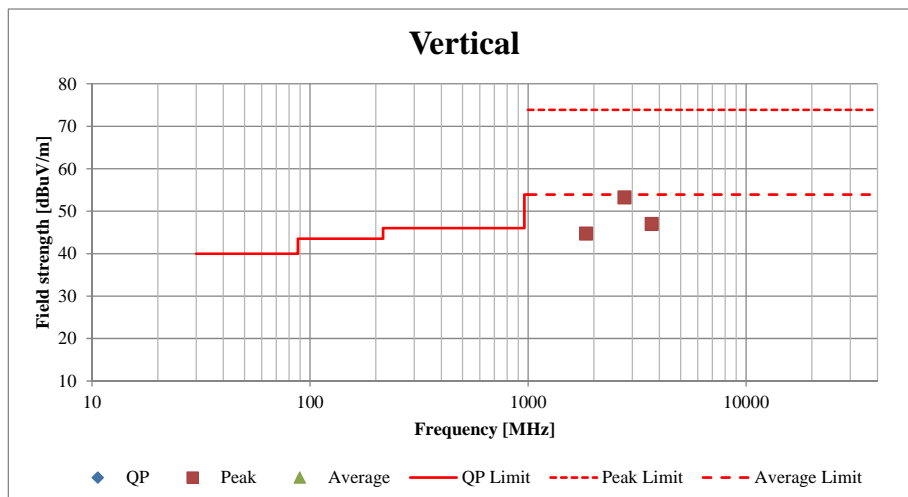
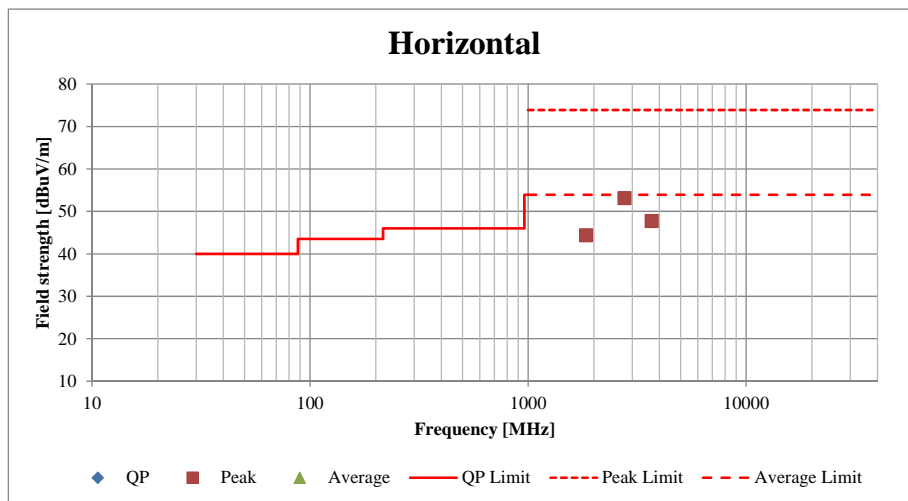
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission (Plot Data, Worst Case)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11439195H	
Date	10/04/2016	10/07/2016
Temperature/ Humidity	20 deg.C / 71 % RH	23 deg.C / 56 % RH
Engineer	Shinya Watanabe (Below 1 GHz)	Shinya Watanabe (Above 1 GHz)
Mode	Transmitting mode, 923.4 MHz	



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

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

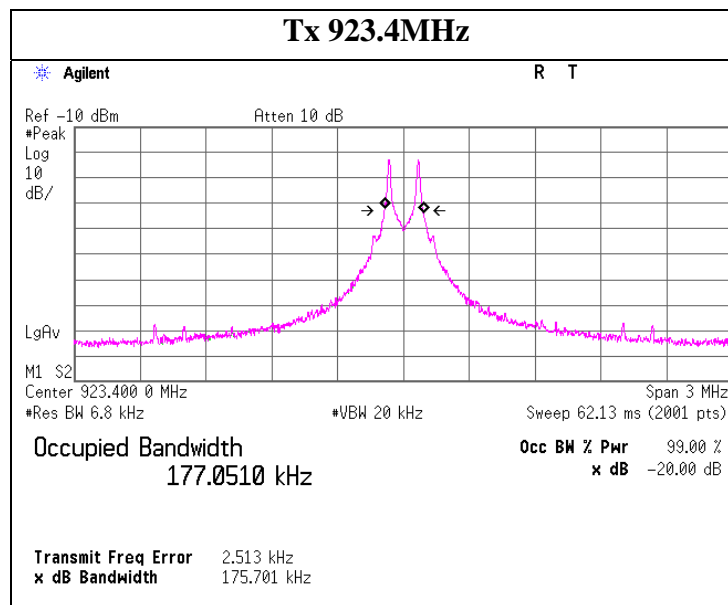
Facsimile : +81 596 24 8124

20 dB Bandwidth

Test place	Ise EMC Lab. No.7 shielded room
Report No.	11439195H
Date	11/01/2016
Temperature/ Humidity	25 deg. C / 44 % RH
Engineer	Shinya Watanabe
Mode	Transmitting mode, 923.4 MHz

Frequency [MHz]	20 dB Bandwidth [kHz]	Limit [kHz]
923.4	175.701	-

20 dB Bandwidth



UL Japan, Inc.

Ise EMC Lab.

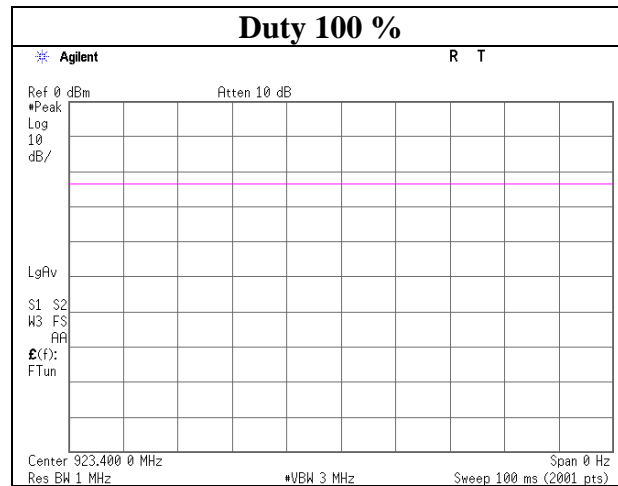
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Duty Cycle

Test place Ise EMC Lab. No.7 shielded room
Report No. 11439195H
Date 11/01/2016
Temperature/ Humidity 25 deg. C / 44 % RH
Engineer Shinya Watanabe
Mode Transmitting mode, 923.4 MHz



UL Japan, Inc.

Ise EMC Lab.

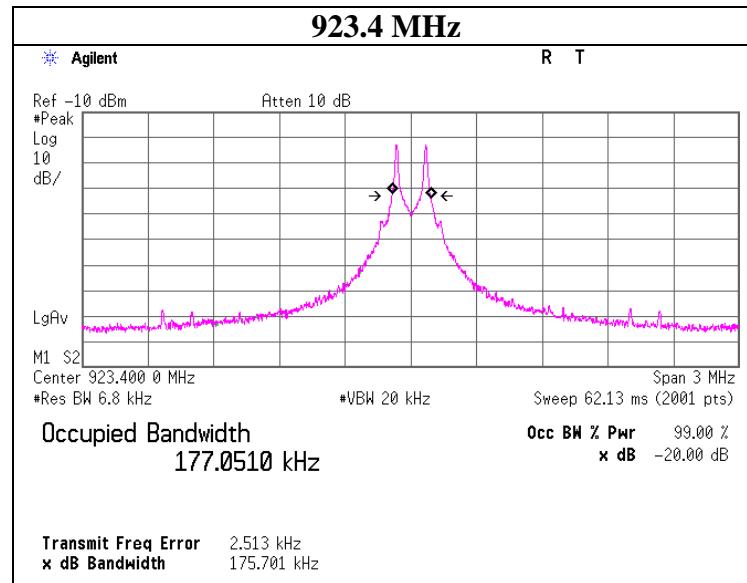
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99%Occupied Bandwidth

Test place	Ise EMC Lab. No.7 shielded room
Report No.	11439195H
Date	11/01/2016
Temperature/ Humidity	25 deg. C / 44 % RH
Engineer	Shinya Watanabe
Mode	Transmitting mode, 923.4 MHz



UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/01/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2016/10/14 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2016/10/21 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2016/01/30 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2016/02/08 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2015/11/10 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2016/09/29 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2016/08/17 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MHF-03	High pass Filter 1.4-5.0GHz	Mini-Circuit	VHF-1320	10411	RE	2016/08/01 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2016/05/29 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2016/05/20 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 12
MOS-34	Thermo-Hygrometer	Custom	CTH-201	3401	RE	2016/01/21 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2016/10/13 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	RE	Pre Check

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:

RE: Radiated emission, 20 dB bandwidth, Duty cycle, and 99%Occupied Bandwidth tests

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124