




RADIO TEST REPORT


Test Report No.: 10012768S

Applicant : SMK Corporation
Type of Equipment : Remote control
Model No. : NSG-MR9U
FCC ID : GT3FC019
Test regulation : FCC Part15 Subpart C: 2012
Test result : Complied

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Date of test: June 3 to 5, 2013

Tested by: 
Tatsuya Arai
Engineer of WiSE Japan,
UL Verification Service

Approved by : 
Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



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Shonan EMC Lab.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : SMK Corporation
Address : 5-5, Togoshi 6-chome, Shinagawa-ku, Tokyo 142-8511 JAPAN
Telephone Number : +81-3-3785-1110
Facsimile Number : +81-3-3785-2804
Contact Person : Mitsuhiko Goto

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

2.1 Identification of E.U.T.

Type of Equipment : Remote control
Model Number : NSG-MR9U
Serial Number : Refer to 4.2 in this report.
Rating : DC3V
Country of Mass-production : China, Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : June 3, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: NSG-MR9U (referred to as the EUT in this report) is a Remote control.

Clock frequency(ies) in the system : 24MHz, 12MHz, 500kHz

Radio specification:

Equipment type : Transceiver
Frequency of operation : 2412-2462MHz
Bandwidth & Channel spacing : 20MHz & 5MHz
Data Rate : IEEE 802.11b: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps
IEEE 802.11g: 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps
Type of modulation : DSSS, OFDM
ITU code : D1D, G1D
Antenna type : Metal (Inverted F)
Antenna connector type : None
Antenna gain : +1.7dBi
Operation temperature range : -10 to +50 deg.C

FCC 15.31 (e)

The equipment provides the Wi-Fi Direct transmitter with stable power supply (DC1.2V). Therefore, the equipment complies with the requirement.

FCC 15.203

The equipment and its antenna comply with this requirement since this antenna is built in the equipment and it cannot be replaced by end users.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 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

The EUT will be tested for the compliance with FCC Part 15 Subpart B.

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 *2)	N/A	N/A
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	7.6dB Freq.: 2277.024MHz Polarization: Vertical Detection: Average Mode: Tx 2437MHz, IEEE 802.11b	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".

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

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.10:2009, 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 (±)
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

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

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%

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

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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
<input type="checkbox"/> No.1 semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.2 semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.3 semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 semi-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input checked="" type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.7 shielded room	-	-	2.76 x 3.76 x 2.4	2.76 x 3.76	-

3.6 Test setup, Test data & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

Test item	Mode	Tested frequency	Power setting	Worst data rate *2)
Radiated emission (below 1GHz) *3)	Transmitting IEEE 802.11g	2412MHz	0dBm	6Mbps, PN9
Other items	Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	0dBm	11Mbps, PN9
	Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	0dBm	6Mbps, PN9

*1) Software used for the test: ATETEST Version 1.0.0.0
*2) The worst condition was determined based on the test result of Maximum Peak Output Power.
*3) Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - "of TCB Council Workshop October 2009.

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

4.2 Configuration and peripherals

A: EUT

* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Remote control	NSG-MR9U	*1)	SMK	EUT

*1) Antenna port conducted test: 000190F08600, Radiated emission test: 000190F0850C

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SECTION 5: 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

SECTION 6: 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".

Detection type: Peak

Summary of the test results: Pass

Refer to APPENDIX 1

SECTION 7: 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

SECTION 8: 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 / 9.1kHz

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

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SECTION 9: Radiated emission

9.1 Operating environment

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

9.2 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.

9.3 Test conditions

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

9.4 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).

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.

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

Worst case:

Antenna polarization	Carrier	Spurious (Below 1GHz)	Spurious (Above 1GHz)
Horizontal	X	X	X
	X	X	X
Vertical	Y	Y	Y
	Y	Y	Y

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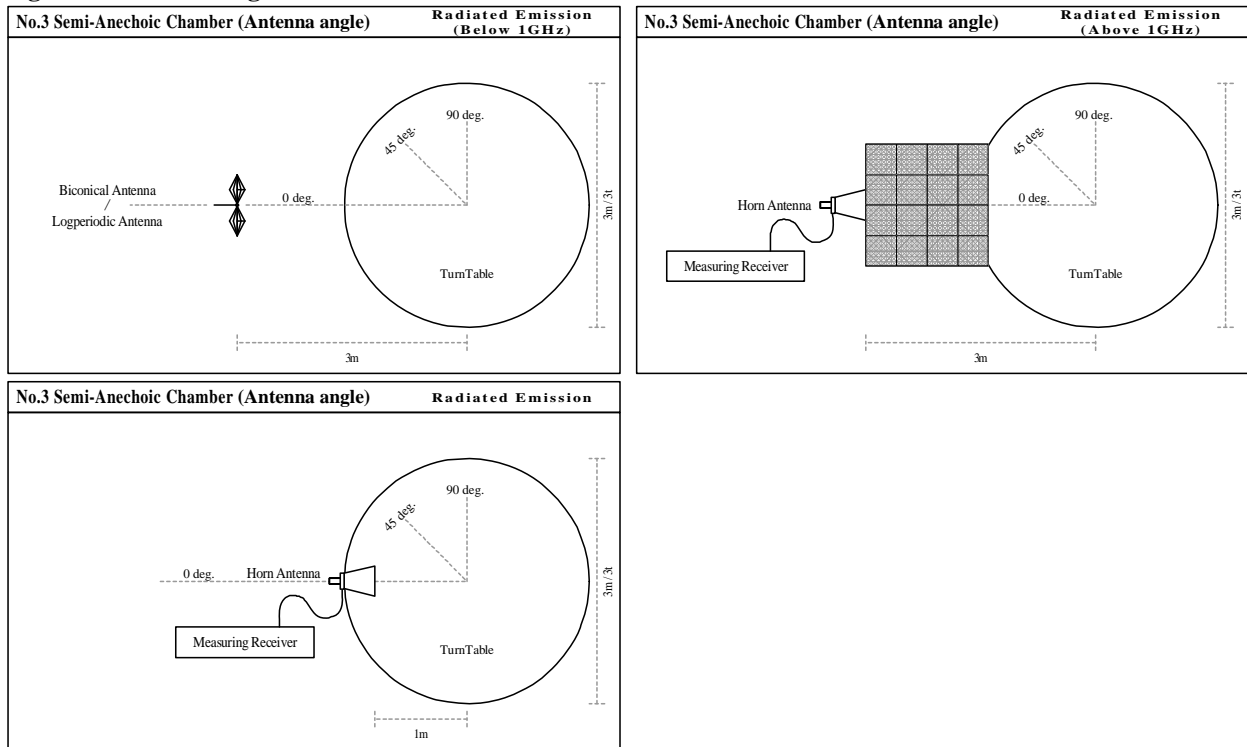
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Figure 1. Antenna angle



9.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

9.6 Results

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

Refer to APPENDIX 1

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APPENDIX 1: Data of Radio tests

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

Radiated emission
Pre-check of the worst position

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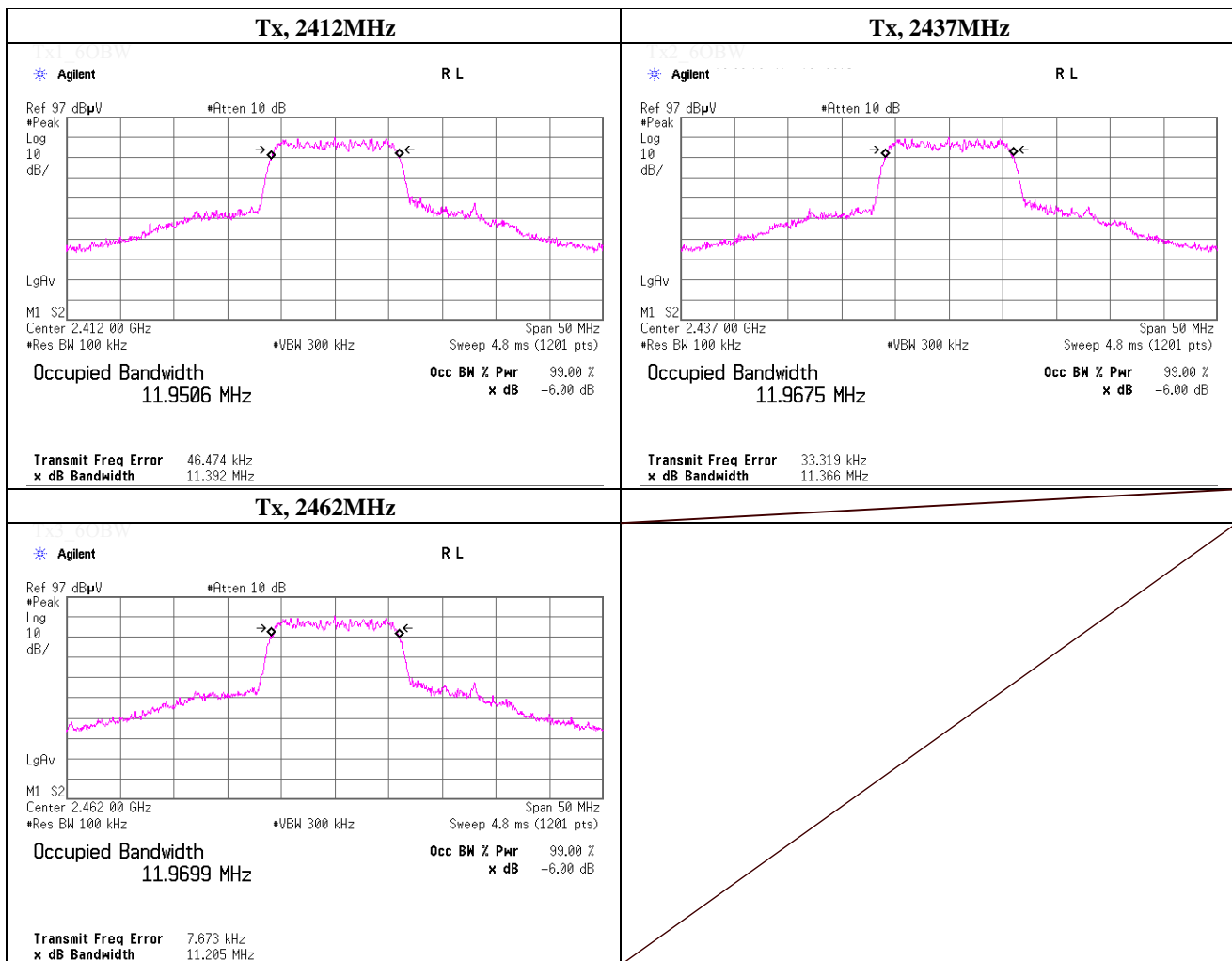
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APPENDIX 1: Data of Radio tests

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 3, 2013	
Temperature / Humidity	22deg.C , 42%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11b, PN9, worst data mode 11Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	11.392	> 0.500
2437.0000	11.366	> 0.500
2462.0000	11.205	> 0.500



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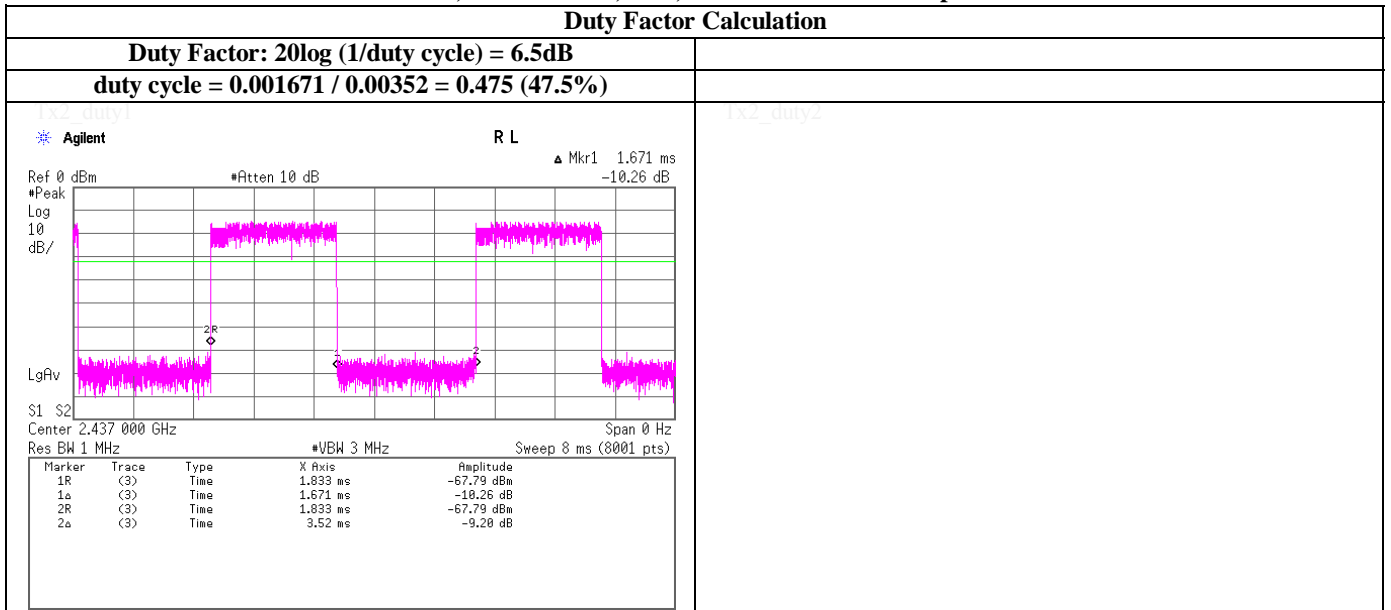
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Duty Factor calculation chart

Tx, IEEE802.11b, PN9, worst data mode 11Mbps



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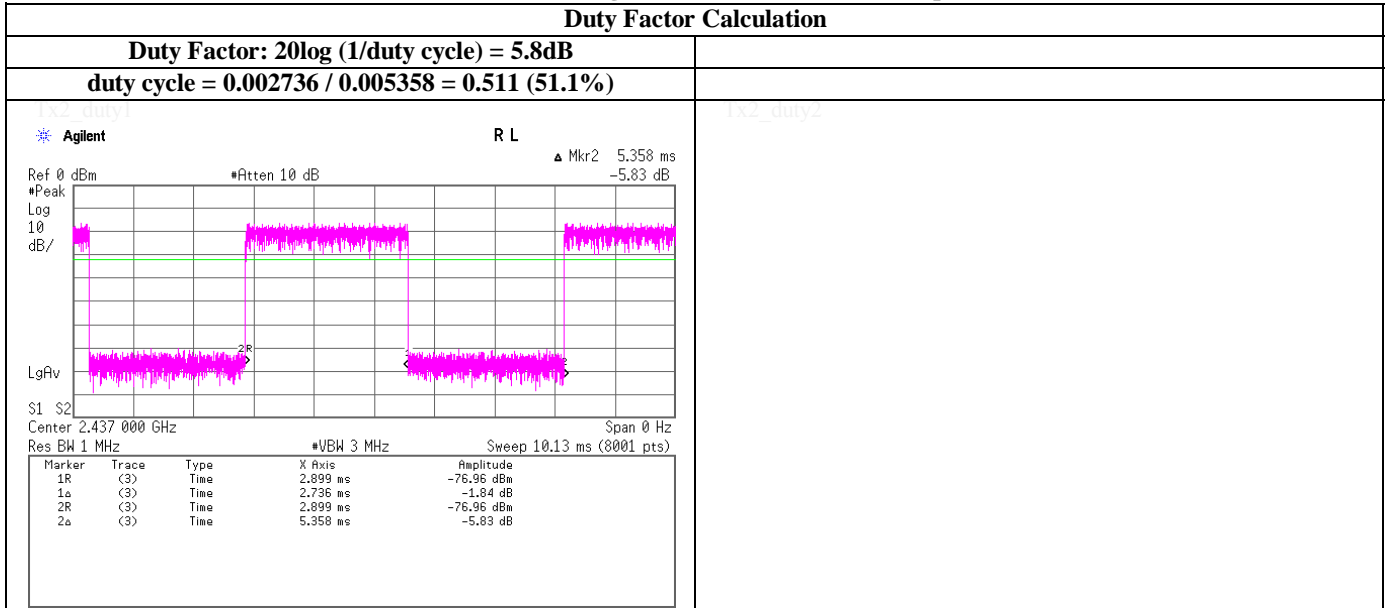
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Duty Factor calculation chart

Tx, IEEE802.11g, PN9, worst data mode 6Mbps



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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date June 4, 2013 June 5, 2013
 Temperature / Humidity 24 deg.C, 34 %RH 23 deg.C, 41 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2412 MHz
 Tx, IEEE802.11b

(* 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.	2252.200	PK	49.3	27.3	14.5	41.3	49.8	73.9	24.1	100	21	
Hori.	2390.000	PK	47.0	27.4	14.7	41.4	47.7	73.9	26.2	104	18	
Hori.	4824.000	PK	56.7	31.1	7.5	41.2	54.1	73.9	19.8	124	247	
Hori.	7236.000	PK	47.6	36.6	9.0	41.4	51.8	73.9	22.1	100	0	
Hori.	2390.000	AV	37.8	27.4	14.7	41.4	38.5	53.9	15.4	104	18	
Hori.	7236.000	AV	38.2	36.6	9.0	41.4	42.4	53.9	11.5	100	0	
Vert.	2252.200	PK	49.5	27.3	14.5	41.3	50.0	73.9	23.9	104	3	
Vert.	2390.000	PK	45.8	27.4	14.7	41.4	46.5	73.9	27.4	115	3	
Vert.	4824.000	PK	56.5	31.1	7.5	41.2	53.9	73.9	20.0	100	38	
Vert.	7236.000	PK	47.4	36.6	9.0	41.4	51.6	73.9	22.3	100	0	
Vert.	2390.000	AV	36.3	27.4	14.7	41.4	37.0	53.9	16.9	115	3	
Vert.	7236.000	AV	38.1	36.6	9.0	41.4	42.3	53.9	11.6	100	0	

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

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2252.200	AV	39.2	27.3	14.5	41.3	6.5	46.2	53.9	7.7	
Hori.	4824.000	AV	39.8	31.1	7.5	41.2	6.5	43.7	53.9	10.2	
Vert.	2252.200	AV	39.0	27.3	14.5	41.3	6.5	46.0	53.9	7.9	
Vert.	4824.000	AV	38.8	31.1	7.5	41.2	6.5	42.7	53.9	11.2	

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	86.7	27.5	14.7	41.4	87.5	-	-	
Hori.	2400.000	PK	47.3	27.4	14.7	41.4	48.0	67.5	19.5	
Hori.	2572.000	PK	43.5	27.7	15.0	41.4	44.8	67.5	22.7	
Hori.	3216.014	PK	48.6	28.8	6.6	41.6	42.4	67.5	25.1	
Vert.	2412.000	PK	85.4	27.5	14.7	41.4	86.2	-	-	
Vert.	2400.000	PK	48.7	27.4	14.7	41.4	49.4	66.2	16.8	
Vert.	2571.920	PK	42.1	27.7	15.0	41.4	43.4	66.2	22.8	
Vert.	3217.000	PK	50.5	28.8	6.6	41.6	44.3	66.2	21.9	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date June 4, 2013 June 5, 2013
 Temperature / Humidity 24 deg.C, 34 %RH 23 deg.C, 41 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2437 MHz
 Tx, IEEE802.11b

(* 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.	2276.109	PK	50.1	27.3	14.6	41.3	50.7	73.9	23.2	100	2	
Hori.	4874.000	PK	56.5	31.3	7.5	41.1	54.2	73.9	19.7	126	305	
Hori.	7311.000	PK	46.2	36.6	9.0	41.4	50.4	73.9	23.5	100	0	
Hori.	7311.000	AV	37.4	36.6	9.0	41.4	41.6	53.9	12.3	100	0	
Vert.	2277.024	PK	50.2	27.3	14.6	41.3	50.8	73.9	23.1	100	5	
Vert.	4874.000	PK	55.3	31.3	7.5	41.1	53.0	73.9	20.9	100	104	
Vert.	7311.000	PK	46.7	36.6	9.0	41.4	50.9	73.9	23.0	100	0	
Vert.	7311.000	AV	37.6	36.6	9.0	41.4	41.8	53.9	12.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)
 Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2276.109	AV	38.9	27.3	14.6	41.3	6.5	46.0	53.9	7.9	
Hori.	4874.000	AV	39.7	31.3	7.5	41.1	6.5	43.9	53.9	10.0	
Vert.	2277.024	AV	39.2	27.3	14.6	41.3	6.5	46.3	53.9	7.6	
Vert.	4874.000	AV	39.8	31.3	7.5	41.1	6.5	44.0	53.9	9.9	

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2437.000	PK	86.2	27.5	14.7	41.4	87.0	-	-	
Hori.	2601.740	PK	43.6	27.7	15.0	41.4	44.9	67.0	22.1	
Hori.	3250.000	PK	49.4	28.9	6.6	41.6	43.3	67.0	23.7	
Vert.	2437.000	PK	85.7	27.5	14.7	41.4	86.5	-	-	
Vert.	2599.640	PK	43.4	27.7	15.0	41.4	44.7	66.5	21.8	
Vert.	3249.338	PK	50.2	28.9	6.6	41.6	44.1	66.5	22.4	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date June 4, 2013 June 5, 2013
 Temperature / Humidity 24 deg.C, 34 %RH 23 deg.C, 41 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2462 MHz
 Tx, IEEE802.11b

(* 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.	2303.000	PK	50.3	27.3	14.6	41.4	50.8	73.9	23.1	100	24	
Hori.	2483.500	PK	44.7	27.5	14.8	41.4	45.6	73.9	28.3	100	0	
Hori.	4924.000	PK	56.3	31.5	7.5	41.0	54.3	73.9	19.6	100	0	
Hori.	7386.000	PK	46.9	36.7	9.0	41.5	51.1	73.9	22.8	100	0	
Hori.	2483.500	AV	36.9	27.5	14.8	41.4	37.8	53.9	16.1	100	0	
Hori.	7386.000	AV	37.7	36.7	9.0	41.5	41.9	53.9	12.0	100	0	
Vert.	2303.000	PK	49.5	27.3	14.6	41.4	50.0	73.9	23.9	159	358	
Vert.	2483.500	PK	45.7	27.5	14.8	41.4	46.6	73.9	27.3	100	9	
Vert.	4924.000	PK	58.9	31.5	7.5	41.0	56.9	73.9	17.0	100	102	
Vert.	7386.000	PK	46.8	36.7	9.0	41.5	51.0	73.9	22.9	100	0	
Vert.	2483.500	AV	37.5	27.5	14.8	41.4	38.4	53.9	15.5	100	9	
Vert.	7386.000	AV	37.2	36.7	9.0	41.5	41.4	53.9	12.5	100	0	

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

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2303.000	AV	38.7	27.3	14.6	41.4	6.5	45.7	53.9	8.2	
Hori.	4924.000	AV	40.4	31.5	7.5	41.0	6.5	44.9	53.9	9.0	
Vert.	2303.000	AV	38.6	27.3	14.6	41.4	6.5	45.6	53.9	8.3	
Vert.	4924.000	AV	40.9	31.5	7.5	41.0	6.5	45.4	53.9	8.5	

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2462.000	PK	85.4	27.5	14.8	41.4	86.3	-	-	
Hori.	2626.700	PK	43.5	27.8	15.0	41.4	44.9	66.3	21.4	
Hori.	3282.668	PK	46.9	28.9	6.6	41.7	40.7	66.3	25.6	
Vert.	2462.000	PK	85.7	27.5	14.8	41.4	86.6	-	-	
Vert.	2626.700	PK	42.7	27.8	15.0	41.4	44.1	66.6	22.5	
Vert.	3282.686	PK	50.6	28.9	6.6	41.7	44.4	66.6	22.2	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date June 4, 2013 June 5, 2013
 Temperature / Humidity 24 deg.C, 34 %RH 23 deg.C, 41 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2412 MHz
 Tx, IEEE802.11g

(* 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.	37.374	QP	22.5	15.4	6.5	32.2	12.2	40.0	27.8	132	349	
Hori.	63.480	QP	22.5	7.4	6.4	32.1	4.2	40.0	35.8	302	2	
Hori.	190.558	QP	24.3	16.1	7.8	32.0	16.2	43.5	27.3	220	53	
Hori.	635.308	QP	21.2	19.4	10.0	32.0	18.6	46.0	27.4	151	307	
Hori.	2247.002	PK	47.9	27.3	14.5	41.3	48.4	73.9	25.5	100	0	
Hori.	2390.000	PK	56.3	27.4	14.7	41.4	57.0	73.9	16.9	100	358	
Hori.	4824.000	PK	52.7	31.1	7.5	41.2	50.1	73.9	23.8	100	0	
Hori.	7236.000	PK	47.6	36.6	9.0	41.4	51.8	73.9	22.1	100	0	
Hori.	2390.000	AV	42.5	27.4	14.7	41.4	43.2	53.9	10.7	100	358	
Hori.	7236.000	AV	37.5	36.6	9.0	41.4	41.7	53.9	12.2	100	0	
Vert.	427.341	QP	21.3	16.5	9.2	31.9	15.1	46.0	30.9	100	45	
Vert.	879.653	QP	20.6	22.0	10.8	31.2	22.2	46.0	23.8	100	304	
Vert.	2246.719	PK	49.1	27.3	14.5	41.3	49.6	73.9	24.3	112	34	
Vert.	2390.000	PK	56.9	27.4	14.7	41.4	57.6	73.9	16.3	111	356	
Vert.	4824.000	PK	52.8	31.1	7.5	41.2	50.2	73.9	23.7	100	22	
Vert.	7236.000	PK	47.6	36.6	9.0	41.4	51.8	73.9	22.1	100	0	
Vert.	2390.000	AV	43.1	27.4	14.7	41.4	43.8	53.9	10.1	111	356	
Vert.	7236.000	AV	37.6	36.6	9.0	41.4	41.8	53.9	12.1	100	0	

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

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2247.002	AV	37.8	27.3	14.5	41.3	5.8	44.1	53.9	9.8	
Hori.	4824.000	AV	40.8	31.1	7.5	41.2	5.8	44.0	53.9	9.9	
Vert.	2246.719	AV	38.1	27.3	14.5	41.3	5.8	44.4	53.9	9.5	
Vert.	4824.000	AV	39.8	31.1	7.5	41.2	5.8	43.0	53.9	10.9	

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	83.5	27.5	14.7	41.4	84.3	-	-	
Hori.	2400.000	PK	54.2	27.4	14.7	41.4	54.9	64.3	9.4	
Hori.	2567.000	PK	40.2	27.7	15.0	41.4	41.5	64.3	22.8	
Hori.	3216.010	PK	46.4	28.8	6.6	41.6	40.2	64.3	24.1	
Vert.	2412.000	PK	84.8	27.5	14.7	41.4	85.6	-	-	
Vert.	2400.000	PK	55.5	27.4	14.7	41.4	56.2	65.6	9.4	
Vert.	2567.000	PK	41.5	27.7	15.0	41.4	42.8	65.6	22.8	
Vert.	3216.022	PK	46.4	28.8	6.6	41.6	40.2	65.6	25.4	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date June 4, 2013 June 5, 2013
 Temperature / Humidity 24 deg.C, 34 %RH 23 deg.C, 41 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2437 MHz
 Tx, IEEE802.11g

(* 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.	2279.908	PK	49.1	27.3	14.6	41.3	49.7	73.9	24.2	110	21	
Hori.	4874.000	PK	52.4	31.3	7.5	41.1	50.1	73.9	23.8	100	309	
Hori.	7311.000	PK	47.0	36.6	9.0	41.4	51.2	73.9	22.7	100	0	
Hori.	7311.000	AV	37.5	36.6	9.0	41.4	41.7	53.9	12.2	100	0	
Vert.	2279.908	PK	48.8	27.3	14.6	41.3	49.4	73.9	24.5	100	22	
Vert.	4874.000	PK	52.3	31.3	7.5	41.1	50.0	73.9	23.9	100	74	
Vert.	7311.000	PK	46.9	36.6	9.0	41.4	51.1	73.9	22.8	100	0	
Vert.	7311.000	AV	37.6	36.6	9.0	41.4	41.8	53.9	12.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)
 Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2279.908	AV	38.5	27.3	14.6	41.3	5.8	44.9	53.9	9.0	
Hori.	4874.000	AV	41.2	31.3	7.5	41.1	5.8	44.7	53.9	9.2	
Vert.	2279.908	AV	38.6	27.3	14.6	41.3	5.8	45.0	53.9	8.9	
Vert.	4874.000	AV	40.3	31.3	7.5	41.1	5.8	43.8	53.9	10.1	

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2437.000	PK	85.6	27.5	14.7	41.4	86.4	-	-	
Hori.	2588.880	PK	41.9	27.7	15.0	41.4	43.2	66.4	23.2	
Hori.	3249.334	PK	45.9	28.9	6.6	41.6	39.8	66.4	26.6	
Vert.	2437.000	PK	84.3	27.5	14.7	41.4	85.1	-	-	
Vert.	2590.000	PK	41.6	27.7	15.0	41.4	42.9	65.1	22.2	
Vert.	3250.000	PK	47.1	28.9	6.6	41.6	41.0	65.1	24.1	

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

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 Engineer Tatsuya Arai
 Mode Tx, 2462 MHz
 Tx, IEEE802.11g

(* 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.	2297.000	PK	46.1	27.3	14.6	41.3	46.7	73.9	27.2	102	13	
Hori.	2483.500	PK	55.1	27.5	14.8	41.4	56.0	73.9	17.9	100	20	
Hori.	4924.000	PK	50.4	31.5	7.5	41.0	48.4	73.9	25.5	103	328	
Hori.	7386.000	PK	46.8	36.7	9.0	41.5	51.0	73.9	22.9	100	0	
Hori.	2483.500	AV	41.3	27.5	14.8	41.4	42.2	53.9	11.7	100	20	
Hori.	7386.000	AV	37.6	36.7	9.0	41.5	41.8	53.9	12.1	100	0	
Vert.	2297.000	PK	47.5	27.3	14.6	41.3	48.1	73.9	25.8	100	34	
Vert.	2483.500	PK	54.6	27.5	14.8	41.4	55.5	73.9	18.4	121	1	
Vert.	4924.000	PK	54.6	31.5	7.5	41.0	52.6	73.9	21.3	100	251	
Vert.	7386.000	PK	46.8	36.7	9.0	41.5	51.0	73.9	22.9	100	0	
Vert.	2483.500	AV	42.3	27.5	14.8	41.4	43.2	53.9	10.7	121	1	
Vert.	7386.000	AV	37.4	36.7	9.0	41.5	41.6	53.9	12.3	100	0	

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

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2297.000	AV	37.5	27.3	14.6	41.3	5.8	43.9	53.9	10.0	
Hori.	4924.000	AV	38.7	31.5	7.5	41.0	5.8	42.5	53.9	11.4	
Vert.	2297.000	AV	38.6	27.3	14.6	41.3	5.8	45.0	53.9	8.9	
Vert.	4924.000	AV	41.3	31.5	7.5	41.0	5.8	45.1	53.9	8.8	

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2462.000	PK	84.5	27.5	14.8	41.4	85.4	-	-	
Hori.	2623.000	PK	42.1	27.8	15.0	41.4	43.5	65.4	21.9	
Hori.	3282.672	PK	45.1	28.9	6.6	41.7	38.9	65.4	26.5	
Vert.	2462.000	PK	84.7	27.5	14.8	41.4	85.6	-	-	
Vert.	2623.000	PK	42.3	27.8	15.0	41.4	43.7	65.6	21.9	
Vert.	3282.674	PK	48.4	28.9	6.6	41.7	42.2	65.6	23.4	

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

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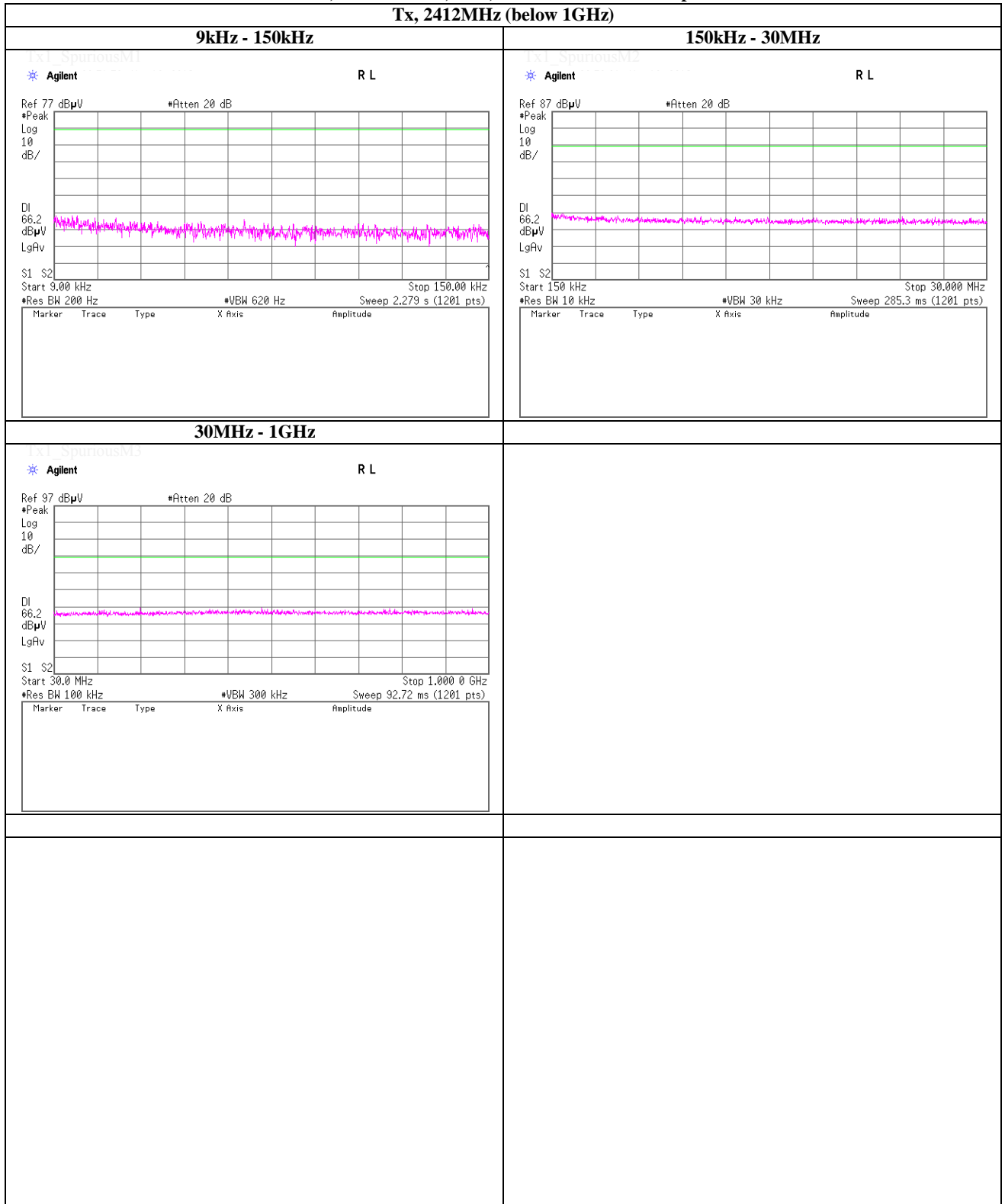
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(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11b, PN9, worst data mode 11Mbps

Tx, 2412MHz (below 1GHz)



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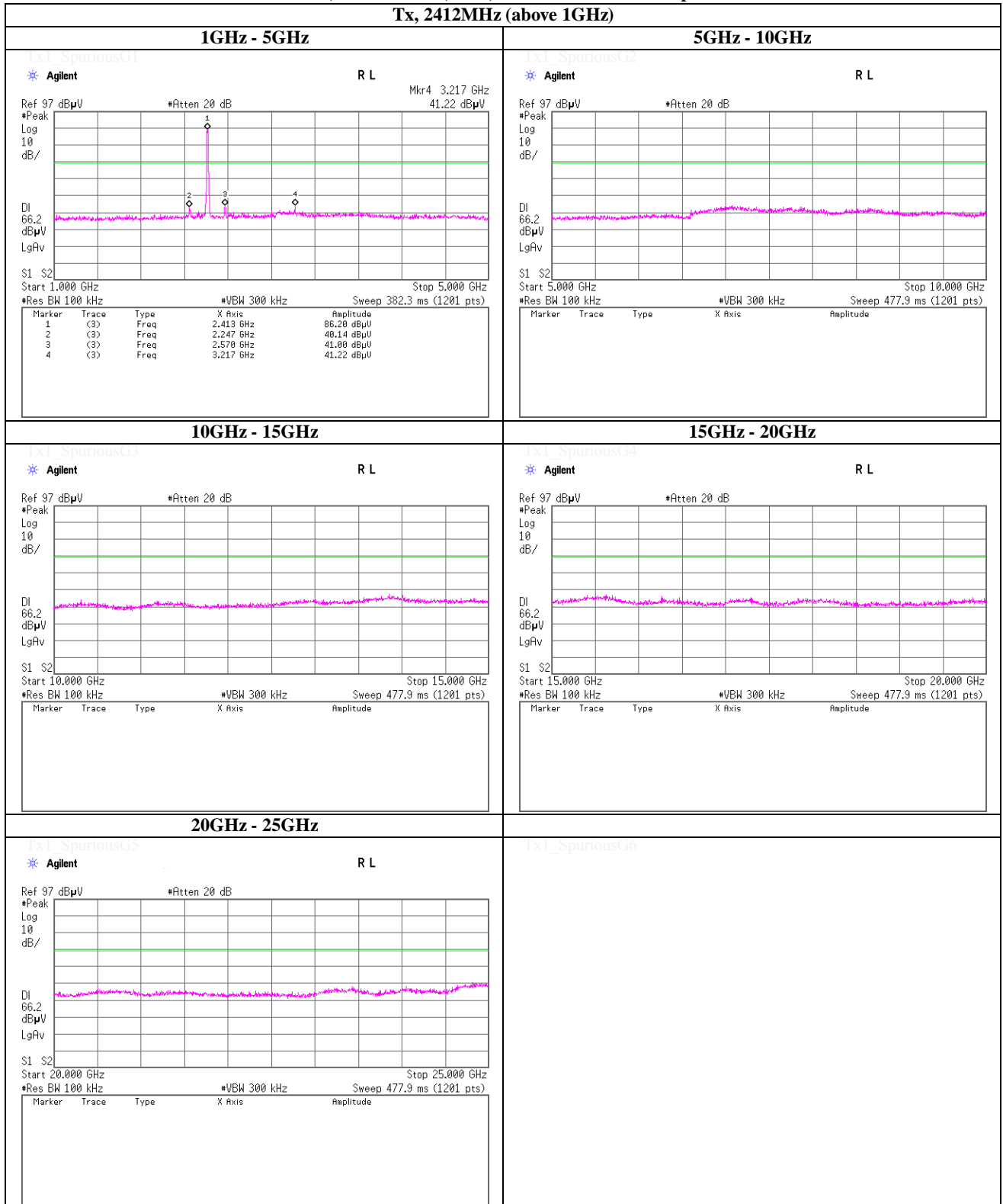
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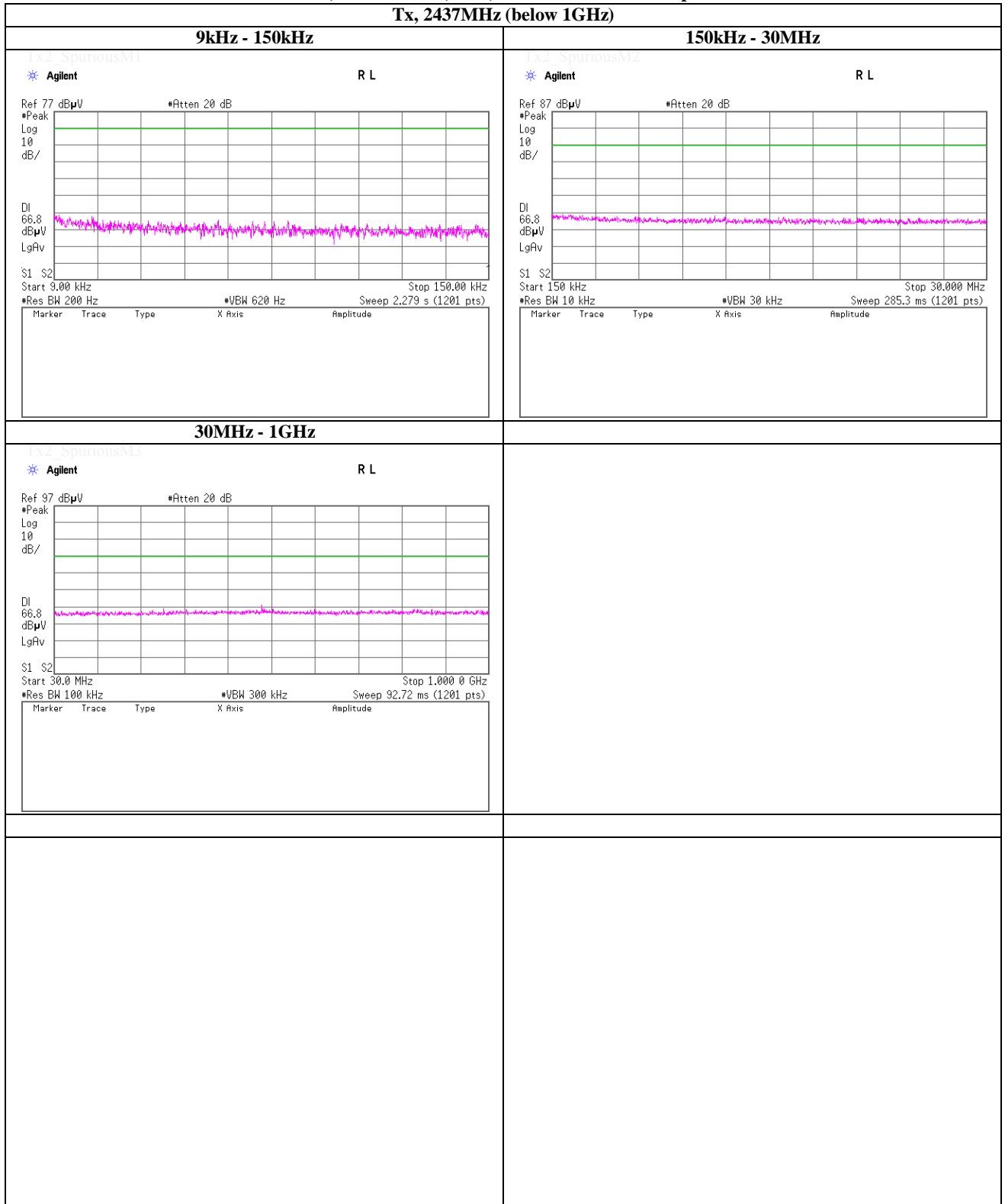
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(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11b, PN9, worst data mode 11Mbps

Tx, 2437MHz (below 1GHz)



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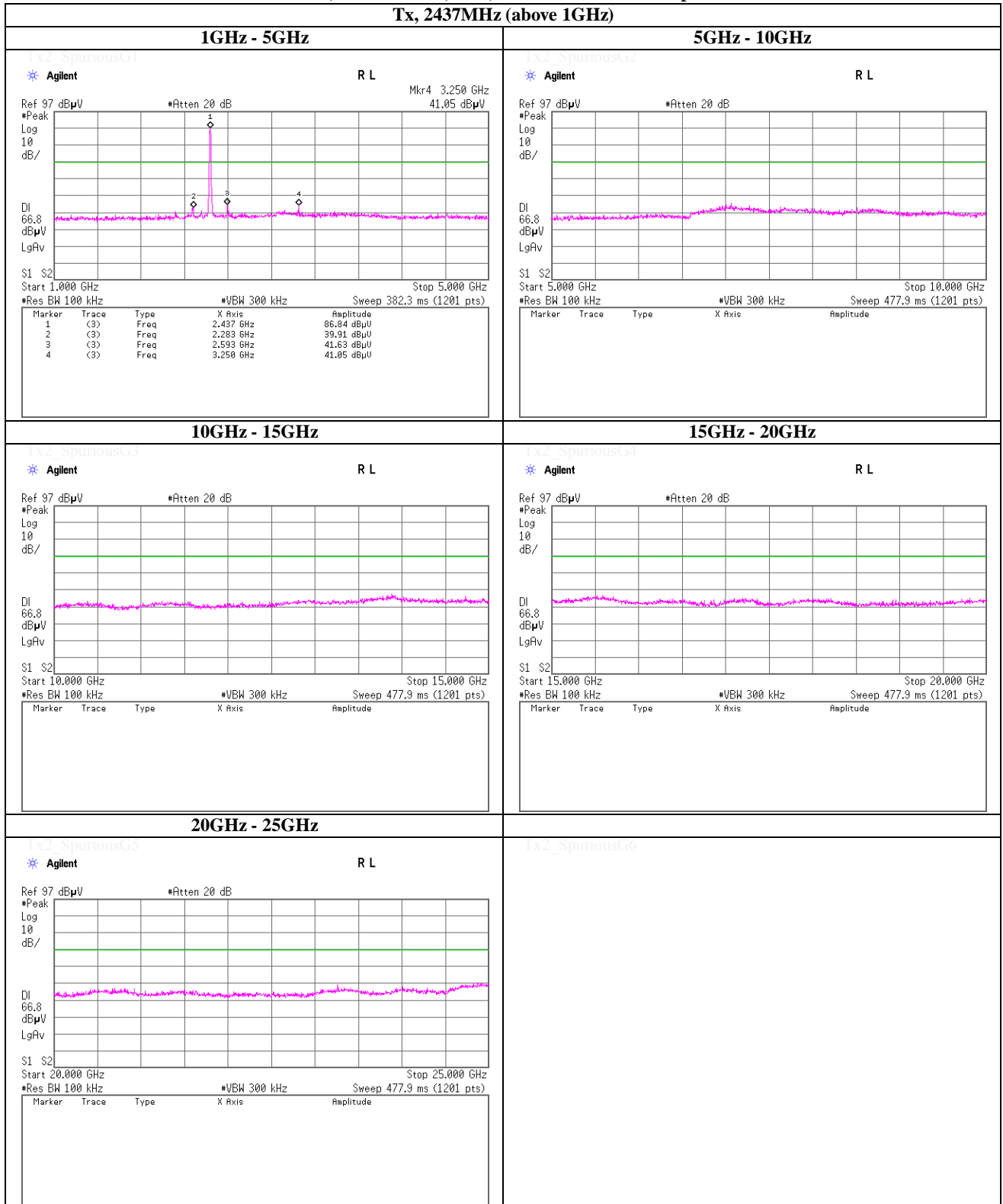
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(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11b, PN9, worst data mode 11Mbps

Tx, 2437MHz (above 1GHz)



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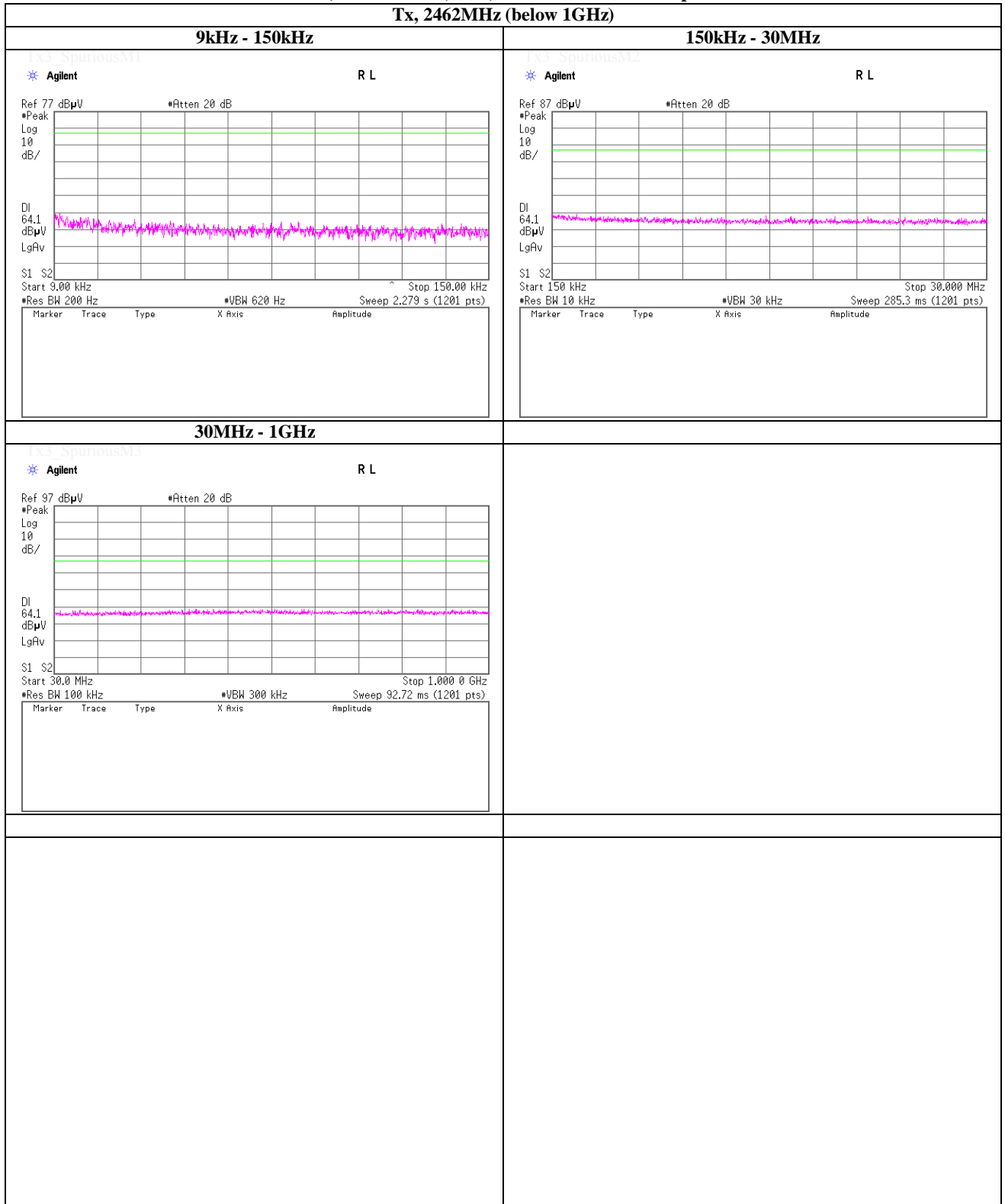
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(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11b, PN9, worst data mode 11Mbps

Tx, 2462MHz (below 1GHz)



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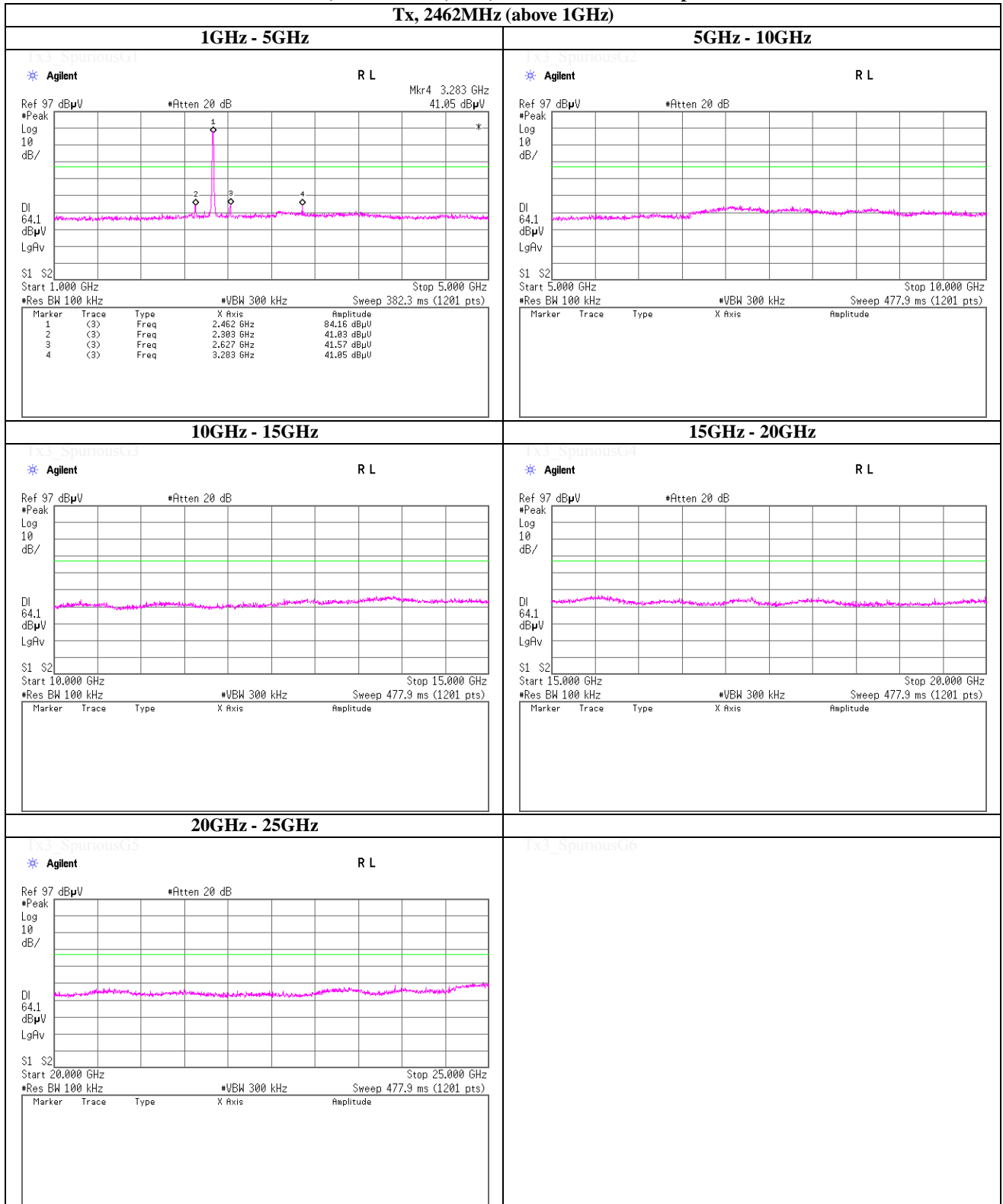
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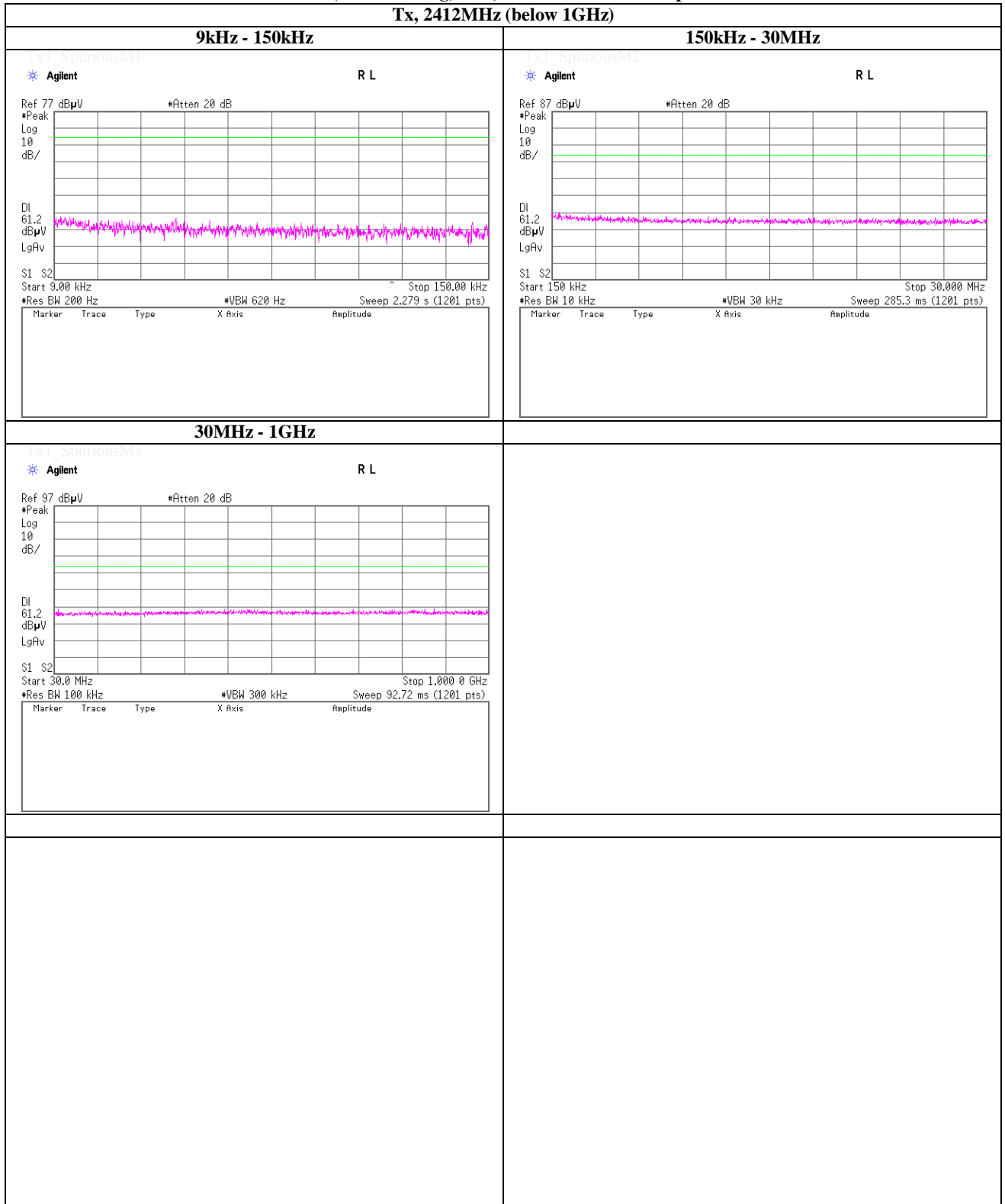
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(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2412MHz (below 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

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

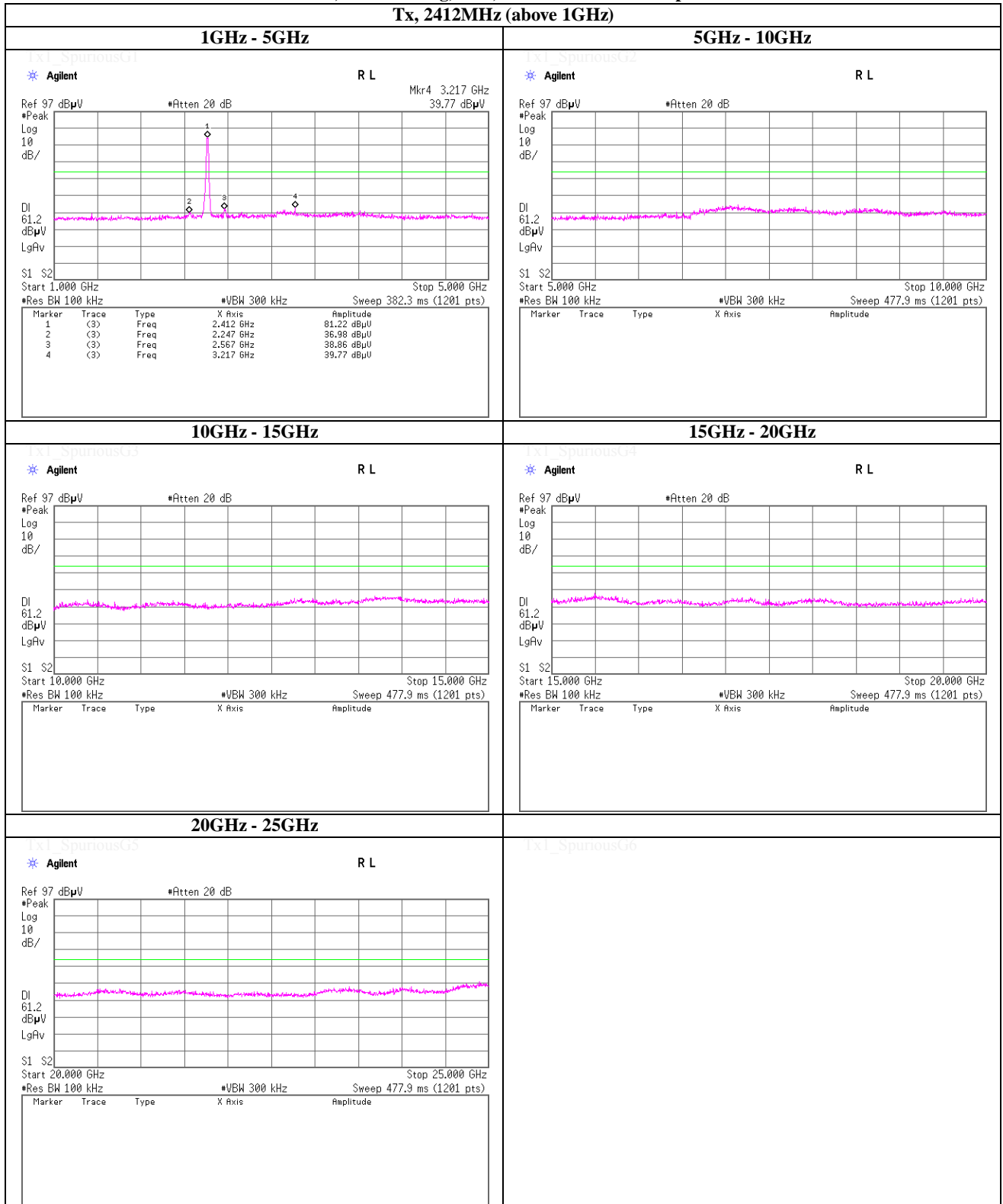
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2412MHz (above 1GHz)



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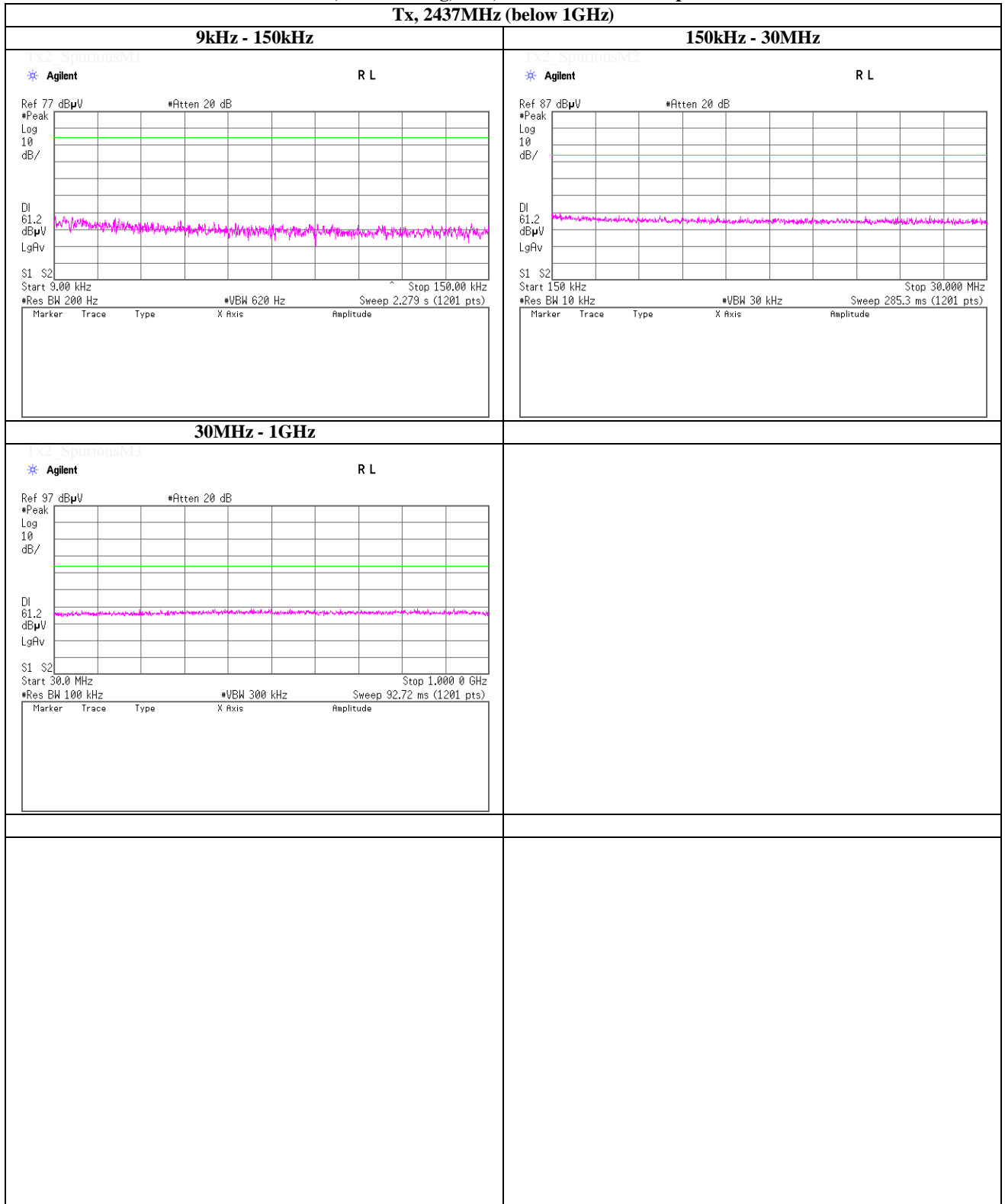
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2437MHz (below 1GHz)



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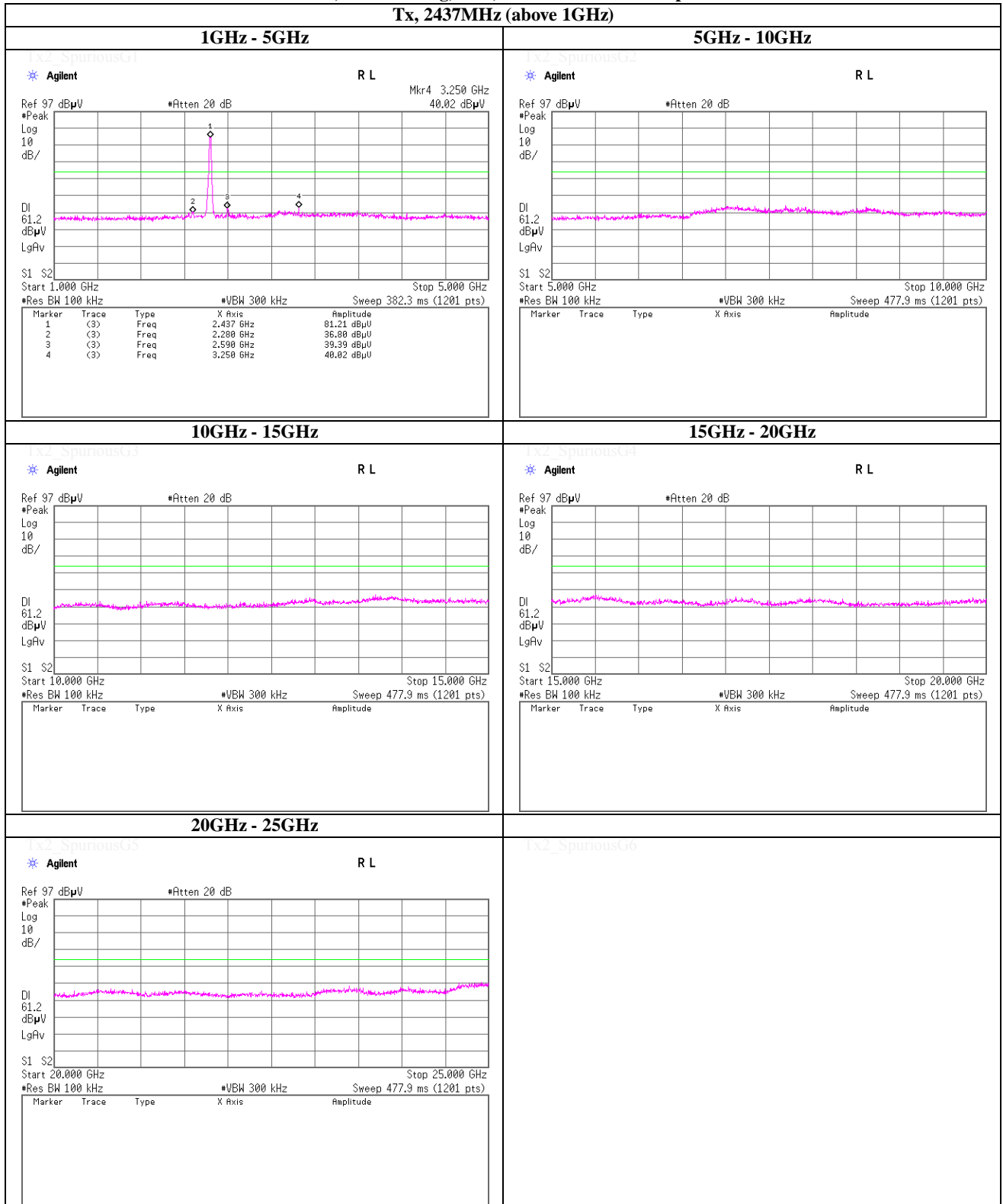
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2437MHz (above 1GHz)



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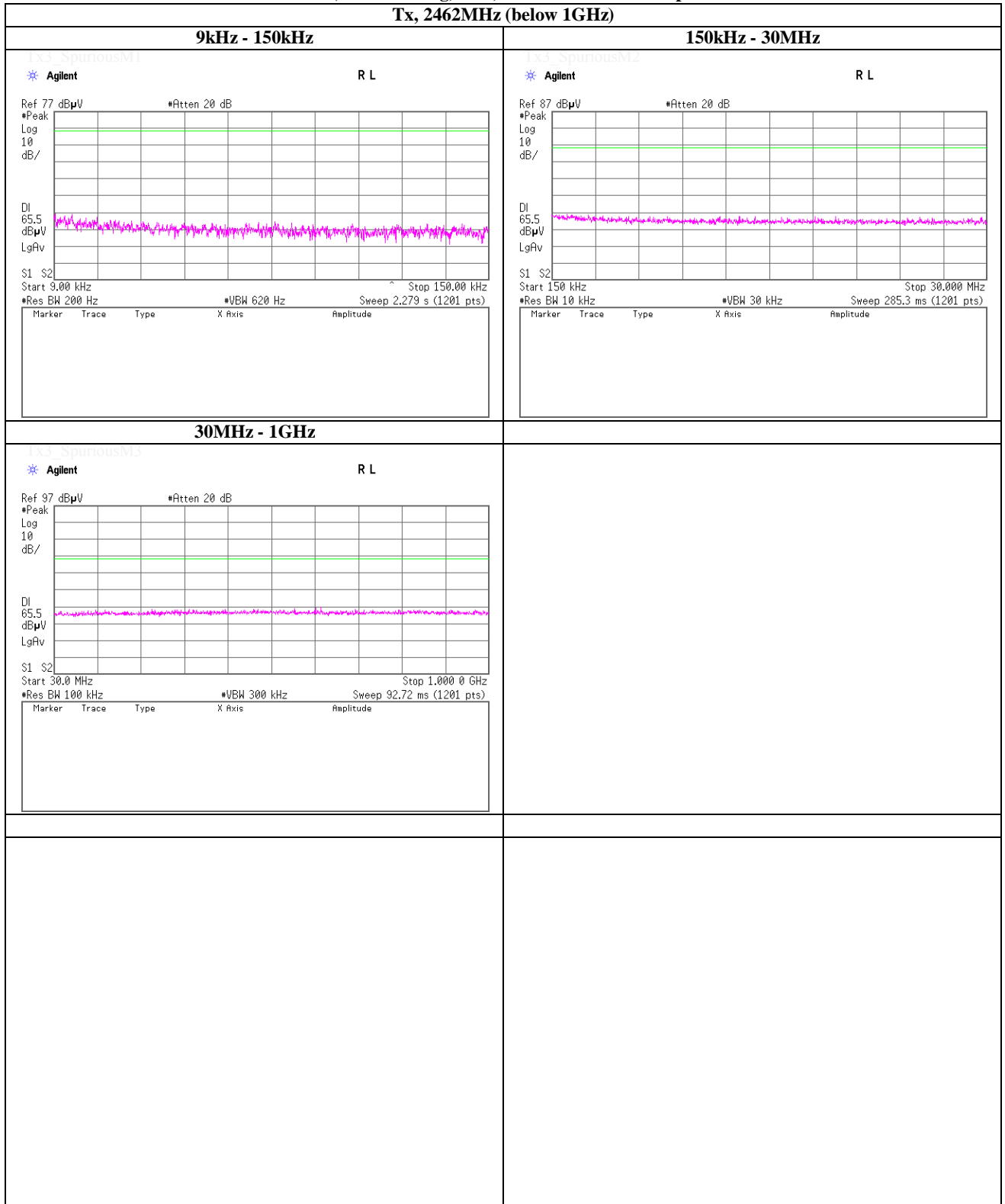
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2462MHz (below 1GHz)



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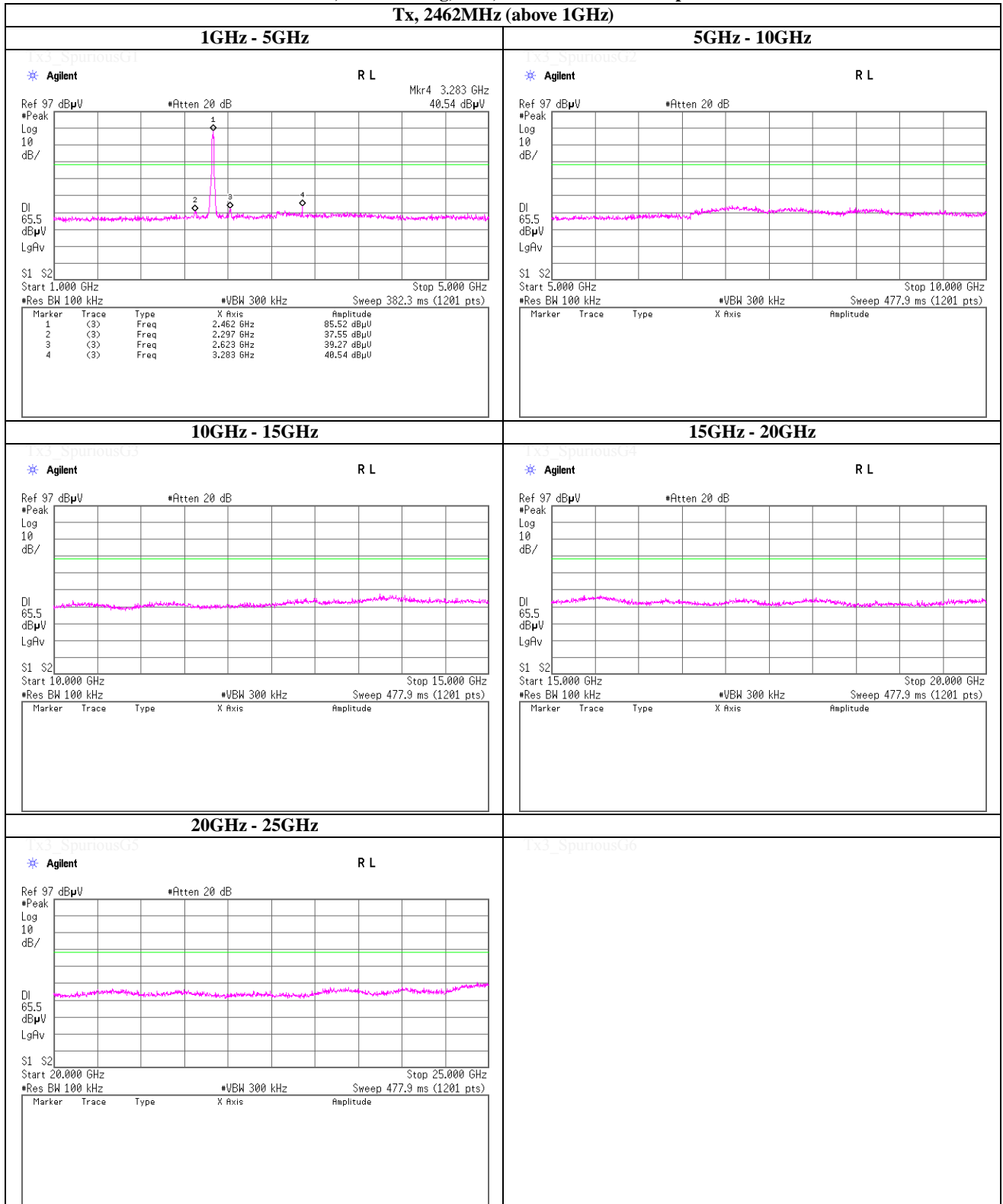
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2462MHz (above 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

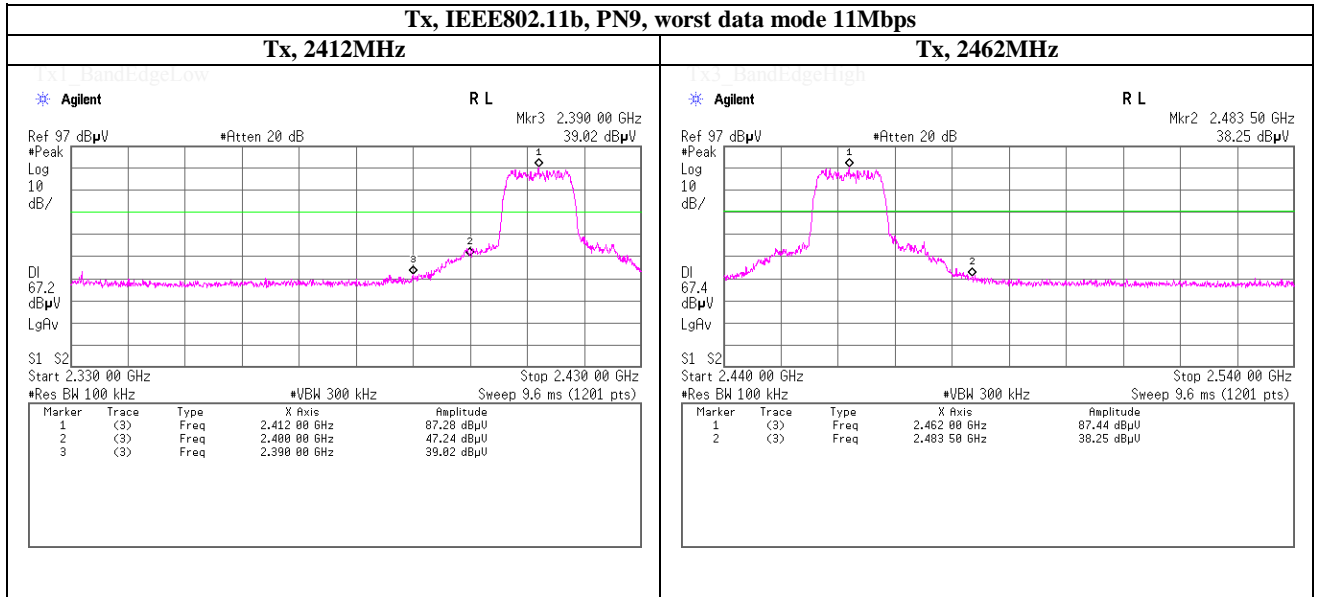
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

Band Edge compliance



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Shonan EMC Lab.

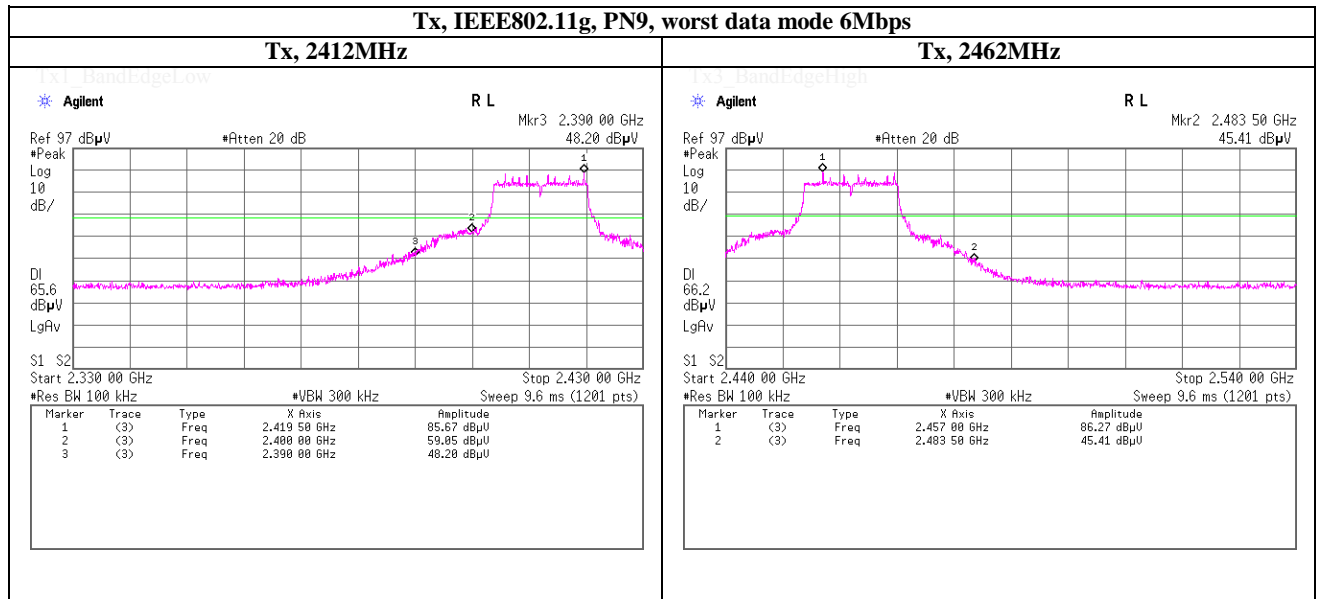
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

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(Reference chart) Spurious emission (Conducted)

Band Edge compliance



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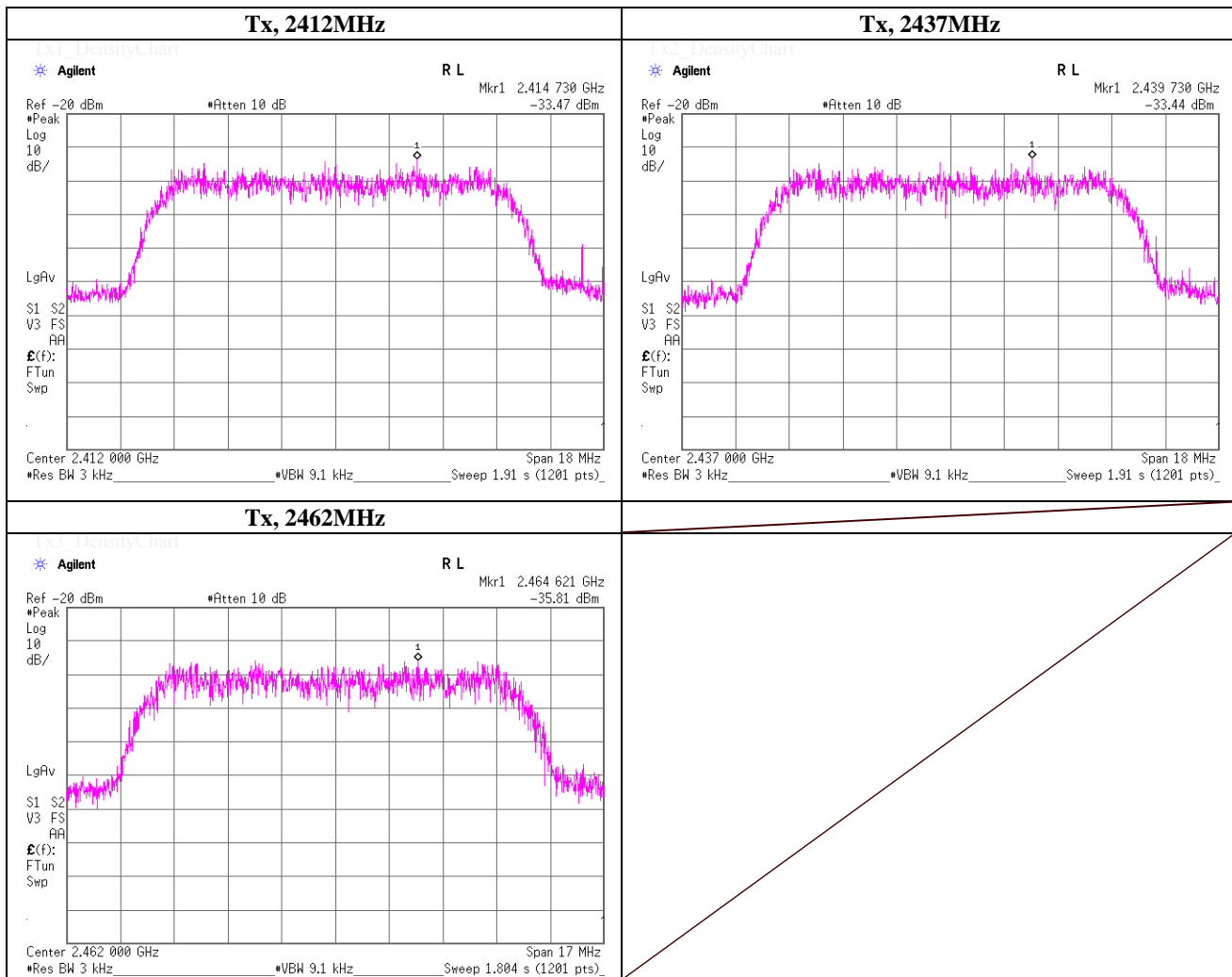
Facsimile : +81 463 50 6401

Maximum Power Spectral Density (PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 3, 2013	
Temperature / Humidity	22deg.C , 42%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11b, PN9, worst data mode 11Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2414.73	-33.47	0.86	9.98	-22.63	8.00	30.63
2437.0000	2439.73	-33.44	0.87	9.98	-22.59	8.00	30.59
2462.0000	2464.62	-35.81	0.87	9.98	-24.96	8.00	32.96

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss



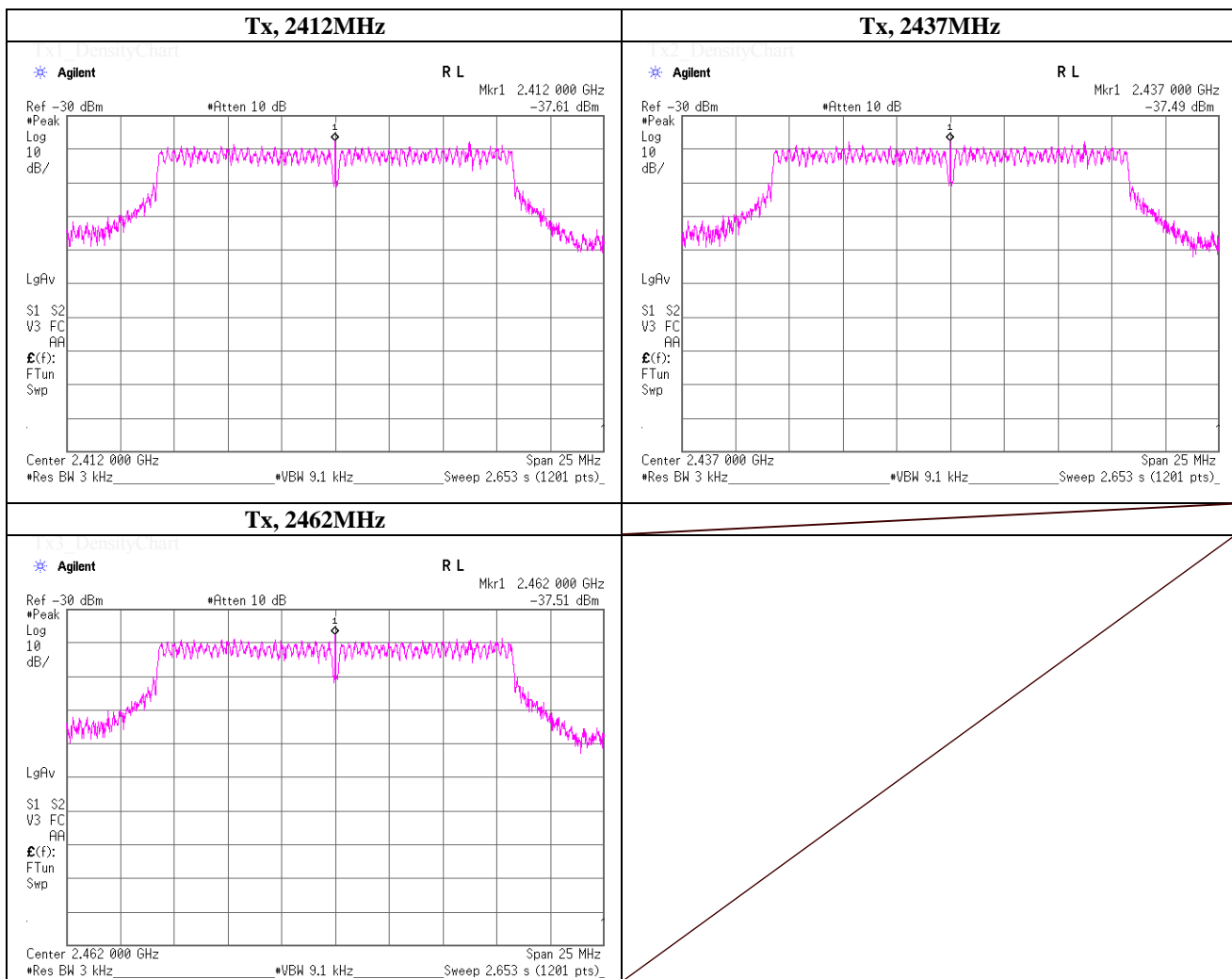
Maximum Power Spectral Density

(PKPSD)

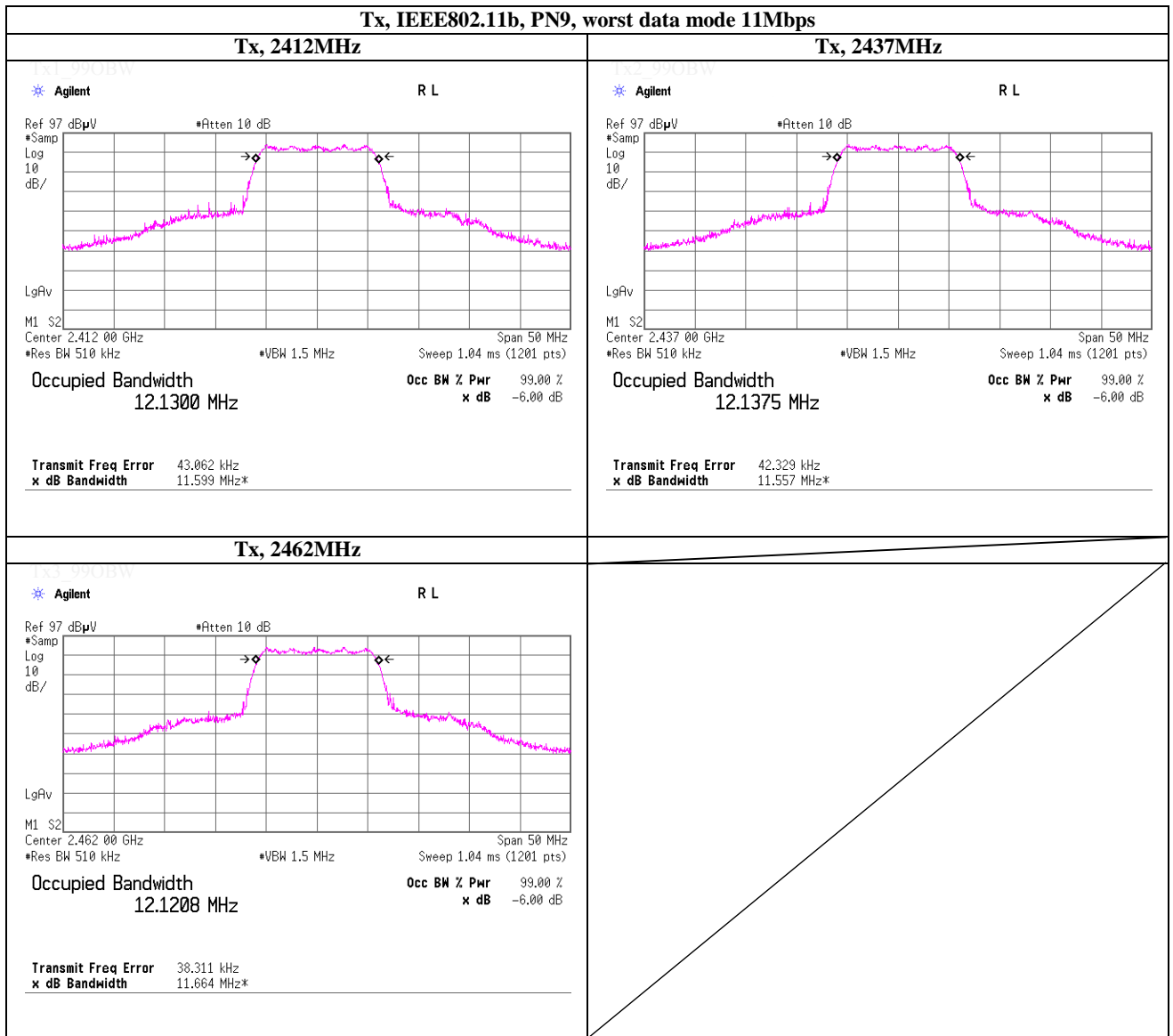
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 3, 2013	
Temperature / Humidity	22deg.C , 42%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11g, PN9, worst data mode 6Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2412.00	-37.61	0.86	9.98	-26.77	8.00	34.77
2437.0000	2437.00	-37.49	0.87	9.98	-26.64	8.00	34.64
2462.0000	2462.00	-37.51	0.87	9.98	-26.66	8.00	34.66

Sample Calculation:
 Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss



99% Occupied Bandwidth



UL Japan, Inc.

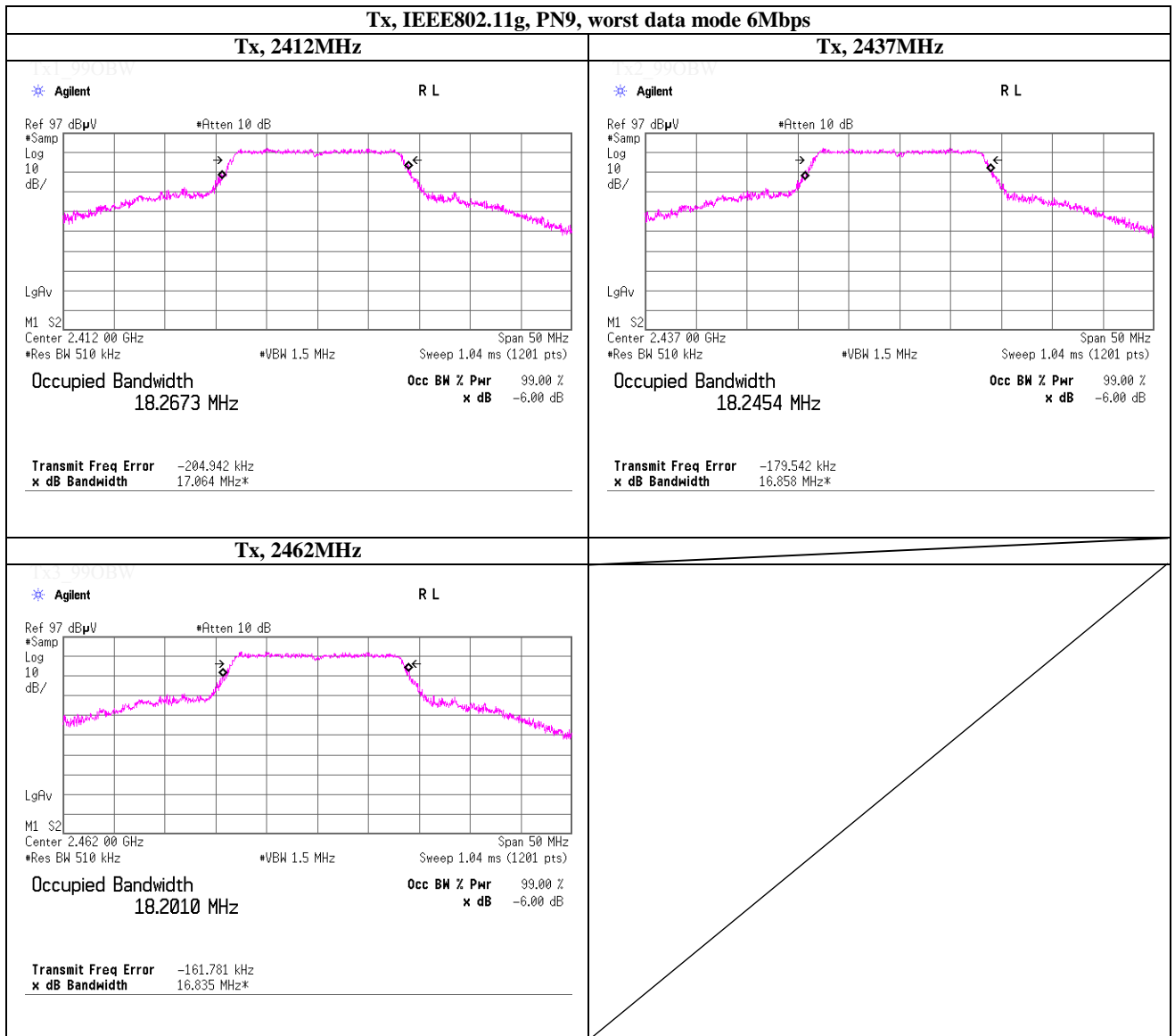
Shonan EMC Lab.

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99% Occupied Bandwidth



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APPENDIX 2 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2013/03/04 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2013/03/16 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2013/04/09 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2012/09/21 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2012/07/18 * 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	2012/08/17 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2013/03/28 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	T SJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	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	2012/10/08 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/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	2012/10/08 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

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

Test Item :

RE: Radiated emission ,

AT: Antenna terminal disturbance voltage

End of Report