

SECTION 5: 6dB bandwidth & Occupied bandwidth (99%)

Test procedure

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

Summary of the test results: Pass

Refer to APPENDIX 1

SECTION 6: Maximum peak output power

Test procedure

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

Summary of the test results: Pass

Refer to APPENDIX 1

SECTION 7: Spurious 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

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SECTION 8: Radiated emission

8.1 Operating environment

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

8.2 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.

8.3 Test conditions

Frequency range : 30MHz to 25GHz
Test distance : 3m (below 15GHz) / 1m (above 15GHz)
EUT position : Table top

8.4 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). 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 of the test receiver and spectrum analyzer.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: *2)	RBW: 100kHz VBW: 300kHz

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

*2) Refer to VBW Calculation Chart.

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 position:

Frequency range		Below 1GHz	Above 1GHz	Carrier
EUT (Module & Antenna)	Horizontal	Y	Z	Y
	Vertical	Y	Y	Z

* The definition of the axis was listed in a 'Pre-check of the worst position' in APPENDIX 3.

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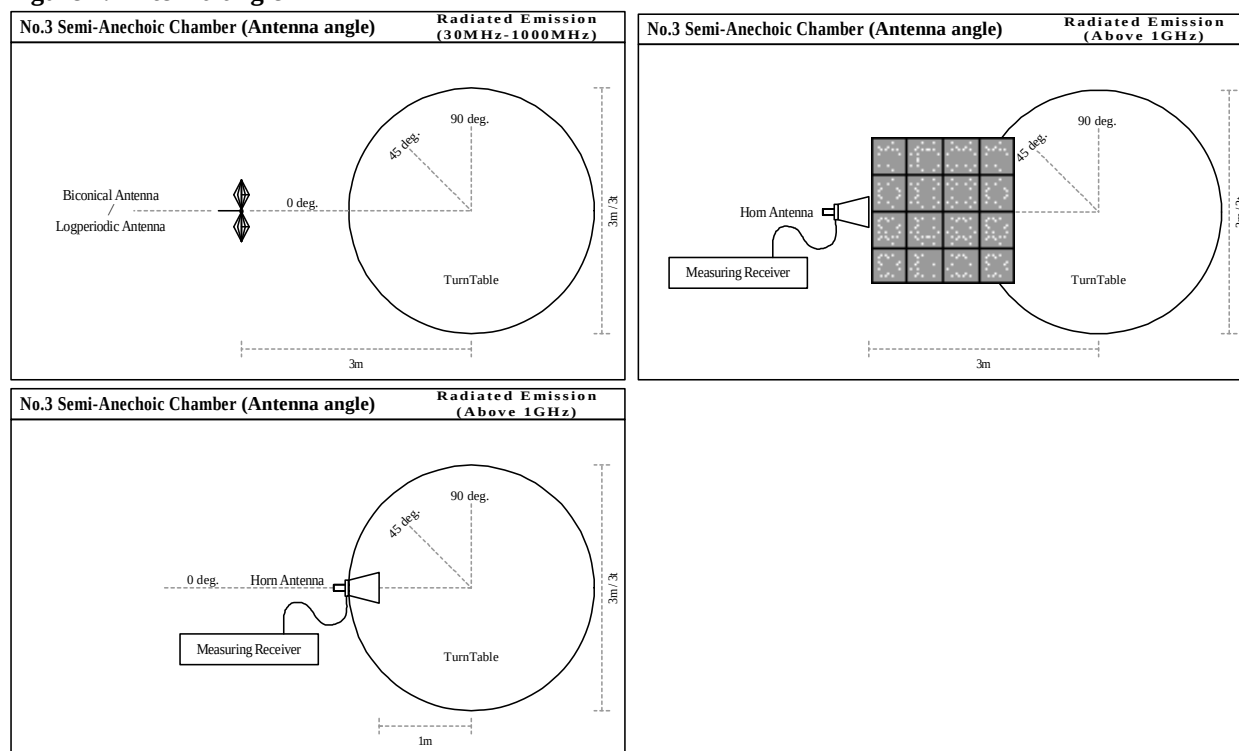
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Figure 1. Antenna angle



8.5 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.

8.6 Results

Summary of the test results : Pass *No noise was detected above the 5th order harmonics.
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 *1)
RBW / VBW : 30kHz / 100kHz *2)

*1) PSD Option 1 of " Measurement of Digital Transmission Systems Operating under Section 15.247".

*2) The test was not performed at RBW: 3kHz that was stated in the Regulation. However, the measurement value with RBW: 3kHz is less than the value of RBW: 30kHz and the test data met the limit with RBW: 30kHz.

Summary of the test results: Pass
Refer to APPENDIX 1

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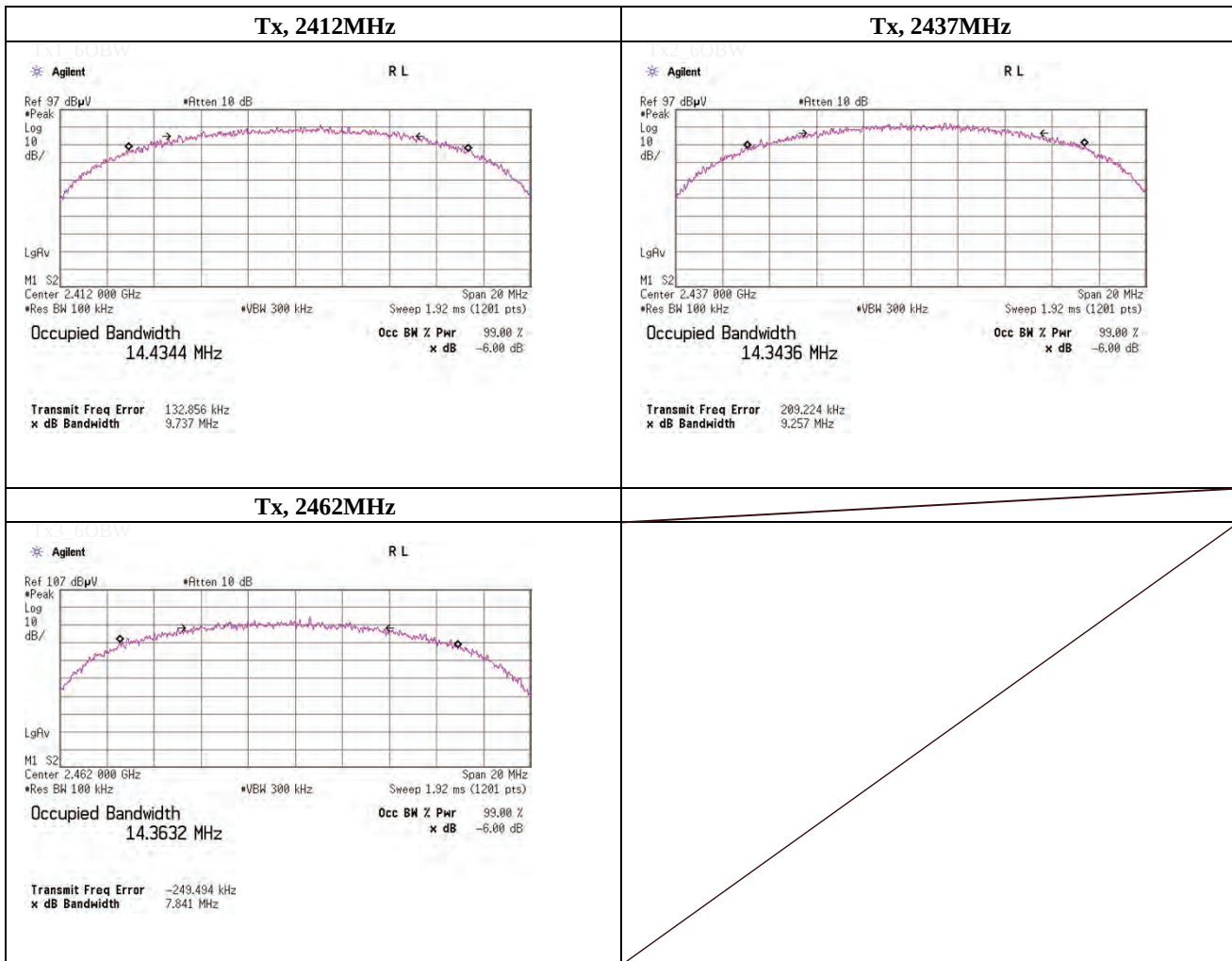
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APPENDIX 1: Data of Radio tests

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June22, 2012	
Temperature / Humidity	23deg.C , 54%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.11b, PN9, worst data mode 11Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	9.737	> 0.500
2437.0000	9.257	> 0.500
2462.0000	7.841	> 0.500



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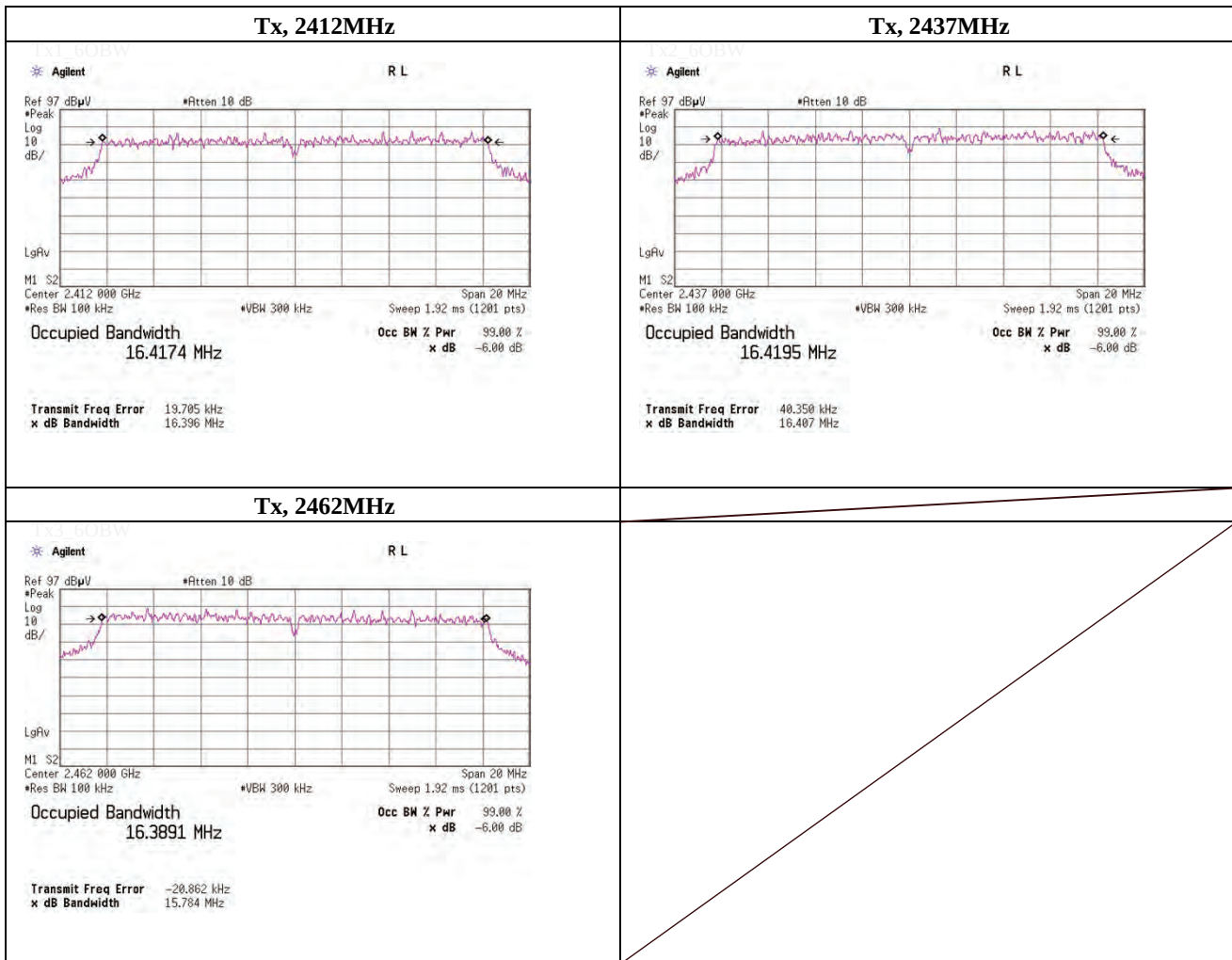
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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June22, 2012	
Temperature / Humidity	23deg.C , 54%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.11g, PN9, worst data mode 48Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	16.396	> 0.500
2437.0000	16.407	> 0.500
2462.0000	15.784	> 0.500

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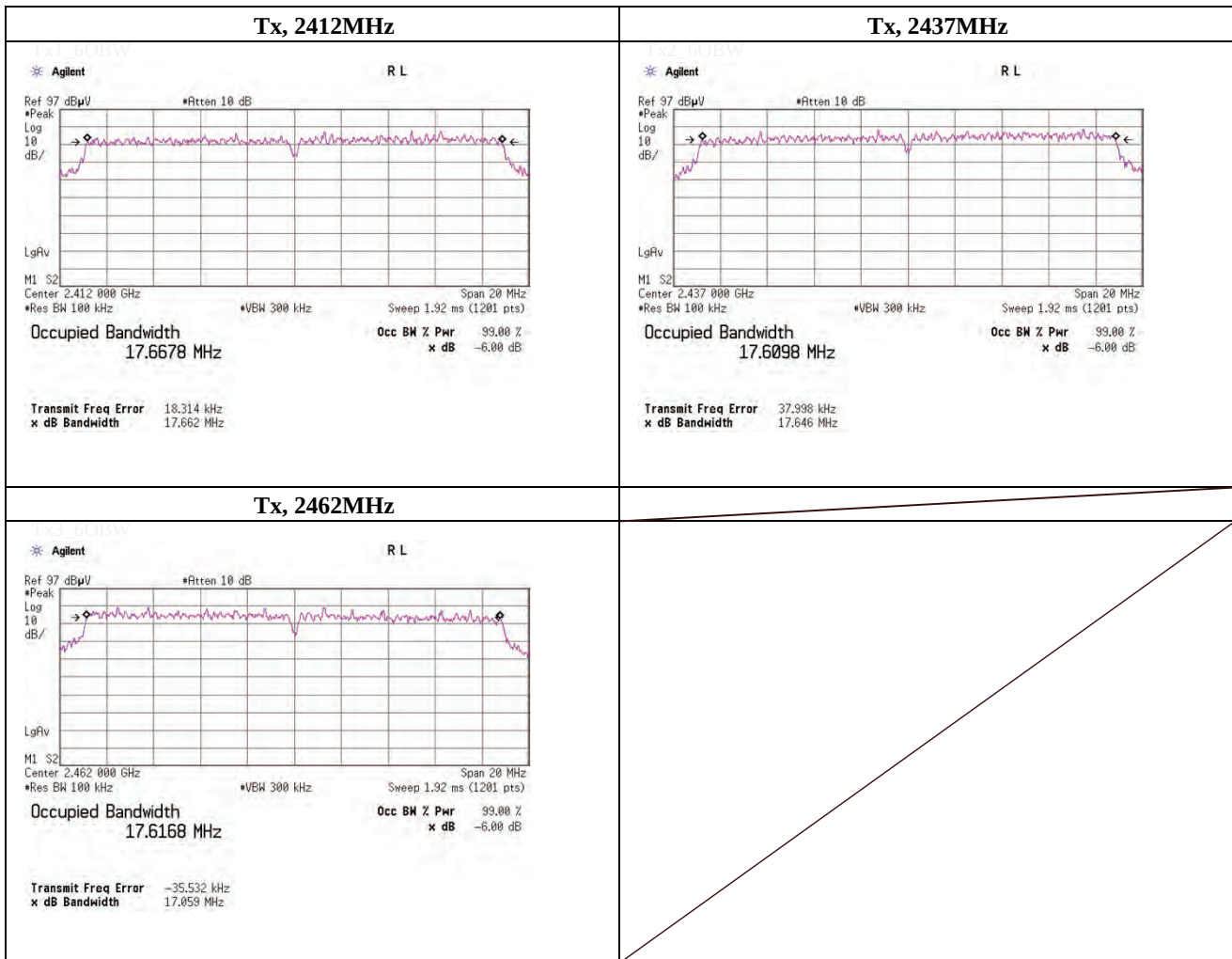
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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June22, 2012	
Temperature / Humidity	23deg.C , 54%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.11n, PN9, worst data mode 3(MCS)	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	17.662	> 0.500
2437.0000	17.646	> 0.500
2462.0000	17.059	> 0.500

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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded room
 Date June 20, 2012
 Temperature / Humidity 26deg.C , 63%RH
 Engineer Akira Sato
 Mode Tx, IEEE802.11b, PN9, worst data mode : 11 Mbps

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2412.0	-7.96	1.50	20.15	13.69	23.39	30.00	1000	16.31
Mid	2437.0	-6.39	1.48	20.15	15.24	33.42	30.00	1000	14.76
High	2462.0	-5.99	1.48	20.15	15.64	36.64	30.00	1000	14.36

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

[Pre check]

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
						[dBm]	[mW]	[dBm]	[mW]	
	1	2437.0	-6.74	1.48	20.15	14.89	30.83	30.00	1000	15.11
	2	2437.0	-6.66	1.48	20.15	14.97	31.41	30.00	1000	15.03
	5.5	2437.0	-6.39	1.48	20.15	15.24	33.42	30.00	1000	14.76
	11	2437.0	-6.15	1.48	20.15	15.48	35.32	30.00	1000	14.52

Worst

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
 Date June 20, 2012
 Temperature / Humidity 26deg.C , 63%RH
 Engineer Akira Sato
 Mode Tx, IEEE802.11g, PN9, worst data mode : 48 Mbps

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2412.0	-2.50	1.50	20.15	19.15	82.22	30.00	1000	10.85
Mid	2437.0	-1.56	1.48	20.15	20.07	101.62	30.00	1000	9.93
High	2462.0	-1.43	1.48	20.15	20.20	104.71	30.00	1000	9.80

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

[Pre check]

	Data rate	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
	[Mbps]					[dBm]	[mW]	[dBm]	[mW]	
	6	2437.0	-1.84	1.48	20.15	19.79	95.28	30.00	1000	10.21
	9	2437.0	-1.97	1.48	20.15	19.66	92.47	30.00	1000	10.34
	12	2437.0	-1.93	1.48	20.15	19.70	93.33	30.00	1000	10.30
	18	2437.0	-1.98	1.48	20.15	19.65	92.26	30.00	1000	10.35
	24	2437.0	-1.83	1.48	20.15	19.80	95.50	30.00	1000	10.20
	36	2437.0	-1.74	1.48	20.15	19.89	97.50	30.00	1000	10.11
	48	2437.0	-1.56	1.48	20.15	20.07	101.62	30.00	1000	9.93
	54	2437.0	-1.82	1.48	20.15	19.81	95.72	30.00	1000	10.19

Worst

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
 Date June 20, 2012
 Temperature / Humidity 26deg.C , 63%RH
 Engineer Akira Sato
 Mode Tx, IEEE802.11n, PN9, worst data mode : 3 (MCS)

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

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2412.0	-2.51	1.50	20.15	19.14	82.04	30.00	1000	10.86
Mid	2437.0	-1.37	1.48	20.15	20.26	106.17	30.00	1000	9.74
High	2462.0	-1.45	1.48	20.15	20.18	104.23	30.00	1000	9.82

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

[Pre check]

	Mode (MCS)	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
						[dBm]	[mW]	[dBm]	[mW]	
	0	2437.0	-1.78	1.48	20.15	19.85	96.61	30.00	1000	10.15
	1	2437.0	-1.56	1.48	20.15	20.07	101.62	30.00	1000	9.93
	2	2437.0	-1.96	1.48	20.15	19.67	92.68	30.00	1000	10.33
	3	2437.0	-1.37	1.48	20.15	20.26	106.17	30.00	1000	9.74
	4	2437.0	-1.39	1.48	20.15	20.24	105.68	30.00	1000	9.76
	5	2437.0	-1.44	1.48	20.15	20.19	104.47	30.00	1000	9.81
	6	2437.0	-1.72	1.48	20.15	19.91	97.95	30.00	1000	10.09
	7	2437.0	-1.53	1.48	20.15	20.10	102.33	30.00	1000	9.90

Worst

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
 Date June 20, 2012 June 21, 2012 June 24, 2012
 Temperature / Humidity 22 deg.C , 68%RH 22 deg.C , 55%RH 24 deg.C , 58%RH
 Engineer Makoto Hosaka Makoto Hosaka Makoto Hosaka
 Mode Tx, 2412 MHz
 Tx, IEEE802.11b, PN9, worst data mode 11Mbps

(* 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.	2390.000	PK	46.7	27.2	24.5	41.1	57.3	73.9	16.6	100	30	
Hori.	4824.000	PK	57.5	31.1	6.8	41.0	54.4	73.9	19.5	106	313	
Hori.	7236.000	PK	52.5	36.6	8.5	41.3	56.3	73.9	17.6	111	353	
Hori.	9648.000	PK	45.0	38.2	9.4	38.8	53.8	73.9	20.1	102	26	
Hori.	12060.000	PK	45.0	39.3	10.7	39.2	55.8	73.9	18.1	100	0	
Hori.	2390.000	AV	35.2	27.2	24.5	41.1	45.8	53.9	8.1	100	30	VBW:820Hz
Hori.	4824.000	AV	51.9	31.1	6.8	41.0	48.8	53.9	5.1	106	313	VBW:820Hz
Hori.	7236.000	AV	48.1	36.6	8.5	41.3	51.9	53.9	2.0	111	353	VBW:10Hz
Hori.	9648.000	AV	35.2	38.2	9.4	38.8	44.0	53.9	9.9	102	26	VBW:820Hz
Hori.	12060.000	AV	34.2	39.3	10.7	39.2	45.0	53.9	8.9	100	0	VBW:820Hz
Vert.	2390.000	PK	46.0	27.2	24.5	41.1	56.6	73.9	17.3	116	154	
Vert.	4824.000	PK	55.1	31.1	6.8	41.0	52.0	73.9	21.9	116	18	
Vert.	7236.000	PK	52.5	36.6	8.5	41.3	56.3	73.9	17.6	152	0	
Vert.	9648.000	PK	44.4	38.2	9.4	38.8	53.2	73.9	20.7	116	214	
Vert.	12060.000	PK	45.8	39.3	10.7	39.2	56.6	73.9	17.3	100	0	
Vert.	2390.000	AV	35.1	27.2	24.5	41.1	45.7	53.9	8.2	116	154	VBW:820Hz
Vert.	4824.000	AV	49.3	31.1	6.8	41.0	46.2	53.9	7.7	116	18	VBW:820Hz
Vert.	7236.000	AV	48.3	36.6	8.5	41.3	52.1	53.9	1.8	152	0	VBW:10Hz
Vert.	9648.000	AV	34.2	38.2	9.4	38.8	43.0	53.9	10.9	116	214	VBW:820Hz
Vert.	12060.000	AV	34.6	39.3	10.7	39.2	45.4	53.9	8.5	100	0	VBW:821Hz

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

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	82.1	27.3	24.5	41.1	92.8	-	-	Carrier
Hori.	2398.110	PK	41.1	27.3	24.5	41.1	51.8	72.8	21.0	
Hori.	2400.000	PK	40.1	27.3	24.5	41.1	50.8	72.8	22.0	
Vert.	2412.000	PK	81.1	27.3	24.5	41.1	91.8	-	-	Carrier
Vert.	2398.110	PK	41.3	27.3	24.5	41.1	52.0	71.8	19.8	
Vert.	2400.000	PK	39.1	27.3	24.5	41.1	49.8	71.8	22.0	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber	
Date	June 20, 2012	June 21, 2012	June 24, 2012
Temperature / Humidity	22 deg.C , 68%RH	22 deg.C , 55%RH	24 deg.C , 58%RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2437 MHz		
	Tx, IEEE802.11b, PN9, worst data mode 11Mbps		

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

[illegible]
$$\text{Result} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz))} - \text{Gain(Amplifier)}$$

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
 Date June 20, 2012 June 21, 2012 June 24, 2012
 Temperature / Humidity 22 deg.C , 68%RH 22 deg.C , 55%RH 24 deg.C , 58%RH
 Engineer Makoto Hosaka Makoto Hosaka Makoto Hosaka
 Mode Tx, 2462 MHz
 Tx, IEEE802.11b, PN9, worst data mode 11Mbps

(* 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.	2483.500	PK	46.2	27.5	24.6	41.1	57.2	73.9	16.7	100	209	
Hori.	4924.000	PK	52.1	31.3	6.9	40.9	49.4	73.9	24.5	107	307	
Hori.	7386.000	PK	53.0	36.9	8.7	41.4	57.2	73.9	16.7	102	353	
Hori.	9848.000	PK	45.7	38.7	9.5	38.8	55.1	73.9	18.8	102	22	
Hori.	12310.000	PK	46.1	39.4	10.8	39.2	57.1	73.9	16.8	100	0	
Hori.	2483.500	AV	34.9	27.5	24.6	41.1	45.9	53.9	8.0	100	209	VBW:820Hz
Hori.	4924.000	AV	45.5	31.3	6.9	40.9	42.8	53.9	11.1	107	307	VBW:820Hz
Hori.	7386.000	AV	47.8	36.9	8.7	41.4	52.0	53.9	1.9	102	353	VBW:10Hz
Hori.	9848.000	AV	34.3	38.7	9.5	38.8	43.7	53.9	10.2	102	22	VBW:820Hz
Hori.	12310.000	AV	34.5	39.4	10.8	39.2	45.5	53.9	8.4	100	0	VBW:820Hz
Vert.	2483.500	PK	46.9	27.5	24.6	41.1	57.9	73.9	16.0	141	104	
Vert.	4924.000	PK	52.5	31.3	6.9	40.9	49.8	73.9	24.1	114	8	
Vert.	7386.000	PK	53.2	36.9	8.7	41.4	57.4	73.9	16.5	157	2	
Vert.	9848.000	PK	45.2	38.7	9.5	38.8	54.6	73.9	19.3	100	31	
Vert.	12310.000	PK	45.9	39.4	10.8	39.2	56.9	73.9	17.0	100	0	
Vert.	2483.500	AV	35.1	27.5	24.6	41.1	46.1	53.9	7.8	141	104	VBW:820Hz
Vert.	4924.000	AV	45.3	31.3	6.9	40.9	42.6	53.9	11.3	114	8	VBW:820Hz
Vert.	7386.000	AV	48.7	36.9	8.7	41.4	52.9	53.9	1.0	157	2	VBW:10Hz
Vert.	9848.000	AV	33.6	38.7	9.5	38.8	43.0	53.9	10.9	100	31	VBW:820Hz
Vert.	12310.000	AV	34.8	39.4	10.8	39.2	45.8	53.9	8.1	100	0	VBW:820Hz

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

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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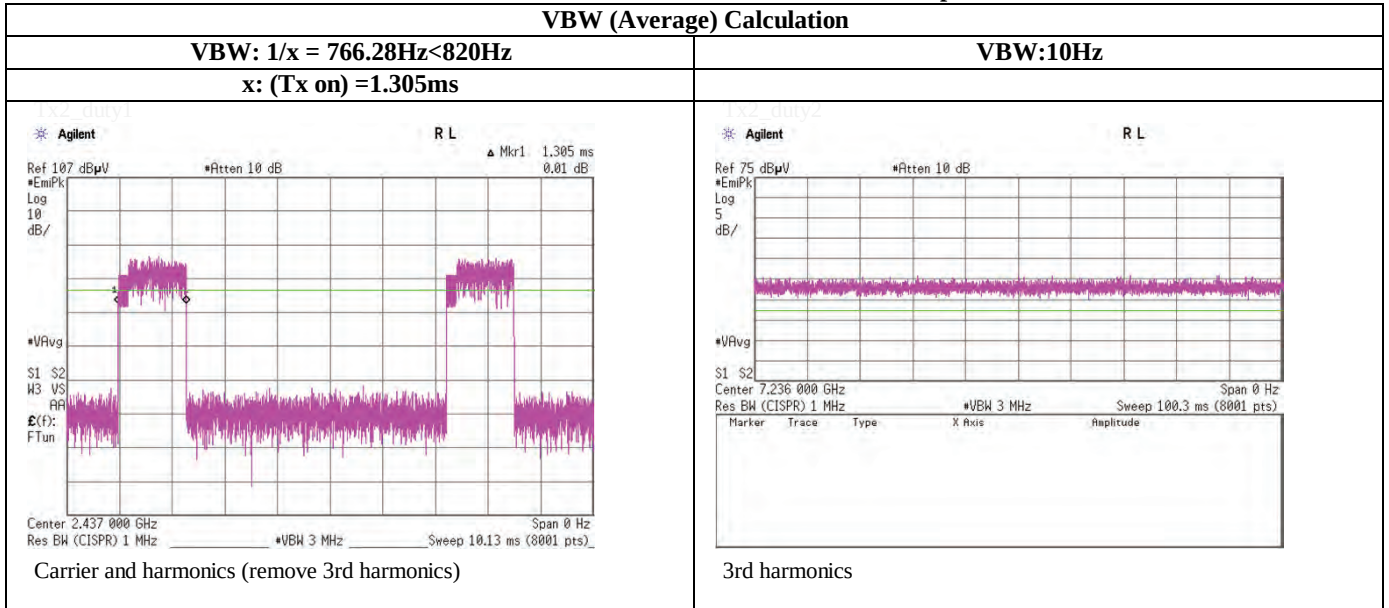
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VBW(Average) Calculation chart

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

VBW (Average) Calculation



UL Japan, Inc.

Shonan EMC Lab.

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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 June 20, 2012 June 21, 2012 June 24, 2012
 Temperature / Humidity 22 deg.C , 68%RH 22 deg.C , 55%RH 24 deg.C , 58%RH
 Engineer Makoto Hosaka Makoto Hosaka Makoto Hosaka
 Mode Tx, 2412 MHz
 Tx, IEEE802.11g, PN9, worst data mode 48Mbps

(* 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.	2390.000	PK	48.9	27.2	24.5	41.1	59.5	73.9	14.4	100	208	
Hori.	4824.000	PK	53.8	31.1	6.8	41.0	50.7	73.9	23.2	108	296	
Hori.	7236.000	PK	51.2	36.6	8.5	41.3	55.0	73.9	18.9	108	353	
Hori.	9648.000	PK	44.9	38.2	9.4	38.8	53.7	73.9	20.2	115	62	
Hori.	12060.000	PK	44.6	39.3	10.7	39.2	55.4	73.9	18.5	100	0	
Hori.	2390.000	AV	37.5	27.2	24.5	41.1	48.1	53.9	5.8	100	208	VBW:3.6kHz
Hori.	4824.000	AV	44.2	31.1	6.8	41.0	41.1	53.9	12.8	108	296	VBW:3.6kHz
Hori.	7236.000	AV	47.1	36.6	8.5	41.3	50.9	53.9	3.0	108	353	VBW:10Hz
Hori.	9648.000	AV	35.6	38.2	9.4	38.8	44.4	53.9	9.5	115	62	VBW:3.6kHz
Hori.	12060.000	AV	35.4	39.3	10.7	39.2	46.2	53.9	7.7	100	0	VBW:3.6kHz
Vert.	2390.000	PK	50.5	27.2	24.5	41.1	61.1	73.9	12.8	119	101	
Vert.	4824.000	PK	50.7	31.1	6.8	41.0	47.6	73.9	26.3	117	16	
Vert.	7236.000	PK	51.3	36.6	8.5	41.3	55.1	73.9	18.8	123	5	
Vert.	9648.000	PK	45.0	38.2	9.4	38.8	53.8	73.9	20.1	118	9	
Vert.	12060.000	PK	45.1	39.3	10.7	39.2	55.9	73.9	18.0	100	0	
Vert.	2390.000	AV	37.2	27.2	24.5	41.1	47.8	53.9	6.1	119	101	VBW:3.6kHz
Vert.	4824.000	AV	41.8	31.1	6.8	41.0	38.7	53.9	15.2	117	16	VBW:3.6kHz
Vert.	7236.000	AV	47.3	36.6	8.5	41.3	51.1	53.9	2.8	123	5	VBW:10Hz
Vert.	9648.000	AV	35.8	38.2	9.4	38.8	44.6	53.9	9.3	118	9	VBW:3.6kHz
Vert.	12060.000	AV	35.5	39.3	10.7	39.2	46.3	53.9	7.6	100	0	VBW:3.6kHz

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

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	78.1	27.3	24.5	41.1	88.8	-	-	Carrier
Hori.	2400.000	PK	50.8	27.3	24.5	41.1	61.5	68.8	7.3	
Vert.	2412.000	PK	77.7	27.3	24.5	41.1	88.4	-	-	Carrier
Vert.	2400.000	PK	48.6	27.3	24.5	41.1	59.3	68.4	9.1	

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

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Radiated Emission

Test place	UL Japan, Inc.	Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	June 20, 2012	June 21, 2012	June 24, 2012
Temperature / Humidity	22 deg.C , 68%RH	22 deg.C , 55%RH	24 deg.C , 58%RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2437 MHz		
	Tx, IEEE802.11g, PN9, worst data mode 48Mbps		

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

[illegible]

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

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
 Date June 20, 2012 June 21, 2012 June 24, 2012
 Temperature / Humidity 22 deg.C , 68%RH 22 deg.C , 55%RH 24 deg.C , 58%RH
 Engineer Makoto Hosaka Makoto Hosaka Makoto Hosaka
 Mode Tx, 2462 MHz
 Tx, IEEE802.11g, PN9, worst data mode 48Mbps

(* 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.	130.001	QP	38.4	13.6	7.4	32.1	27.3	43.5	16.2	137	179	
Hori.	2483.500	PK	53.1	27.5	24.6	41.1	64.1	73.9	9.8	100	179	
Hori.	4924.000	PK	47.9	31.3	6.9	40.9	45.2	73.9	28.7	102	302	
Hori.	7386.000	PK	52.6	36.9	8.7	41.4	56.8	73.9	17.1	100	355	
Hori.	9848.000	PK	45.3	38.7	9.5	38.8	54.7	73.9	19.2	100	0	
Hori.	12310.000	PK	45.9	39.4	10.8	39.2	56.9	73.9	17.0	100	0	
Hori.	2483.500	AV	38.5	27.5	24.6	41.1	49.5	53.9	4.4	100	179	VBW:3.6kHz
Hori.	4924.000	AV	38.7	31.3	6.9	40.9	36.0	53.9	17.9	102	302	VBW:3.6kHz
Hori.	7386.000	AV	47.5	36.9	8.7	41.4	51.7	53.9	2.2	100	355	VBW:10Hz
Hori.	9848.000	AV	34.9	38.7	9.5	38.8	44.3	53.9	9.6	100	0	VBW:3.6kHz
Hori.	12310.000	AV	35.7	39.4	10.8	39.2	46.7	53.9	7.2	100	0	VBW:3.6kHz
Vert.	52.393	QP	34.4	10.4	6.7	32.2	19.3	40.0	20.7	100	194	
Vert.	55.736	QP	35.5	9.5	6.6	32.2	19.4	40.0	20.6	100	78	
Vert.	78.000	QP	37.2	6.2	7.3	32.2	18.5	40.0	21.5	100	160	
Vert.	93.830	QP	34.4	8.4	7.4	32.2	18.0	43.5	25.5	100	164	
Vert.	130.001	QP	37.4	13.6	7.4	32.1	26.3	43.5	17.2	100	160	
Vert.	182.000	QP	31.1	15.9	7.7	32.1	22.6	43.5	20.9	100	230	
Vert.	2483.500	PK	52.6	27.5	24.6	41.1	63.6	73.9	10.3	105	103	
Vert.	4924.000	PK	47.0	31.3	6.9	40.9	44.3	73.9	29.6	112	25	
Vert.	7386.000	PK	52.5	36.9	8.7	41.4	56.7	73.9	17.2	118	317	
Vert.	9848.000	PK	44.9	38.7	9.5	38.8	54.3	73.9	19.6	100	0	
Vert.	12310.000	PK	45.0	39.4	10.8	39.2	56.0	73.9	17.9	100	0	
Vert.	2483.500	AV	38.3	27.5	24.6	41.1	49.3	53.9	4.6	105	103	VBW:3.6kHz
Vert.	4924.000	AV	37.8	31.3	6.9	40.9	35.1	53.9	18.8	112	25	VBW:3.6kHz
Vert.	7386.000	AV	46.8	36.9	8.7	41.4	51.0	53.9	2.9	118	317	VBW:10Hz
Vert.	9848.000	AV	34.5	38.7	9.5	38.8	43.9	53.9	10.0	100	0	VBW:3.6kHz
Vert.	12310.000	AV	35.6	39.4	10.8	39.2	46.6	53.9	7.3	100	0	VBW:3.6kHz

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

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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VBW(Average) Calculation chart

Tx, IEEE802.11g, PN9, worst data mode 48Mbps

VBW (Average) Calculation

VBW: $1/x = 3582.95\text{Hz} < 3600\text{Hz}$ x: (Tx on) = 0.2791ms	VBW: 10Hz
Carrier and harmonics (remove 3rd harmonics)	3rd harmonics

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Semi Anechoic Chamber	
Date	June 20, 2012	June 21, 2012	June 24, 2012
Temperature / Humidity	22 deg.C , 68%RH	22 deg.C , 55%RH	24 deg.C , 58%RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2412 MHz Tx, IEEE802.11n, PN9, worst data mode 3(MCS)		

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

[illegible]

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

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

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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

Polarity	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2412.000	PK	78.3	27.3	24.5	41.1	89.0	-	-	Carrier
Hori.	2400.000	PK	49.4	27.3	24.5	41.1	60.1	69.0	8.9	
Vert.	2412.000	PK	78.4	27.3	24.5	41.1	89.1	-	-	Carrier
Vert.	2400.000	PK	50.2	27.3	24.5	41.1	60.9	69.1	8.2	

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

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Radiated Emission

Test place	UL Japan, Inc.	Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	June 20, 2012	June 21, 2012	June 24, 2012
Temperature / Humidity	22 deg.C , 68%RH	22 deg.C , 55%RH	24 deg.C , 58%RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2437 MHz Tx, IEEE802.11n, PN9, worst data mode 3(MCS)		

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

[illegible]

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Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

Radiated Emission

Test place	UL Japan, Inc.	Shonan EMC Lab.	No.3 Semi Anechoic Chamber
Date	June 20, 2012	June 21, 2012	June 24, 2012
Temperature / Humidity	22 deg.C , 68%RH	22 deg.C , 55%RH	24 deg.C , 58%RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2462 MHz Tx, IEEE802.11n, PN9, worst data mode 3(MCS)		

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

[illegible]

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

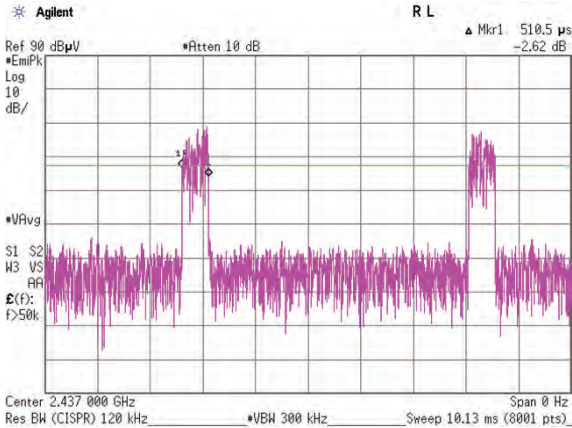
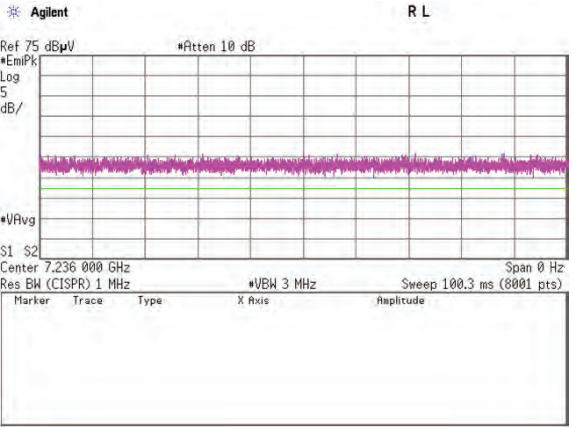
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 5th order harmonics.

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

VBW(Average) Calculation chart

Tx, IEEE802.11n, PN9, worst data mode 3(MCS)

VBW (Average) Calculation	
VBW: $1/x = 1958.86\text{Hz} < 2000\text{Hz}$ x: (Tx on) = 0.5105ms	VBW: 10Hz
tx2_duty1  Carrier and harmonics (remove 3rd harmonics)	tx2_duty2  3rd harmonics

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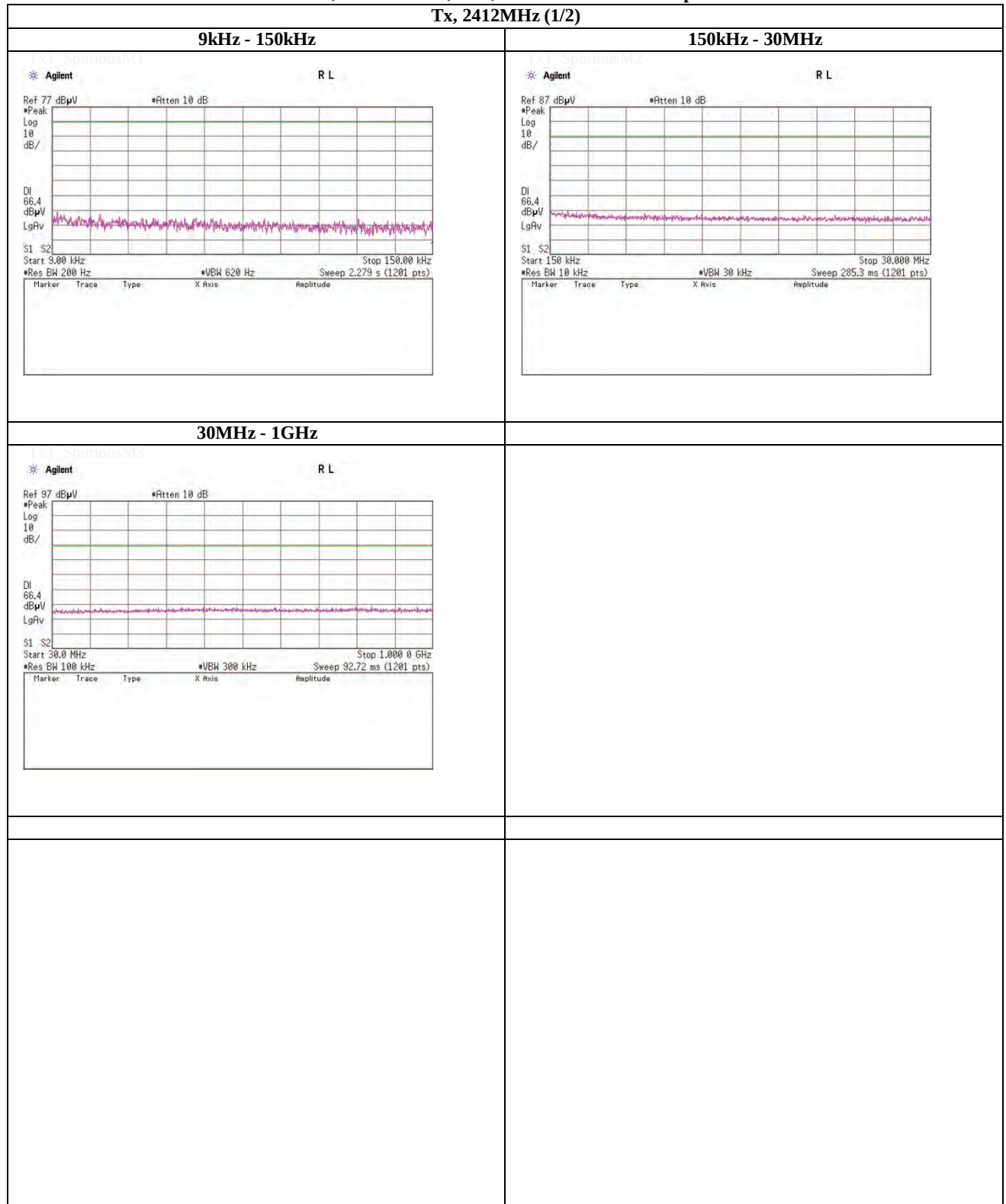
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Spurious emission (Conducted)

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

Tx, 2412MHz (1/2)



UL Japan, Inc.

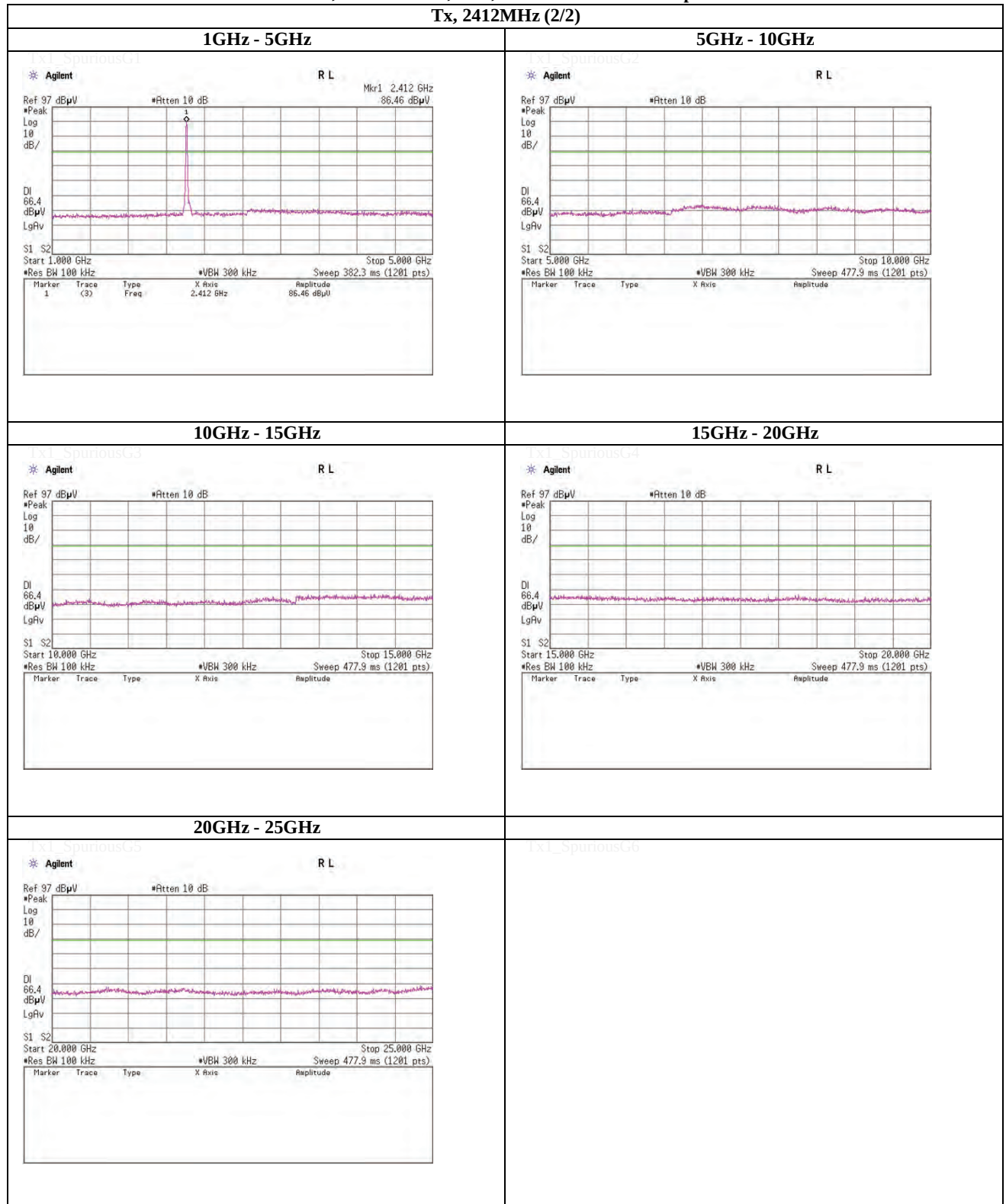
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Spurious emission (Conducted)
Tx, IEEE802.11b, PN9, worst data mode 11Mbps
Tx, 2412MHz (2/2)



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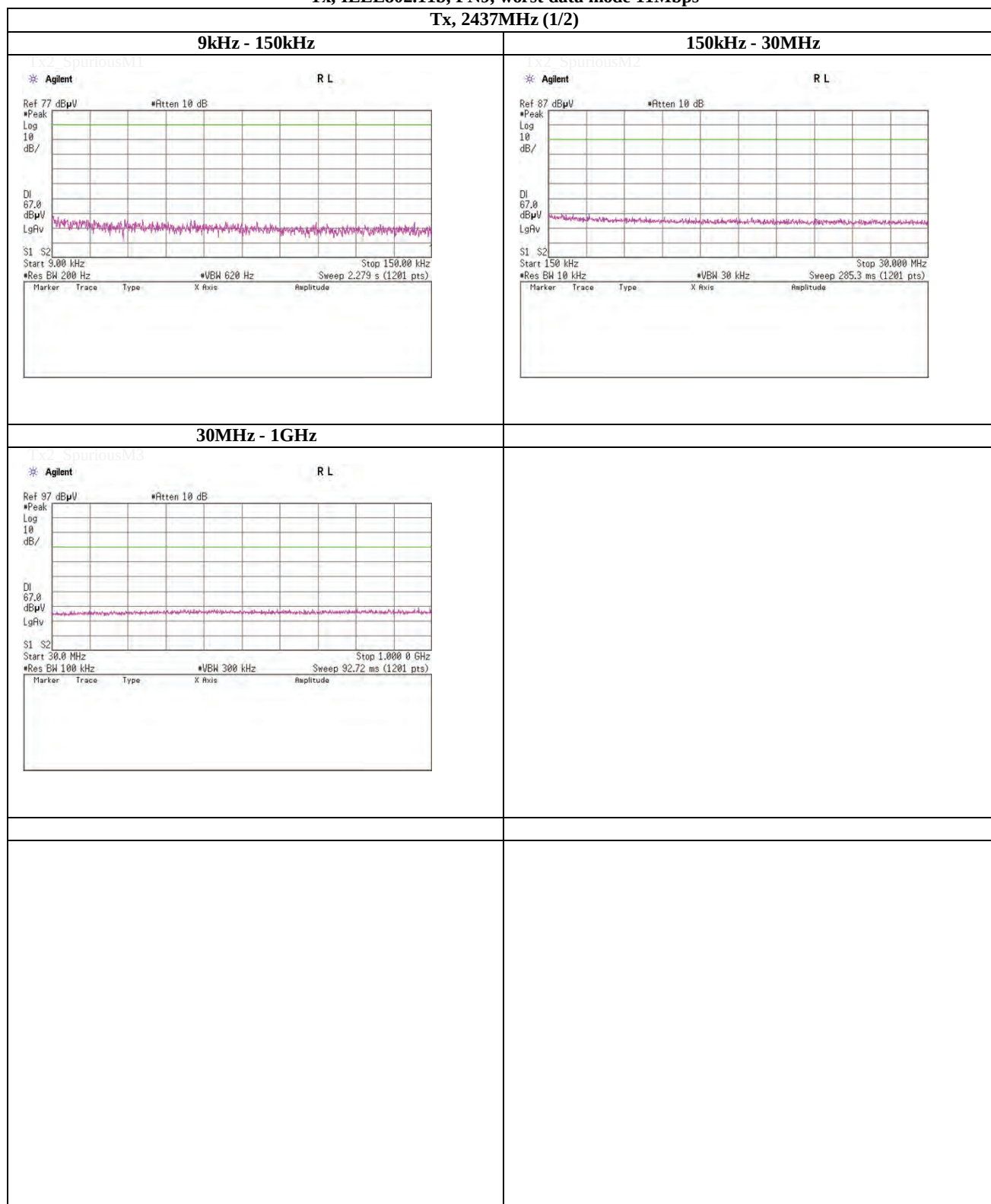
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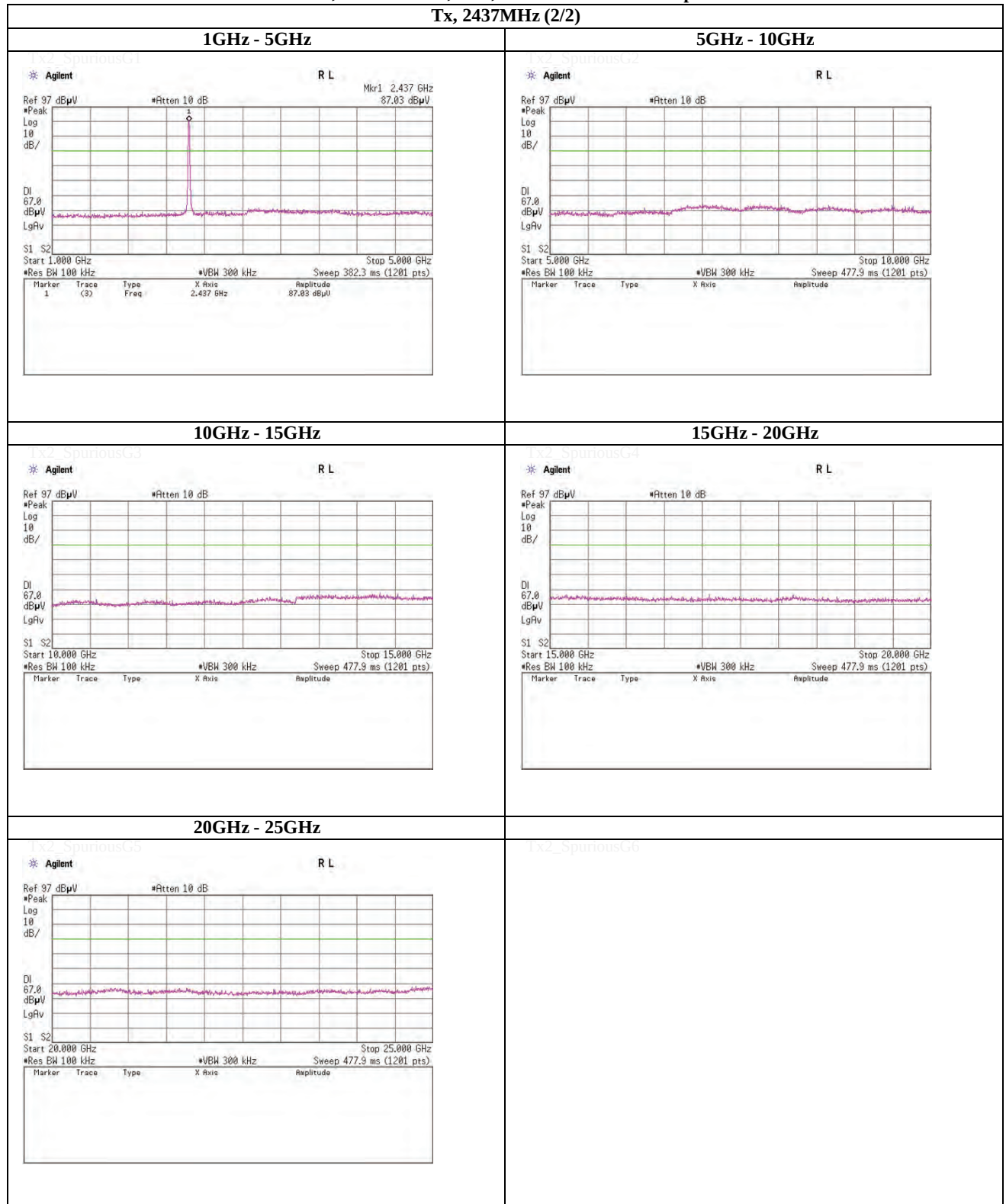
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Spurious emission (Conducted)
Tx, IEEE802.11b, PN9, worst data mode 11Mbps
Tx, 2437MHz (1/2)



Spurious emission (Conducted)
Tx, IEEE802.11b, PN9, worst data mode 11Mbps
Tx, 2437MHz (2/2)



UL Japan, Inc.

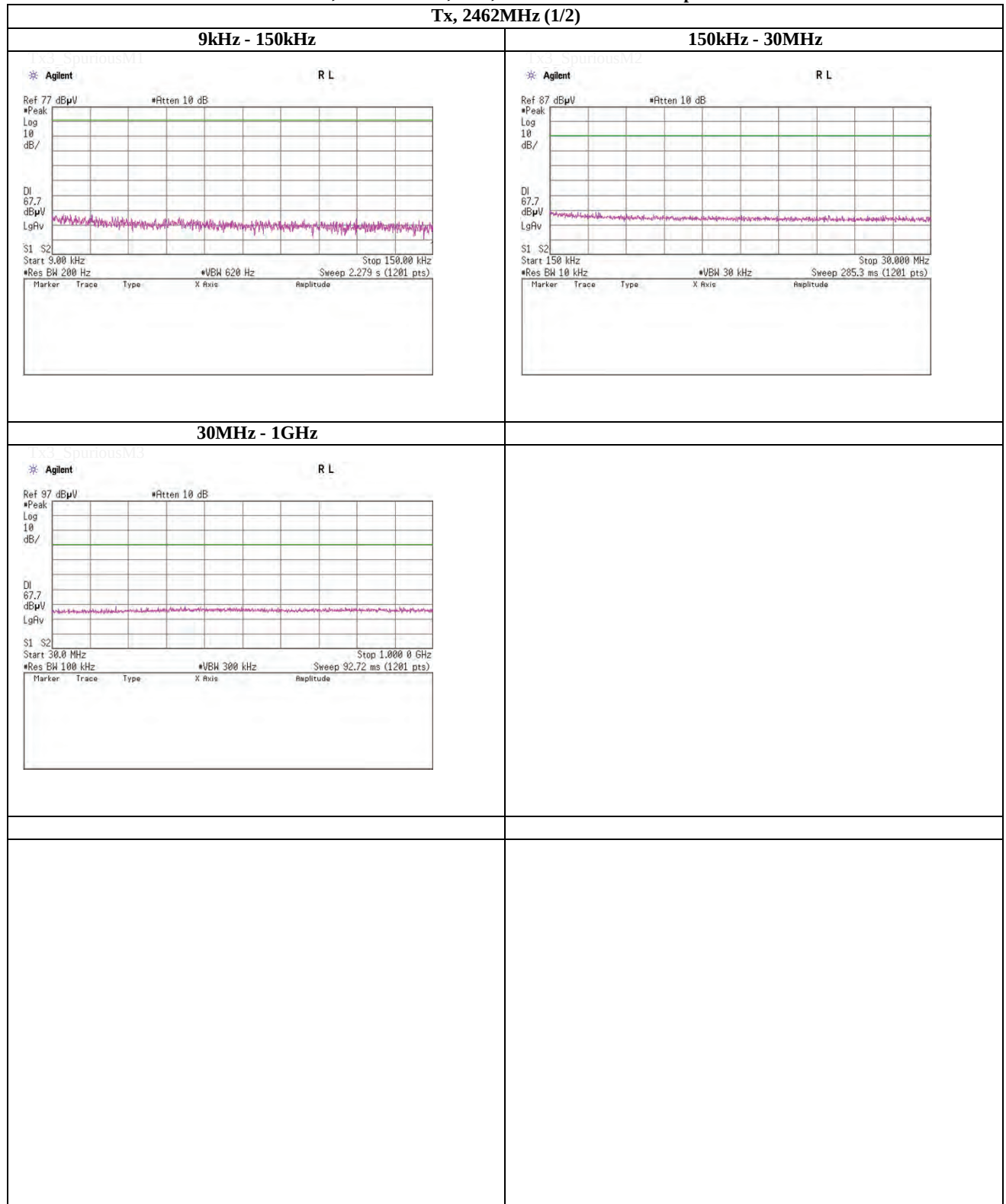
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Spurious emission (Conducted)
Tx, IEEE802.11b, PN9, worst data mode 11Mbps
Tx, 2462MHz (1/2)



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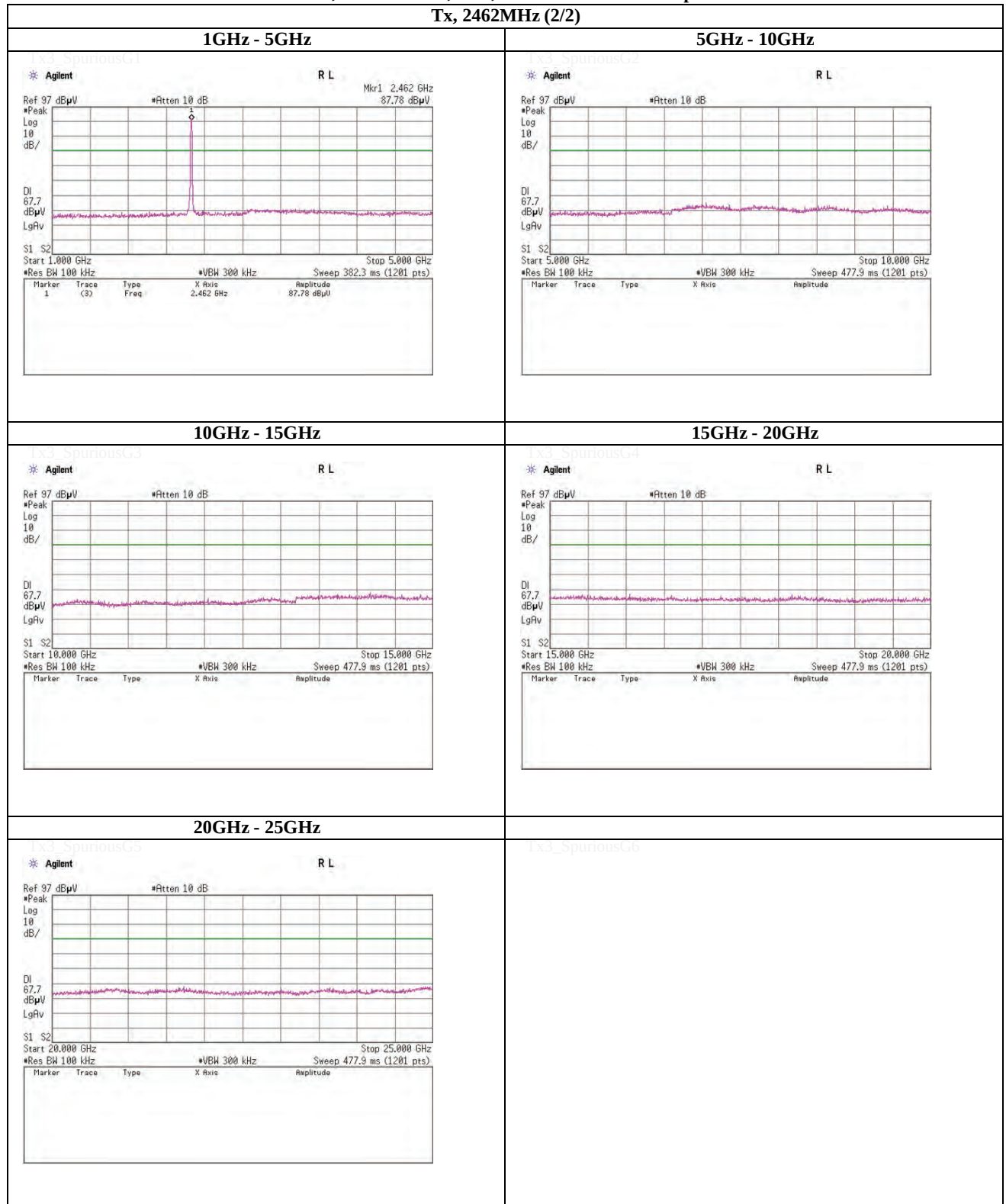
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Spurious emission (Conducted)

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

Tx, 2462MHz (2/2)



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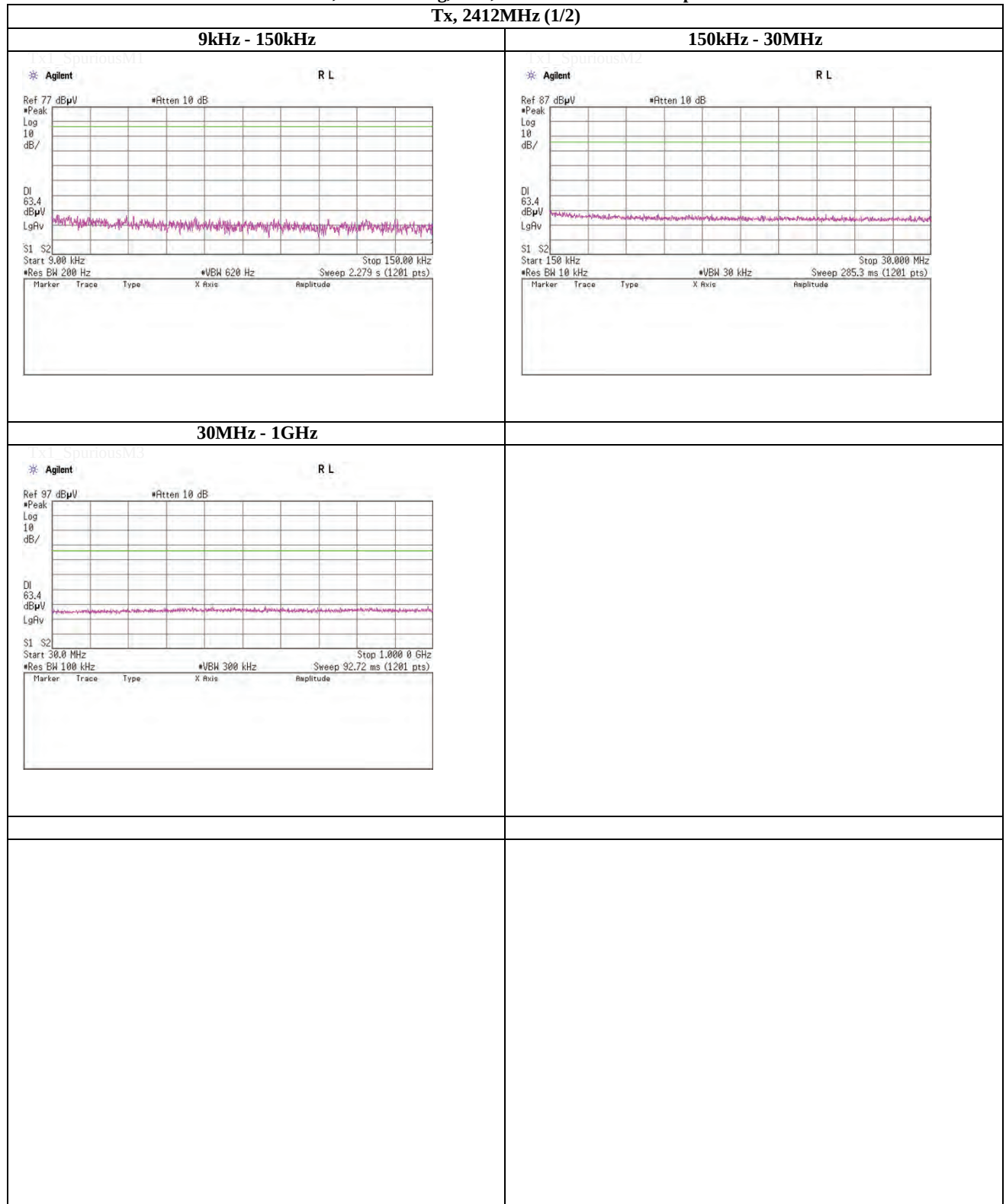
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Spurious emission (Conducted)
Tx, IEEE802.11g, PN9, worst data mode 48Mbps
Tx, 2412MHz (1/2)



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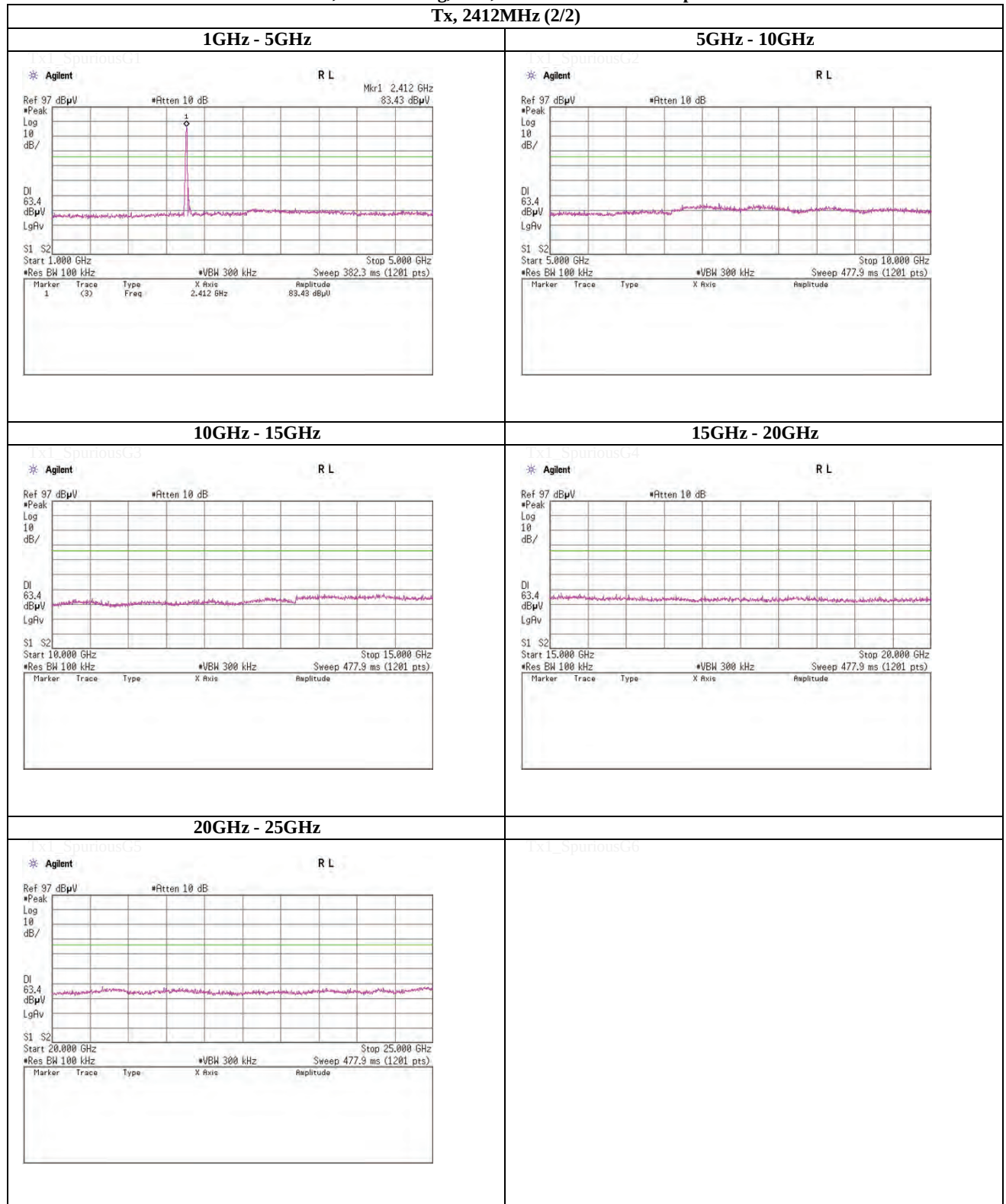
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Spurious emission (Conducted)
Tx, IEEE802.11g, PN9, worst data mode 48Mbps
Tx, 2412MHz (2/2)



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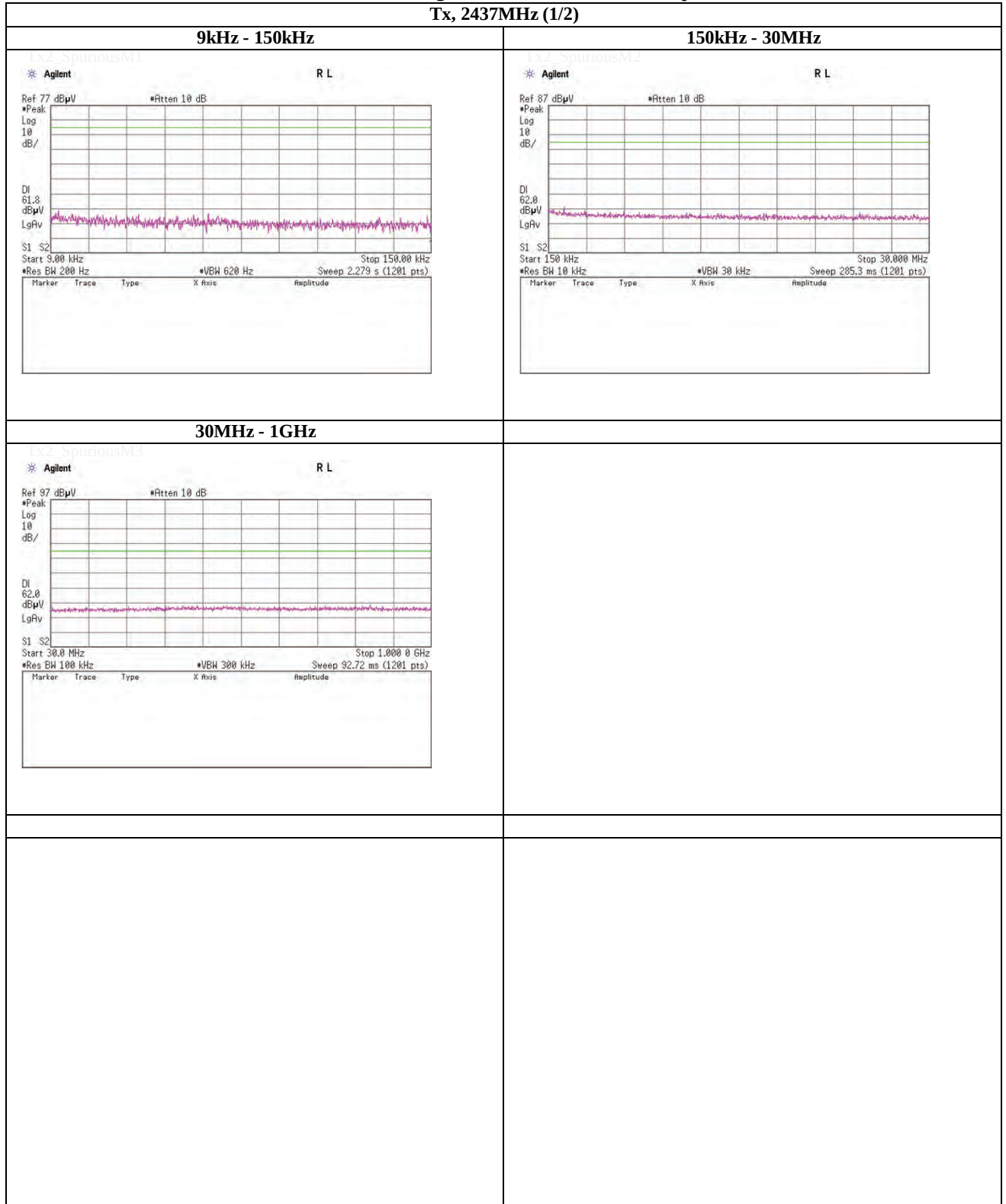
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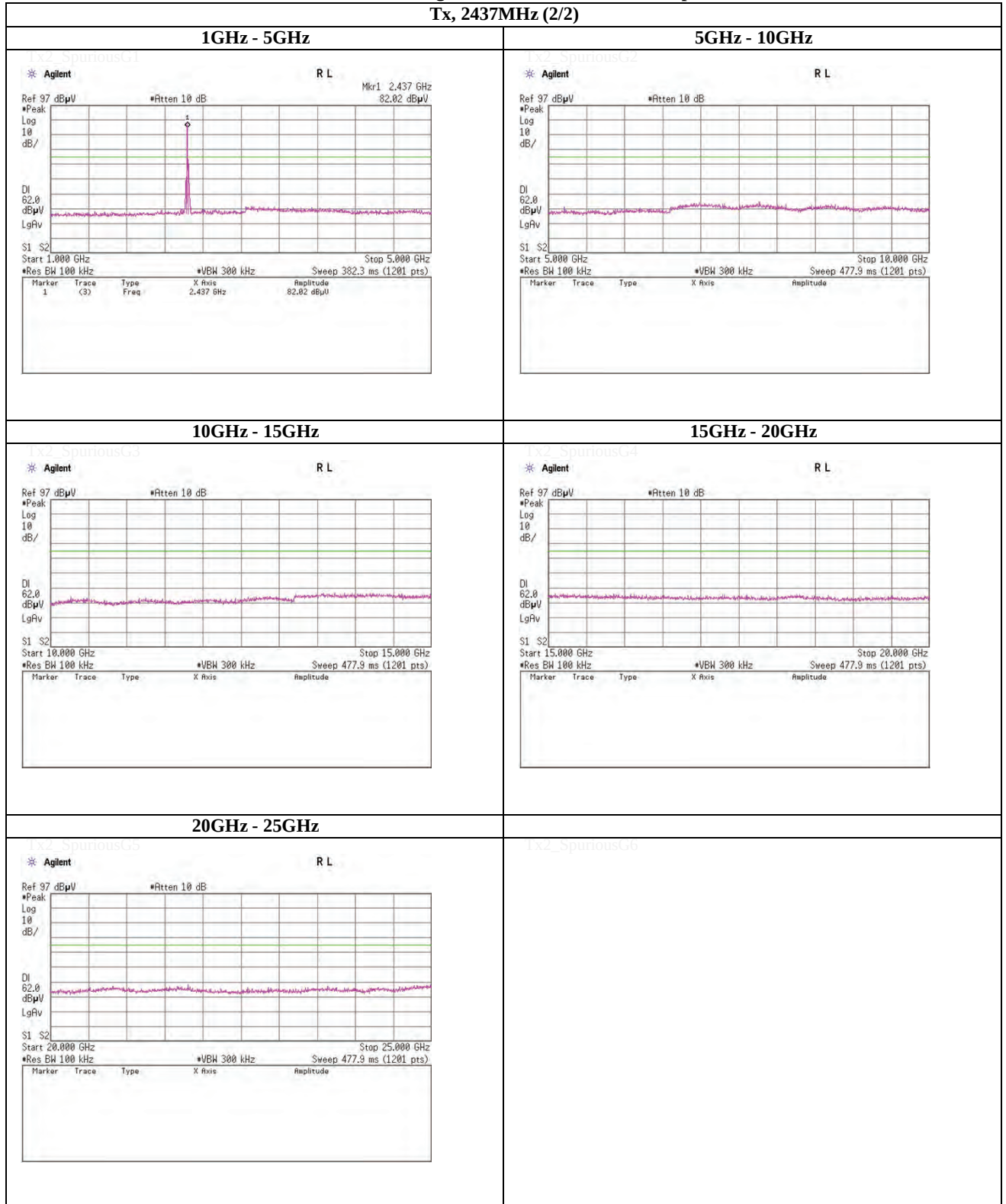
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Spurious emission (Conducted)
Tx, IEEE802.11g, PN9, worst data mode 48Mbps
Tx, 2437MHz (1/2)



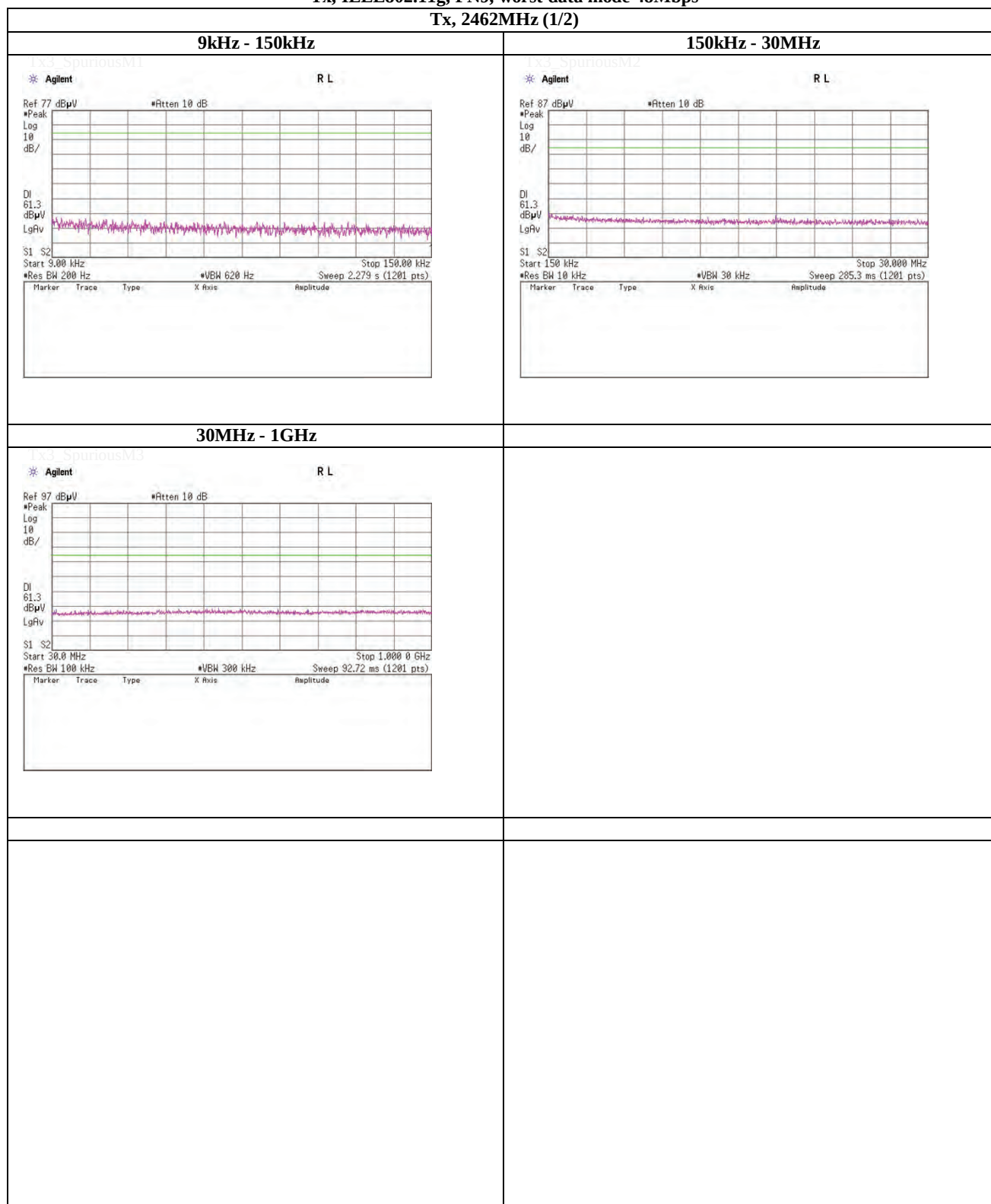
Spurious emission (Conducted)
Tx, IEEE802.11g, PN9, worst data mode 48Mbps
Tx, 2437MHz (2/2)



Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 48Mbps

Tx, 2462MHz (1/2)



UL Japan, Inc.

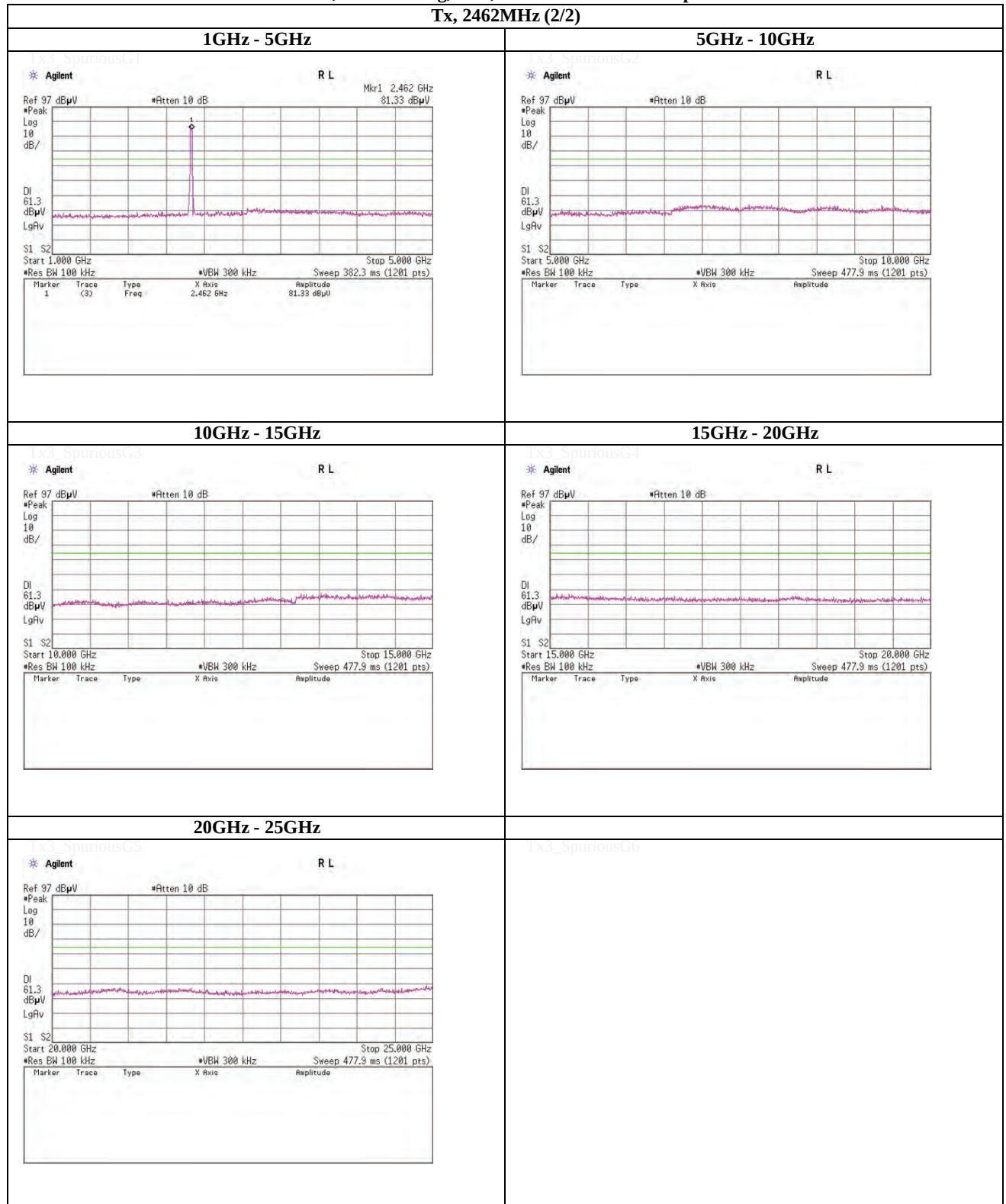
Shonan EMC Lab.

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Spurious emission (Conducted)
Tx, IEEE802.11g, PN9, worst data mode 48Mbps
Tx, 2462MHz (2/2)



UL Japan, Inc.

Shonan EMC Lab.

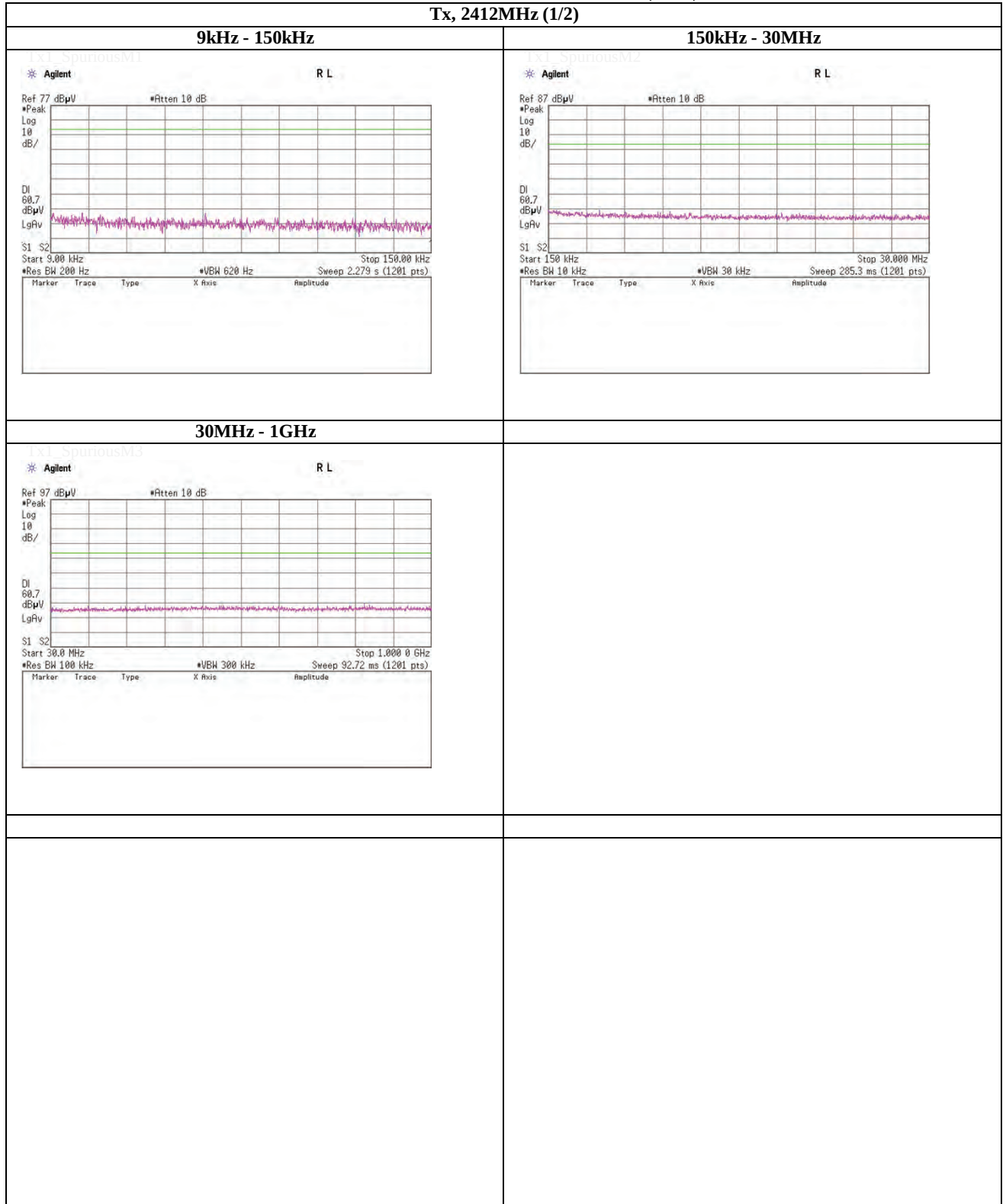
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Spurious emission (Conducted)
Tx, IEEE802.11n, PN9, worst data mode 3(MCS)

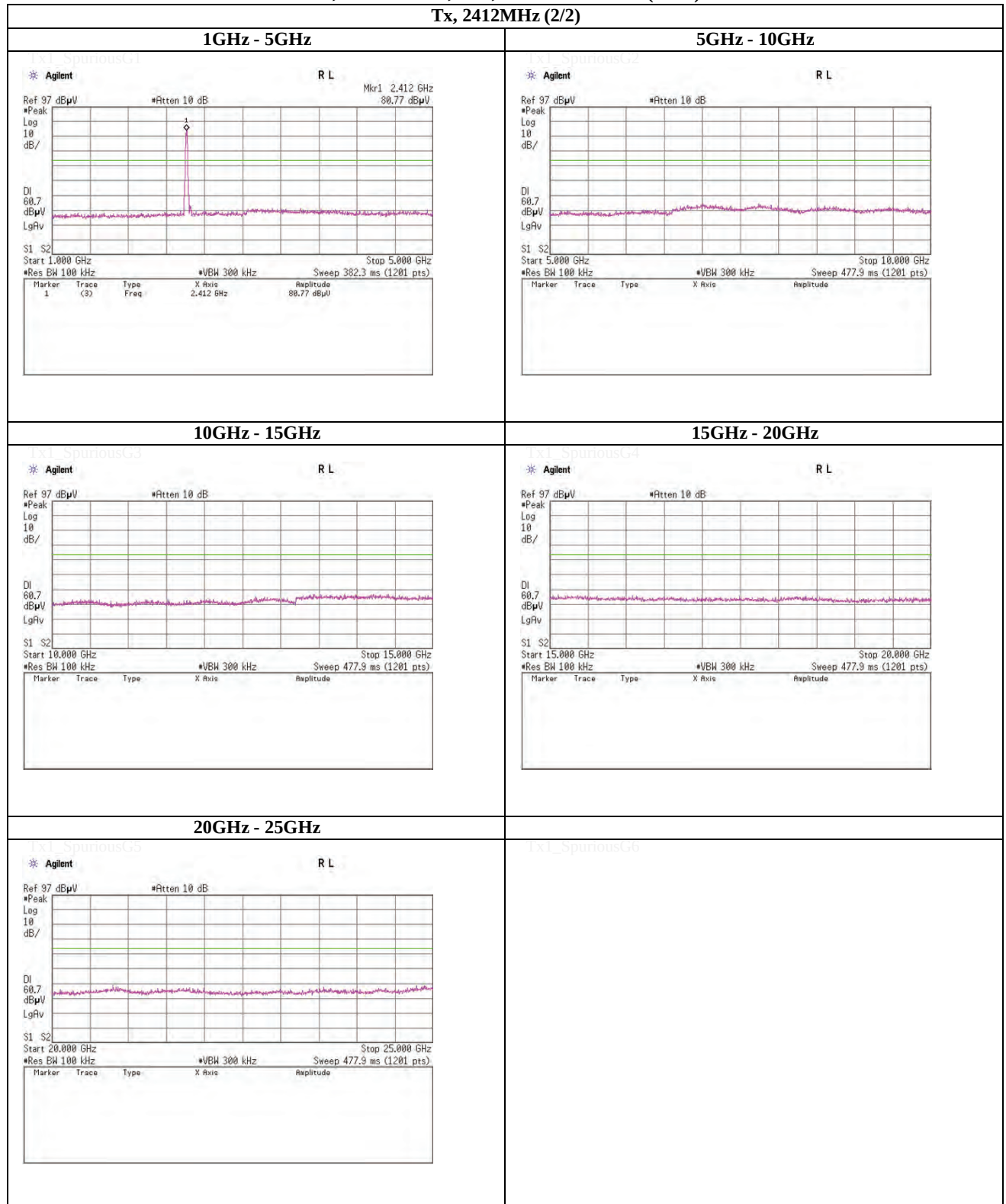
Tx, 2412MHz (1/2)



Spurious emission (Conducted)

Tx, IEEE802.11n, PN9, worst data mode 3(MCS)

Tx, 2412MHz (2/2)



UL Japan, Inc.

Shonan EMC Lab.

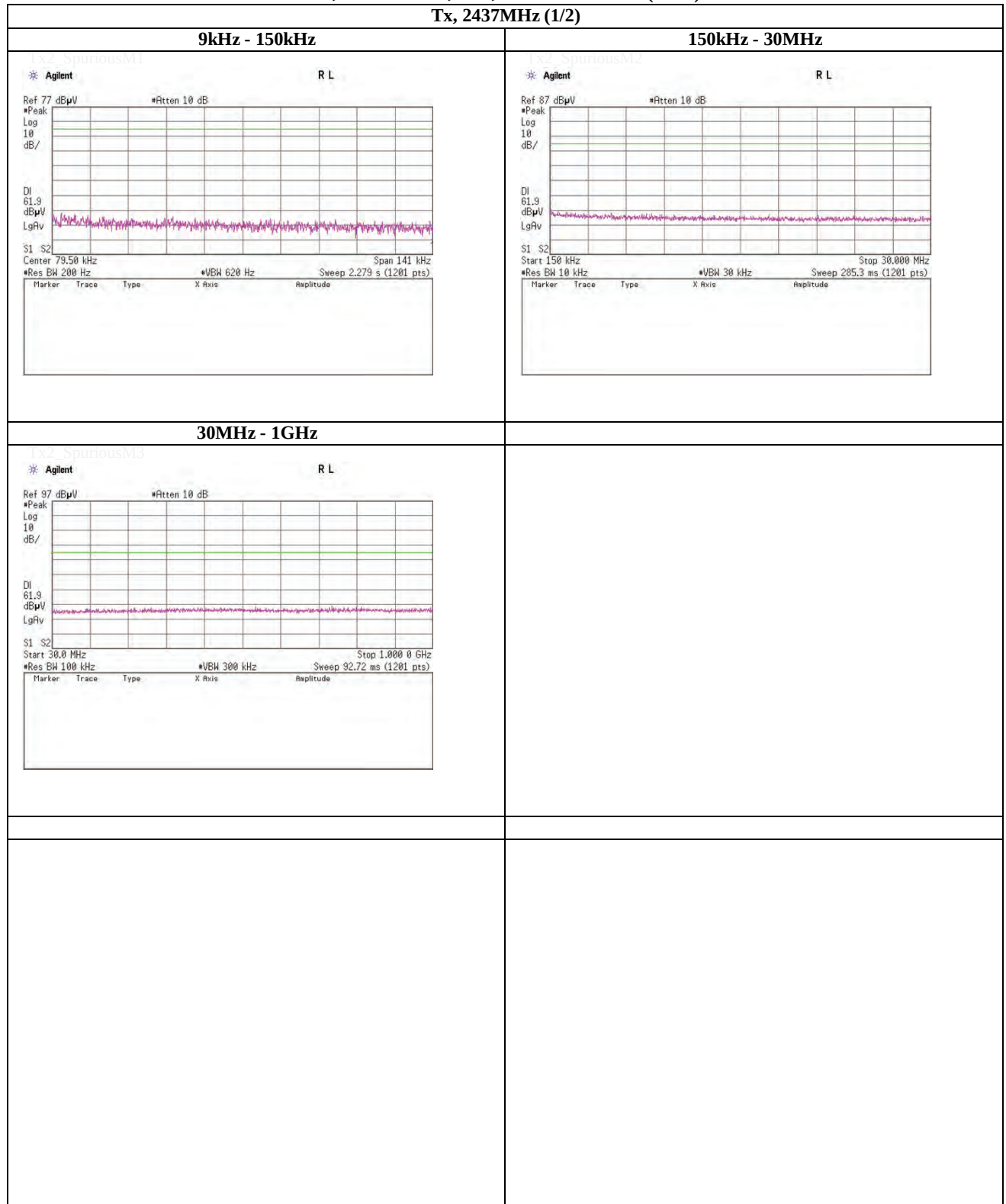
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Telephone : +81 463 50 6400

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Spurious emission (Conducted)
Tx, IEEE802.11n, PN9, worst data mode 3(MCS)

Tx, 2437MHz (1/2)



UL Japan, Inc.

Shonan EMC Lab.

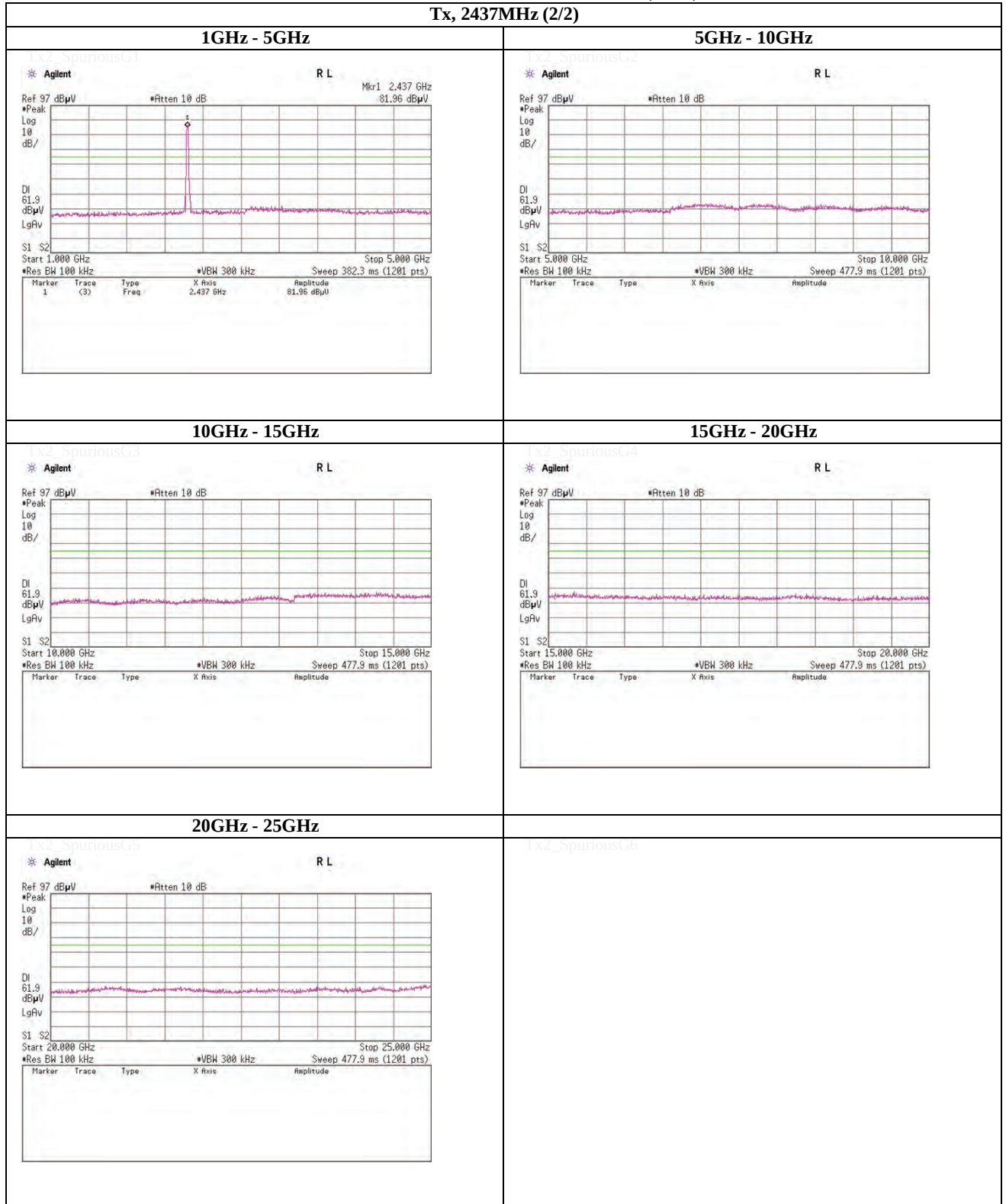
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Spurious emission (Conducted) **Tx, IEEE802.11n, PN9, worst data mode 3(MCS)**

Tx, 2437MHz (2/2)



Tx, IEEE802.11n, PN9, worst data mode 3(MCS)

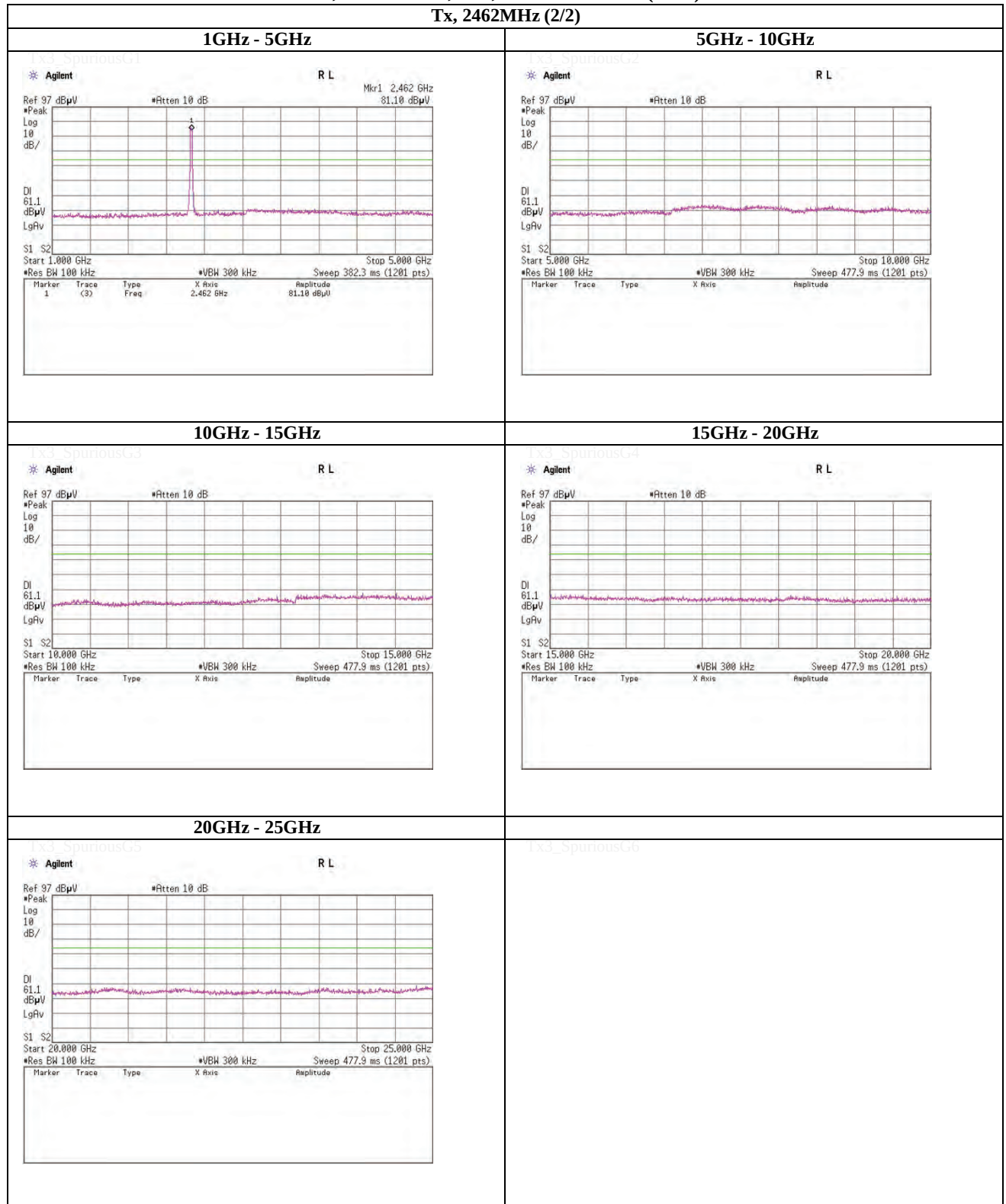
Tx, 2462MHz (1/2)

47

Spurious emission (Conducted)

Tx, IEEE802.11n, PN9, worst data mode 3(MCS)

Tx, 2462MHz (2/2)



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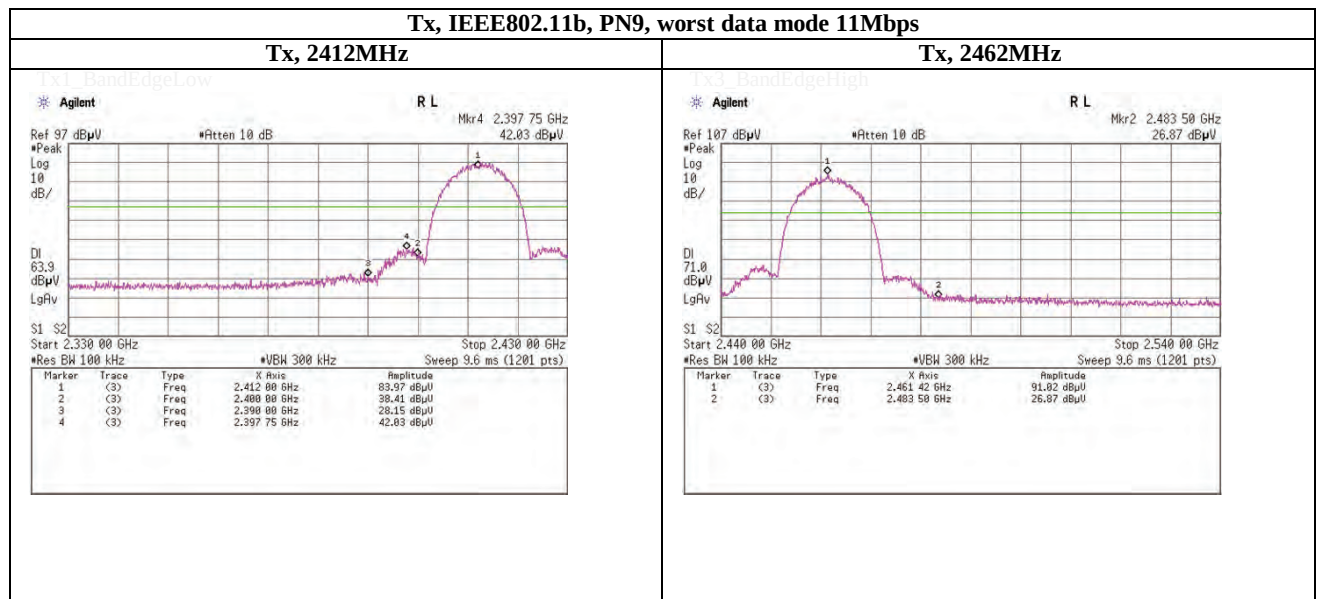
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Band Edge compliance



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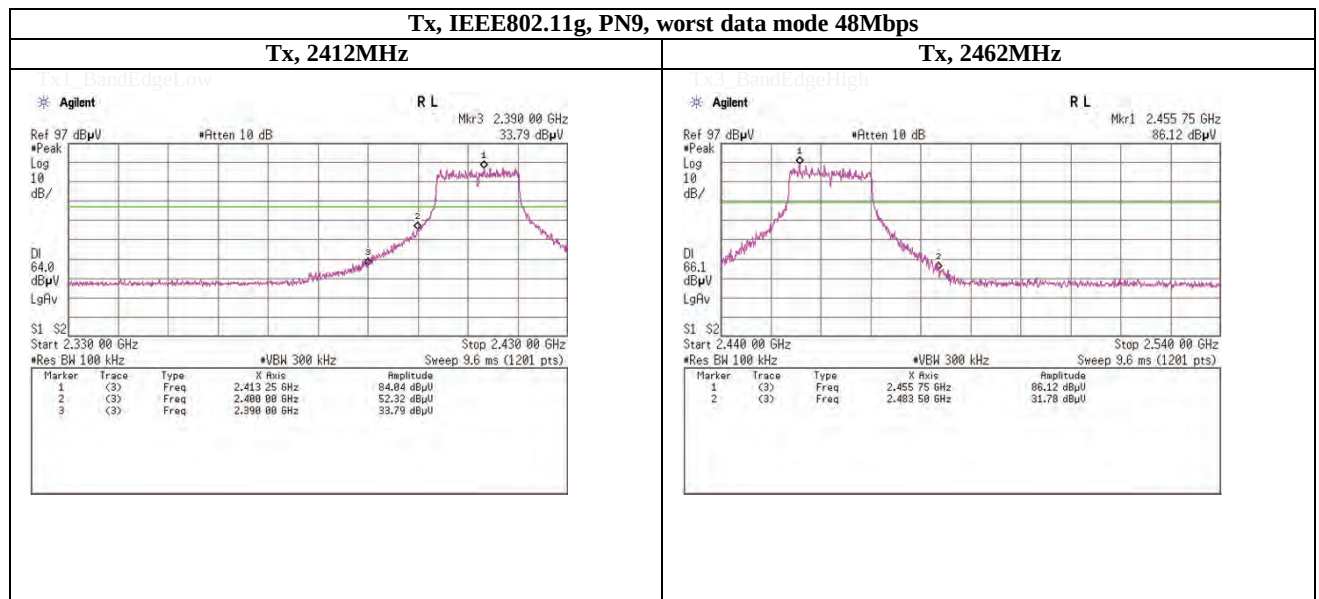
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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Spurious emission (Conducted)

Band Edge compliance



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Shonan EMC Lab.

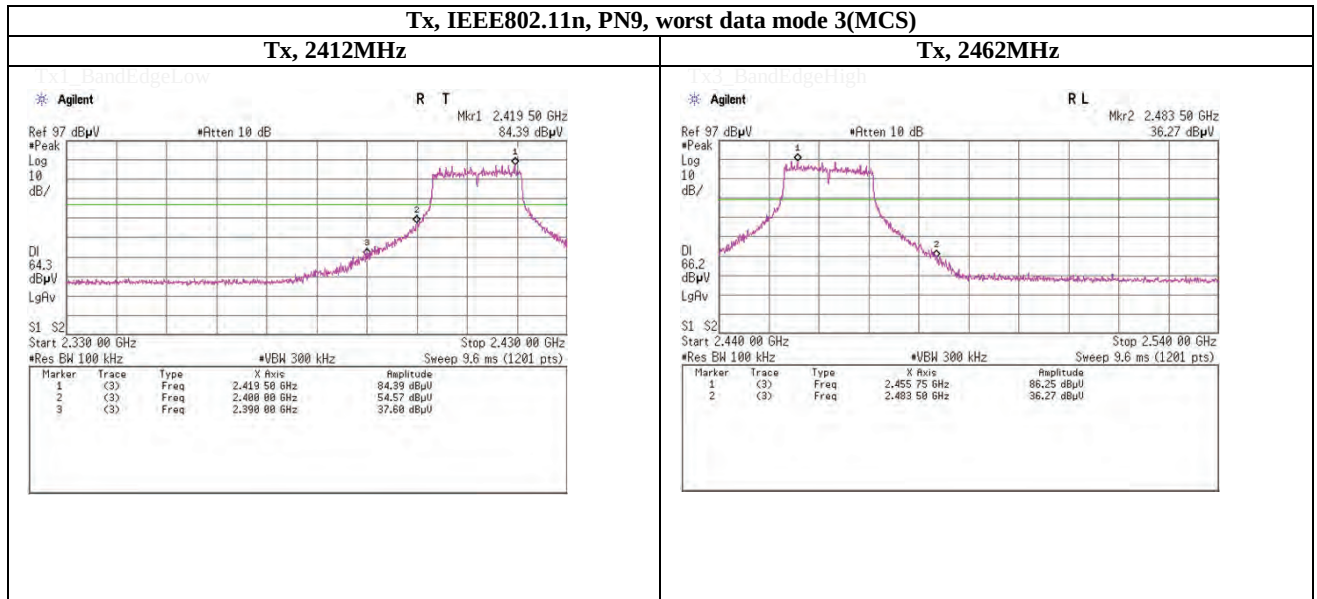
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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Spurious emission (Conducted)

Band Edge compliance



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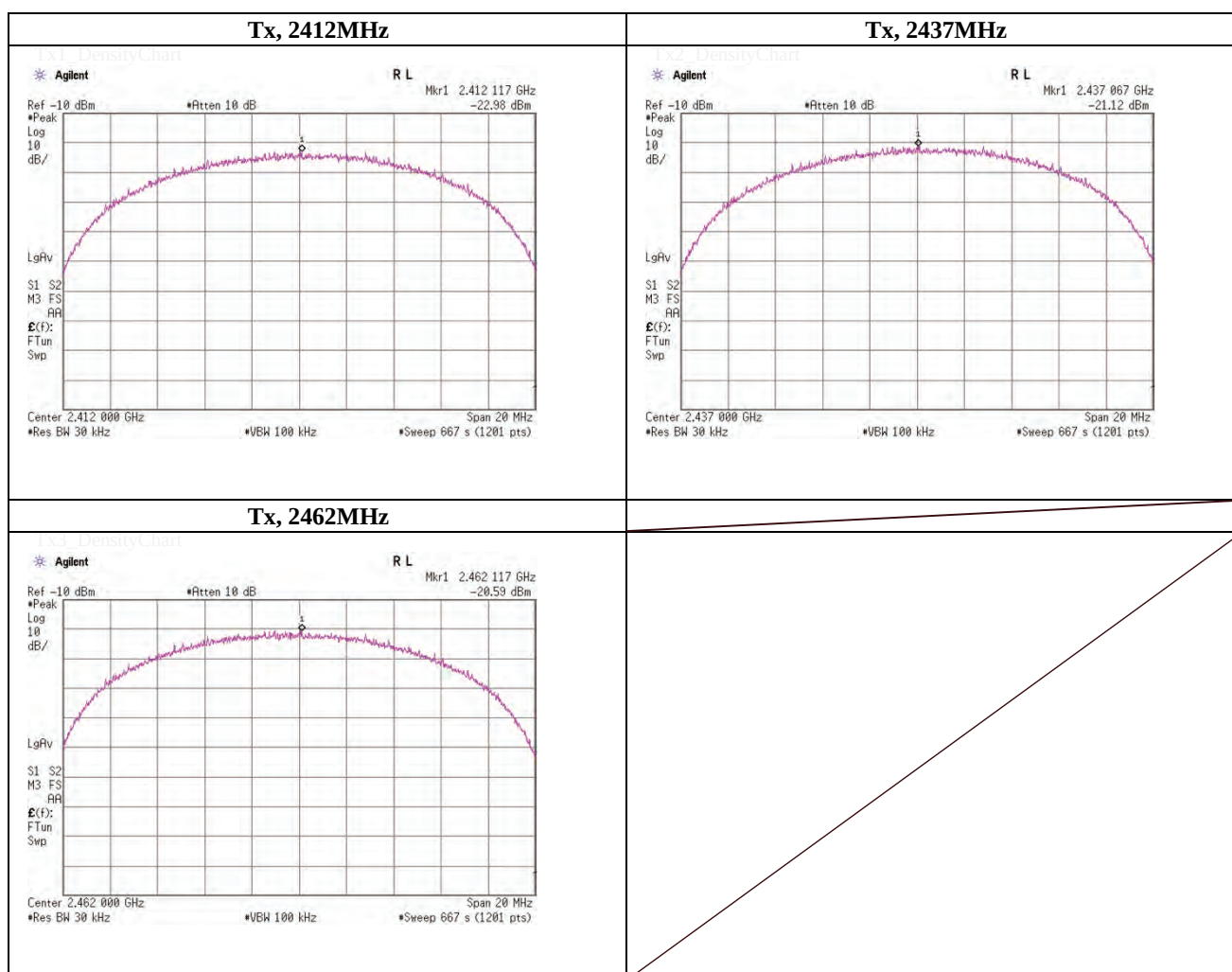
Power Density

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June22, 2012	
Temperature / Humidity	23deg.C , 54%RH	
Engineer	Makoto Hosaka	
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	2412.12	-22.98	1.50	20.15	-1.33	8.00	9.33
2437.0000	2437.07	-21.12	1.48	20.15	0.51	8.00	7.49
2462.0000	2462.12	-20.60	1.48	20.15	1.04	8.00	6.97

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss



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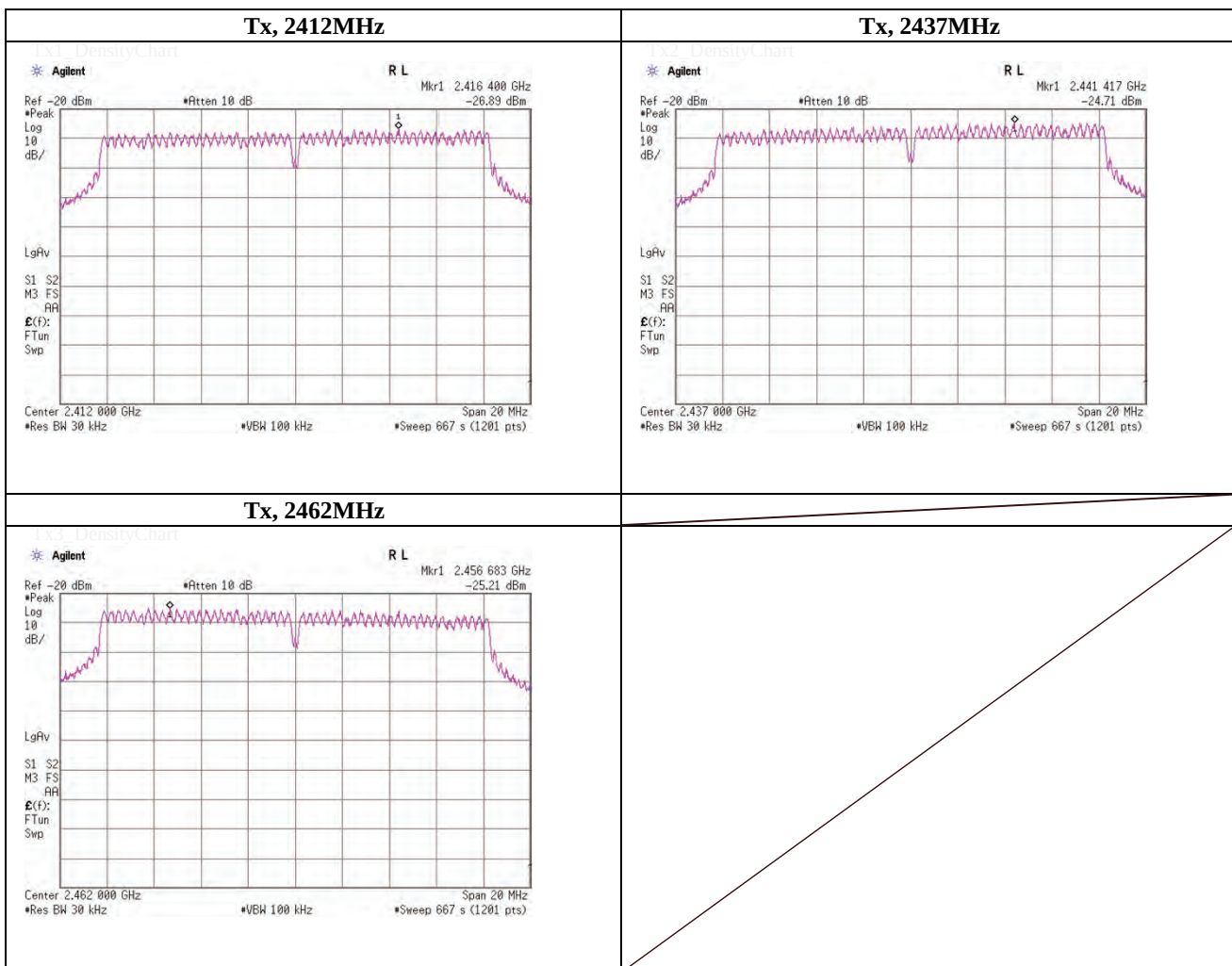
Power Density

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June22, 2012	
Temperature / Humidity	23deg.C , 54%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.11g, PN9, worst data mode 48Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2416.40	-26.89	1.50	20.15	-5.24	8.00	13.24
2437.0000	2441.42	-24.71	1.48	20.15	-3.08	8.00	11.08
2462.0000	2456.68	-25.21	1.48	20.15	-3.58	8.00	11.58

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss



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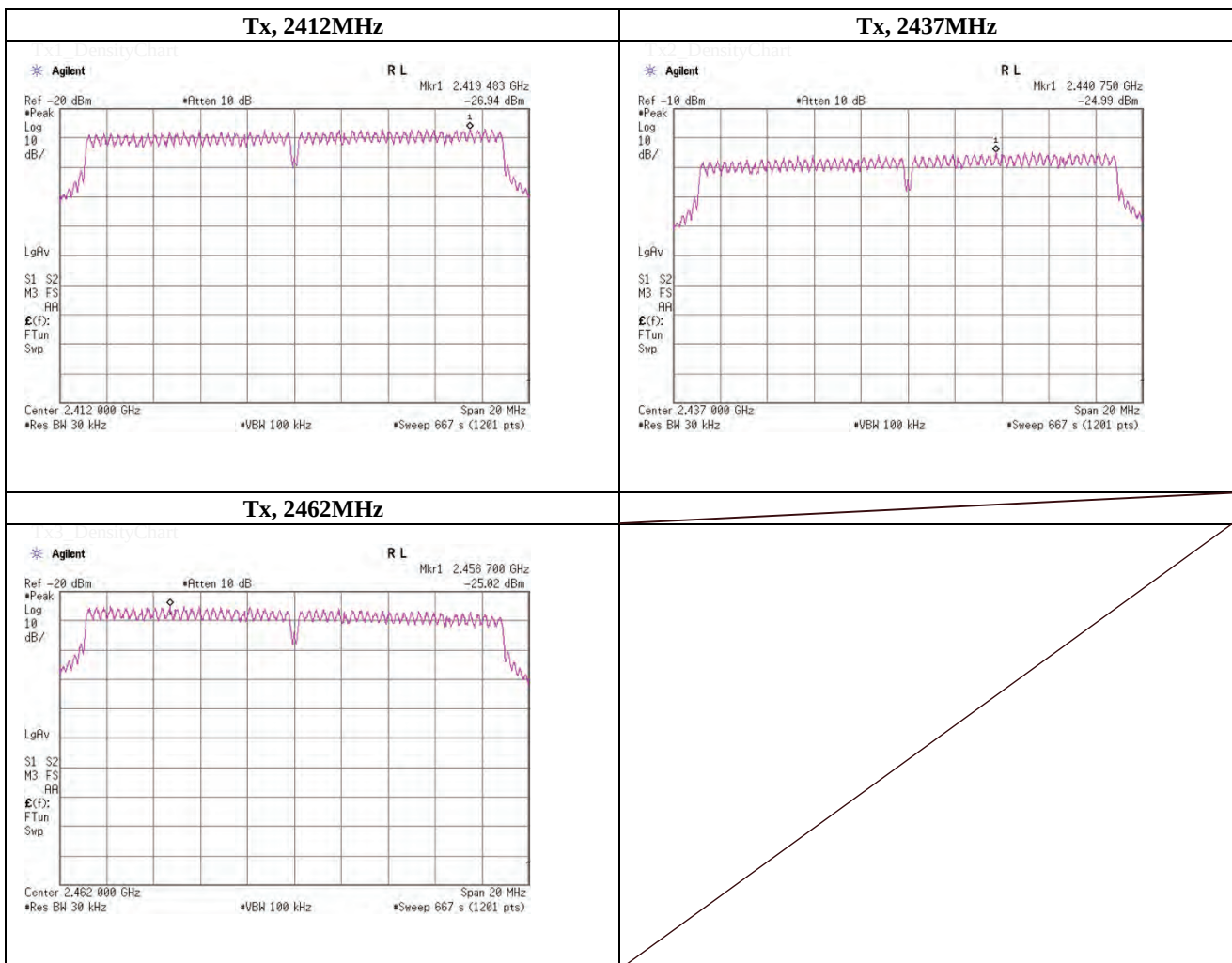
Power Density

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June22, 2012	
Temperature / Humidity	23deg.C , 54%RH	
Engineer	Makoto Hosaka	
Mode	Tx, IEEE802.11n, PN9, worst data mode 3(MCS)	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2419.48	-26.94	1.50	20.15	-5.29	8.00	13.29
2437.0000	2440.75	-24.99	1.48	20.15	-3.36	8.00	11.36
2462.0000	2456.70	-25.02	1.48	20.15	-3.39	8.00	11.39

Sample Calculation:

Result = Reading + Cable Loss + Atten. Loss



UL Japan, Inc.

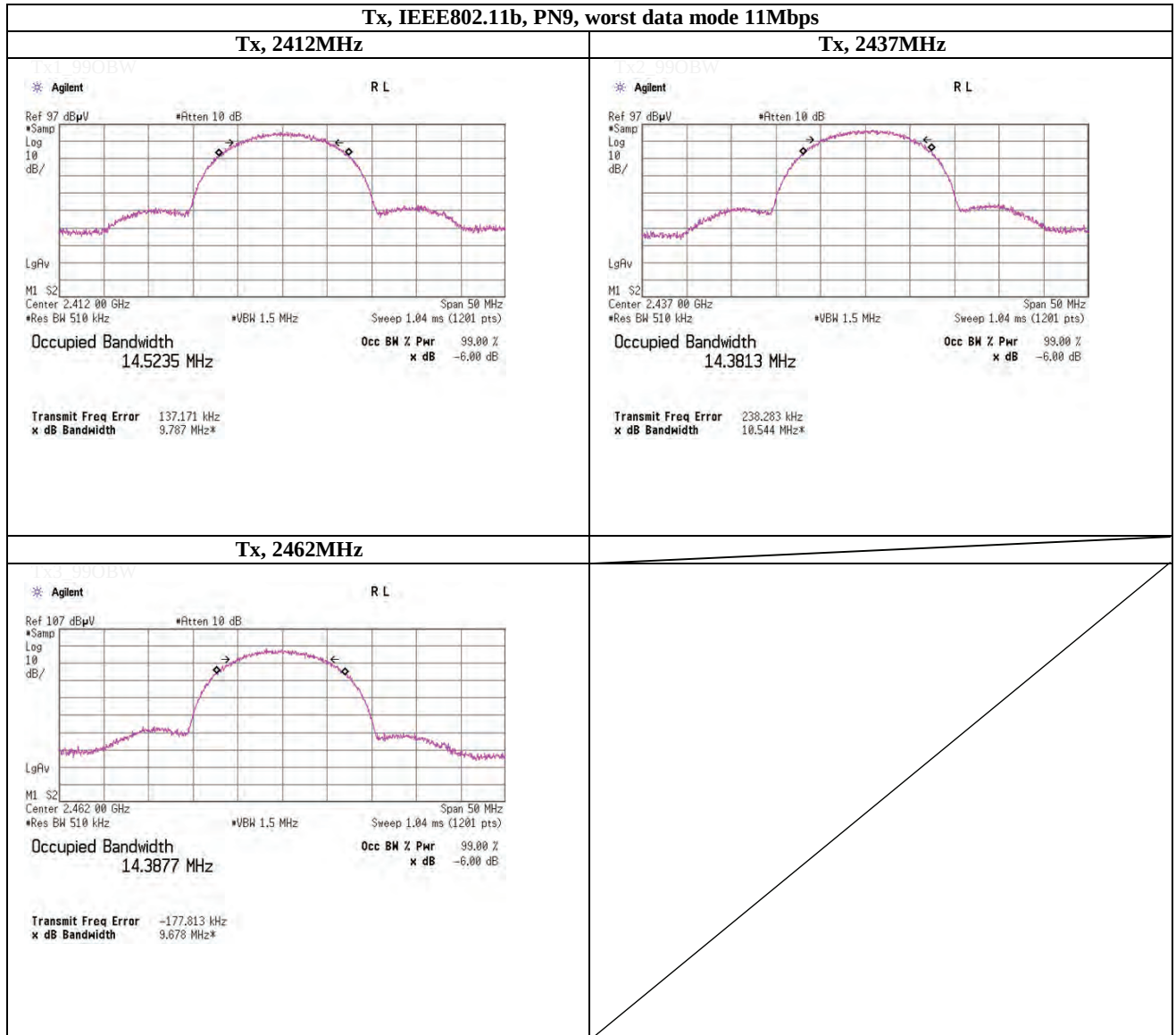
Shonan EMC Lab.

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99% Occupied Bandwidth



UL Japan, Inc.

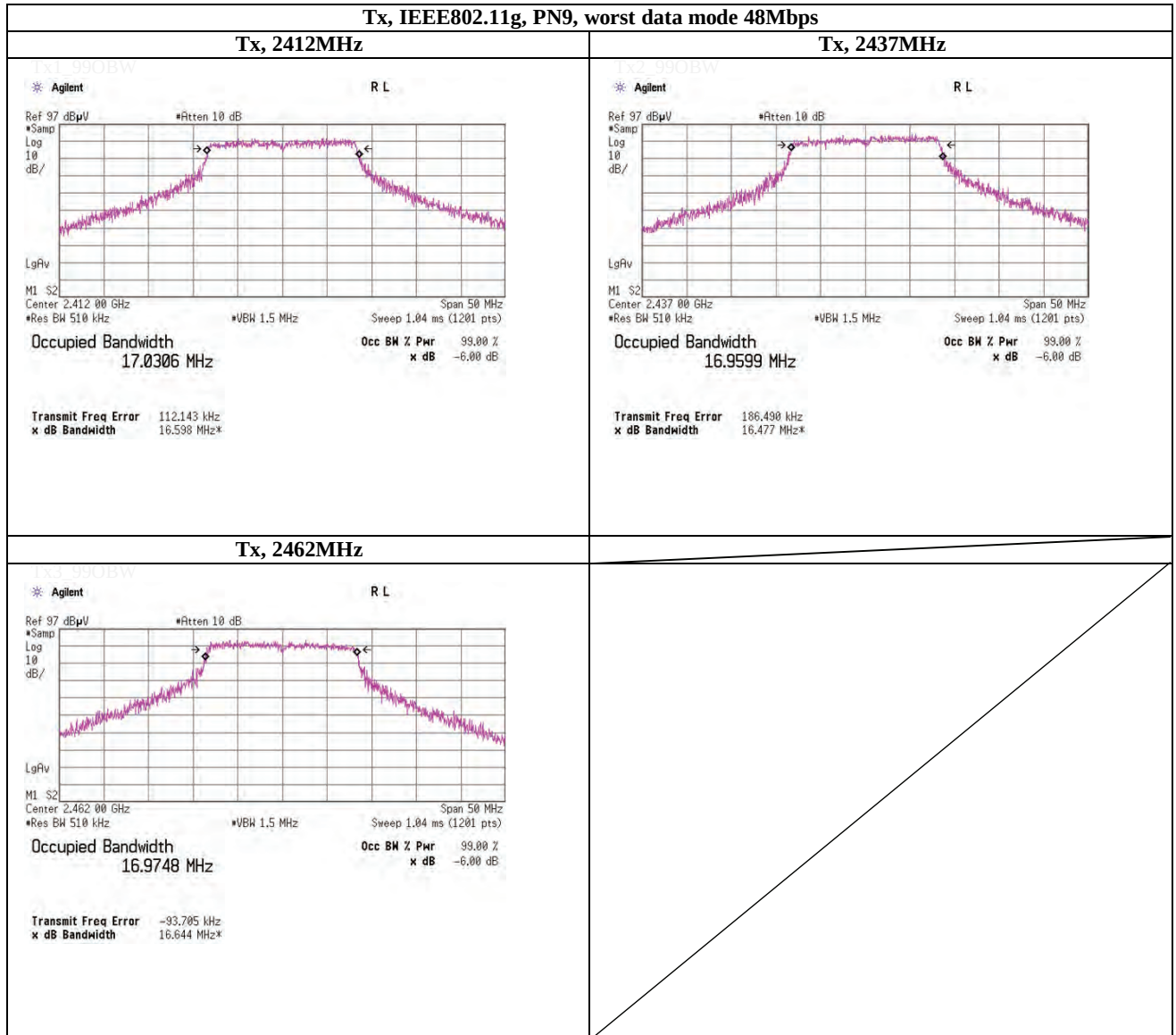
Shonan EMC Lab.

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99% Occupied Bandwidth



UL Japan, Inc.

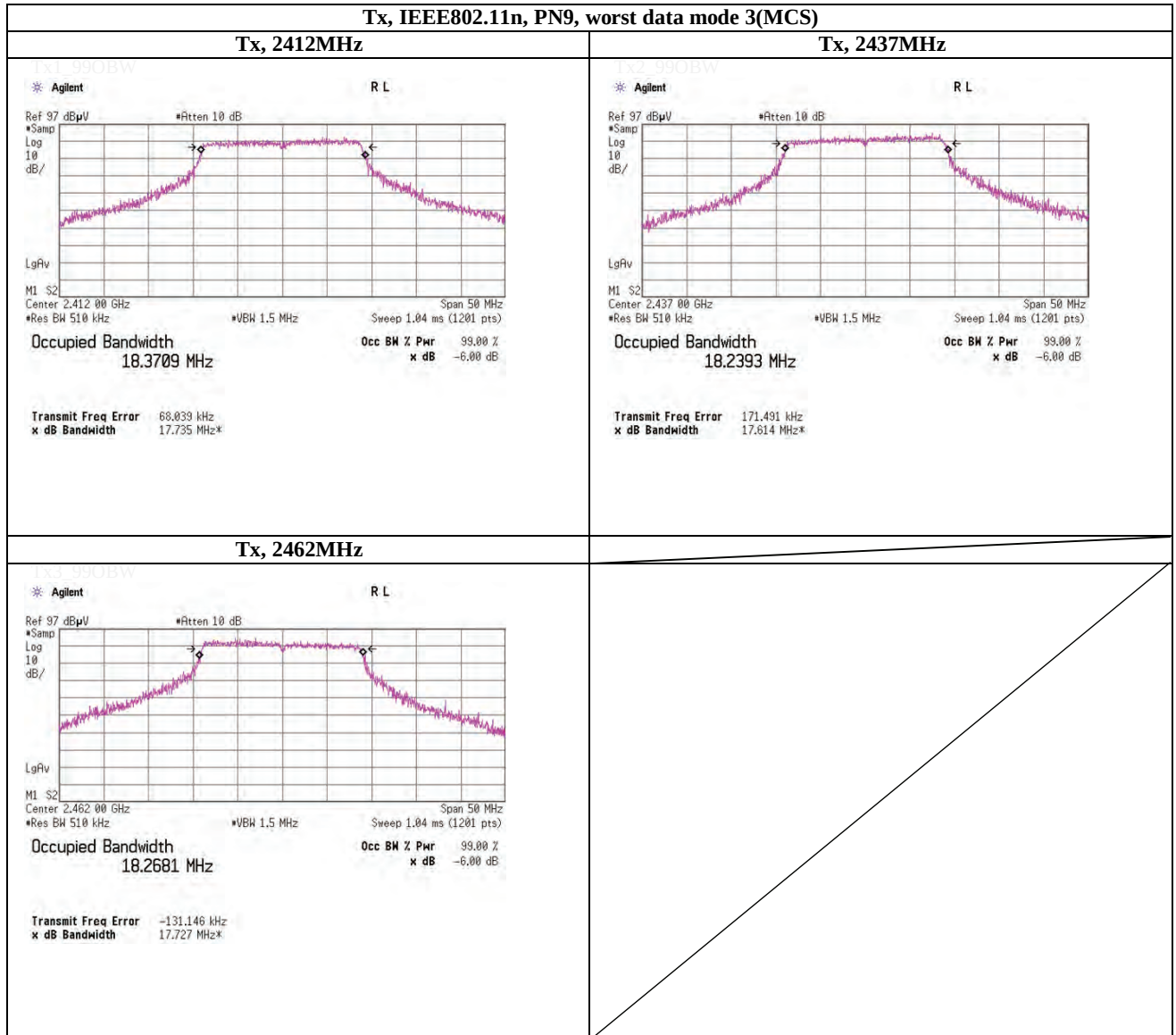
Shonan EMC Lab.

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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)
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2011/07/19 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2012/04/10 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2011/08/28 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2012/02/06 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	RE	2011/12/05 * 12
SJM-10	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF, MF)	-	RE	-
SAT20-01	Attenuator(above1GHz)	Agilent	8493C-020	74889	RE	2011/12/27 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SAT20-03	Attenuator	Agilent	8493C-020	74891	AT	2012/03/12 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2012/03/12 * 12
SCC-H1	Microwave cable	Hirose Electric	U.FL-2LP-066J1-A-(200)	-	AT	Pre Check
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2012/03/16 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT	2012/03/26 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2012/03/30 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2012/03/12 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2012/03/12 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2012/02/10 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2011/10/23 * 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/NS4906	-/0901-271(RF Selector)	RE	2012/04/10 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A0901	RE	2011/10/23 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2012/02/07 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2011/09/23 * 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 test