



RADIO TEST REPORT

Test Report No.: 10071930S-A

Applicant : Aplix IP Holdings Corporation
Type of Equipment : JM1
Model No. : JM1L2X
FCC ID : O8CJM1L2X
Test regulation : FCC Part15 Subpart C: 2013
Test result : Complied

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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: November 24 to December 4, 2013

Tested by:

T. Arai

Tatsuya Arai
Engineer of WiSE Japan,
UL Verification Service

Approved by :

G. Ishiwata

Go Ishiwata
Manager of WiSE Japan,
UL Verification Service



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☒ There is no testing item of "Non-accreditation".

UL Japan, Inc.

Shonan EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10071930S-A

[illegible]

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SECTION 1: Customer information

Company Name : Aplix IP Holdings Corporation
Address : Shinjuku Eastside Square 13F 27-30, Shinjuku 6-chome, Shinjuku-ku, Tokyo,
160-0022 Japan
Telephone Number : +81-50-3786-1702
Facsimile Number : +81-80-8462-0681
Contact Person : Isamu Shimosako

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

2.1 Identification of E.U.T.

Type of Equipment : JM1
Model Number : JM1L2X
Serial Number : Refer to 4.2 in this report.
Rating : DC3.3V
Country of Mass-production : Japan, Taiwan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : November 19, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: JM1L2X (referred to as the EUT in this report) is JM1 (Input Device).

Clock frequency(ies) in the system : 16MHz, 32.768kHz

<Radio part>

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth : 1MHz
Channel spacing : 2MHz
Type of modulation : DSSS
Antenna type : Chip *1)/PCB Trace (Pattern)
Antenna gain : 0.5dBi
Antenna connector type : U.FL
ITU code : F1D
Operation temperature range : -20 to +75 deg.C

*1) There are 3-type of chip antenna.

Model No.	Antenna gain (Peak)
2450AT18A100	0.5dBi
2450AT18B100	0.5dBi
AT3216-B2R7HAA	0.5dBi

FCC 15.31 (e) / 212

The RF transmitter has its own regulator. The RF transmitter is constantly provided voltage (DC1.35V) through the regulator regardless of input voltage. Therefore, the equipment complies with the requirement.

FCC 15.203 / 212

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2013,
final revised on September 30, 2013 and effective October 30, 2013
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 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,
and 5725-5850MHz

3.2 Procedures & Results

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A	19.5dB Freq.: 0.40962MHz Detector: Quasi-Peak Phase: N&L1 Mode: Tx 2440MHz Antenna: Chip Freq.: 0.41119MHz Detector: Quasi-Peak Phase: N&L1 Mode: Tx 2440MHz Antenna: Pattern	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	* See data	Complied
Maximum peak output power	ANSI C63.10:2009	FCC 15.247 (b)(3)	Conducted	N/A		Complied
Out of band emission & Restricted band edges	ANSI C63.10:2009	FCC 15.109, 15.247 (d) & 15.209	Conducted / Radiated	N/A	0.1 dB Freq.: 212.000MHz Polarization: Vertical Detection: Quasi-Peak Mode: Tx 2480MHz Antenna: Chip	Complied
Power density	ANSI C63.10:2009	FCC 15.247 (e)	Conducted	N/A	* See data	Complied

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

*1) These tests were also referred to KDB 558074 v03r01 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	-	Conducted	-	-

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

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

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3.4 Uncertainty

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

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Conducted emission (AC Mains) LISN	150kHz-30MHz	3.6 dB	3.6 dB	3.5 dB
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.9 dB	5.1 dB	4.9 dB
	300MHz-1GHz	5.0 dB	5.2 dB	4.9 dB
	1GHz-15GHz	4.8 dB	4.8 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.6 dB	5.6 dB	5.6 dB
	18GHz-40GHz	4.6 dB	4.3 dB	4.4 dB

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

Conducted emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test

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

Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.7dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB

Bandwidth measurement uncertainty for this test was: (±) 5.4%

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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

	FCC Registration No.	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	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ 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	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 3 to 3.

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

4.1 Operating mode

Test item	Mode	Tested frequency
All items	Transmitting Hopping OFF (Low Energy), Payload: PRBS9	2402MHz, 2440MHz, 2480MHz

*EUT has the power settings by the software as follows;

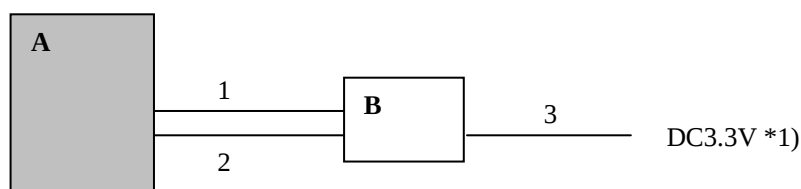
Power settings: "0005"(Transmit power level)

Test software: CSR uEnergy Test Application, version 2.0.0.99

Antenna: AT3216-B2R7HAA was used for the test, since there is no difference in the specification and shape of 3-type of chip antenna.

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

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	JM1	JM1L2X	*2)	Aplix IP Holdings Corporation	EUT
B	Jig Board	-	-	Aplix IP Holdings Corporation	-

*1) DC Power Supply (Model No.: PAN35-10A) was used for DC input.

*2) Conducted / Radiated emission:004 (Chip Antenna), 005 (Pattern Antenna), Other test: 001

List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal	0.7	Unshielded	Unshielded	-
2	DC	0.7	Unshielded	Unshielded	-
3	DC	1.8	Unshielded	Unshielded	-

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SECTION 5: Conducted 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, 1m by 1.5m, raised 0.8m above the conducting ground plane.

The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source.

Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT position : Table top

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT via DC Power Supply within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN) DC Power Supply.

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ Average
IF Bandwidth : 9kHz

5.5 Results

Summary of the test results : Pass

Refer to APPENDIX 1

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

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

The test was measured based on Method 8.1 Option 1 and 8.2 Option 2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 7: Maximum peak output power

Test procedure

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

The test was measured based on Method 9.1.3 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 8: Out of band emissions (Antenna port conducted)

Test procedure

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement. In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 9: Peak power density

Test procedure

The peak power density was measured with a spectrum analyzer connected to the antenna port.

Instrument used : Spectrum Analyzer
RBW / VBW : 3kHz / 9kHz

The test was measured based on Method 10.2 PKPSD of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

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SECTION 10: Radiated emission

10.1 Operating environment

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

10.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

10.3 Test conditions

Frequency range : 30MHz to 25GHz
EUT position : Table top

10.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 3MHz Detector: RMS	RBW: 100kHz VBW: 300kHz

*1) Average Power Measurement was measured based on 12.2.5 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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.

Worst case:

Antenna type	Antenna polarization	Carrier (Band edge)	Spurious		
			Below 1GHz	1-18GHz	18-25GHz
Chip	Horizontal	X	X	X	X
	Vertical	X	X	Y	Y
Pattern	Horizontal	Y	X	Y	Y
	Vertical	Y	X	Y	Y

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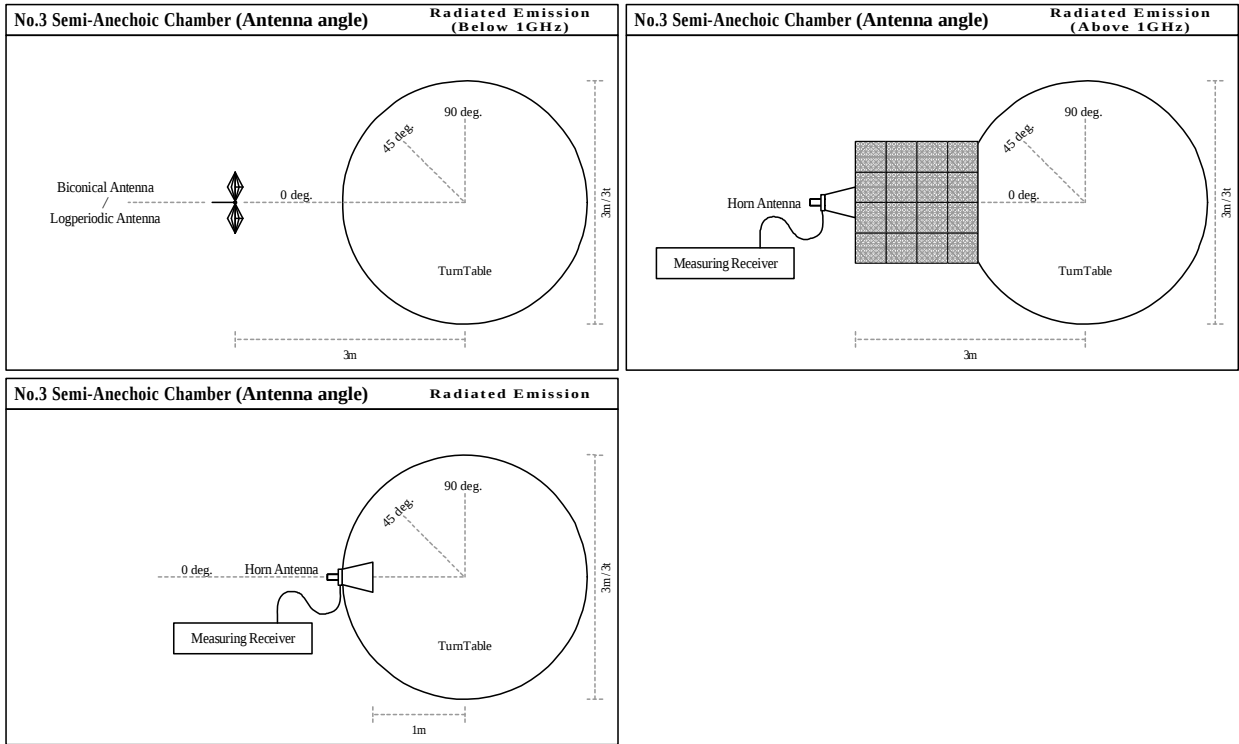
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Figure 1. Antenna angle



10.5 Band edge

Band edge level at 2390MHz, 2400MHz and 2483.5MHz is below the limits of FCC 15.209. Refer to the data.

10.6 Results

Summary of the test results : Pass
* No noise was detected above the 3rd order harmonics.

Refer to APPENDIX 1

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

Conducted emission
6dB bandwidth
Maximum peak output power
Radiated emission
Spurious emission (Antenna port conducted)
Peak power density
Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Conducted emission
Radiated emission
Pre-check of worst position

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DATA OF CONDUCTED EMISSION TEST

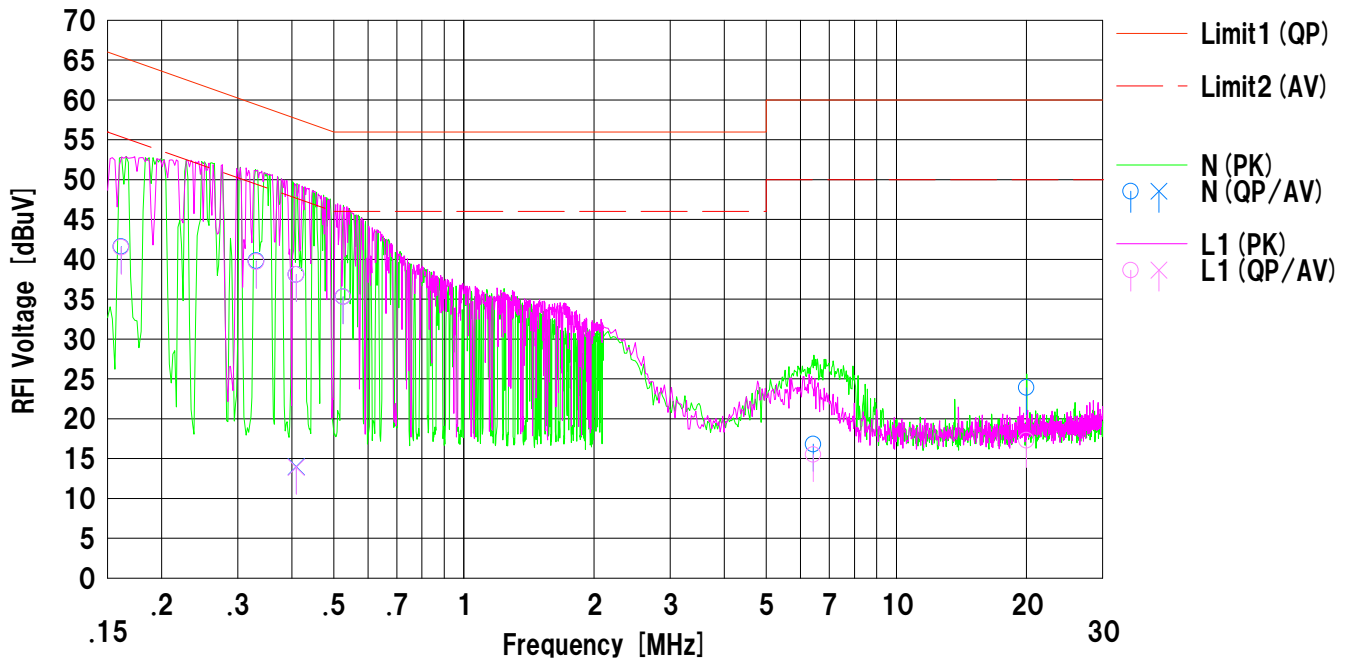
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/12/04

Company : Aplix IP Holdings Corporation
 Kind of EUT : JM1
 Model No. : JM1L2X
 Serial No. : 004
 Remarks : Chip Antenna

Mode : Tx 2440MHz
 Report No. : 10071930S
 Power : AC120V/60Hz (EUT: DC3.3V)
 Temp./Humi. : 23deg.C. / 26%RH

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

Engineer : Tatsuya Arai



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	0.16123	28.9	---	12.7	41.6	---	65.4	55.4	23.8	---	N	
2	0.33124	27.1	---	12.7	39.8	---	59.4	49.4	19.6	---	N	
3	0.40962	25.4	1.3	12.7	38.1	14.0	57.6	47.6	19.5	33.6	N	
4	0.52613	22.6	---	12.7	35.3	---	56.0	46.0	20.7	---	N	
5	6.42643	3.8	---	13.0	16.8	---	60.0	50.0	43.2	---	N	
6	20.00020	10.3	---	13.6	23.9	---	60.0	50.0	36.1	---	N	
7	0.16123	28.8	---	12.7	41.5	---	65.4	55.4	23.9	---	L1	
8	0.33124	27.0	---	12.7	39.7	---	59.4	49.4	19.7	---	L1	
9	0.40962	25.4	1.2	12.7	38.1	13.9	57.6	47.6	19.5	33.7	L1	
10	0.52613	22.6	---	12.7	35.3	---	56.0	46.0	20.7	---	L1	
11	6.42643	2.5	---	13.0	15.5	---	60.0	50.0	44.5	---	L1	
12	20.00000	3.7	---	13.6	17.3	---	60.0	50.0	42.7	---	L1	

DATA OF CONDUCTED EMISSION TEST

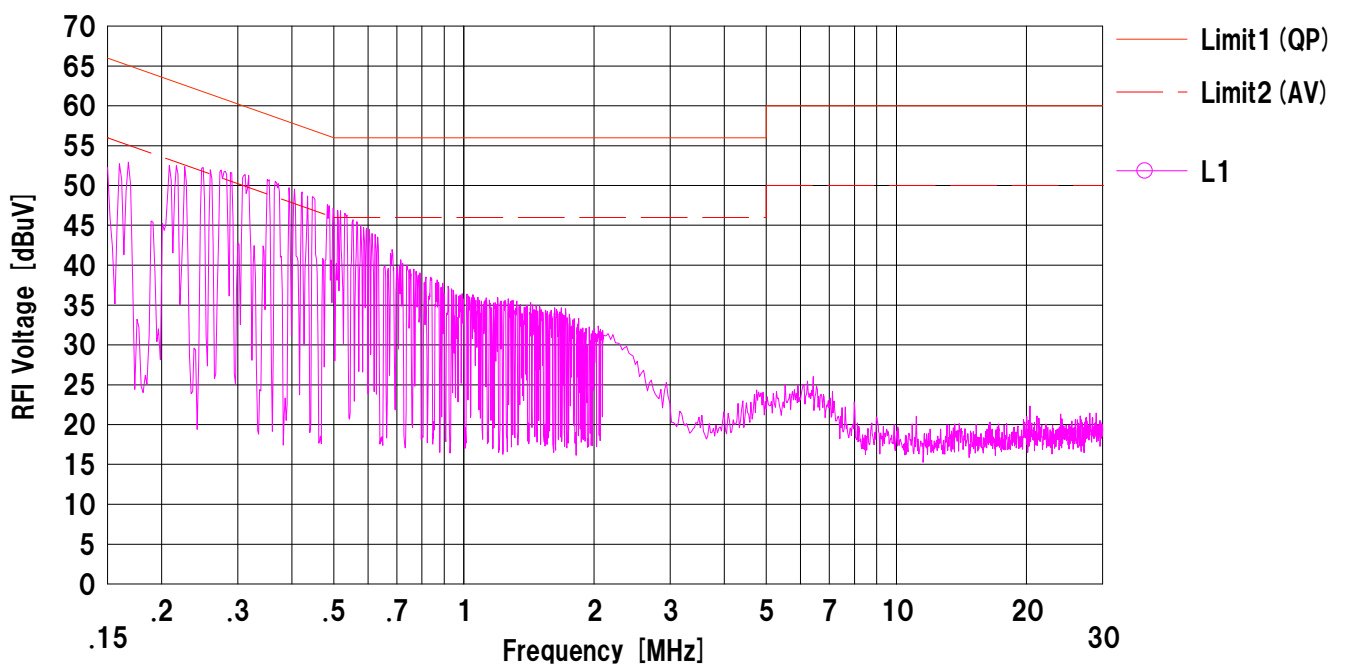
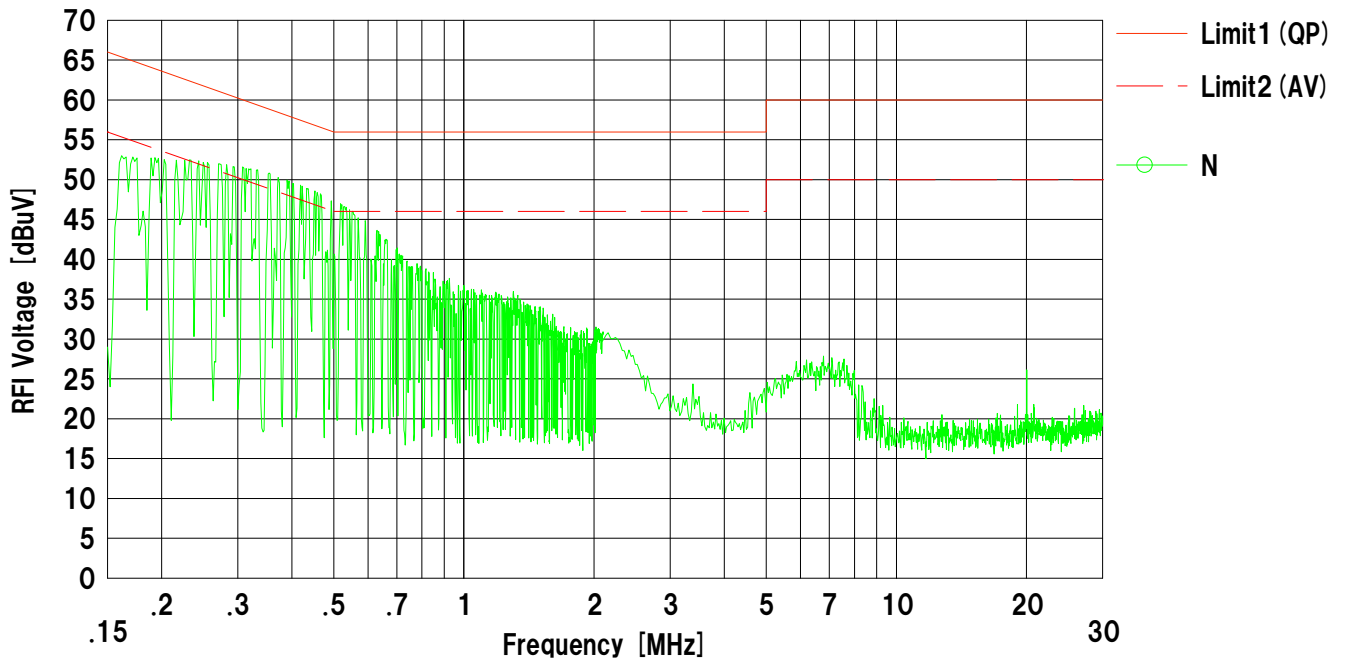
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/12/04

Company : Aplix IP Holdings Corporation
Kind of EUT : JM1
Model No. : JM1L2X
Serial No. : 004
Remarks : Chip Antenna

Mode : Tx 2402MHz
Report No. : 10071930S
Power : AC120V/60Hz (EUT: DC3.3V)
Temp./Humi. : 23deg.C. / 26%RH

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

Engineer : Tatsuya Arai



DATA OF CONDUCTED EMISSION TEST

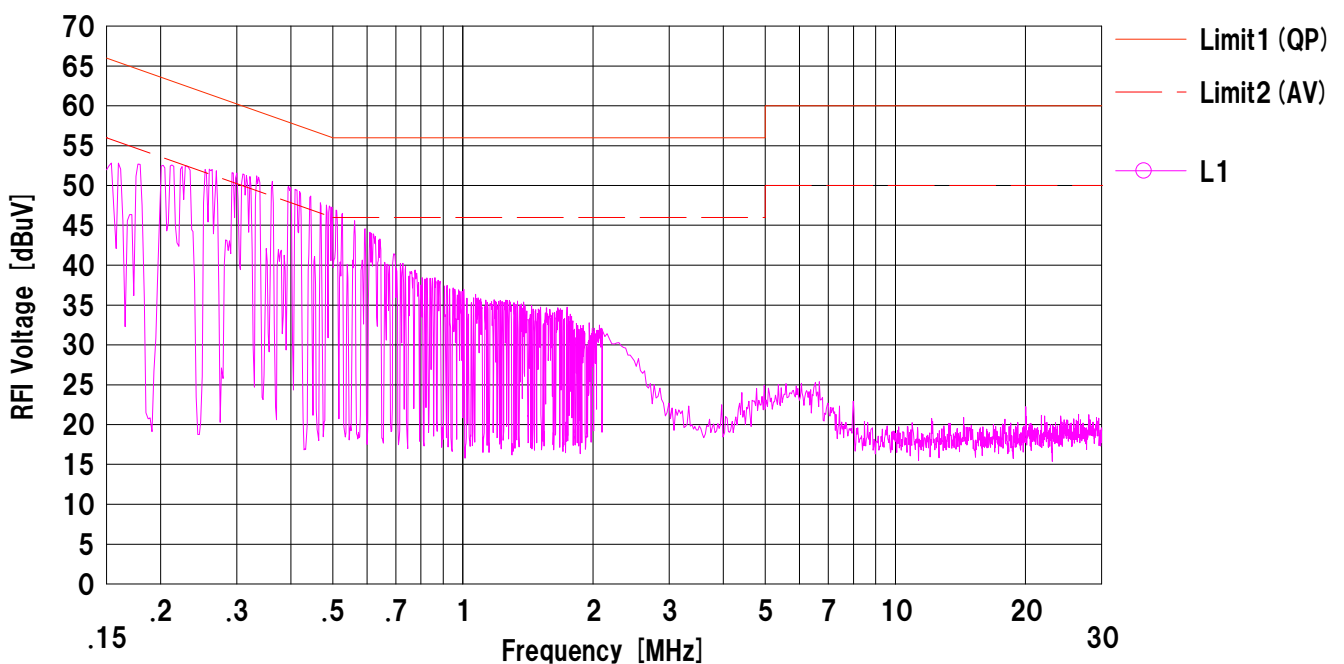
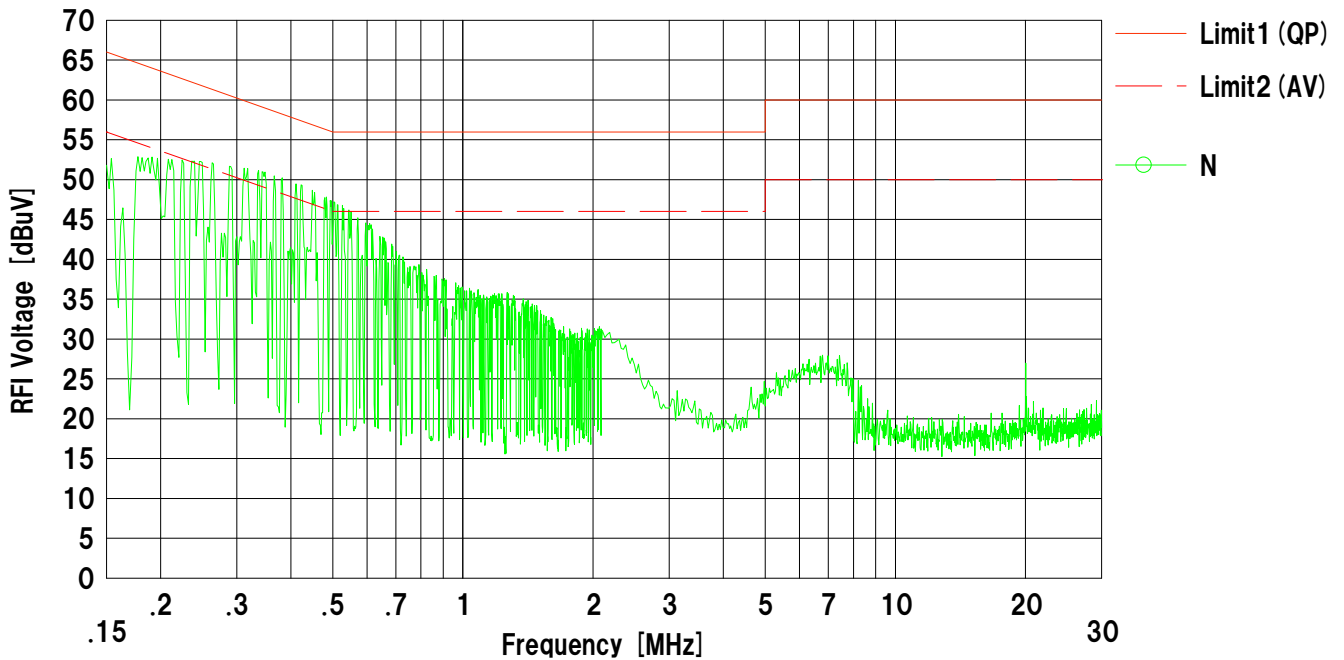
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/12/04

Company : Aplix IP Holdings Corporation
Kind of EUT : JM1
Model No. : JM1L2X
Serial No. : 004
Remarks : Chip Antenna

Mode : Tx 2480MHz
Report No. : 10071930S
Power : AC120V/60Hz (EUT: DC3.3V)
Temp./Humi. : 23deg.C. / 26%RH

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

Engineer : Tatsuya Arai



DATA OF CONDUCTED EMISSION TEST

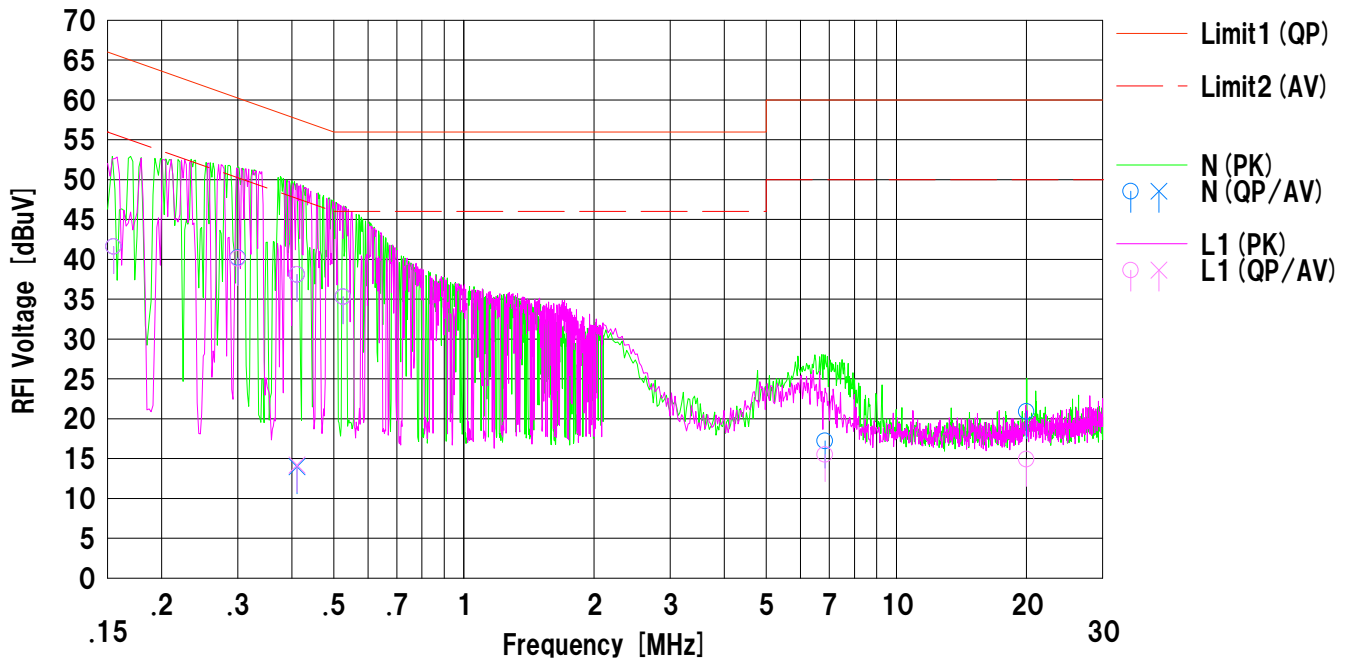
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/12/04

Company : Aplix IP Holdings Corporation
Kind of EUT : JM1
Model No. : JM1L2X
Serial No. : 005
Remarks : Pattern Antenna

Mode : Tx 2440MHz
Report No. : 10071930S
Power : AC120V/60Hz (EUT: DC3.3V)
Temp./Humi. : 23deg.C. / 26%RH

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

Engineer : Tatsuya Arai



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	0.15498	28.9	---	12.7	41.6	---	65.7	55.7	24.1	---	N	
2	0.29998	27.5	---	12.7	40.2	---	60.2	50.2	20.0	---	N	
3	0.41119	25.4	1.3	12.7	38.1	14.0	57.6	47.6	19.5	33.6	N	
4	0.52595	22.6	---	12.7	35.3	---	56.0	46.0	20.7	---	N	
5	6.83831	4.2	---	13.0	17.2	---	60.0	50.0	42.8	---	N	
6	20.00020	7.3	---	13.6	20.9	---	60.0	50.0	39.1	---	N	
7	0.15498	28.9	---	12.7	41.6	---	65.7	55.7	24.1	---	L1	
8	0.29998	27.4	---	12.7	40.1	---	60.2	50.2	20.1	---	L1	
9	0.41119	25.4	1.5	12.7	38.1	14.2	57.6	47.6	19.5	33.4	L1	
10	0.52595	22.6	---	12.7	35.3	---	56.0	46.0	20.7	---	L1	
11	6.83831	2.5	---	13.0	15.5	---	60.0	50.0	44.5	---	L1	
12	20.00040	1.3	---	13.6	14.9	---	60.0	50.0	45.1	---	L1	

DATA OF CONDUCTED EMISSION TEST

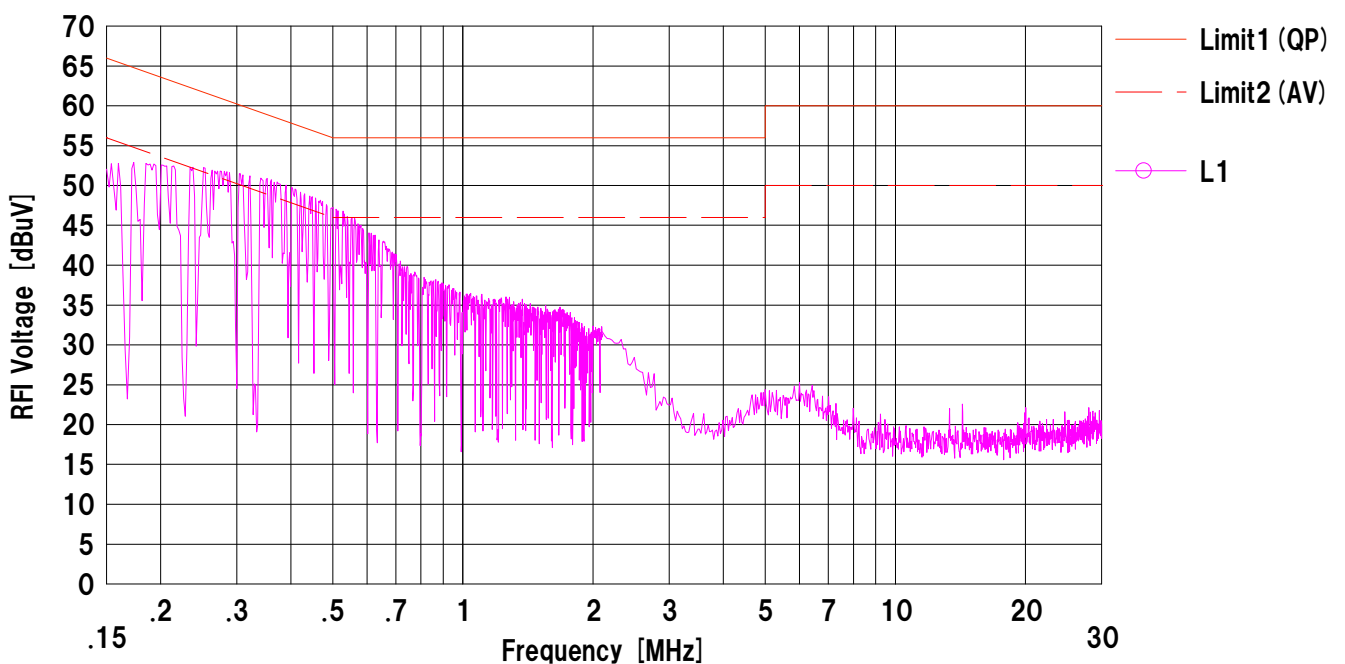
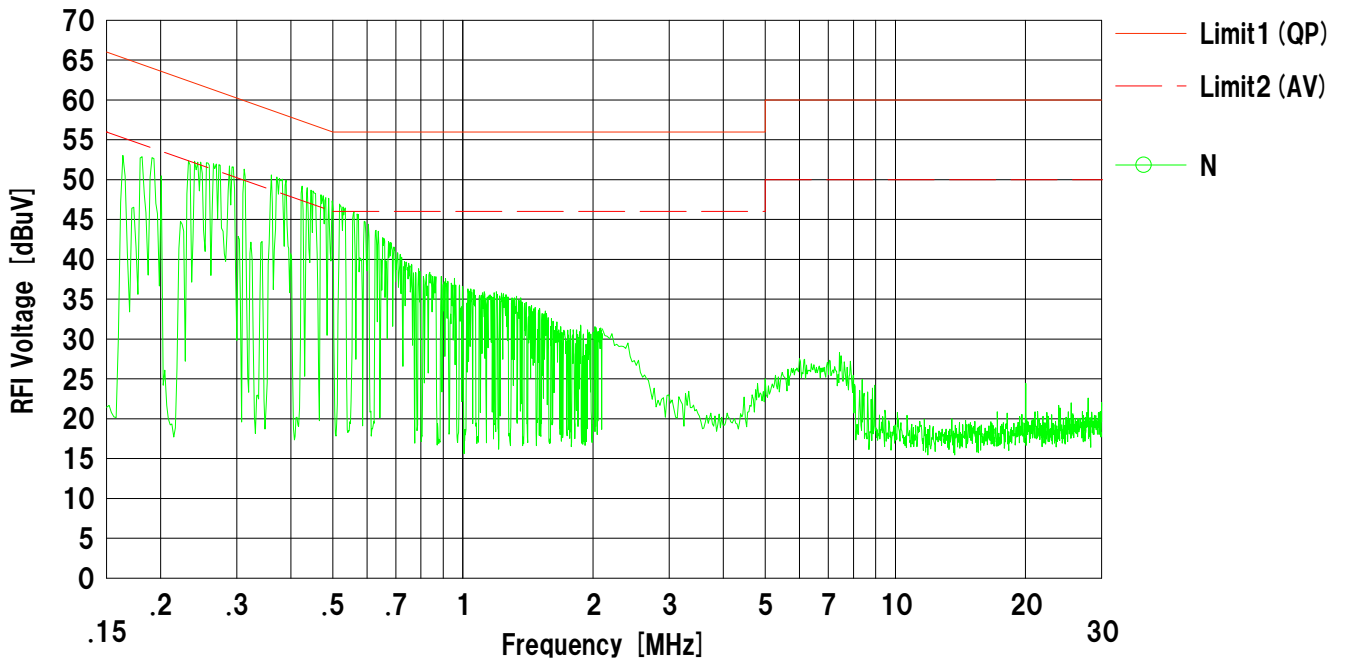
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/12/04

Company : Aplix IP Holdings Corporation
Kind of EUT : JM1
Model No. : JM1L2X
Serial No. : 005
Remarks : Pattern Antenna

Mode : Tx 2402MHz
Report No. : 10071930S
Power : AC120V/60Hz (EUT: DC3.3V)
Temp./Humi. : 23deg.C. / 26%RH

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

Engineer : Tatsuya Arai



DATA OF CONDUCTED EMISSION TEST

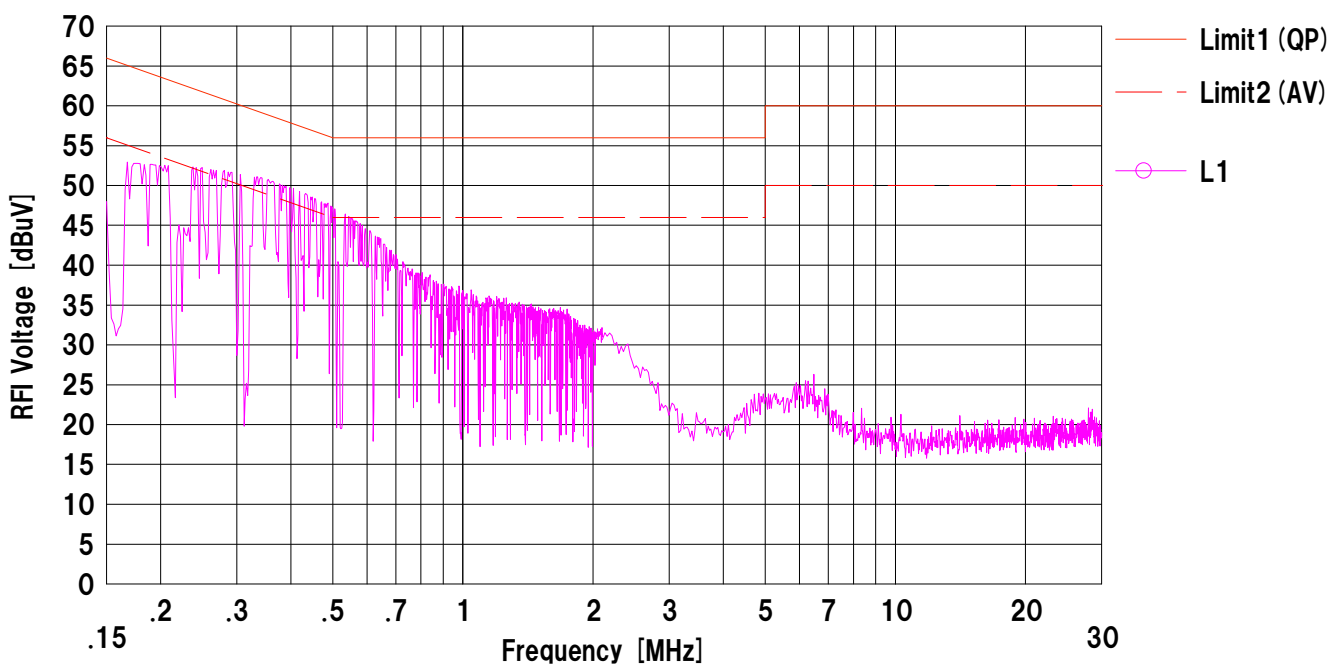
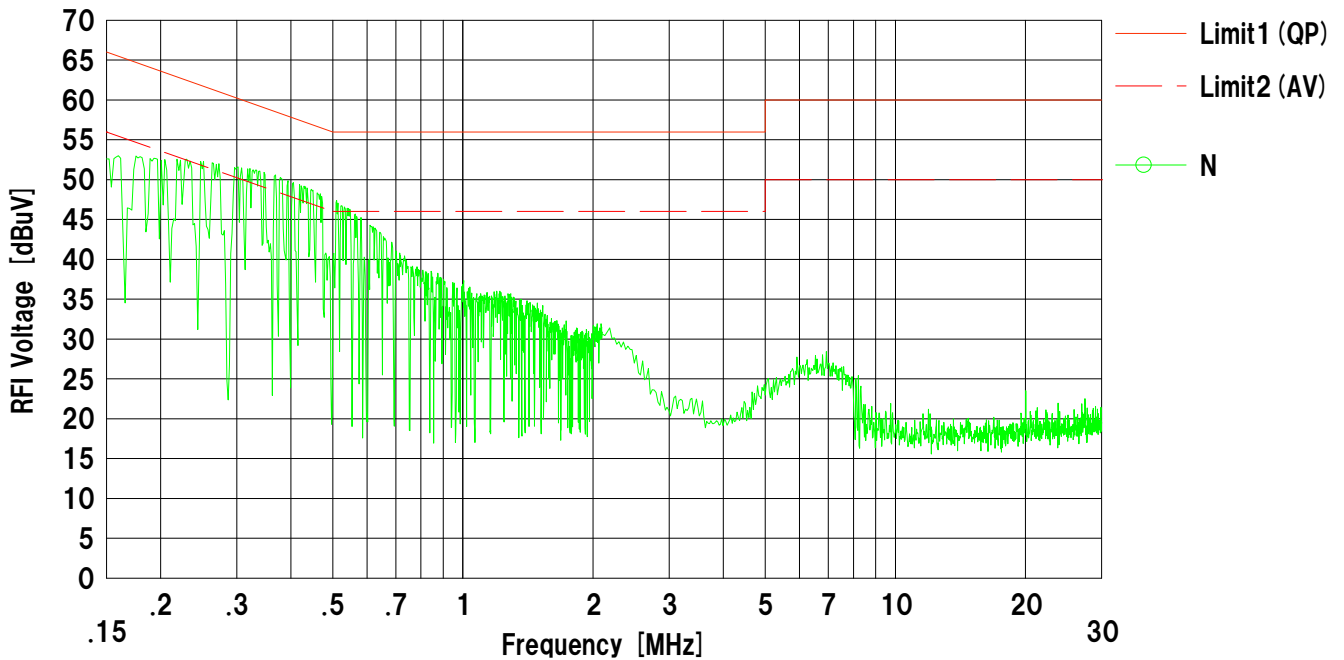
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2013/12/04

Company : Aplix IP Holdings Corporation
Kind of EUT : JM1
Model No. : JM1L2X
Serial No. : 005
Remarks : Pattern Antenna

Mode : Tx 2480MHz
Report No. : 10071930S
Power : AC120V/60Hz (EUT: DC3.3V)
Temp./Humi. : 23deg.C. / 26%RH

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

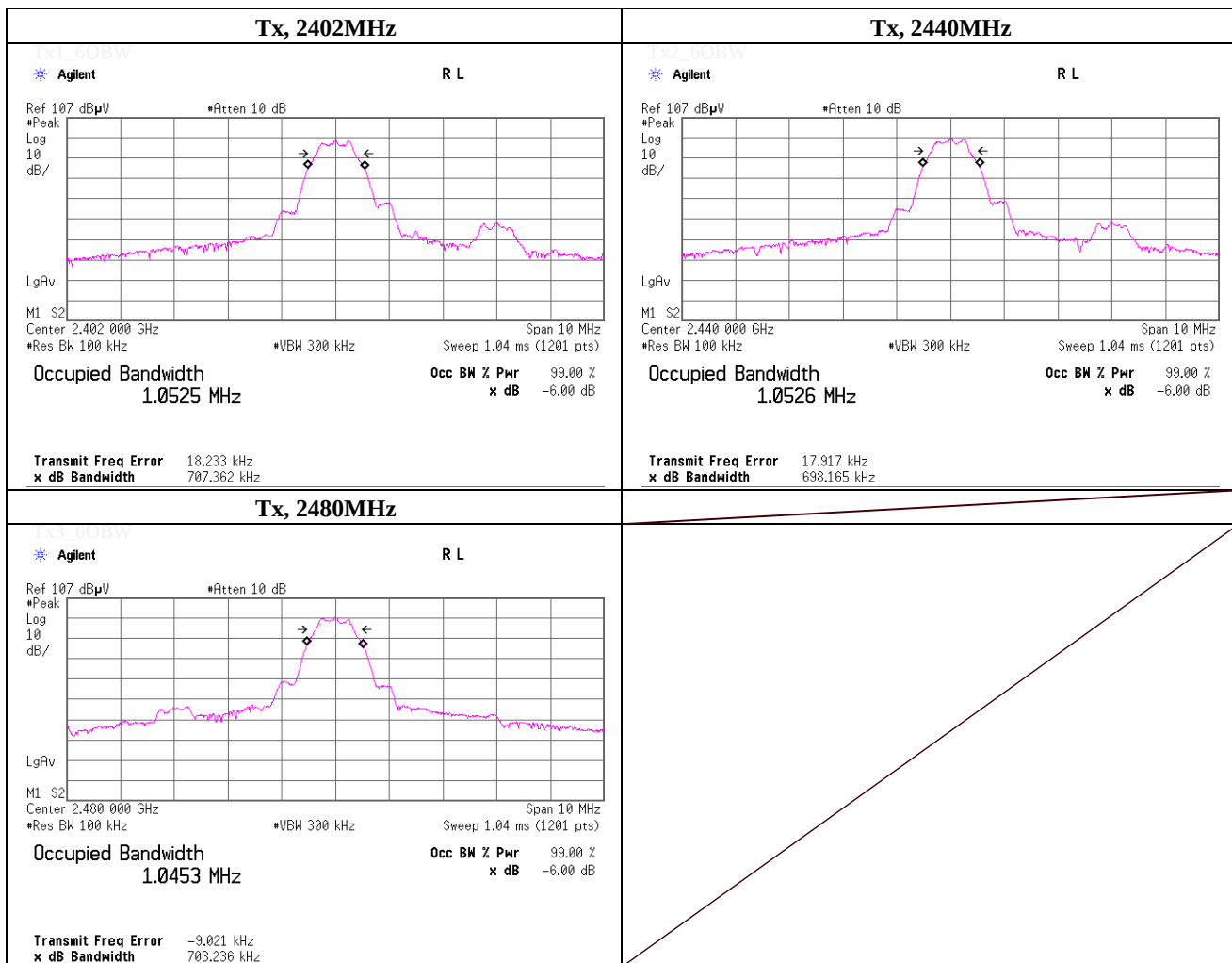
Engineer : Tatsuya Arai



-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	November 27, 2013	
Temperature / Humidity	25deg.C , 34%RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth Low Energy, PN9	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2402.0000	0.707	> 0.500
2440.0000	0.698	> 0.500
2480.0000	0.703	> 0.500



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Peak Conducted Output Power

(PKPM1)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date November 27, 2013
Temperature / Humidity 25deg.C , 34%RH
Engineer Tatsuya Arai
Mode Tx, Bluetooth Low Energy, PN9,

(* P/M: Power Meter with power sensor)

Ch	Freq.	P/M (Peak Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	
Low	2402.0	-10.92	1.48	10.04	0.60	1.15	30.00	1000	29.40
Mid	2440.0	-9.93	1.50	10.04	1.61	1.45	30.00	1000	28.39
High	2480.0	-9.28	1.50	10.04	2.26	1.68	30.00	1000	27.74

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

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Shonan EMC Lab.

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

Telephone : +81 463 50 6400

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 24, 2013 December 4, 2013
Temperature / Humidity 24 deg.C, 37 %RH 23 deg.C, 26 %RH
Engineer Akira Sato Tatsuya Arai
Mode Tx, 2402 MHz
Antenna type: Chip

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	208.000	QP	46.0	16.5	8.0	32.0	38.5	43.5	5.0	150	90	
Hori.	212.000	QP	46.8	16.6	8.0	32.0	39.4	43.5	4.1	140	85	
Hori.	2370.000	PK	48.8	26.8	14.7	41.1	49.2	73.9	24.7	100	145	
Hori.	2390.000	PK	48.4	26.8	14.7	41.1	48.8	73.9	25.1	100	125	
Hori.	2400.000	PK	59.8	26.8	14.7	41.1	60.2	73.9	13.7	100	125	
Hori.	2497.000	PK	49.0	26.9	14.8	41.0	49.7	73.9	24.2	100	200	
Hori.	4804.000	PK	53.7	30.9	7.9	41.2	51.3	73.9	22.6	100	190	
Hori.	7206.000	PK	49.5	37.1	9.1	41.0	54.7	73.9	19.2	100	150	
Hori.	2390.000	AV	37.6	26.8	14.7	41.1	38.0	53.9	15.9	100	125	*1
Hori.	2400.000	AV	44.9	26.8	14.7	41.1	45.3	53.9	8.6	100	125	*1
Vert.	64.000	QP	50.0	7.4	6.4	32.1	31.7	40.0	8.3	100	185	
Vert.	208.000	QP	50.8	16.5	8.0	32.0	43.3	43.5	0.2	100	216	
Vert.	212.000	QP	50.6	16.6	8.0	32.0	43.2	43.5	0.3	100	200	
Vert.	2370.000	PK	46.8	26.8	14.7	41.1	47.2	73.9	26.7	100	234	
Vert.	2390.000	PK	46.9	26.8	14.7	41.1	47.3	73.9	26.6	100	234	
Vert.	2400.000	PK	57.1	26.8	14.7	41.1	57.5	73.9	16.4	100	234	
Vert.	2497.000	PK	47.3	26.9	14.8	41.0	48.0	73.9	25.9	100	70	
Vert.	4804.000	PK	51.6	30.9	7.9	41.2	49.2	73.9	24.7	100	135	
Vert.	7206.000	PK	47.3	37.1	9.1	41.0	52.5	73.9	21.4	100	280	
Vert.	2390.000	AV	37.3	26.8	14.7	41.1	37.7	53.9	16.2	100	234	*1
Vert.	2400.000	AV	42.4	26.8	14.7	41.1	42.8	53.9	11.1	100	234	*1

Result = Reading + Ant Factor + Loss(Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2370.000	AV	41.0	26.8	14.7	41.1	3.7	45.1	53.9	8.8	
Hori.	2497.000	AV	40.0	26.9	14.8	41.0	3.7	44.4	53.9	9.5	
Hori.	4804.000	AV	45.1	30.9	7.9	41.2	3.7	46.4	53.9	7.5	
Hori.	7206.000	AV	37.5	37.1	9.1	41.0	3.7	46.4	53.9	7.5	
Vert.	2370.000	AV	38.9	26.8	14.7	41.1	3.7	43.0	53.9	10.9	
Vert.	2497.000	AV	36.0	26.9	14.8	41.0	3.7	40.4	53.9	13.5	
Vert.	4804.000	AV	42.7	30.9	7.9	41.2	3.7	44.0	53.9	9.9	
Vert.	7206.000	AV	38.6	37.1	9.1	41.0	3.7	47.5	53.9	6.4	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 24, 2013 December 4, 2013
Temperature / Humidity 24 deg.C, 37 %RH 23 deg.C, 26 %RH
Engineer Akira Sato Tatsuya Arai
Mode Tx, 2440 MHz
Antenna type: Chip

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	208.000	QP	46.7	16.5	8.0	32.0	39.2	43.5	4.3	150	90	
Hori.	212.000	QP	46.5	16.6	8.0	32.0	39.1	43.5	4.4	140	85	
Hori.	2377.000	PK	48.3	26.8	14.7	41.1	48.7	73.9	25.2	100	190	
Hori.	2504.000	PK	51.3	26.9	14.9	41.0	52.1	73.9	21.8	100	202	
Hori.	4880.000	PK	56.3	31.4	7.5	41.1	54.1	73.9	19.8	100	193	
Hori.	7320.000	PK	51.3	37.2	9.0	41.1	56.4	73.9	17.5	124	123	
Vert.	64.000	QP	50.3	7.4	6.4	32.1	32.0	40.0	8.0	100	155	
Vert.	208.000	QP	50.5	16.5	8.0	32.0	43.0	43.5	0.5	100	220	
Vert.	212.000	QP	50.6	16.6	8.0	32.0	43.2	43.5	0.3	100	190	
Vert.	2377.000	PK	46.5	26.8	14.7	41.1	46.9	73.9	27.0	100	240	
Vert.	2504.000	PK	48.5	26.9	14.9	41.0	49.3	73.9	24.6	100	300	
Vert.	4880.000	PK	56.2	31.4	7.5	41.1	54.0	73.9	19.9	100	269	
Vert.	7320.000	PK	49.6	37.2	9.0	41.1	54.7	73.9	19.2	100	67	

Result = Reading + Ant Factor + Loss(Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2377.000	AV	39.1	26.8	14.7	41.1	3.7	43.2	53.9	10.7	
Hori.	2504.000	AV	43.9	26.9	14.9	41.0	3.7	48.4	53.9	5.5	
Hori.	4880.000	AV	49.2	31.4	7.5	41.1	3.7	50.7	53.9	3.2	
Hori.	7320.000	AV	42.0	37.2	9.0	41.1	3.7	50.8	53.9	3.1	
Vert.	2377.000	AV	37.1	26.8	14.7	41.1	3.7	41.2	53.9	12.7	
Vert.	2504.000	AV	40.7	26.9	14.9	41.0	3.7	45.2	53.9	8.7	
Vert.	4880.000	AV	48.6	31.4	7.5	41.1	3.7	50.1	53.9	3.8	
Vert.	7320.000	AV	39.7	37.2	9.0	41.1	3.7	48.5	53.9	5.4	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 24, 2013 December 4, 2013
Temperature / Humidity 24 deg.C, 37 %RH 23 deg.C, 26 %RH
Engineer Akira Sato Tatsuya Arai
Mode Tx, 2480 MHz
Antenna type: Chip

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	208.000	QP	45.0	16.5	8.0	32.0	37.5	43.5	6.0	150	90	
Hori.	212.000	QP	47.3	16.6	8.0	32.0	39.9	43.5	3.6	140	95	
Hori.	2383.000	PK	46.0	26.8	14.7	41.1	46.4	73.9	27.5	100	170	
Hori.	2483.500	PK	63.4	26.9	14.8	41.0	64.1	73.9	9.8	138	194	
Hori.	2512.000	PK	52.6	26.9	14.9	41.1	53.3	73.9	20.6	138	194	
Hori.	4960.000	PK	59.1	31.8	7.5	41.1	57.3	73.9	16.6	100	264	
Hori.	7440.000	PK	51.7	37.4	9.0	41.1	57.0	73.9	16.9	100	266	
Hori.	2483.500	AV	44.3	26.9	14.8	41.0	45.0	53.9	8.9	138	194	*1
Vert.	64.000	QP	50.5	7.4	6.4	32.1	32.2	40.0	7.8	100	170	
Vert.	208.000	QP	50.5	16.5	8.0	32.0	43.0	43.5	0.5	100	185	
Vert.	212.000	QP	50.8	16.6	8.0	32.0	43.4	43.5	0.1	100	190	
Vert.	2383.000	PK	46.0	26.8	14.7	41.1	46.4	73.9	27.5	100	245	
Vert.	2483.500	PK	60.1	26.9	14.8	41.0	60.8	73.9	13.1	100	339	
Vert.	2512.000	PK	48.9	26.9	14.9	41.1	49.6	73.9	24.3	100	339	
Vert.	4960.000	PK	60.2	31.8	7.5	41.1	58.4	73.9	15.5	100	106	
Vert.	7440.000	PK	49.8	37.4	9.0	41.1	55.1	73.9	18.8	100	83	
Vert.	2483.500	AV	42.2	26.9	14.8	41.0	42.9	53.9	11.0	100	339	*1

Result = Reading + Ant Factor + Loss(Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2383.000	AV	37.1	26.8	14.7	41.1	3.7	41.2	53.9	12.7	
Hori.	2512.000	AV	46.3	26.9	14.9	41.1	3.7	50.7	53.9	3.2	
Hori.	4960.000	AV	50.0	31.8	7.5	41.1	3.7	51.9	53.9	2.0	
Hori.	7440.000	AV	42.8	37.4	9.0	41.1	3.7	51.8	53.9	2.1	
Vert.	2383.000	AV	37.5	26.8	14.7	41.1	3.7	41.6	53.9	12.3	
Vert.	2512.000	AV	40.4	26.9	14.9	41.1	3.7	44.8	53.9	9.1	
Vert.	4960.000	AV	51.0	31.8	7.5	41.1	3.7	52.9	53.9	1.0	
Vert.	7440.000	AV	39.7	37.4	9.0	41.1	3.7	48.7	53.9	5.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 24, 2013 December 4, 2013
Temperature / Humidity 24 deg.C, 37 %RH 23 deg.C, 26 %RH
Engineer Akira Sato Tatsuya Arai
Mode Tx, 2402 MHz
Antenna type: Pattern

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	240.000	QP	50.0	16.9	8.2	32.0	43.1	46.0	2.9	140	260	
Hori.	252.000	QP	48.8	17.1	8.3	32.0	42.2	46.0	3.8	140	250	
Hori.	2370.000	PK	48.6	26.8	14.7	41.1	49.0	73.9	24.9	100	340	
Hori.	2390.000	PK	48.4	26.8	14.7	41.1	48.8	73.9	25.1	100	193	
Hori.	2400.000	PK	58.7	26.8	14.7	41.1	59.1	73.9	14.8	100	193	
Hori.	2497.000	PK	47.0	26.9	14.8	41.0	47.7	73.9	26.2	100	108	
Hori.	4804.000	PK	51.9	30.9	7.9	41.2	49.5	73.9	24.4	100	150	
Hori.	7206.000	PK	48.0	37.1	9.1	41.0	53.2	73.9	20.7	136	172	
Hori.	2390.000	AV	37.5	26.8	14.7	41.1	37.9	53.9	16.0	100	193	*1
Hori.	2400.000	AV	41.5	26.8	14.7	41.1	41.9	53.9	12.0	100	193	*1
Vert.	76.000	QP	49.0	6.3	7.2	32.1	30.4	40.0	9.6	125	188	
Vert.	240.000	QP	49.7	16.9	8.2	32.0	42.8	46.0	3.2	100	200	
Vert.	252.000	QP	48.0	17.1	8.3	32.0	41.4	46.0	4.6	100	173	
Vert.	2370.000	PK	48.3	26.8	14.7	41.1	48.7	73.9	25.2	126	312	
Vert.	2390.000	PK	46.9	26.8	14.7	41.1	47.3	73.9	26.6	100	182	
Vert.	2400.000	PK	56.8	26.8	14.7	41.1	57.2	73.9	16.7	100	182	
Vert.	2497.000	PK	46.7	26.9	14.8	41.0	47.4	73.9	26.5	114	100	
Vert.	4804.000	PK	48.7	30.9	7.9	41.2	46.3	73.9	27.6	100	130	
Vert.	7206.000	PK	48.5	37.1	9.1	41.0	53.7	73.9	20.2	175	328	
Vert.	2390.000	AV	37.4	26.8	14.7	41.1	37.8	53.9	16.1	100	182	*1
Vert.	2400.000	AV	39.2	26.8	14.7	41.1	39.6	53.9	14.3	100	182	*1

Result = Reading + Ant Factor + Loss(Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2370.000	AV	39.8	26.8	14.7	41.1	3.7	43.9	53.9	10.0	
Hori.	2497.000	AV	37.1	26.9	14.8	41.0	3.7	41.5	53.9	12.4	
Hori.	4804.000	AV	44.5	30.9	7.9	41.2	3.7	45.8	53.9	8.1	
Hori.	7206.000	AV	39.3	37.1	9.1	41.0	3.7	48.2	53.9	5.7	
Vert.	2370.000	AV	39.5	26.8	14.7	41.1	3.7	43.6	53.9	10.3	
Vert.	2497.000	AV	37.4	26.9	14.8	41.0	3.7	41.8	53.9	12.1	
Vert.	4804.000	AV	39.7	30.9	7.9	41.2	3.7	41.0	53.9	12.9	
Vert.	7206.000	AV	37.3	37.1	9.1	41.0	3.7	46.2	53.9	7.7	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 24, 2013 December 4, 2013
Temperature / Humidity 24 deg.C, 37 %RH 23 deg.C, 26 %RH
Engineer Akira Sato Tatsuya Arai
Mode Tx, 2440 MHz
Antenna type: Pattern

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	240.000	QP	52.0	16.9	8.2	32.0	45.1	46.0	0.9	140	265	
Hori.	252.000	QP	48.5	17.1	8.3	32.0	41.9	46.0	4.1	140	250	
Hori.	2377.000	PK	47.7	26.8	14.7	41.1	48.1	73.9	25.8	100	346	
Hori.	2504.000	PK	49.7	26.9	14.9	41.0	50.5	73.9	23.4	100	158	
Hori.	4880.000	PK	53.8	31.4	7.5	41.1	51.6	73.9	22.3	100	179	
Hori.	7320.000	PK	51.6	37.2	9.0	41.1	56.7	73.9	17.2	158	358	
Vert.	76.000	QP	50.2	6.3	7.2	32.1	31.6	40.0	8.4	125	190	
Vert.	240.000	QP	51.7	16.9	8.2	32.0	44.8	46.0	1.2	100	200	
Vert.	252.000	QP	47.5	17.1	8.3	32.0	40.9	46.0	5.1	100	170	
Vert.	2377.000	PK	46.8	26.8	14.7	41.1	47.2	73.9	26.7	100	322	
Vert.	2504.000	PK	49.9	26.9	14.9	41.0	50.7	73.9	23.2	100	164	
Vert.	4880.000	PK	50.7	31.4	7.5	41.1	48.5	73.9	25.4	100	281	
Vert.	7320.000	PK	50.1	37.2	9.0	41.1	55.2	73.9	18.7	100	359	

Result = Reading + Ant Factor + Loss(Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2377.000	AV	39.0	26.8	14.7	41.1	3.7	43.1	53.9	10.8	
Hori.	2504.000	AV	41.3	26.9	14.9	41.0	3.7	45.8	53.9	8.1	
Hori.	4880.000	AV	46.2	31.4	7.5	41.1	3.7	47.7	53.9	6.2	
Hori.	7320.000	AV	42.9	37.2	9.0	41.1	3.7	51.7	53.9	2.2	
Vert.	2377.000	AV	38.0	26.8	14.7	41.1	3.7	42.1	53.9	11.8	
Vert.	2504.000	AV	41.2	26.9	14.9	41.0	3.7	45.7	53.9	8.2	
Vert.	4880.000	AV	43.5	31.4	7.5	41.1	3.7	45.0	53.9	8.9	
Vert.	7320.000	AV	41.2	37.2	9.0	41.1	3.7	50.0	53.9	3.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date November 24, 2013 December 4, 2013
Temperature / Humidity 24 deg.C, 37 %RH 23 deg.C, 26 %RH
Engineer Akira Sato Tatsuya Arai
Mode Tx, 2480 MHz
Antenna type: Pattern

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	240.000	QP	52.1	16.9	8.2	32.0	45.2	46.0	0.8	140	255	
Hori.	252.000	QP	48.5	17.1	8.3	32.0	41.9	46.0	4.1	140	250	
Hori.	2383.000	PK	46.5	26.8	14.7	41.1	46.9	73.9	27.0	100	142	
Hori.	2483.500	PK	59.2	26.9	14.8	41.0	59.9	73.9	14.0	100	342	
Hori.	2512.000	PK	50.6	26.9	14.9	41.1	51.3	73.9	22.6	100	342	
Hori.	4960.000	PK	54.3	31.8	7.5	41.1	52.5	73.9	21.4	100	359	
Hori.	7440.000	PK	51.5	37.4	9.0	41.1	56.8	73.9	17.1	100	168	
Hori.	2483.500	AV	41.5	26.9	14.8	41.0	42.2	53.9	11.7	100	342	*1
Vert.	76.000	QP	50.2	6.3	7.2	32.1	31.6	40.0	8.4	120	190	
Vert.	240.000	QP	51.7	16.9	8.2	32.0	44.8	46.0	1.2	100	213	
Vert.	252.000	QP	47.5	17.1	8.3	32.0	40.9	46.0	5.1	100	180	
Vert.	2383.000	PK	46.3	26.8	14.7	41.1	46.7	73.9	27.2	100	150	
Vert.	2483.500	PK	60.1	26.9	14.8	41.0	60.8	73.9	13.1	100	27	
Vert.	2512.000	PK	51.3	26.9	14.9	41.1	52.0	73.9	21.9	100	27	
Vert.	4960.000	PK	53.7	31.8	7.5	41.1	51.9	73.9	22.0	100	245	
Vert.	7440.000	PK	53.0	37.4	9.0	41.1	58.3	73.9	15.6	149	15	
Vert.	2483.500	AV	42.5	26.9	14.8	41.0	43.2	53.9	10.7	100	27	*1

Result = Reading + Ant Factor + Loss(Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

*Distance factor [dB](15GHz - 40GHz)= 20 x log (3.0[m] / 1.0[m]) = 9.5 [dB]

*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2383.000	AV	37.2	26.8	14.7	41.1	3.7	41.3	53.9	12.6	
Hori.	2512.000	AV	43.4	26.9	14.9	41.1	3.7	47.8	53.9	6.1	
Hori.	4960.000	AV	49.3	31.8	7.5	41.1	3.7	51.2	53.9	2.7	
Hori.	7440.000	AV	42.8	37.4	9.0	41.1	3.7	51.8	53.9	2.1	
Vert.	2383.000	AV	37.1	26.8	14.7	41.1	3.7	41.2	53.9	12.7	
Vert.	2512.000	AV	44.8	26.9	14.9	41.1	3.7	49.2	53.9	4.7	
Vert.	4960.000	AV	46.7	31.8	7.5	41.1	3.7	48.6	53.9	5.3	
Vert.	7440.000	AV	43.9	37.4	9.0	41.1	3.7	52.9	53.9	1.0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator or Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

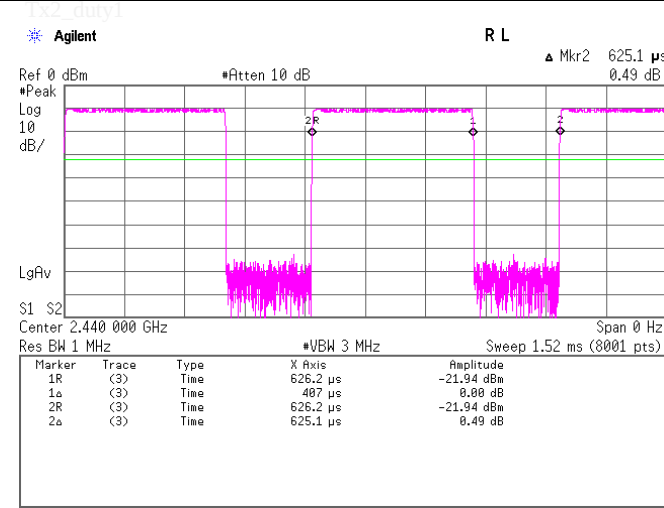
Duty Factor Calculation chart

Tx, Bluetooth Low Energy, PN9

Duty Factor Calculation

Duty Factor: $20\log(1/\text{duty cycle}) = 3.7\text{dB}$

duty cycle = $0.00040698 / 0.0006251 = 0.651$ (65.1%)



tx2_duty2

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Tx, Bluetooth Low Energy, PN9

Tx, 2402MHz (below 1GHz)

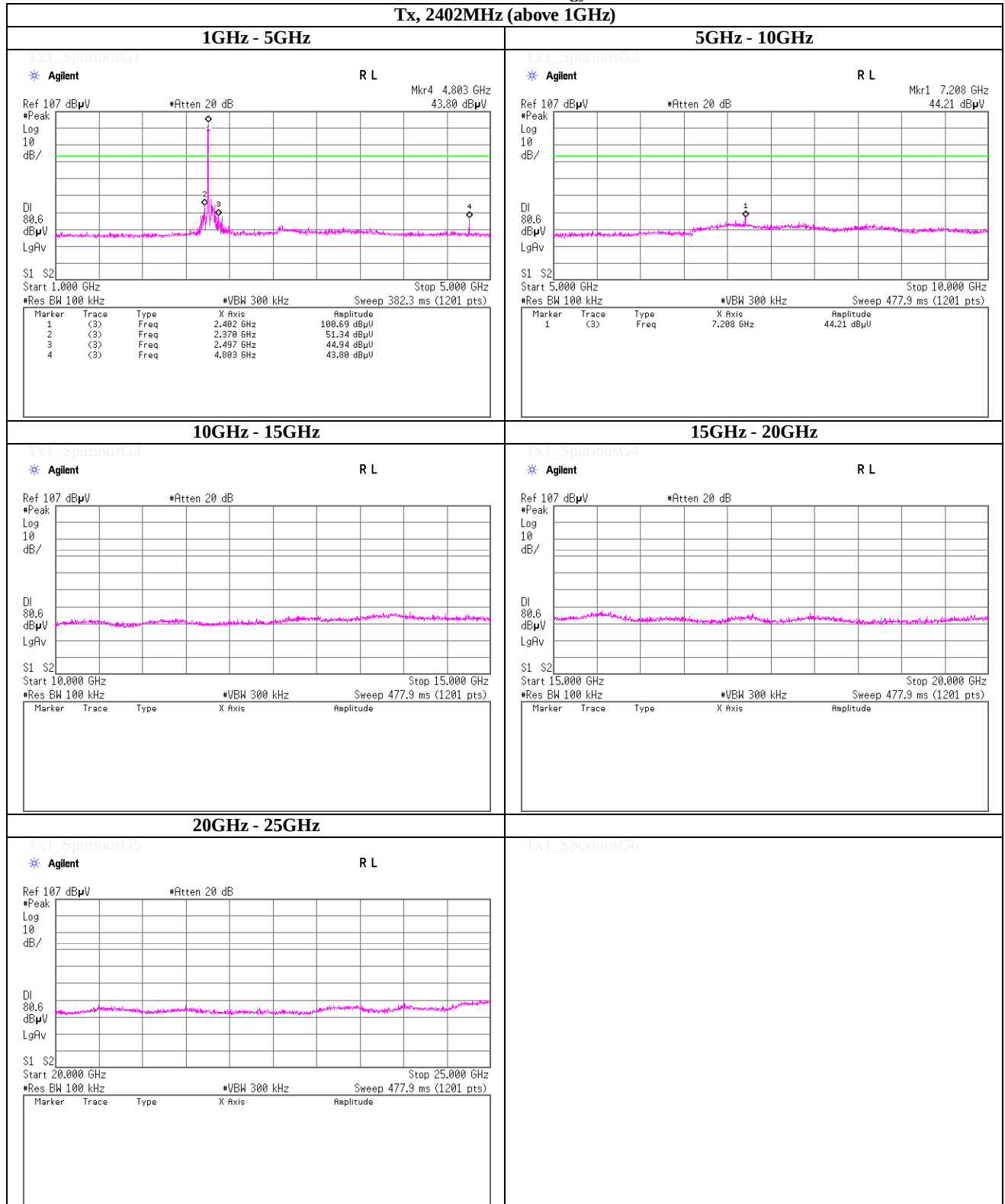
9kHz - 150kHz	150kHz - 30MHz										
Ref 87 dBμV #Atten 20 dB #Peak Log 10 dB/ DI 80.6 dBμV LgAv S1 S2 Start 9.00 kHz Stop 150.00 kHz #Res BW 200 Hz #VBW 620 Hz Sweep 2.279 s (1201 pts) <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr></thead><tbody></tbody></table>	Marker	Trace	Type	X Axis	Amplitude	Ref 97 dBμV #Atten 20 dB #Peak Log 10 dB/ DI 80.6 dBμV LgAv S1 S2 Start 150 kHz Stop 30.000 MHz #Res BW 10 kHz #VBW 30 kHz Sweep 285.3 ms (1201 pts) <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr></thead><tbody></tbody></table>	Marker	Trace	Type	X Axis	Amplitude
Marker	Trace	Type	X Axis	Amplitude							
Marker	Trace	Type	X Axis	Amplitude							
30MHz - 1GHz											
Ref 107 dBμV #Atten 20 dB #Peak Log 10 dB/ DI 80.6 dBμV LgAv S1 S2 Start 30.0 MHz Stop 1.000 0 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 92.72 ms (1201 pts) <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Marker</th><th>Trace</th><th>Type</th><th>X Axis</th><th>Amplitude</th></tr></thead><tbody></tbody></table>	Marker	Trace	Type	X Axis	Amplitude						
Marker	Trace	Type	X Axis	Amplitude							

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(Reference chart) Spurious emission (Conducted)

Tx, Bluetooth Low Energy, PN9

Tx, 2402MHz (above 1GHz)



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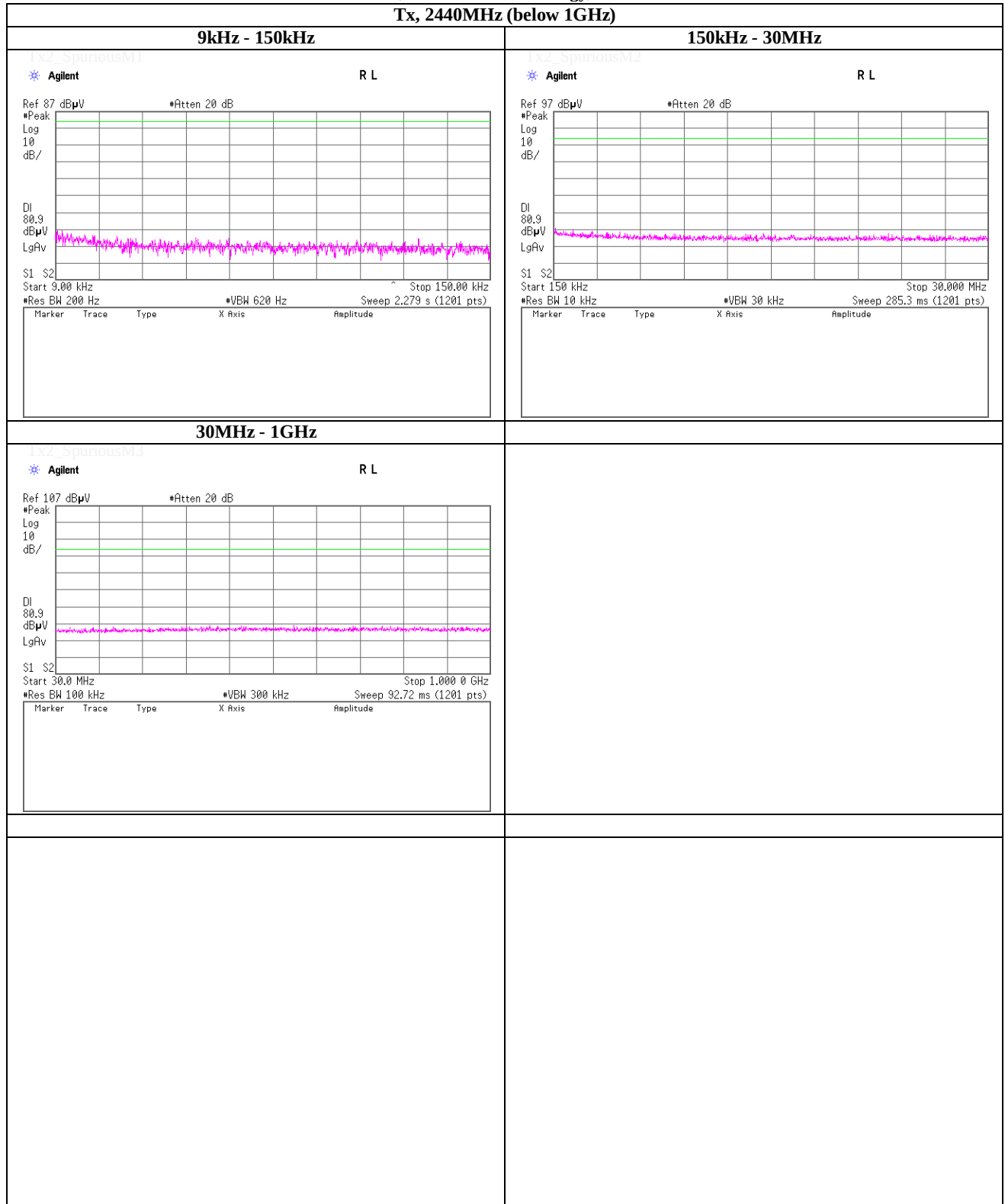
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(Reference chart) Spurious emission (Conducted)

Tx, Bluetooth Low Energy, PN9

Tx, 2440MHz (below 1GHz)



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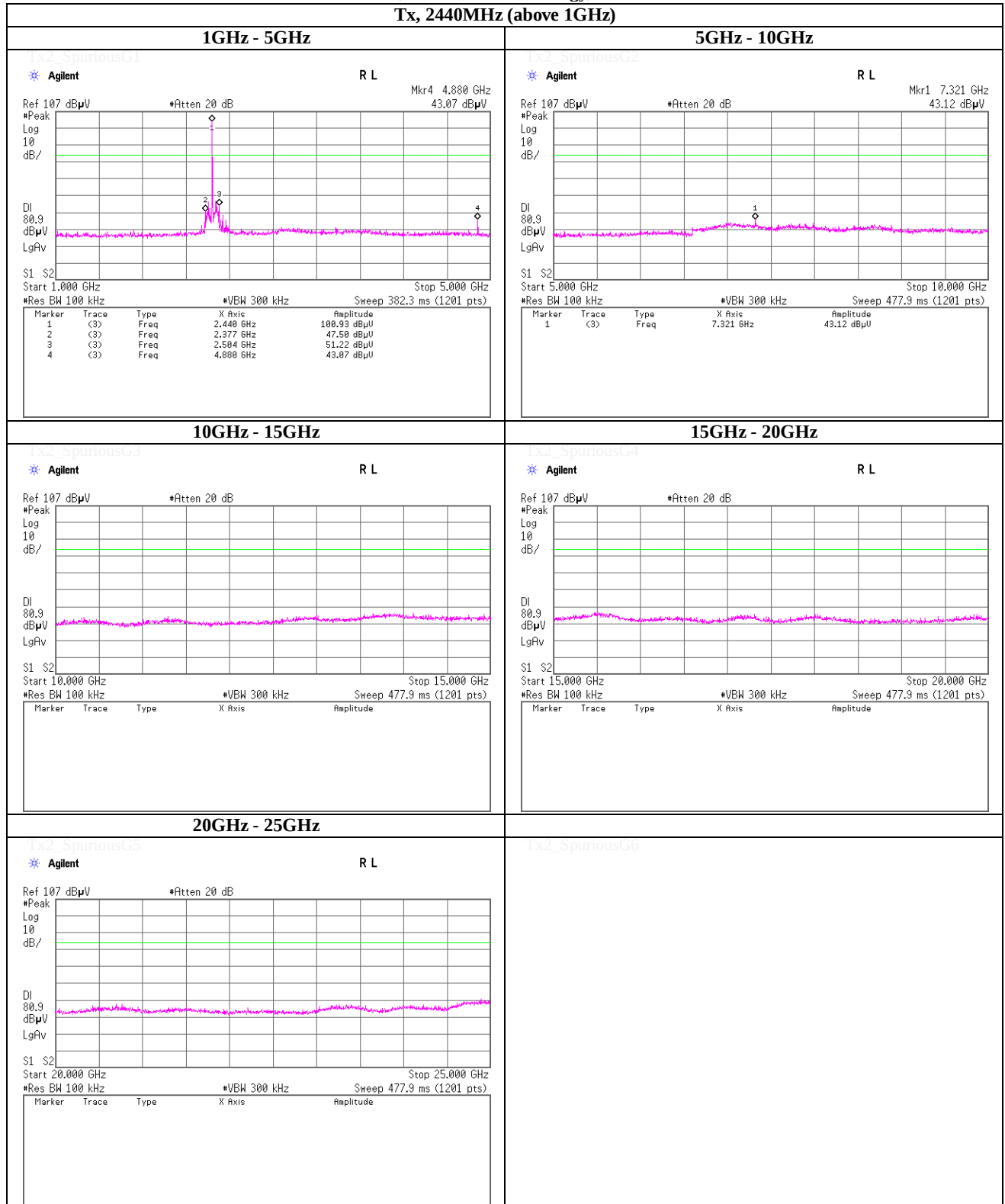
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(Reference chart) Spurious emission (Conducted)

Tx, Bluetooth Low Energy, PN9

Tx, 2440MHz (above 1GHz)



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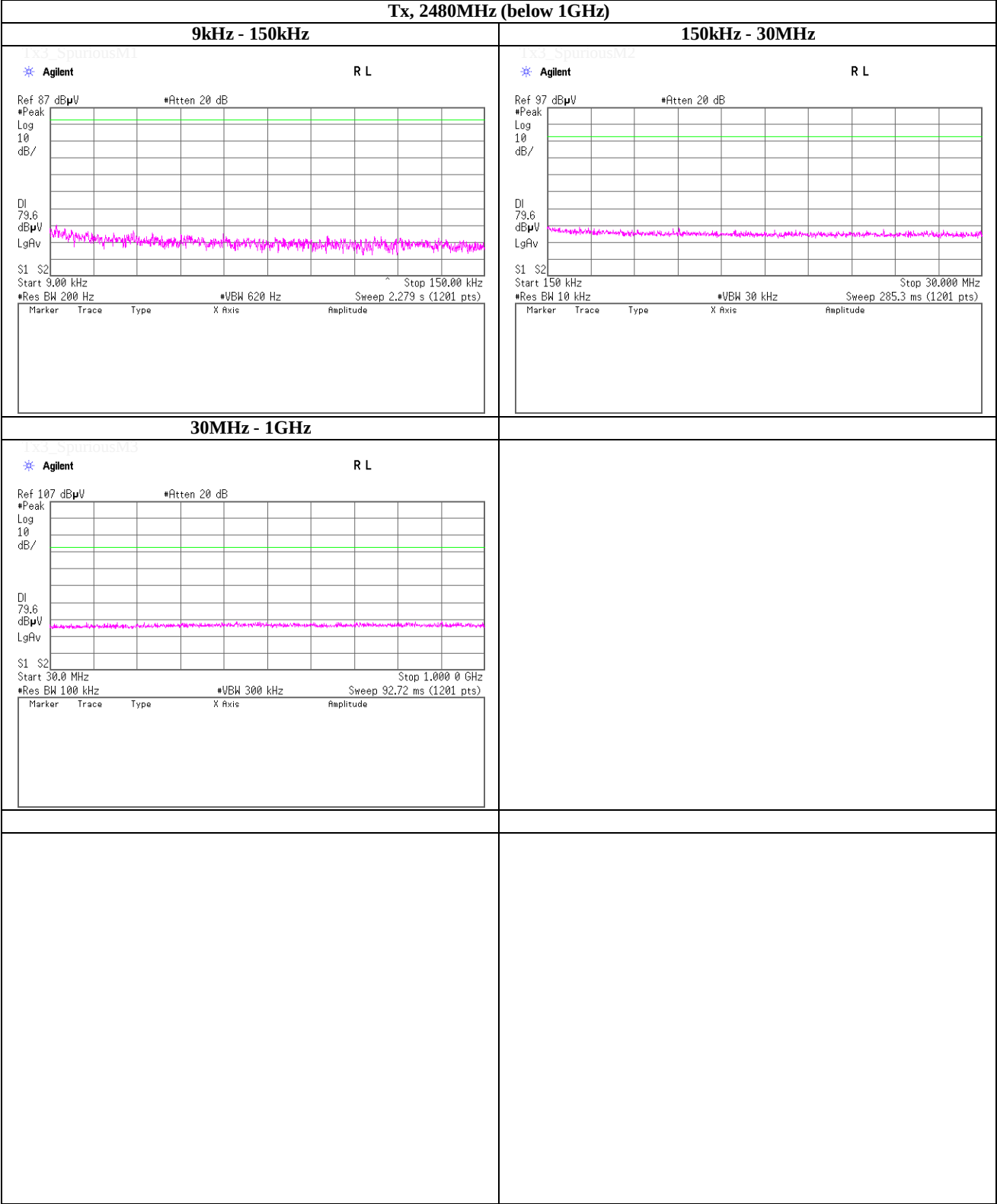
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(Reference chart) Spurious emission (Conducted)

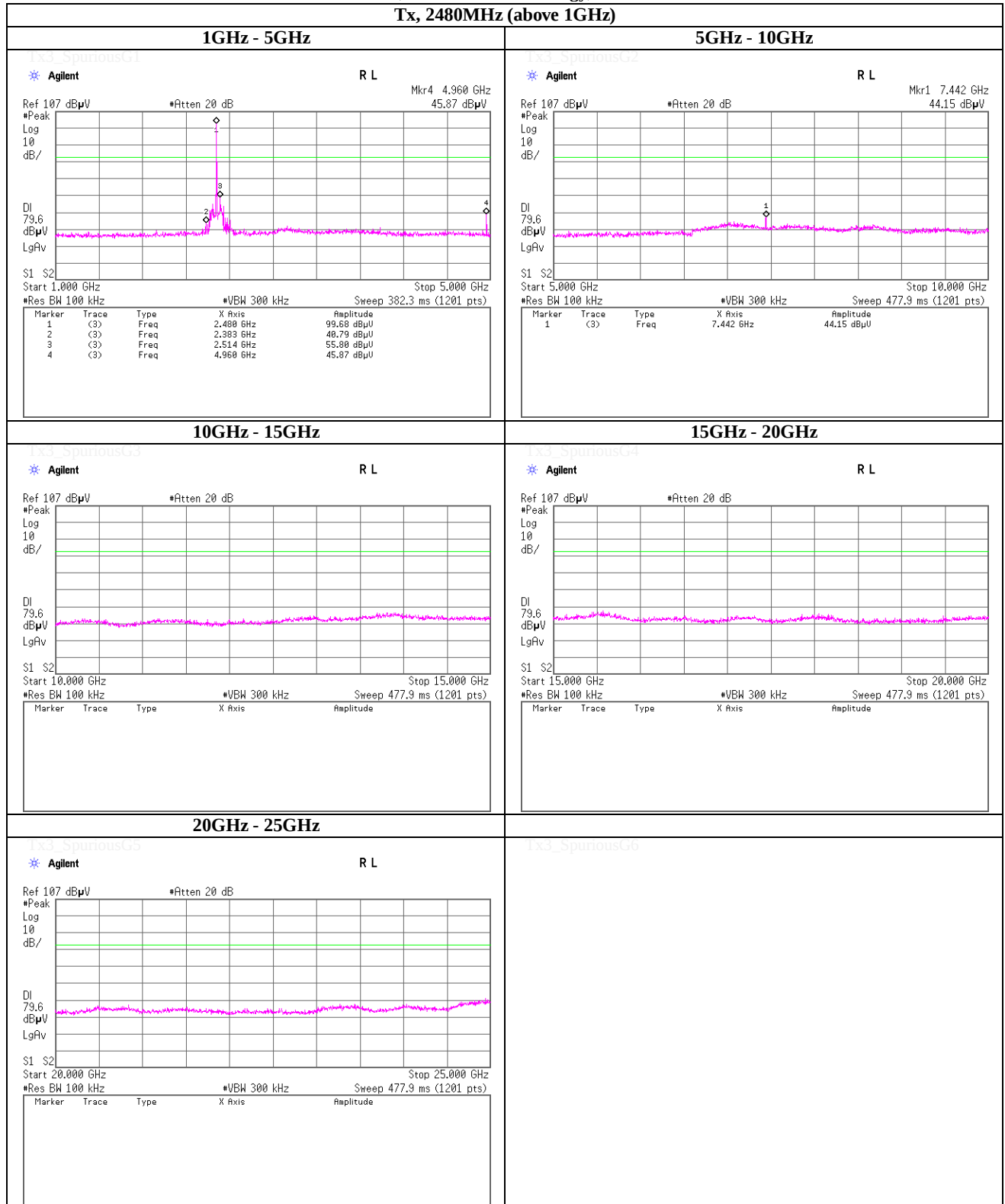
Tx, Bluetooth Low Energy, PN9
Tx, 2480MHz (below 1GHz)



(Reference chart) Spurious emission (Conducted)

Tx, Bluetooth Low Energy, PN9

Tx, 2480MHz (above 1GHz)



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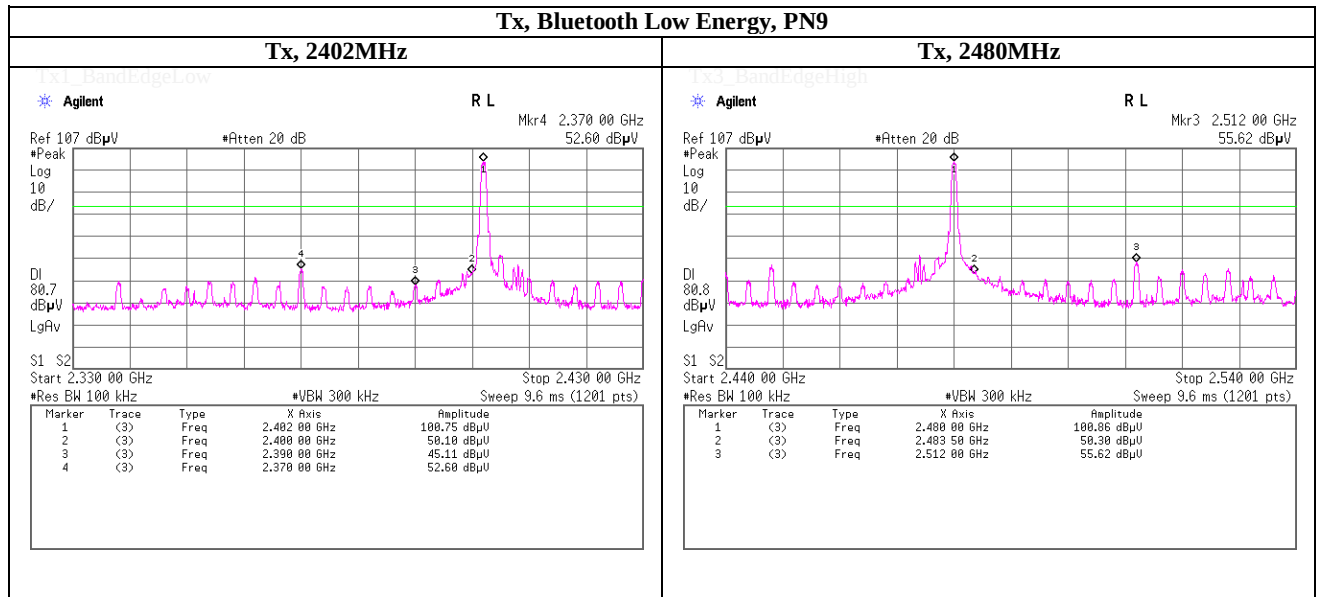
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(Reference chart) Spurious emission (Conducted)

Band Edge compliance



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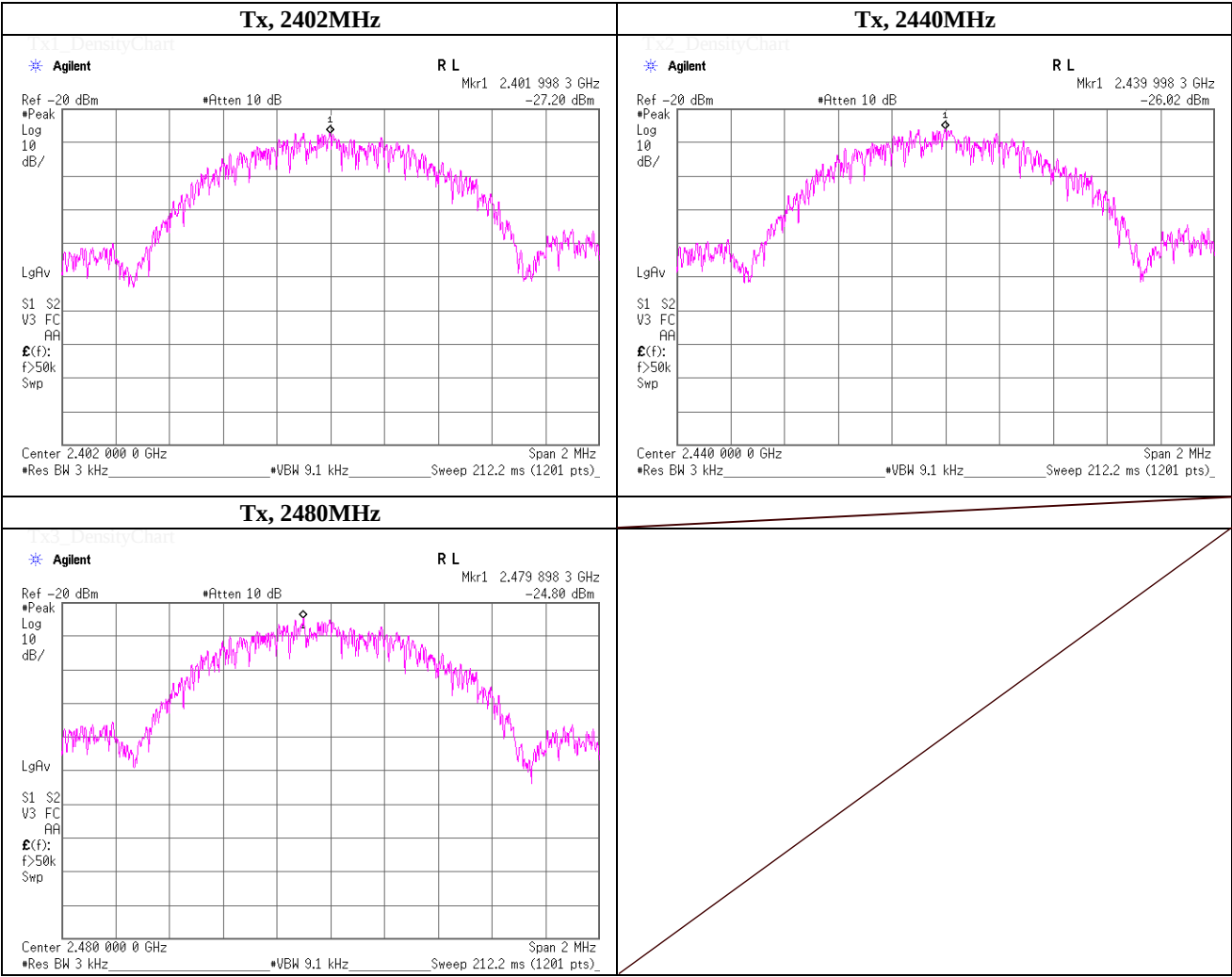
Facsimile : +81 463 50 6401

Maximum Power Spectral Density
(PKPSD)

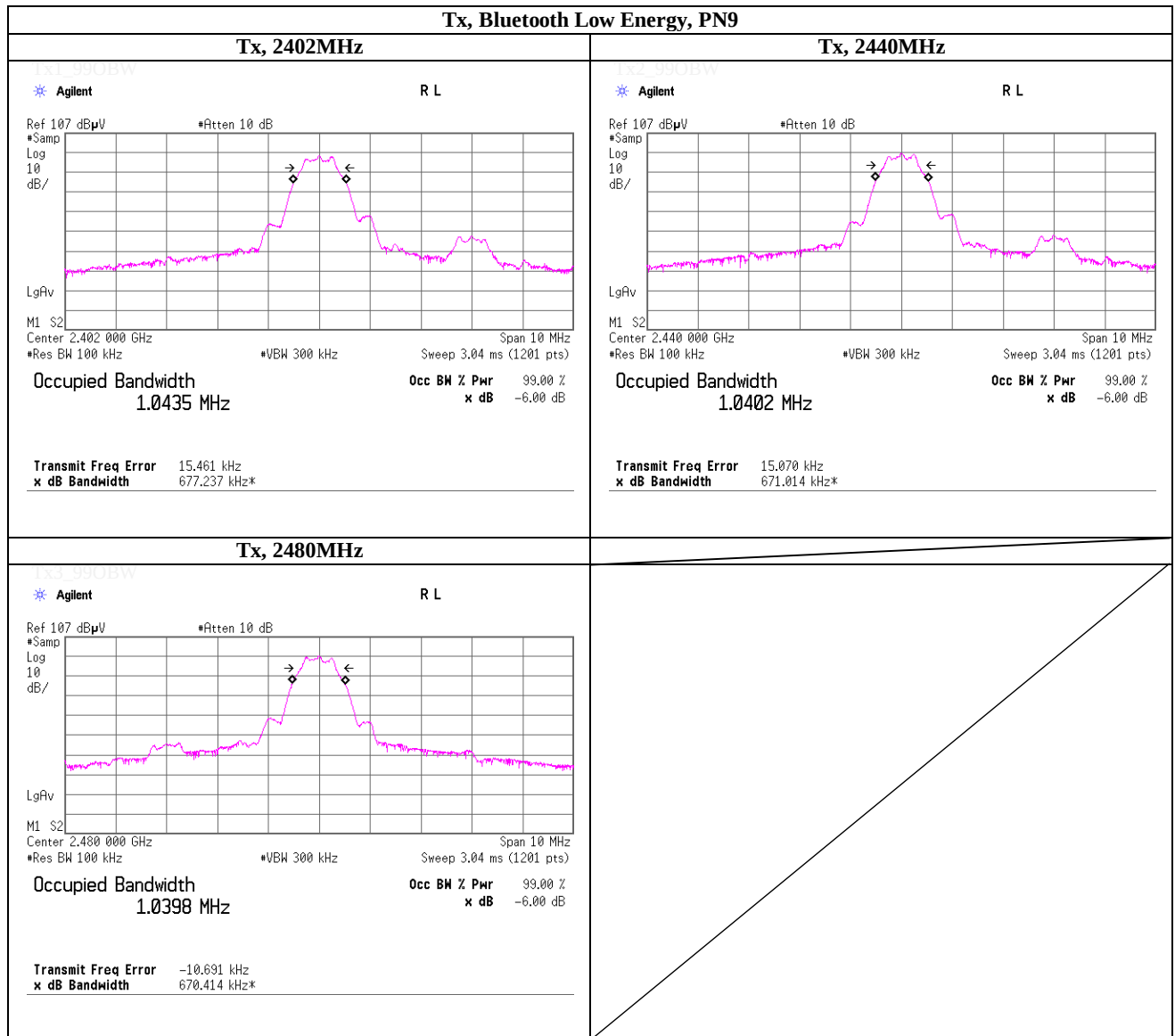
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	November 27, 2013	
Temperature / Humidity	25deg.C , 34%RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth Low Energy, PN9	

Ch. Freq.	Freq. Reading	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402.0000	2402.00	-27.20	1.48	10.04	-15.68	8.00	23.68
2440.0000	2440.00	-26.02	1.50	10.04	-14.48	8.00	22.48
2480.0000	2479.90	-24.80	1.50	10.04	-13.26	8.00	21.26

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss



99% Occupied Bandwidth



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APPENDIX

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT/RE	2013/01/08 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-01	Power Sensor	Anritsu	MA2444D	0738366	AT	2013/04/09 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2013/04/09 * 12
SCC-G31	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	OCT-08-13-04 6	AT	2013/10/21 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2013/03/07 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2013/07/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE/CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE/CE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2013/11/22 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2013/03/14 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2013/03/19 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2013/03/16 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2013/10/26 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2013/10/26 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 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

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: Out of Band Emission (Radiated)

AT: Antenna terminal conducted test