



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

CERTIFICATION TEST REPORT

FOR

RF MODULE

MODEL NUMBER: FMAM

FCC ID: UY6-FMAM

IC: 6561B-FMAM

REPORT NUMBER: 33IE0013-SH-A

ISSUE DATE: April 26, 2013

Prepared for

**TOHNICHI MFG. CO., LTD
2-12, OMORI-KITA 2-CHOME, OTA-KU
TOKYO 143-0016, JAPAN**

Prepared by

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JAB Accreditation No. : RTL02610**



Revision History

Issue			
Rev.	Date	Revisions	Revised By
--	04/26/13	Initial Issue	K. Adachi

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TOHNICHI MFG. CO., LTD
2-12, OMORI-KITA 2-CHOME, OTA-KU
TOKYO, 143-0016 JAPAN

EUT DESCRIPTION: RF MODULE

MODEL: FMAM

SERIAL NUMBER: 1 (for Chip antenna), 2 (for Dipole antenna)

DATE TESTED: April 11 to 24, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Japan, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by any government agency.

Approved & Released For UL Japan, Inc. By:

Tested By:



Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



Kenichi Adachi
Engineer of WiSE Japan,
UL Verification Service
(Representative)

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN.

UL Japan is accredited by JAB, Laboratory Code RTL02610. The full scope of accreditation can be viewed at

http://www.jab.or.jp/cgi-bin/jab_exam_proof_i.cgi?page=2&authorization_number=RTL02610

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor} \\ &(\text{dB/m}) + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER		UNCERTAINTY
Power Line Conducted Emission	150kHz-30MHz	+/- 3.6 dB
	30MHz-300MHz	+/- 4.9 dB
Radiated Emission	300MHz-1000MHz	+/- 4.9 dB
	1000MHz-13GHz	+/- 4.9 dB
	13GHz-18GHz	+/- 5.6 dB
	18GHz-26.5GHz	+/- 4.4 dB

Uncertainty figures are valid to a confidence level of 95% using a coverage factor k=2.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a 900MHz Band RF module.

The radio module is manufactured by SA Systems.

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:

Frequency Range (MHz)	Antenna	Output E-field Strength (dBuV/m)	Output E-field Strength (mV/m)
902 - 928	Chip	92.2	40.7
902 - 928	Dipole	93.4	46.8

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Chip antenna or a Dipole antenna, with a maximum gain of 0 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was D2XX drivers for FTDI devices, rev. 2.08.28. (USB-serial interface driver)

The test utility software used during testing was A024_remote.exe, rev. 2009/10/30.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

The fundamental and spurious was measured in three different orientations X, Y and Z to find worst-case orientation, and final testing for radiated emissions was performed with EUT in following orientation.

	Chip antenna		Dipole antenna			
	Horizontal	Vertical	module		Antenna	
			Horizontal	Vertical	Horizontal	Vertical
Spurious (below 1GHz)	Z	X	Z	X	X	Y
Spurious (above 1GHz)	Y	Z	Y	X	X	Y

The worst-case channel is determined as the channel with the highest output power, power line conducted emissions were performed with the EUT set to the channel with highest output power.

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
C: Jig	TOHNICHI MFG. CO., LTD	—	—	

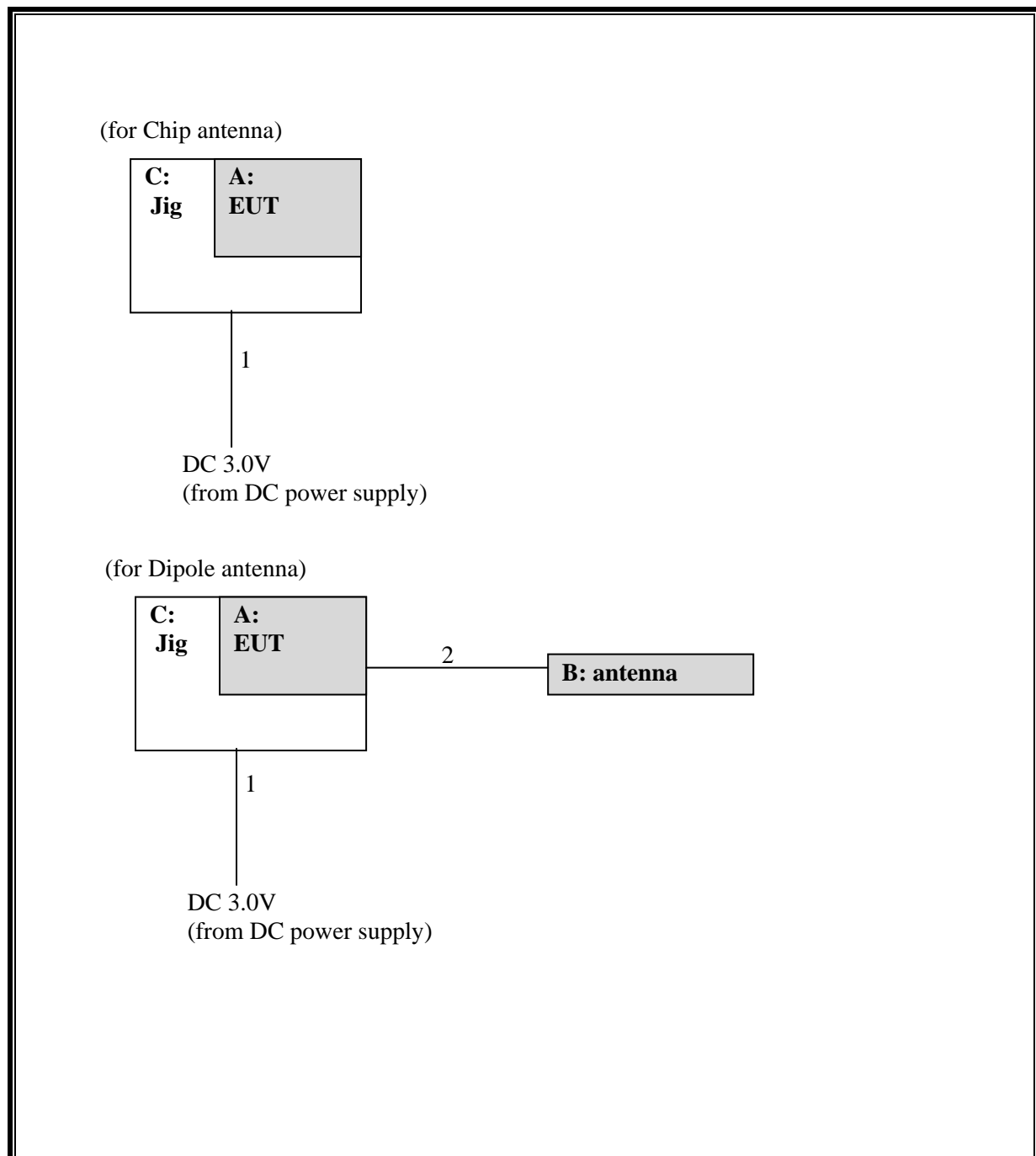
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	DC	Un-Shielded	1.5	N/A
2	Antenna	2	U.FL	Un-Shielded	0.1	N/A

TEST SETUP

The EUT is connected with laptop computer only during the test setting. Test software exercised the radio module.

SETUP DIAGRAM FOR TESTS



7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2012/10/08 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108 A	UHALP 9108-A 0901	RE	2012/10/08 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSF A/141PE/141 PE/141PE/141 PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
STR-03	EMI Test Receiver / Spectrum Analyzer	Rohde & Schwarz	ESI40	100054/040	RE,CE	2012/06/14 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE,CE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2012/09/21 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,R FI,MF)	-	RE,CE	-
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2012/07/18 * 12
SFL-01	Highpass Filter	MICRO-TRONICS	HPM50115	1	RE	2012/12/18 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2012/08/17 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2012/10/31 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	CE	2013/04/03 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2013/02/25 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2013/02/12 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2013/03/07 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2013/01/16 * 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:

CE: Conducted emission, RE: Radiated emission

8. TEST RESULTS

8.1. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 20 dB bandwidth, and the RBW is set to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% occupied bandwidth function is utilized.

RESULTS

(Chip antenna)

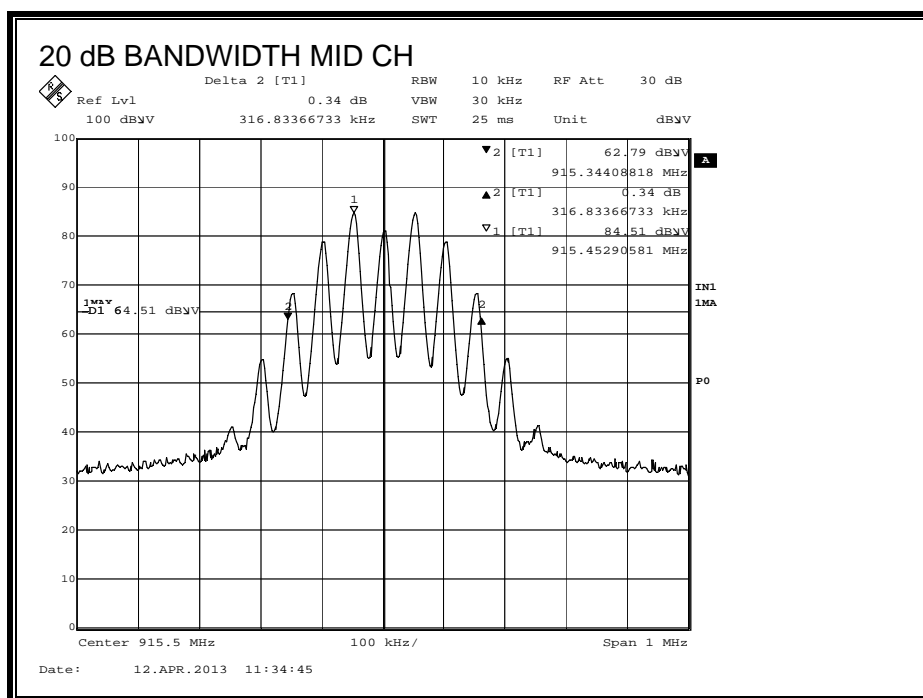
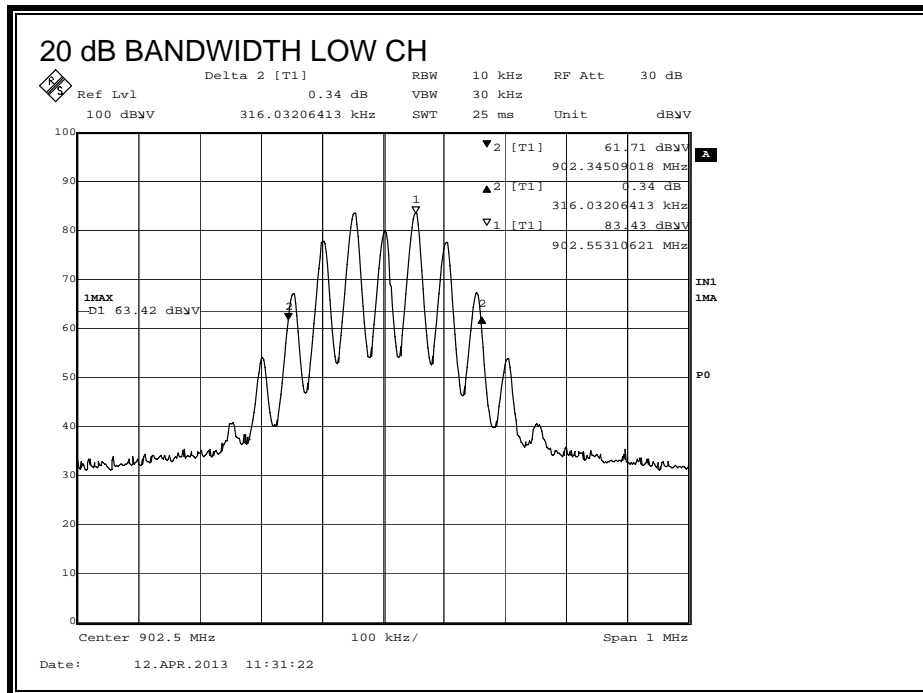
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.5	316.0321	298.5972
Middle	915.5	316.8337	298.5972
High	927.5	316.0321	298.5972

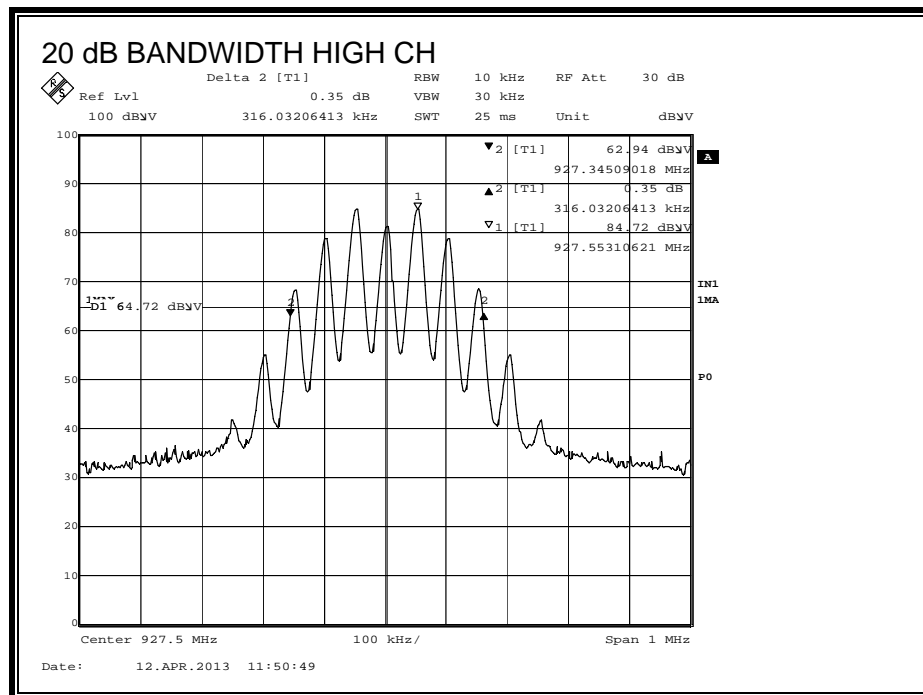
(Dipole antenna)

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.5	316.0321	298.5972
Middle	915.5	316.0321	298.5972
High	927.5	316.0321	298.5972

20 dB BANDWIDTH

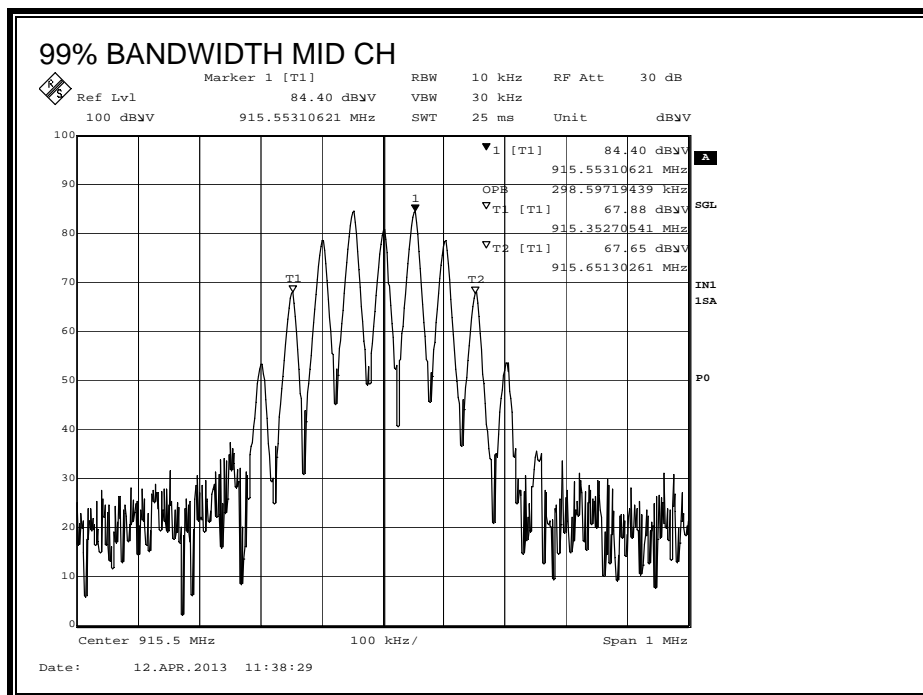
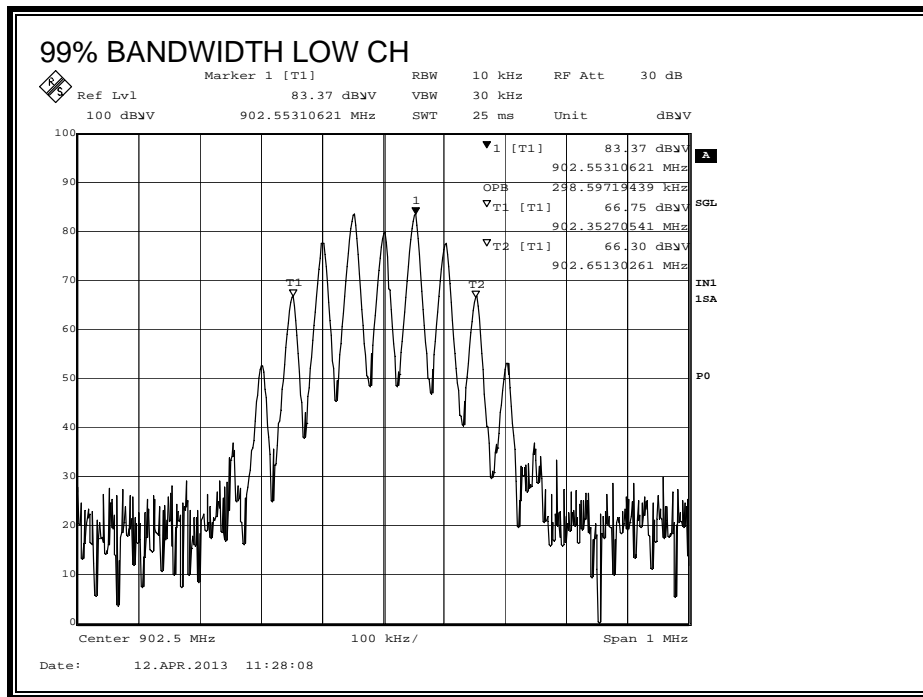
(Chip antenna)

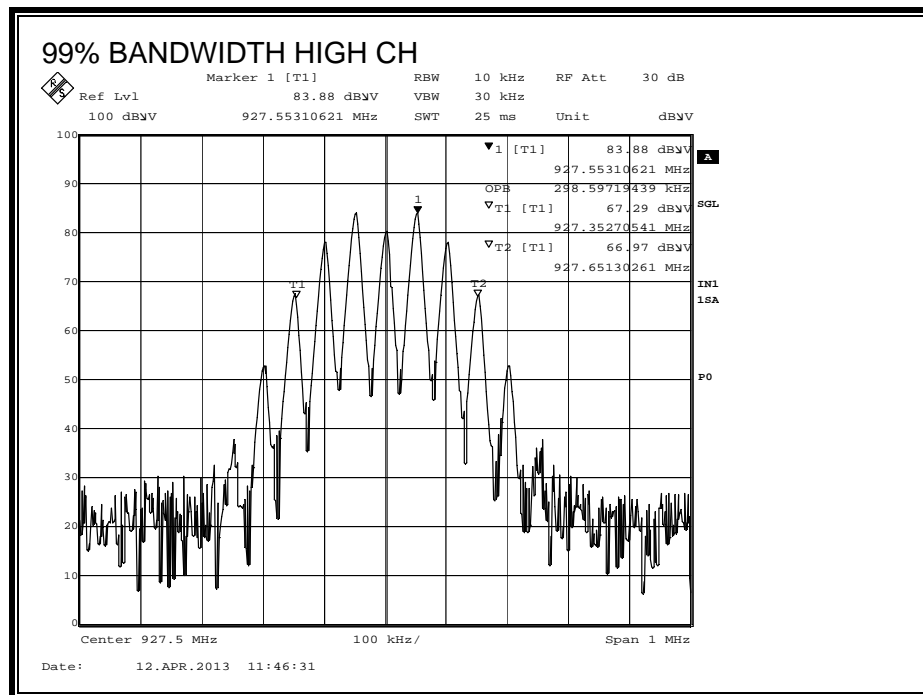




99% BANDWIDTH

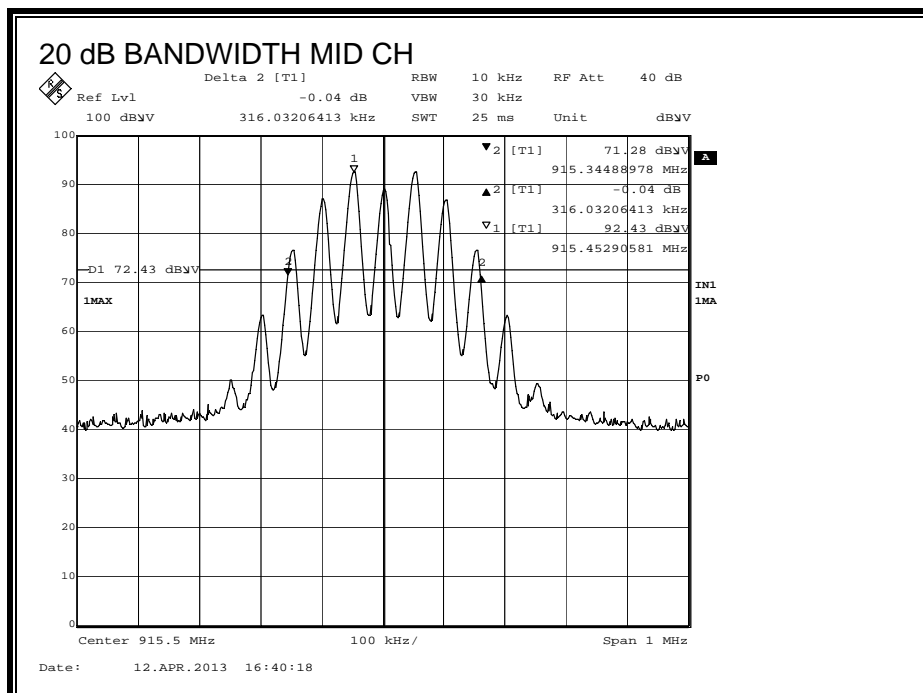
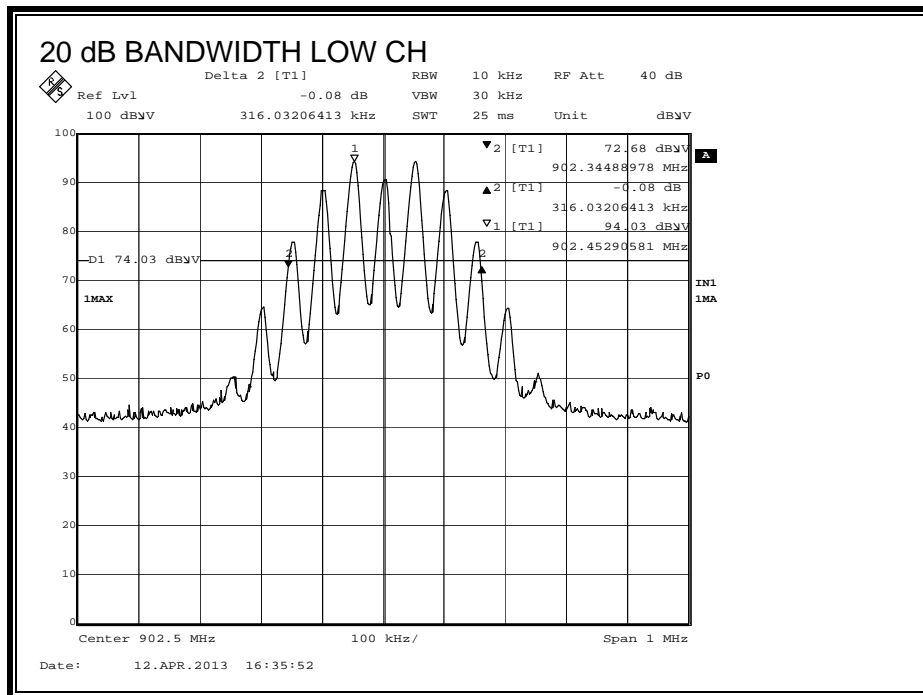
(Chip antenna)

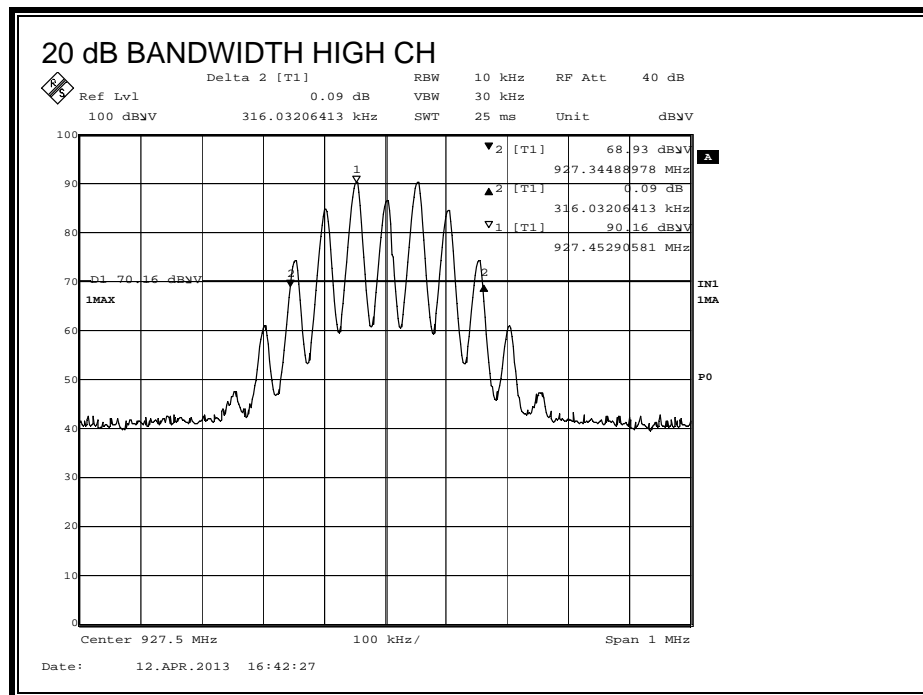




20 dB BANDWIDTH

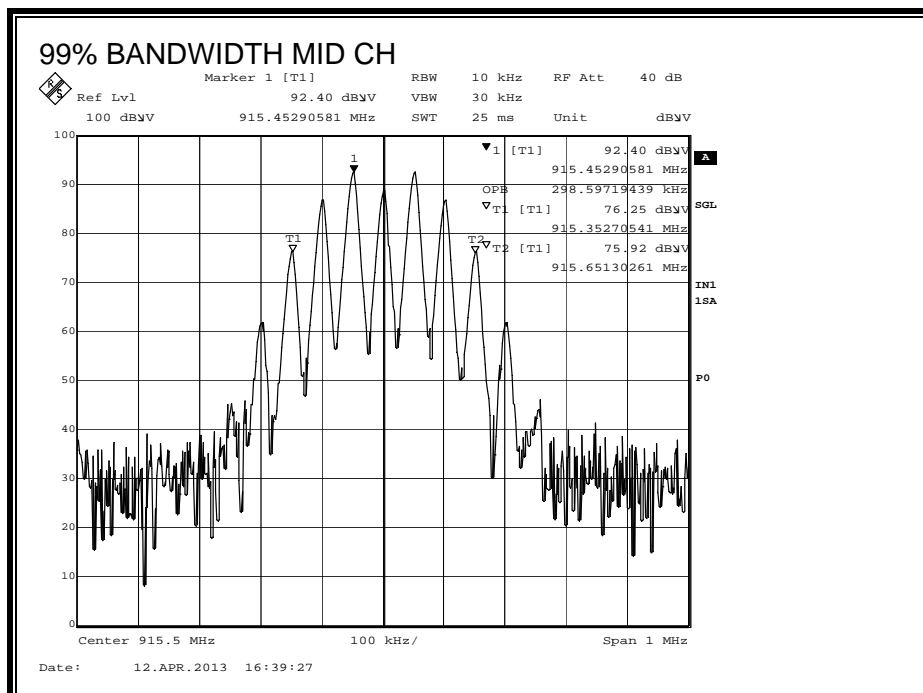
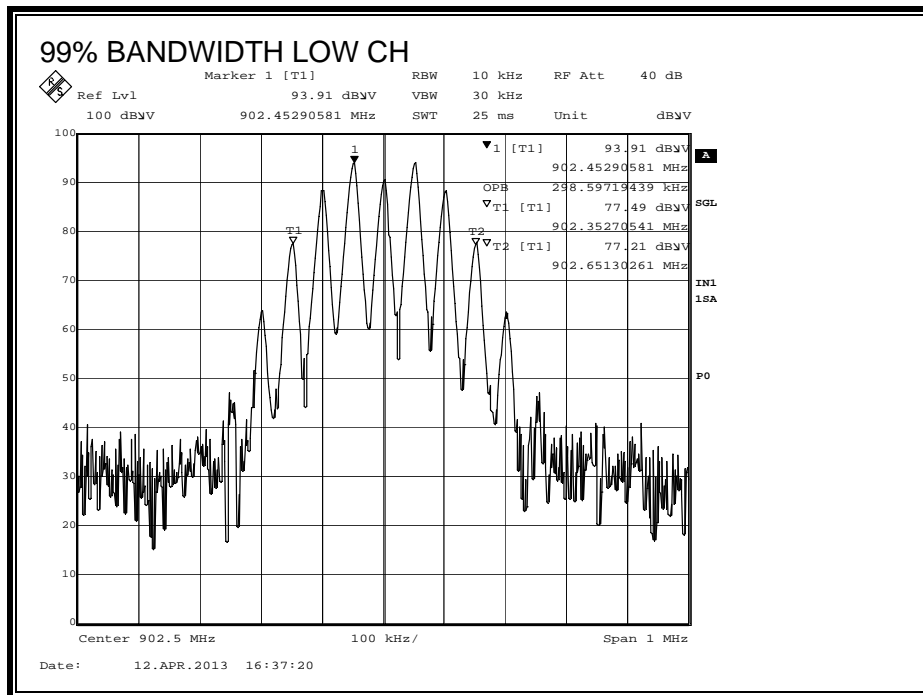
(Dipole antenna)

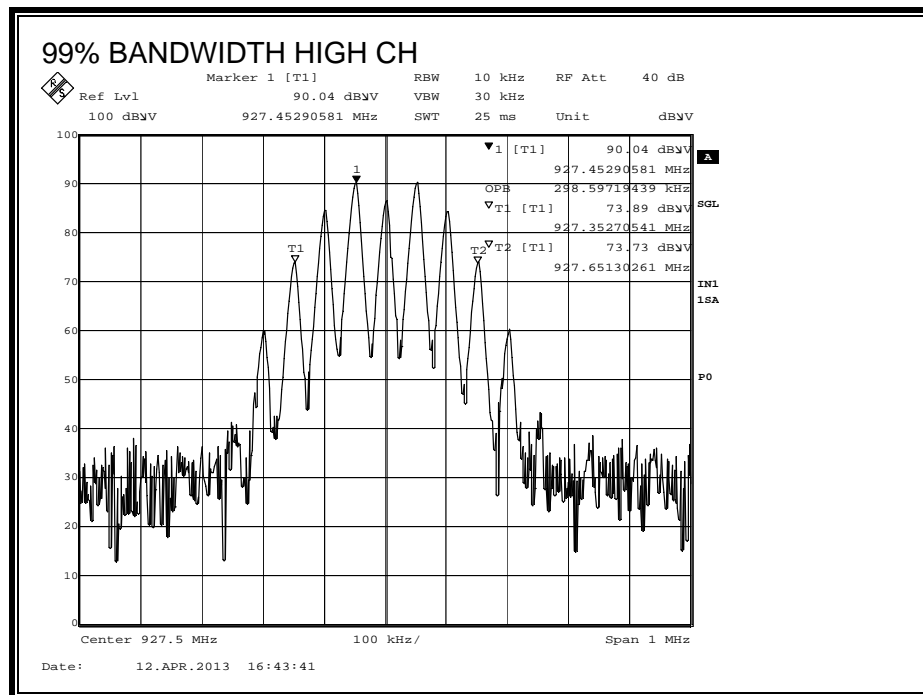




99% BANDWIDTH

(Dipole antenna)





8.2. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

IC RSS-210, A2.9
FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

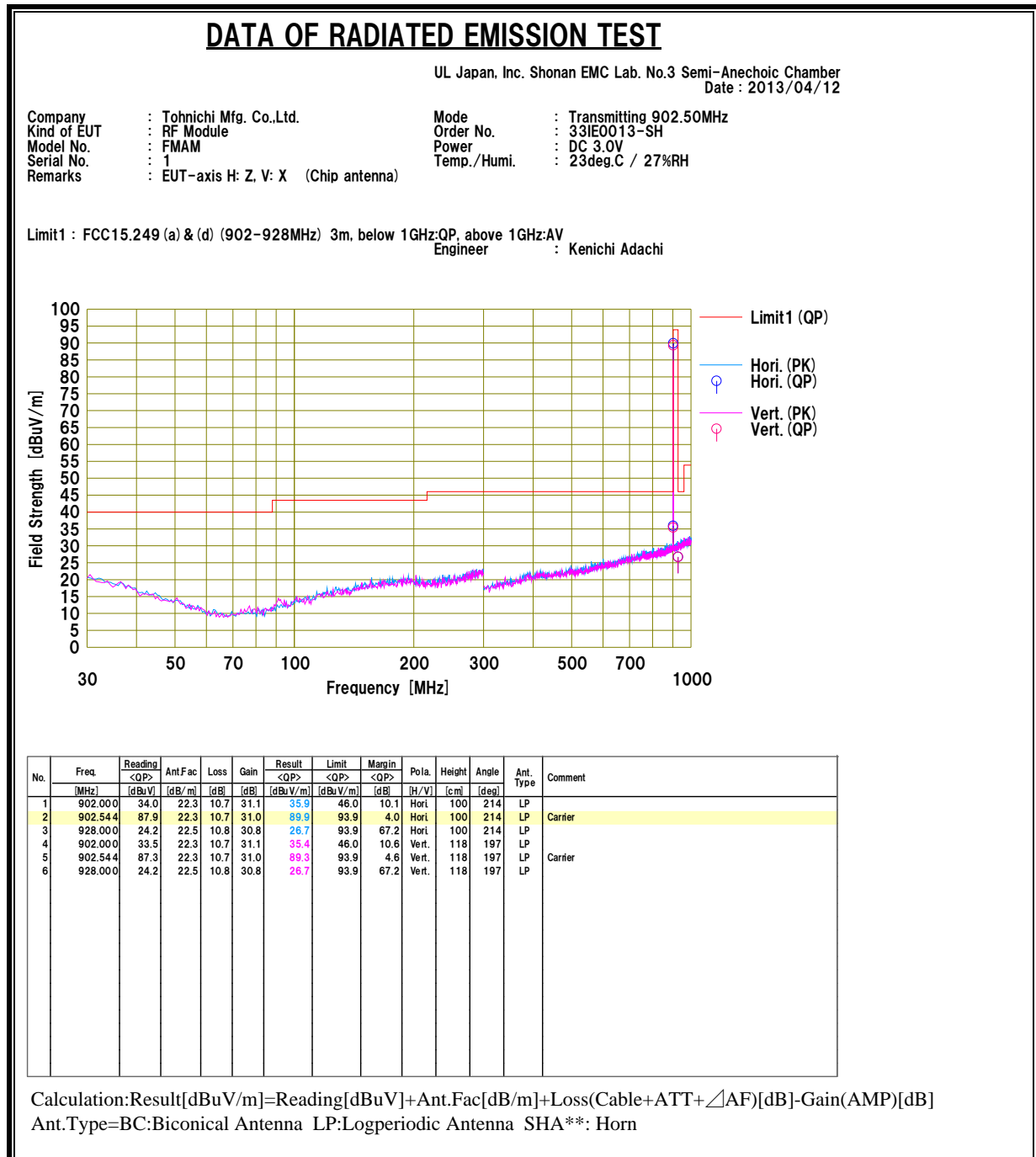
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

RESULTS

8.2.1. TRANSMITTER BELOW 1 GHz



* The range of below 30MHz was nothing detect signal.

DATA OF RADIATED EMISSION TEST

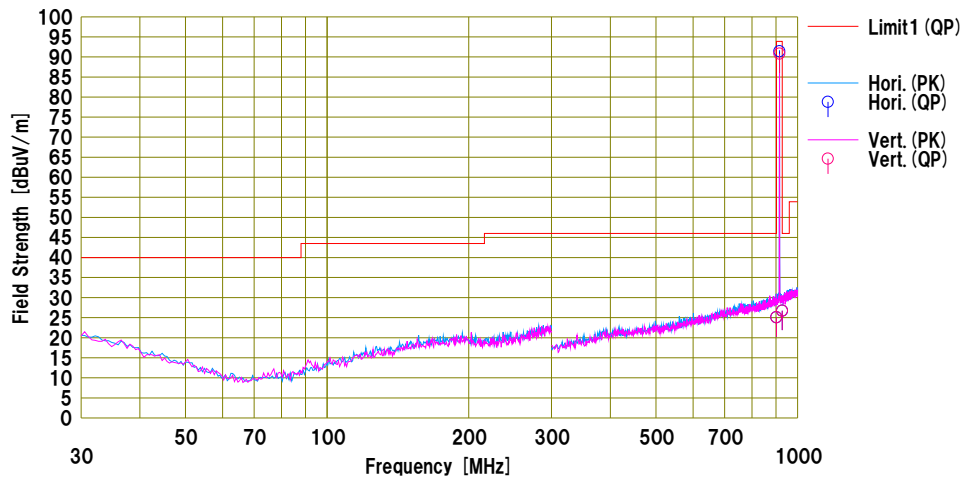
UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/12

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 1
Remarks : EUT-axis H: Z, V: X (Chip antenna)

Mode : Transmitting 915.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 23deg.C / 27%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV

Engineer : Kenichi Adachi



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]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	902.000	23.2	22.3	10.7	31.1	25.1	46.0	20.9	Hori.	100	221	LP	
2	915.545	89.1	22.4	10.8	30.9	91.4	93.9	2.5	Hori.	100	221	LP	Carrier
3	928.000	24.2	22.5	10.8	30.8	26.7	93.9	67.2	Hori.	100	221	LP	
4	902.000	23.2	22.3	10.7	31.1	25.1	46.0	20.9	Vert.	122	199	LP	
5	915.545	88.5	22.4	10.8	30.9	90.8	93.9	3.1	Vert.	122	199	LP	Carrier
6	928.000	24.2	22.5	10.8	30.8	26.7	93.9	67.2	Vert.	122	199	LP	

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

Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

* The range of below 30MHz was nothing detect signal.

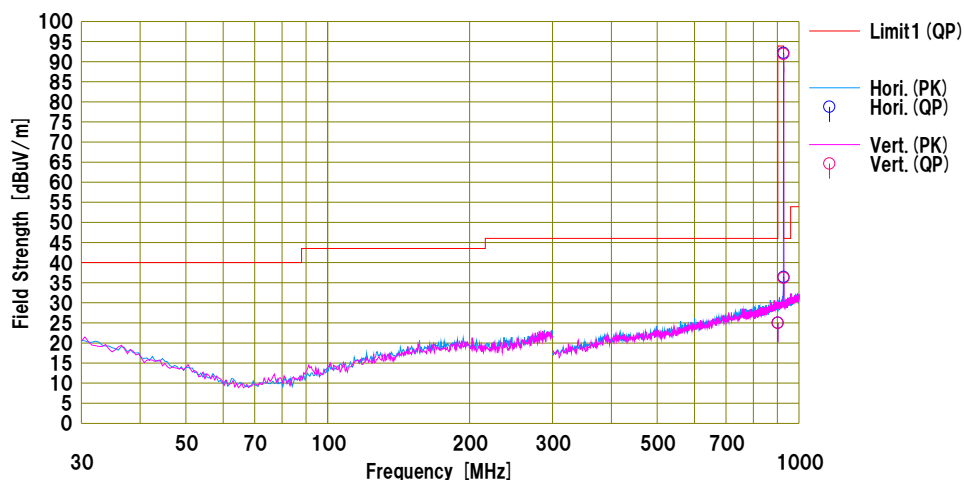
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/12

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 1
Remarks : EUT-axis H: Z, V: X (Chip antenna)

Mode : Transmitting 927.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 23deg.C / 27%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Engineer : Kenichi Adachi



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	902.000	23.1	22.3	10.7	31.1	25.0	46.0	21.0	Hori	100	215	LP	
2	927.546	89.7	22.5	10.8	30.8	92.2	93.9	1.7	Hori	100	215	LP	Carrier
3	928.000	33.9	22.5	10.8	30.8	36.4	93.9	57.5	Hori	100	215	LP	
4	902.000	23.1	22.3	10.7	31.1	25.0	46.0	21.0	Vert.	119	201	LP	
5	927.546	89.4	22.5	10.8	30.8	91.9	93.9	2.0	Vert.	119	201	LP	Carrier
6	928.000	33.7	22.5	10.8	30.8	36.2	93.9	57.7	Vert.	119	201	LP	

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT+∠AF)[dB]-Gain(AMP)[dB]
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*:Horn

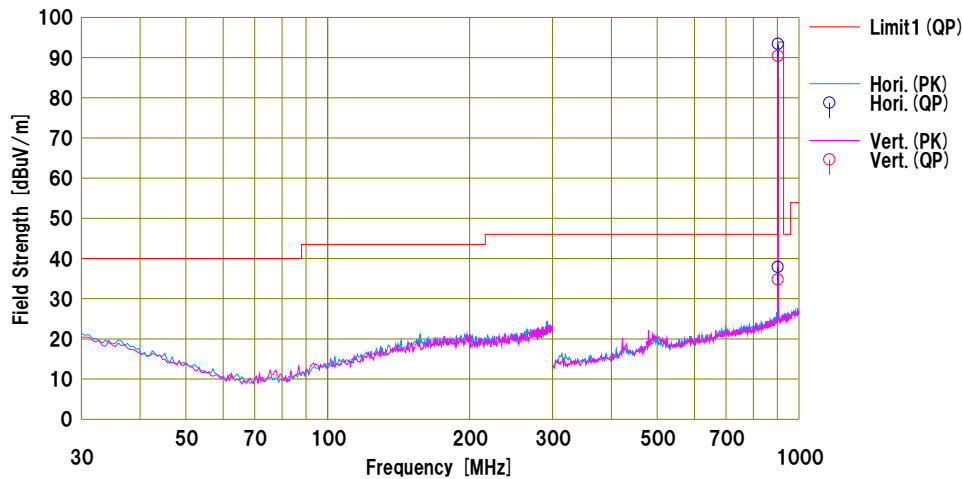
* The range of below 30MHz was nothing detect signal.

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/23

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 2
Remarks : EUT-axis H: Z, V: X, Ant-worst-axis: H: X, V:Y (Dipole antenna)
Mode : Transmitting 902.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 21deg.C / 24%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol.	Height [cm]	Angle [deg]	Ant. Type	Comment
1	902.000	36.0	22.3	10.7	31.1	37.9	46.0	8.1	Hori.	100	258	LP	
2	902.436	91.4	22.3	10.7	31.0	93.4	93.9	0.5	Hori.	100	258	LP	
3	902.000	32.9	22.3	10.7	31.1	34.8	46.0	11.2	Vert.	119	228	LP	
4	902.436	88.4	22.3	10.7	31.0	90.4	93.9	3.5	Vert.	119	228	LP	

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT+∠AF)[dB]-Gain(AMP)[dB]
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

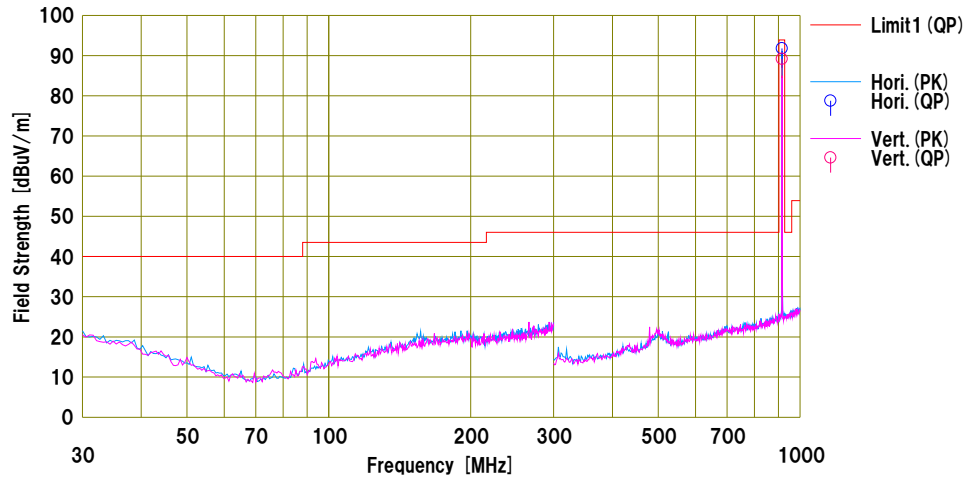
* The range of below 30MHz was nothing detect signal.

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/23

Company : Tohnichi Mfg. Co., Ltd. Mode : Transmitting 915.50MHz
Kind of EUT : RF Module Order No. : 33IE0013-SH
Model No. : FMAM Power : DC 3.0V
Serial No. : 2 Temp./Humi. : 21deg.C / 24%RH
Remarks : EUT-axis H: Z, V: X, Ant-worst-axis: H: X, V: Y (Dipole antenna)

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol.	Height [cm]	Angle [deg]	Ant. Type	Comment
1	915.508	89.5	22.4	10.8	30.9	91.8	93.9	2.1	Hori.	100	253	LP	
2	915.508	86.9	22.4	10.8	30.9	89.2	93.9	4.7	Vert.	115	229	LP	

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

Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

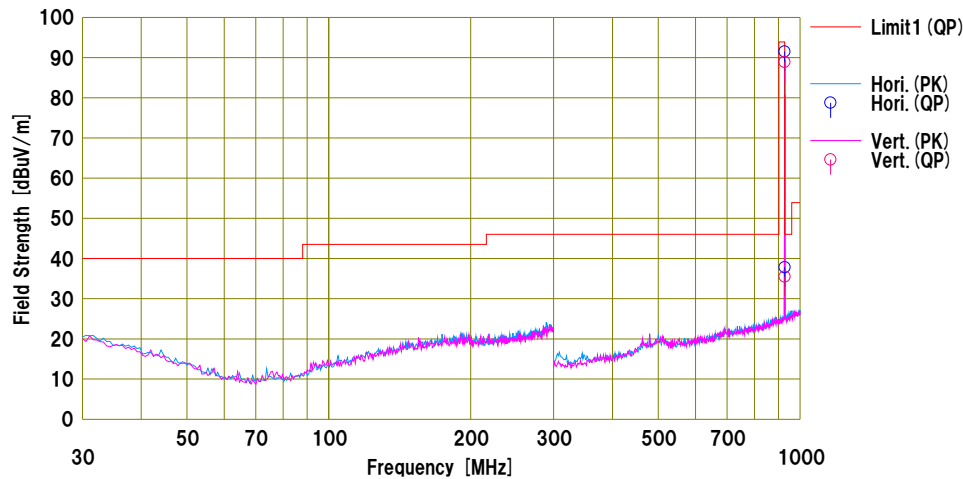
* The range of below 30MHz was nothing detect signal.

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/23

Company : Tohnichi Mfg. Co., Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 2
Remarks : EUT-axis H: Z, V: X, Ant-worst-axis: H: X, V: Y (Dipole antenna)
Mode : Transmitting 927.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 21deg.C / 24%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol.	Height [cm]	Angle [deg]	Ant. Type	Comment
1	927.504	89.0	22.5	10.8	30.8	91.5	93.9	2.4	Hori.	100	245	LP	
2	928.000	35.3	22.5	10.8	30.8	37.8	93.9	56.1	Hori.	100	245	LP	
3	927.501	86.4	22.5	10.8	30.8	88.9	93.9	5.0	Vert.	113	232	LP	
4	928.000	33.0	22.5	10.8	30.8	35.5	93.9	58.4	Vert.	113	232	LP	

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

Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

* The range of below 30MHz was nothing detect signal.

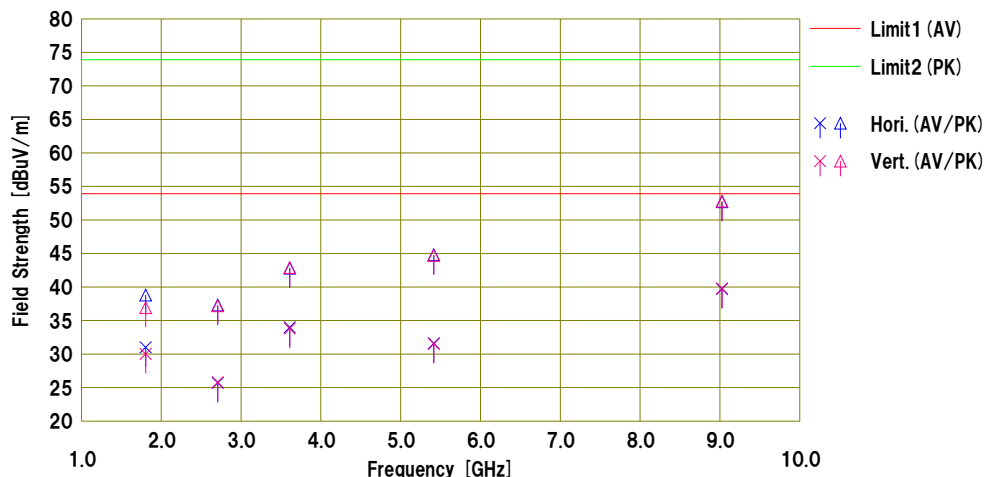
8.2.2. TRANSMITTER ABOVE 1 GHz

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/11

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 1
Remarks : EUT-axis H: Y, V: Z (Chip antenna)
Mode : Transmitting 902.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 23deg.C / 32%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Limit2 : FCC15.249 (a) (d) (902-928MHz) 3m, above 1GHz:PK Engineer : Kenichi Adachi



No.	Freq. [MHz]	Reading		Ant Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]				<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dB]	<PK> [dB]					
1	1805.000	42.0	49.8	26.1	4.0	41.1	31.0	38.8	53.9	73.9	22.9	35.1	Hori.	100	268	SHAO 3	
2	2707.500	34.1	45.7	27.9	5.1	41.4	25.7	37.3	53.9	73.9	28.2	36.6	Hori.	100	29	SHAO 3	
3	3610.000	40.9	49.7	29.4	5.5	41.8	34.0	42.8	53.9	73.9	19.9	31.1	Hori.	100	3	SHAO 3	
4	5415.000	32.8	46.0	32.0	7.0	40.2	31.6	44.8	53.9	73.9	22.3	29.1	Hori.	100	0	SHAO 3	noise floor level
5	9025.000	32.0	45.0	37.9	9.4	39.6	39.7	52.7	53.9	73.9	14.2	21.2	Hori.	100	0	SHAO 3	noise floor level
6	1805.000	41.0	47.9	26.1	4.0	41.1	30.0	36.9	53.9	73.9	23.9	37.0	Vert.	100	297	SHAO 3	
7	2707.500	34.2	45.6	27.9	5.1	41.4	25.8	37.2	53.9	73.9	28.1	36.7	Vert.	100	6	SHAO 3	
8	3610.000	40.7	49.8	29.4	5.5	41.8	33.8	42.9	53.9	73.9	20.1	31.0	Vert.	100	4	SHAO 3	
9	5415.000	32.7	45.9	32.0	7.0	40.2	31.5	44.7	53.9	73.9	22.4	29.2	Vert.	100	0	SHAO 3	noise floor level
10	9025.000	32.1	45.1	37.9	9.4	39.6	39.8	52.8	53.9	73.9	14.1	21.1	Vert.	100	0	SHAO 3	noise floor level

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+Filter)[dB]-Gain(AMP)[dB]
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

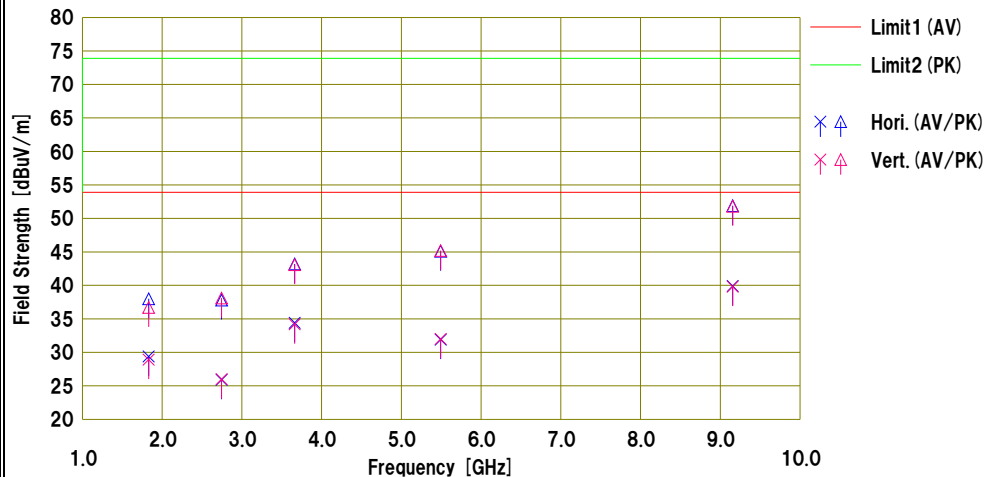
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/11

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 1
Remarks : EUT-axis H: Y, V: Z (Chip antenna)

Mode : Transmitting 915.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 23deg.C / 32%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Limit2 : FCC15.249 (a) (d) (902-928MHz) 3m, above 1GHz:PK Engineer : Kenichi Adachi



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]				<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dB]	<PK> [dB]					
1	1831.000	40.2	48.8	26.2	4.1	41.1	29.4	38.0	53.9	73.9	24.5	35.9	Hori	100	258	SHAO3	
2	2746.500	34.1	46.0	28.0	5.2	41.4	25.9	37.8	53.9	73.9	28.0	36.1	Hori	100	32	SHAO3	
3	3662.000	41.3	50.1	29.4	5.5	41.8	34.4	43.2	53.9	73.9	19.5	30.7	Hori	100	359	SHAO3	
4	5493.000	32.9	46.1	32.0	7.0	40.0	31.9	45.1	53.9	73.9	22.0	28.8	Hori	100	0	SHAO3	noise floor level
5	9155.000	32.0	44.0	38.0	9.3	39.4	39.9	51.9	53.9	73.9	14.0	22.0	Hori	100	0	SHAO3	noise floor level
6	1831.000	39.7	47.5	26.2	4.1	41.1	28.9	36.7	53.9	73.9	25.0	37.2	Vert.	100	302	SHAO3	
7	2746.500	34.2	46.3	28.0	5.2	41.4	26.0	38.1	53.9	73.9	27.9	35.8	Vert.	100	4	SHAO3	
8	3662.000	41.1	50.0	29.4	5.5	41.8	34.2	43.1	53.9	73.9	19.7	30.8	Vert.	100	359	SHAO3	
9	5493.000	33.0	46.2	32.0	7.0	40.0	32.0	45.2	53.9	73.9	21.9	28.7	Vert.	100	0	SHAO3	noise floor level
10	9155.000	31.9	43.9	38.0	9.3	39.4	39.8	51.8	53.9	73.9	14.1	22.1	Vert.	100	0	SHAO3	noise floor level

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

Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*:Horn

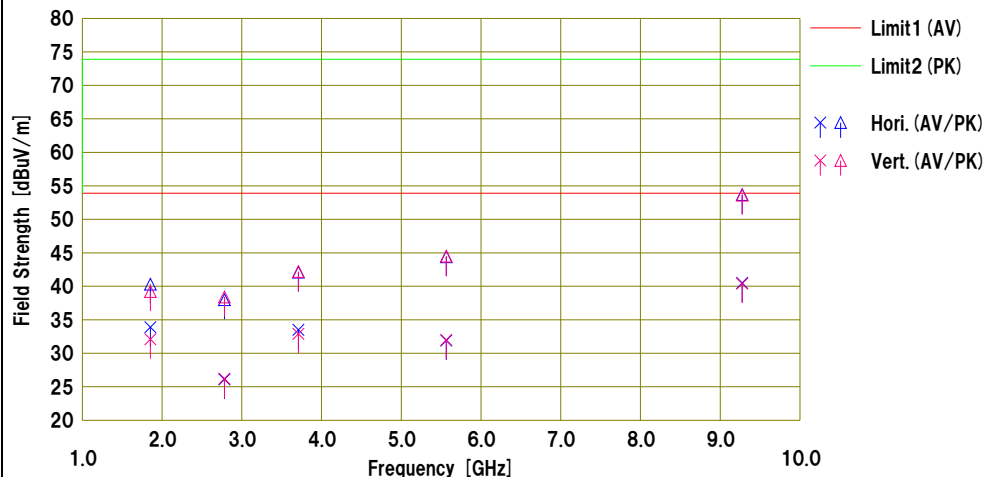
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/11

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 1
Remarks : EUT-axis H: Y, V: Z (Chip antenna)

Mode : Transmitting 927.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 23deg.C / 32%RH

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Limit2 : FCC15.249 (a) & (d) (902-928MHz) 3m,above 1GHz:PK Engineer : Kenichi Adachi



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]				<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dB]	<PK> [dB]					
1	1855.000	44.6	51.0	26.3	4.1	41.1	33.9	40.3	53.9	73.9	20.0	33.6	Hori	100	263	SHA03	
2	2782.500	34.2	46.1	28.1	5.2	41.4	26.1	38.0	53.9	73.9	27.8	35.9	Hori	100	27	SHA03	
3	3710.000	40.2	48.8	29.5	5.6	41.8	33.5	42.1	53.9	73.9	20.4	31.8	Hori	100	347	SHA03	
4	5565.000	32.8	45.3	32.2	7.0	40.1	31.9	44.4	53.9	73.9	22.0	29.5	Hori	100	0	SHA03	noise floor level
5	9275.000	32.2	45.4	38.2	9.3	39.2	40.5	53.7	53.9	73.9	13.4	20.2	Hori	100	0	SHA03	noise floor level
6	1855.000	42.8	49.9	26.3	4.1	41.1	32.1	39.2	53.9	73.9	21.8	34.7	Vert.	100	298	SHA03	
7	2782.500	34.3	46.5	28.1	5.2	41.4	26.2	38.4	53.9	73.9	27.7	35.5	Vert.	100	6	SHA03	
8	3710.000	39.6	48.9	29.5	5.6	41.8	32.9	42.2	53.9	73.9	21.0	31.7	Vert.	100	358	SHA03	
9	5565.000	32.9	45.4	32.2	7.0	40.1	32.0	44.5	53.9	73.9	21.9	29.4	Vert.	100	0	SHA03	noise floor level
10	9275.000	32.1	45.3	38.2	9.3	39.2	40.4	53.6	53.9	73.9	13.5	20.3	Vert.	100	0	SHA03	noise floor level

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

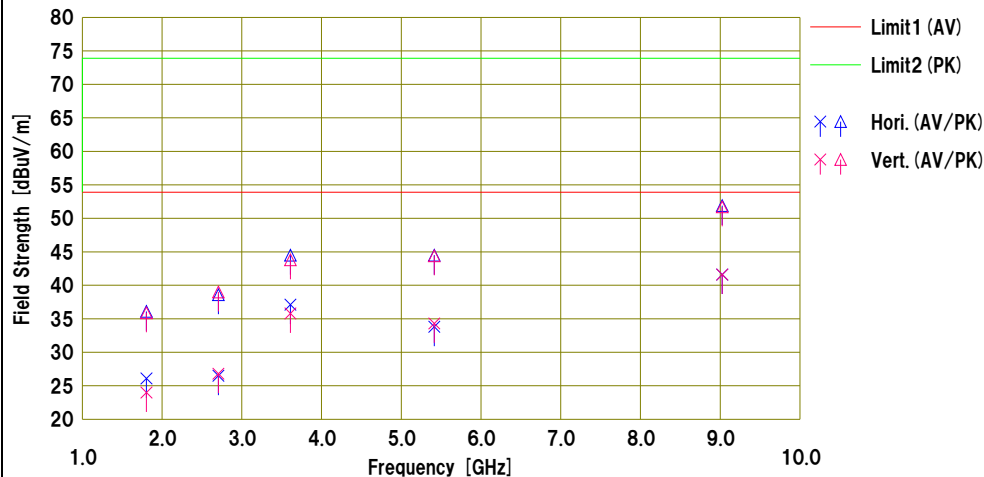
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/24

Company : Tohnichi Mfg. Co., Ltd. Mode : Transmitting 902.50MHz
Kind of EUT : RF Module Order No. : 33IE0013-SH
Model No. : FMAM Power : DC 3.0V
Serial No. : 2 Temp./Humi. : 24deg.C / 38%RH
Remarks : EUT-axis H: Y, V: X, Ant-worst-axis: H: X, V: Y (Dipole antenna)

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Limit2 : FCC15.249 (a) (d) (902-928MHz) 3m, above 1GHz:PK Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]				<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dB]	<PK> [dB]					
1	1805.000	36.5	46.5	26.1	4.6	41.1	26.1	36.1	53.9	73.9	27.8	37.8	Hori.	100	0	SHA03	
2	2707.500	34.2	46.3	27.9	5.8	41.4	26.5	38.6	53.9	73.9	27.4	35.3	Hori.	100	0	SHA03	
3	3610.000	43.0	50.4	29.4	6.5	41.8	37.1	44.5	53.9	73.9	16.8	29.4	Hori.	100	356	SHA03	
4	5415.000	34.2	44.9	32.0	7.8	40.2	33.8	44.5	53.9	73.9	20.1	29.4	Hori.	100	0	SHA03	noise floor level
5	9025.000	33.2	43.5	37.9	10.1	39.6	41.6	51.9	53.9	73.9	12.3	22.0	Hori.	100	0	SHA03	noise floor level
6	1805.000	34.4	46.3	26.1	4.6	41.1	24.0	35.9	53.9	73.9	29.9	38.0	Vert.	100	0	SHA03	
7	2707.500	34.5	46.7	27.9	5.8	41.4	26.8	39.0	53.9	73.9	27.1	34.9	Vert.	100	0	SHA03	
8	3610.000	41.7	49.7	29.4	6.5	41.8	35.8	43.8	53.9	73.9	18.1	30.1	Vert.	100	0	SHA03	
9	5415.000	34.7	44.8	32.0	7.8	40.2	34.3	44.4	53.9	73.9	19.6	29.5	Vert.	100	0	SHA03	noise floor level
10	9025.000	33.2	43.3	37.9	10.1	39.6	41.6	51.7	53.9	73.9	12.3	22.2	Vert.	100	0	SHA03	noise floor level

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

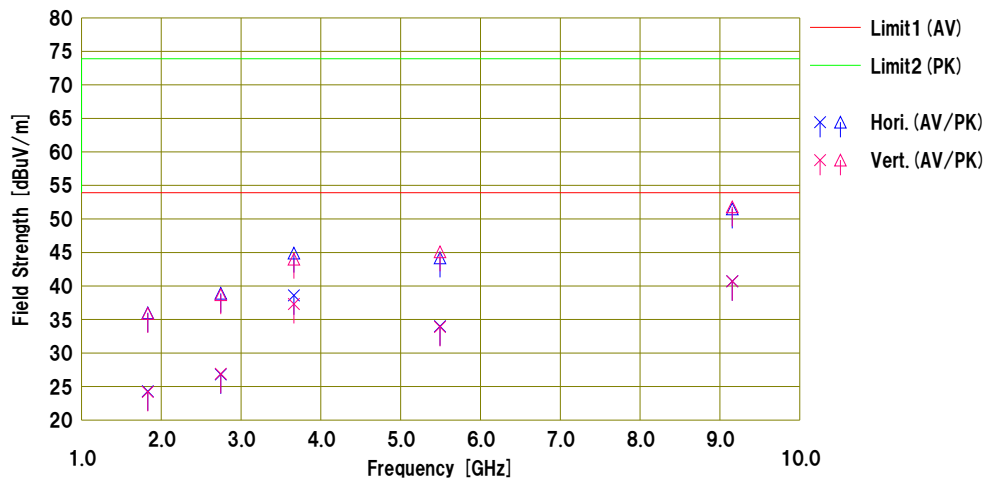
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/24

Company : Tohnichi Mfg. Co.,Ltd. Mode : Transmitting 915.50MHz
Kind of EUT : RF Module Order No. : 33IE0013-SH
Model No. : FMAM Power : DC 3.0V
Serial No. : 2 Temp./Humi. : 24deg.C / 38%RH
Remarks : EUT-axis H: Y, V: X, Ant-worst-axis: H: X, V: Y (Dipole antenna)

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Limit2 : FCC15.249 (a) (d) (902-928MHz) 3m, above 1GHz:PK Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		Ant Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]				<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dB]	<PK> [dB]					
1	1831.000	34.6	46.3	26.2	4.6	41.1	24.3	36.0	53.9	73.9	29.6	37.9	Hori.	100	0	SHAO3	
2	2746.500	34.3	46.4	28.0	5.9	41.4	26.8	38.9	53.9	73.9	27.1	35.0	Hori.	100	0	SHAO3	
3	3662.000	44.5	50.8	29.4	6.5	41.8	38.6	44.9	53.9	73.9	15.3	29.0	Hori.	100	356	SHAO3	
4	5493.000	34.2	44.4	32.0	7.8	40.0	34.0	44.2	53.9	73.9	19.9	29.7	Hori.	100	0	SHAO3	noise floor level
5	9155.000	32.1	42.9	38.0	10.0	39.4	40.7	51.5	53.9	73.9	13.2	22.4	Hori.	100	0	SHAO3	noise floor level
6	1831.000	34.5	46.2	26.2	4.6	41.1	24.2	35.9	53.9	73.9	29.7	38.0	Vert.	100	342	SHAO3	
7	2746.500	34.4	46.2	28.0	5.9	41.4	26.9	38.7	53.9	73.9	27.0	35.2	Vert.	100	0	SHAO3	
8	3662.000	43.2	49.9	29.4	6.5	41.8	37.3	44.0	53.9	73.9	16.6	29.9	Vert.	100	51	SHAO3	
9	5493.000	34.1	45.3	32.0	7.8	40.0	33.9	45.1	53.9	73.9	20.0	28.8	Vert.	100	0	SHAO3	noise floor level
10	9155.000	32.1	43.2	38.0	10.0	39.4	40.7	51.8	53.9	73.9	13.2	22.1	Vert.	100	0	SHAO3	noise floor level

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

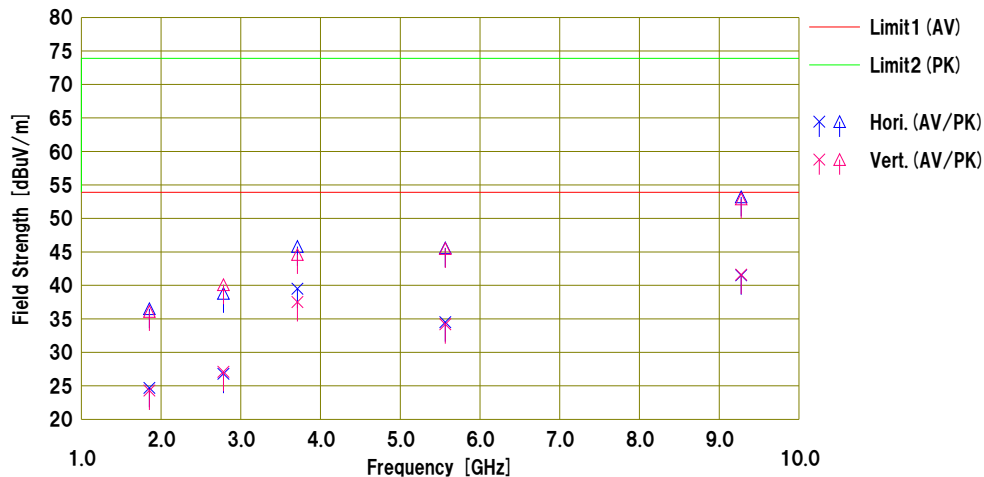
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA**: Horn

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2013/04/24

Company : Tohnichi Mfg. Co., Ltd. Mode : Transmitting 927.50MHz
Kind of EUT : RF Module Order No. : 33IE0013-SH
Model No. : FMAM Power : DC 3.0V
Serial No. : 2 Temp./Humi. : 24deg.C / 38%RH
Remarks : EUT-axis H: Y, V: X, Ant-worst-axis: H: X, V: Y (Dipole antenna)

Limit1 : FCC15.249 (a) & (d) (902-928MHz) 3m, below 1GHz:QP, above 1GHz:AV
Limit2 : FCC15.249 (a) (d) (902-928MHz) 3m, above 1GHz:PK Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola.	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]				<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dBuV/m]	<AV> [dB]	<PK> [dB]					
1	1855.000	34.9	46.7	26.3	4.6	41.1	24.7	36.5	53.9	73.9	29.2	37.4	Hori.	100	0	SHA03	
2	2782.500	34.2	46.2	28.1	5.9	41.4	26.8	38.8	53.9	73.9	27.1	35.1	Hori.	100	0	SHA03	
3	3710.000	45.2	51.5	29.5	6.6	41.8	39.5	45.8	53.9	73.9	14.4	28.1	Hori.	100	129	SHA03	
4	5565.000	34.5	45.6	32.2	7.9	40.1	34.5	45.6	53.9	73.9	19.4	28.3	Hori.	100	0	SHA03	noise floor level
5	9275.000	32.4	44.1	38.2	10.1	39.2	41.5	53.2	53.9	73.9	12.4	20.7	Hori.	100	0	SHA03	noise floor level
6	1855.000	34.5	46.3	26.3	4.6	41.1	24.3	36.1	53.9	73.9	29.6	37.8	Vert.	100	0	SHA03	
7	2782.500	34.5	47.5	28.1	5.9	41.4	27.1	40.1	53.9	73.9	26.8	33.8	Vert.	100	0	SHA03	
8	3710.000	43.2	50.3	29.5	6.6	41.8	37.5	44.6	53.9	73.9	16.4	29.3	Vert.	117	58	SHA03	
9	5565.000	34.2	45.5	32.2	7.9	40.1	34.2	45.5	53.9	73.9	19.7	28.4	Vert.	100	0	SHA03	noise floor level
10	9275.000	32.5	43.8	38.2	10.1	39.2	41.6	52.9	53.9	73.9	12.3	21.0	Vert.	100	0	SHA03	noise floor level

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

Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA*: Horn

8.3. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

(Chip antenna, worst power mode)

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/04/24

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 1
Remarks : (Chip antenna)

Mode : Transmitting 927.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 24deg.C / 38%RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano

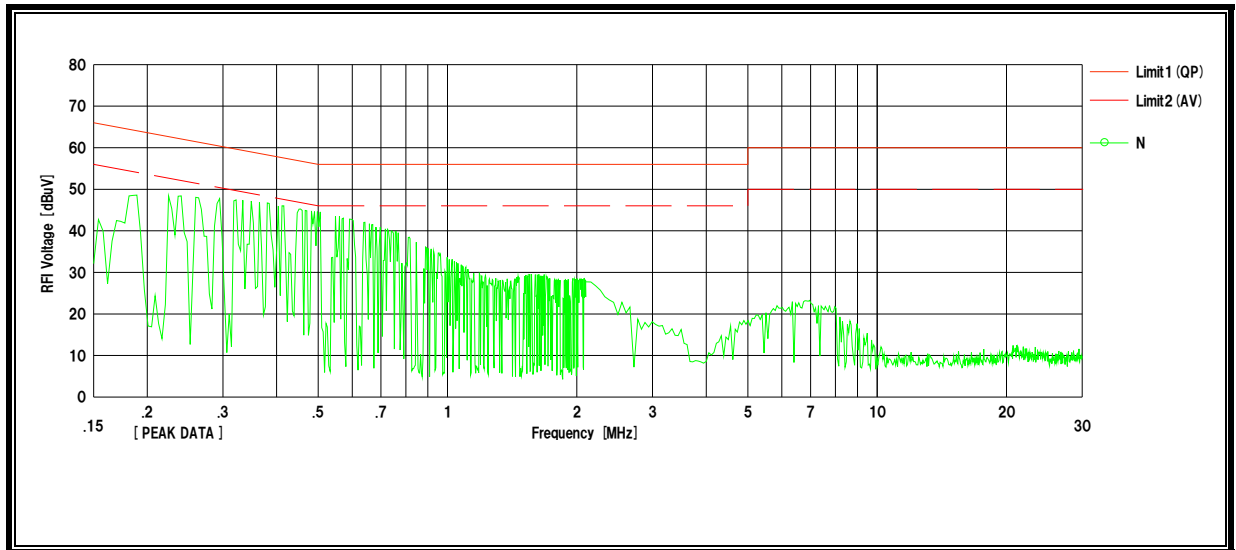
<< QP/AV DATA >>

No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.17045	25.8	---	12.7	38.5	---	64.9	54.9	26.4	---	N	
2	0.40360	23.1	---	12.7	35.8	---	57.7	47.7	21.9	---	N	
3	0.50958	21.2	---	12.7	33.9	---	56.0	46.0	22.1	---	N	
4	0.63890	18.9	---	12.7	31.6	---	56.0	46.0	24.4	---	N	
5	1.81215	4.6	---	12.8	17.4	---	56.0	46.0	38.6	---	N	
6	6.63423	0.3	---	13.0	13.3	---	60.0	50.0	46.7	---	N	
7	0.17045	25.7	---	12.7	38.4	---	64.9	54.9	26.5	---	L1	
8	0.40360	23.1	---	12.7	35.8	---	57.7	47.7	21.9	---	L1	
9	0.50958	21.4	---	12.7	34.1	---	56.0	46.0	21.9	---	L1	
10	0.63890	18.8	---	12.7	31.5	---	56.0	46.0	24.5	---	L1	
11	1.81215	7.5	---	12.8	20.3	---	56.0	46.0	35.7	---	L1	
12	6.63423	0.1	---	13.0	13.1	---	60.0	50.0	46.9	---	L1	

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

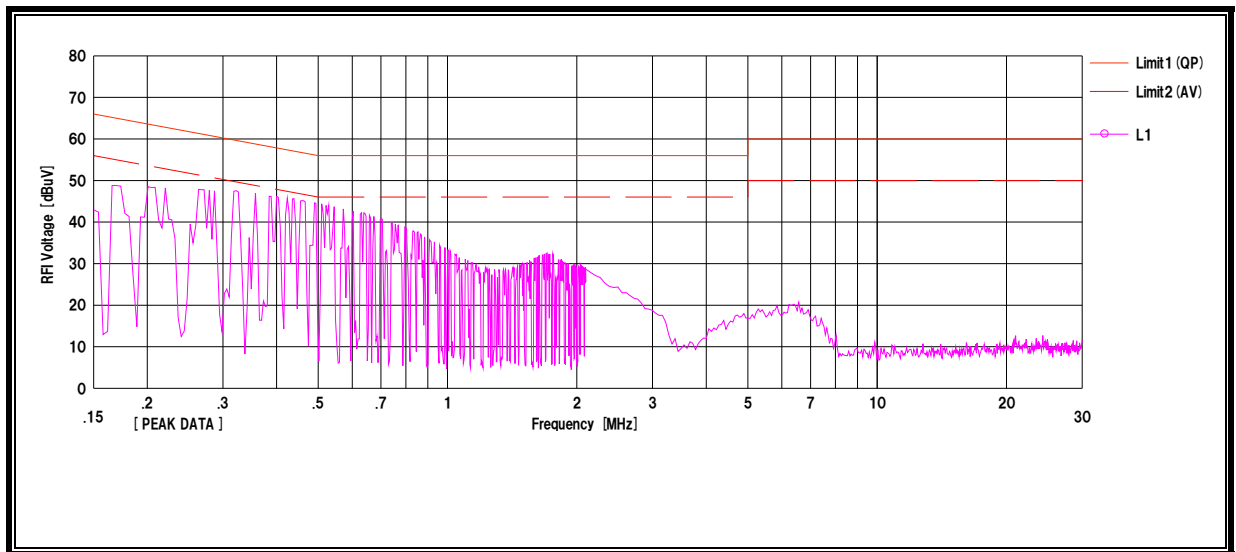
LINE 1 RESULTS

(Chip antenna, worst power mode)



LINE 2 RESULTS

(Chip antenna, worst power mode)



RESULTS

(Dipole antenna, worst power mode)

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/04/24

Company : Tohnichi Mfg. Co.,Ltd.
Kind of EUT : RF Module
Model No. : FMAM
Serial No. : 2
Remarks : (Dipole antenna)

Mode : Transmitting 902.50MHz
Order No. : 33IE0013-SH
Power : DC 3.0V
Temp./Humi. : 24deg.C / 38%RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano

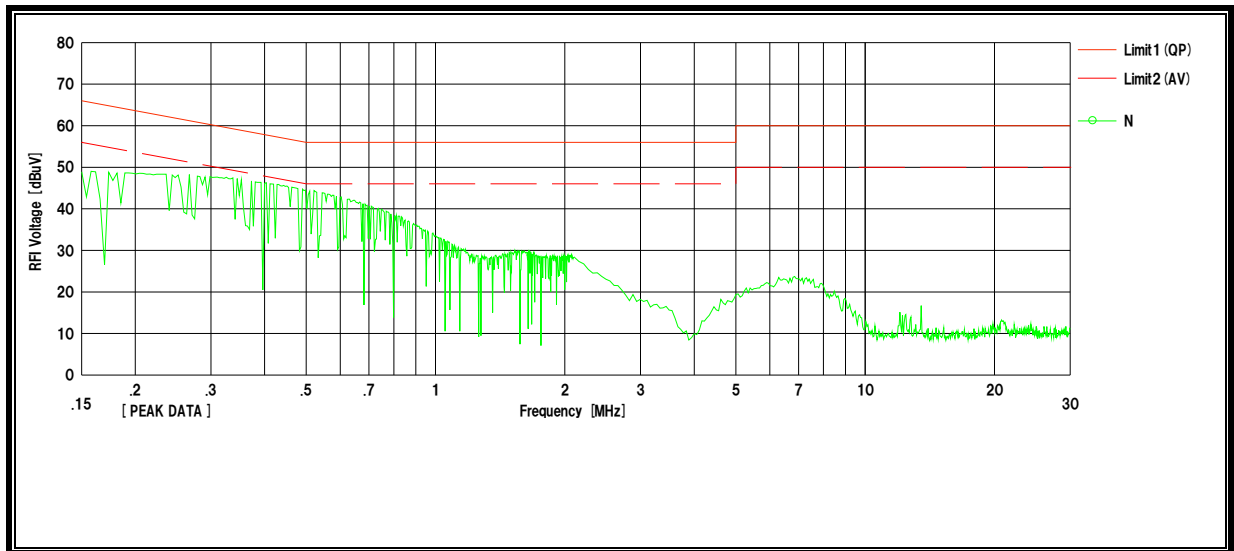
<< QP/AV DATA >>

No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15156	25.8	---	12.7	38.5	---	65.9	55.9	27.4	---	N	
2	0.27994	24.7	---	12.7	37.4	---	60.8	50.8	23.4	---	N	
3	0.41519	22.8	---	12.7	35.5	---	57.5	47.5	22.0	---	N	
4	0.47897	21.8	---	12.7	34.5	---	56.3	46.3	21.8	---	N	
5	1.72697	5.6	---	12.7	18.3	---	56.0	46.0	37.7	---	N	
6	7.01709	0.4	---	13.0	13.4	---	60.0	50.0	46.6	---	N	
7	0.15156	25.4	---	12.7	38.1	---	65.9	55.9	27.8	---	L1	
8	0.27994	24.7	---	12.7	37.4	---	60.8	50.8	23.4	---	L1	
9	0.41519	22.8	---	12.7	35.5	---	57.5	47.5	22.0	---	L1	
10	0.47897	21.7	---	12.7	34.4	---	56.3	46.3	21.9	---	L1	
11	1.72697	9.0	---	12.7	21.7	---	56.0	46.0	34.3	---	L1	
12	7.01709	0.3	---	13.0	13.3	---	60.0	50.0	46.7	---	L1	

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

LINE 1 RESULTS

(Dipole antenna, worst power mode)



LINE 2 RESULTS

(Dipole antenna, worst power mode)

