



RADIO TEST REPORT

Test Report No. : 32IE0294-SH-02-A

Applicant : SMK Corporation
Type of Equipment : ZigBee RF4CE-compatible RF receiver
Model No. : SSR-RFNANO
FCC ID : GT3FC015
Test regulation : FCC Part15 Subpart C: 2012
Test result : Complied

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3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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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: May 18 to 19, 2012

Representative test engineer:

Akio Hayashi
Engineer of WiSE Japan,
UL Verification Service

Approved by :

Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service

- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
 There is no testing item of "Non-accreditation".



JAB
Testing
RTL02610

UL Japan, Inc.

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 : +81-3-3785-1111
Facsimile Number : +81-3-3785-1878
Contact Person : Mitsuhiro Goto

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

2.1 Identification of E.U.T.

Type of Equipment : ZigBee RF4CE-compatible RF receiver
Model No. : SSR-RFNANO
Serial No. : Refer to 4.2 in this report.
Rating : DC3.4 to 5.5V (USB)
Receipt Date of Sample : May 18, 2012
Country of Mass-production : China, Japan, Malaysia, USA, Mexico, Hungary
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: SSR-RFNANO (referred to as the EUT in this report) is a ZigBee RF4CE-compatible RF receiver.

Clock frequency(ies) in the system : 32MHz, 32kHz

Radio specification

Equipment type : Transceiver
Frequency of operation : 2425-2475MHz
Bandwidth & channel spacing : 2MHz & 5MHz
Type of modulation : OQPSK
Antenna type : Chip Antenna
Antenna connector type : None
Antenna gain with cable loss : +2.5dBi
ITU code : G1D
Operation temperature range : -20 to +70 deg.C.

FCC 15.31 (e)

The stable voltage (DC3.3V) is constantly provided with the RF transmitter through the regulator. Therefore, this EUT complies with the requirement.

FCC 15.203

It is impossible for end users to replace the antenna, because the antenna is mounted inside of 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: 2012
final revised on March 30, 2012 and effective April 30, 2012
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 complies with FCC Part 15 Subpart B. Refer to the test report: 32IE0294-SH-02-C.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A	14.2dB Freq.: 0.20300MHz Detector: Quasi-Peak Phase: L1 Mode: Tx 2425MHz	Complied
6dB bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(2) & 15.209	Conducted	N/A	* See data	Complied
Maximum peak output power	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (b)(3) & 15.209	Conducted	N/A		Complied
Spurious emission & Restricted band edges	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.109, 15.247 (d) & 15.209	Conducted / Radiated	N/A	7.9dB Freq.: 497.788MHz Detector: Quasi-Peak Polarization: Vertical Mode: Tx 2475MHz	Complied
Power density	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (e) & 15.209	Conducted	N/A	* See data	Complied

Note: UL Japan's Work Procedures No.13-EM-W0420 and 13-EM-W0422
These tests were also referred to "Guidance on Measurement for Digital Transmission Systems Section15.247".

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) AMN/LISN	150kHz-30MHz	3.6 dB	3.6 dB	3.6 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	5.0 dB
	300MHz-1GHz	5.0 dB	5.2 dB	5.0 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	4.8 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 site margin.

Radiated emission test

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

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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 Full-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 checked="" 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	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

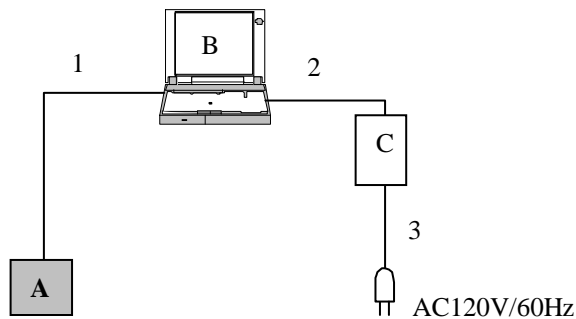
4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Mode	Tested frequency
All items	Transmitting	2425MHz, 2450MHz, 2475MHz
*1) Software: "CC2531app[201008181656].exe" ver.0		
*2) Power setting: D5		

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	ZigBee RF4CE-compatible RF receiver	SSR-RFNANO	*1)	SMK	EUT
B	Personal Computer	PC-LW43H23D6 U	020167HA	NEC	-
C	AC Adapter	ADP-50MB	4500187DC	NEC	-

1) 3: Conducted emission and Radiated emission, 1: Other test

List of cables used

No.	Cable	Length (m)	Shield-Cable	Shield-Connector	Remarks
1	USB	3.0	Shielded	Shielded	-
2	DC	1.8	Unshielded	Unshielded	-
3	AC	1.8	Unshielded	Unshielded	-

* All cables used for the measurement are exclusive use or marketed.

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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 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 and excess AC cable was bundled in center. 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 PC within a shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN) via PC. 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 detector of the test receiver.

Detector 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.

Summary of the test results: Pass
Refer to APPENDIX 1

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SECTION 7: Maximum peak output power

Test procedure

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

Detection type: Peak / Average *1)

Summary of the test results: Pass

Refer to APPENDIX 1

*1) Testing using an average detector was performed in order to confirm that the output power of the EUT met the exclusion limits stated in FCC Part 2 Section 2.1093 and FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET 65 and the EUT was exempt from RF exposure SAR evaluation.

SECTION 8: Spurious emission (Antenna port conducted)

Test procedure

The spurious emission 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 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 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). 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	
Detection type	Quasi-Peak	Peak	* Average
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz

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

The test was performed with VBW 10Hz since the EUT had no intervals during which the transmitter was off (see APPENDIX).

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

Worst position:

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

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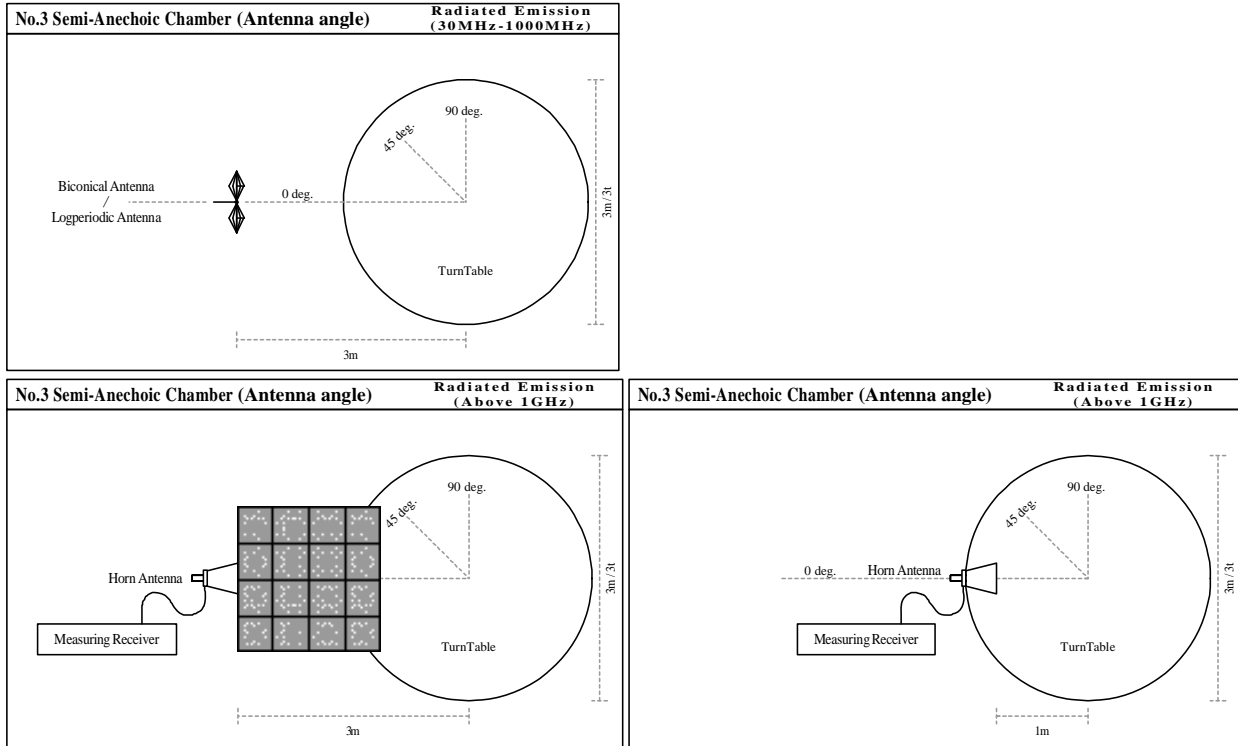
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Figure 1. Antenna angle



9.5 Band edge

Band edge level is below the limits of FCC 15.209. Refer to the data.

9.6 Results

Summary of the test results : Pass *No noise was detected above the 6th order harmonics.
 Refer to APPENDIX 1

SECTION 10: 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 : 3kHz / 10kHz

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

Summary of the test results: Pass
 Refer to APPENDIX 1

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Contents of APPENDIXES

APPENDIX 1: Data of radio test

Conducted emission
6dB bandwidth
Maximum peak output power
Radiated emission
Spurious emission (Antenna port conducted)
Peak power density
99% Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Conducted emission
Radiated emission
Pre-check of the worst position

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Appendix1 :Data of radio test

Conducted Emission

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Date : 2012/05/19

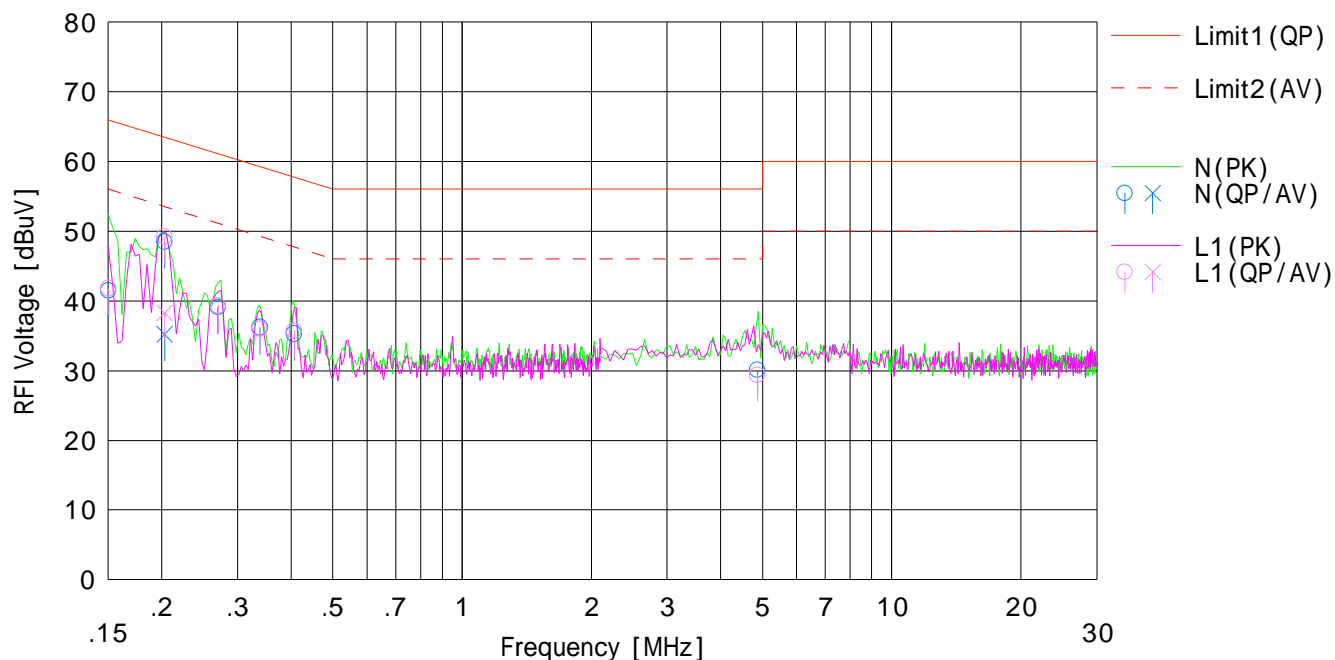
Company : SMK Corporation
Kind of EUT : ZigBee RF4CE - compatible RF receiver
Model No. : SSR - RFNANO
Serial No. : 3

Mode : Transmitting(2425MHz)
Report No. : 32IE0294 - SH - 02 - A
Power : AC120V / 60Hz
Temp./Humi. : 24deg.C / 47%RH

Remarks : -

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

Engineer : Wataru Kojima



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dB]	[dB]	[dB]	[dB]		
1	0.15041	28.9	---	12.6	41.5	---	65.9	55.9	24.4	---	N	
2	0.20300	35.9	22.6	12.6	48.5	35.2	63.4	53.4	14.9	18.2	N	
3	0.27030	26.5	---	12.6	39.1	---	61.1	51.1	22.0	---	N	
4	0.33850	23.6	---	12.6	36.2	---	59.2	49.2	23.0	---	N	
5	0.40632	22.7	---	12.6	35.3	---	57.7	47.7	22.4	---	N	
6	4.86800	17.3	---	12.8	30.1	---	56.0	46.0	25.9	---	N	
7	0.15000	29.2	---	12.6	41.8	---	66.0	56.0	24.2	---	L1	
8	0.20300	36.6	25.7	12.6	49.2	38.3	63.4	53.4	14.2	15.1	L1	
9	0.27090	26.7	---	12.6	39.3	---	61.0	51.0	21.7	---	L1	
10	0.33790	23.4	---	12.6	36.0	---	59.2	49.2	23.2	---	L1	
11	0.40620	23.1	---	12.6	35.7	---	57.7	47.7	22.0	---	L1	
12	4.86800	16.6	---	12.8	29.4	---	56.0	46.0	26.6	---	L1	

Conducted Emission

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2012/05/19

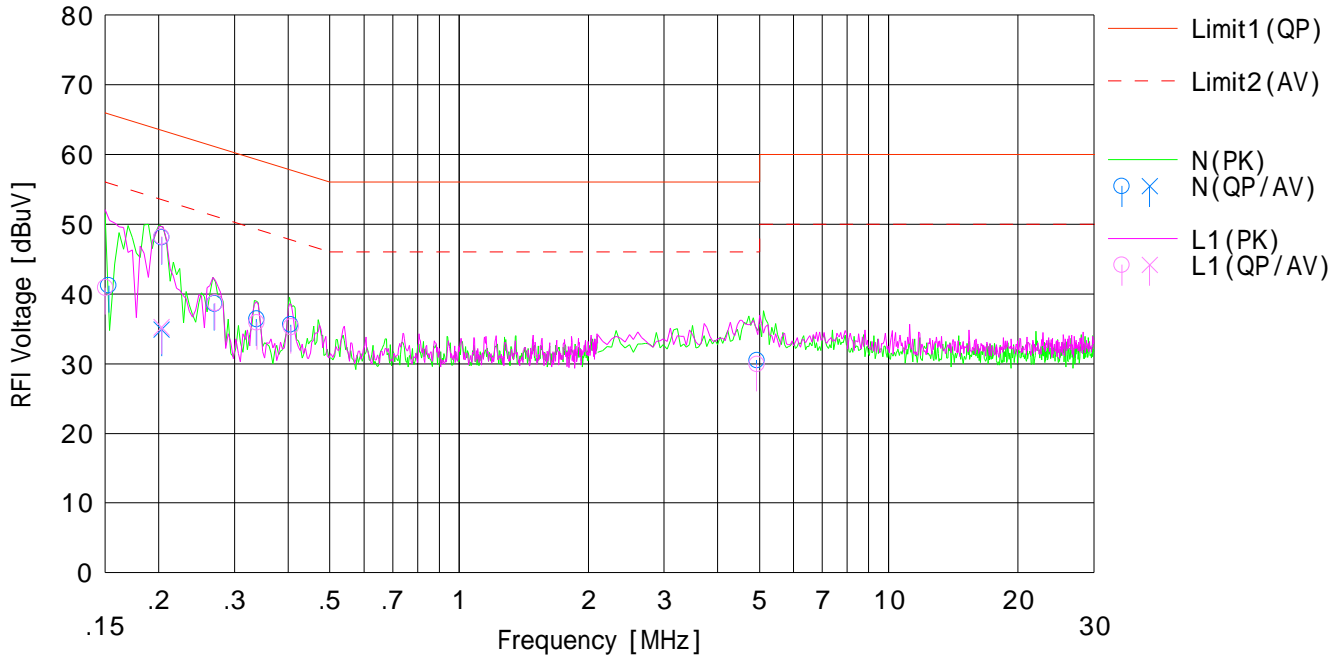
Company : SMK Corporation
Kind of EUT : ZigBee RF4CE-compatible RF receiver
Model No. : SSR-RFNANO
Serial No. : 3

Mode : Transmitting(2450MHz)
Report No. : 32IE0294-SH-02-A
Power : AC120V / 60Hz
Temp./Humi. : 24deg.C / 47%RH

Remarks : -

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

Engineer : Wataru Kojima



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15301	28.6	---	12.6	41.2	---	65.8	55.8	24.6	---	N	
2	0.20300	35.5	22.3	12.6	48.1	34.9	63.4	53.4	15.3	18.5	N	
3	0.26940	26.0	---	12.6	38.6	---	61.1	51.1	22.5	---	N	
4	0.33768	23.8	---	12.6	36.4	---	59.2	49.2	22.8	---	N	
5	0.40516	23.0	---	12.6	35.6	---	57.7	47.7	22.1	---	N	
6	4.93136	17.7	---	12.8	30.5	---	56.0	46.0	25.5	---	N	
7	0.15000	28.3	---	12.6	40.9	---	66.0	56.0	25.1	---	L1	
8	0.20300	35.6	22.6	12.6	48.2	35.2	63.4	53.4	15.2	18.2	L1	
9	0.27000	26.1	---	12.6	38.7	---	61.1	51.1	22.4	---	L1	
10	0.33780	23.3	---	12.6	35.9	---	59.2	49.2	23.3	---	L1	
11	0.40572	22.7	---	12.6	35.3	---	57.7	47.7	22.4	---	L1	
12	4.93136	17.1	---	12.8	29.9	---	56.0	46.0	26.1	---	L1	

Conducted Emission

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2012/05/19

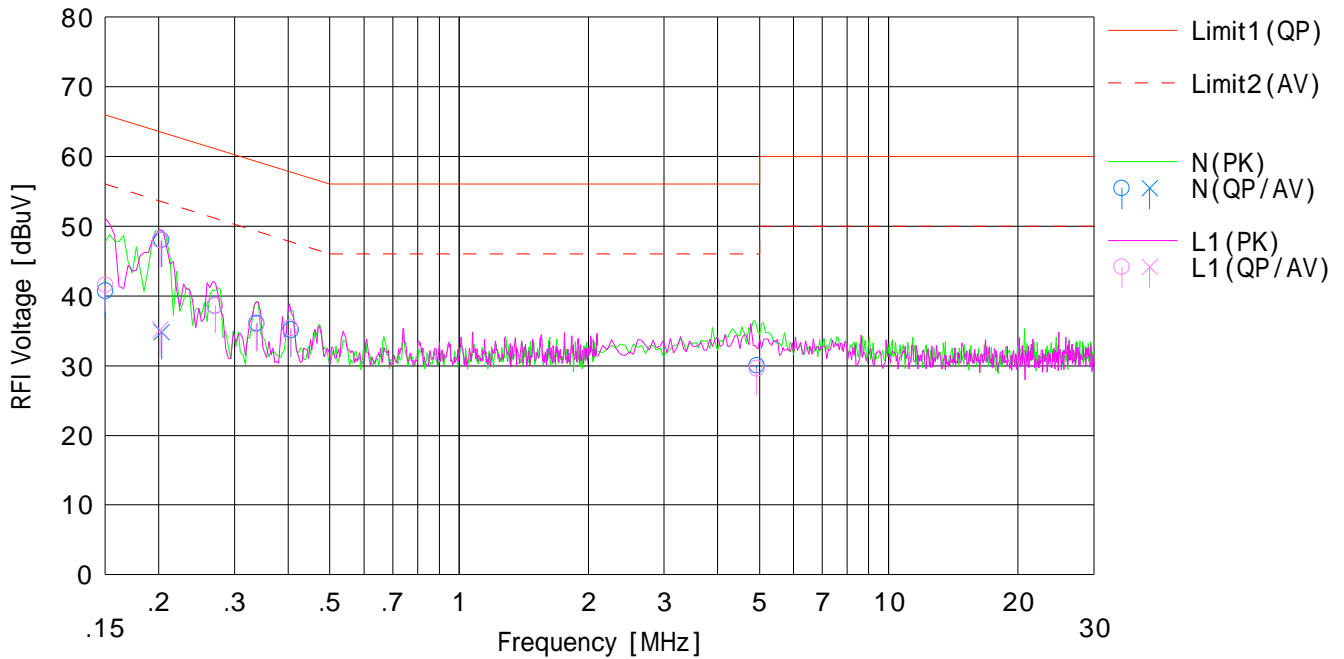
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Remarks : -

Limit1 : FCC 15C(15.207) QP
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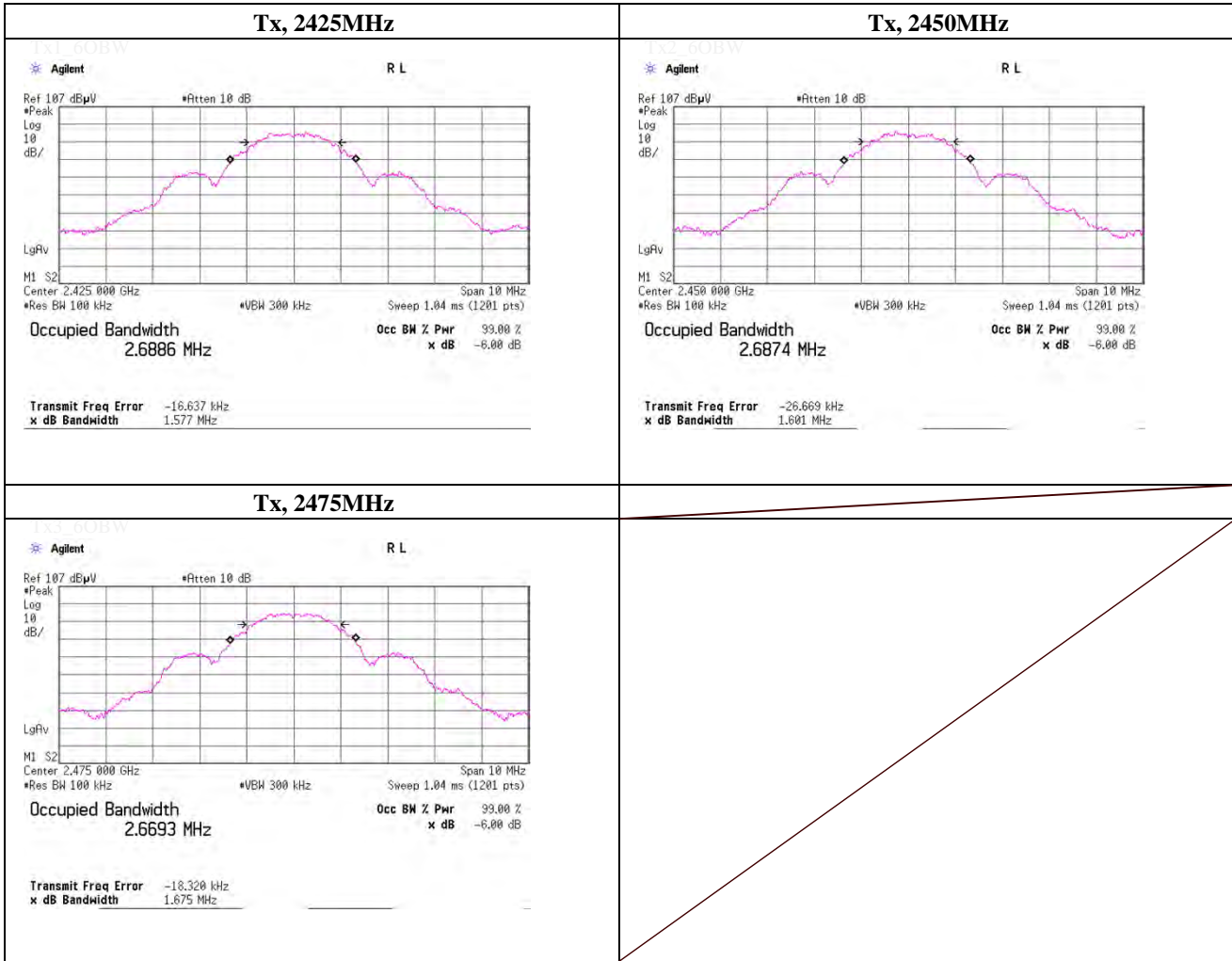


No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.1	---	12.6	40.7	---	65.9	55.9	25.2	---	N	
2	0.20300	35.4	22.2	12.6	48.0	34.8	63.4	53.4	15.4	18.6	N	
3	0.27060	26.0	---	12.6	38.6	---	61.0	51.0	22.4	---	N	
4	0.33770	23.5	---	12.6	36.1	---	59.2	49.2	23.1	---	N	
5	0.40590	22.5	---	12.6	35.1	---	57.7	47.7	22.6	---	N	
6	4.92900	17.2	---	12.8	30.0	---	56.0	46.0	26.0	---	N	
7	0.15000	29.0	---	12.6	41.6	---	65.9	55.9	24.3	---	L1	
8	0.20123	35.4	22.5	12.6	48.0	35.1	63.5	53.5	15.5	18.4	L1	
9	0.27060	26.0	---	12.6	38.6	---	61.0	51.0	22.4	---	L1	
10	0.33740	23.3	---	12.6	35.9	---	59.2	49.2	23.3	---	L1	
11	0.40560	22.8	---	12.6	35.4	---	57.7	47.7	22.3	---	L1	
12	4.92900	16.8	---	12.8	29.6	---	56.0	46.0	26.4	---	L1	

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	May 18, 2012	
Temperature / Humidity	26deg.C , 52%RH	
Engineer	Akio Hayashi	
Mode	Tx, Transmitting, PN9	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2425.0000	1.577	> 0.500
2450.0000	1.601	> 0.500
2475.0000	1.675	> 0.500



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Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date May 18, 2012
 Temperature / Humidity 26deg.C , 52%RH
 Engineer Akio Hayashi
 Mode Tx, Transmitting, PN9

(* 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	2425.0	-10.56	1.09	10.00	0.53	1.13	30.00	1000	29.47
Mid	2450.0	-10.53	1.09	10.00	0.56	1.14	30.00	1000	29.44
High	2475.0	-10.69	1.10	10.00	0.41	1.10	30.00	1000	29.59

Sample Calculation:

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

Sample Calculation:

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

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Average Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date May 18, 2012
 Temperature / Humidity 26deg.C , 52%RH
 Engineer Akio Hayashi
 Mode Tx, Transmitting, PN9

(* P/M: Power Meter with power sensor, AV: Average with gate trigger mode)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
					[dBm]	[mW]
Low	2425.0	-11.04	1.09	10.00	0.05	1.01
Mid	2450.0	-11.03	1.09	10.00	0.06	1.01
High	2475.0	-11.17	1.10	10.00	-0.07	0.98

Sample Calculation:

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

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date May 18, 2012 May 19, 2012
Temperature / Humidity 24 deg.C , 49%RH 25 deg.C , 39%RH
Engineer Wataru Kojima Akio Hayashi
Mode Tx, 2425 MHz
 Tx, Transmitting, PN9

(* 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.	373.340	QP	38.7	15.7	8.9	32	31.3	46	14.7	150	343	
Hori.	2390.000	PK	45.7	27.2	14.1	41.1	45.9	73.9	28.0	100	147	
Hori.	2400.000	PK	46	27.3	14.1	41.1	46.3	73.9	27.6	100	147	
Hori.	4850.000	PK	53.2	31.2	6.6	41	50	73.9	23.9	113	262	
Hori.	7275.000	PK	47.6	36.7	8.3	41.4	51.2	73.9	22.7	100	0	
Hori.	9700.000	PK	44.3	38.4	9.3	38.8	53.2	73.9	20.7	100	0	
Hori.	2390.000	AV	34.2	27.2	14.1	41.1	34.4	53.9	19.5	100	147	
Hori.	2400.000	AV	34.2	27.3	14.1	41.1	34.5	53.9	19.4	100	147	
Hori.	4850.000	AV	48.1	31.2	6.6	41	44.9	53.9	9.0	113	262	
Hori.	7275.000	AV	35.2	36.7	8.3	41.4	38.8	53.9	15.1	100	0	
Hori.	9700.000	AV	32.3	38.4	9.3	38.8	41.2	53.9	12.7	100	0	
Vert.	45.910	QP	33.4	12.4	6.7	32.2	20.3	40	19.7	100	266	
Vert.	100.226	QP	45.5	9.8	7.2	32.1	30.4	43.5	13.1	100	257	
Vert.	101.877	QP	38.9	10	7.2	32.1	24	43.5	19.5	100	126	
Vert.	334.028	QP	34.6	14.8	8.7	32	26.1	46	19.9	100	258	
Vert.	373.340	QP	42.6	15.7	8.9	32	35.2	46	10.8	100	206	
Vert.	497.794	QP	39.5	17.7	9.4	32	34.6	46	11.4	295	190	
Vert.	2390.000	PK	47	27.2	14.1	41.1	47.2	73.9	26.7	100	83	
Vert.	2400.000	PK	46.6	27.3	14.1	41.1	46.9	73.9	27.0	100	83	
Vert.	4850.000	PK	52.2	31.2	6.6	41	49	73.9	24.9	100	241	
Vert.	7275.000	PK	47.4	36.7	8.3	41.4	51	73.9	22.9	100	0	
Vert.	9700.000	PK	44.7	38.4	9.3	38.8	53.6	73.9	20.3	100	0	
Vert.	12125.000	PK	45.1	39.3	10.5	39.2	55.7	73.9	18.2	100	0	
Vert.	2390.000	AV	34.1	27.2	14.1	41.1	34.3	53.9	19.6	100	83	
Vert.	2400.000	AV	34.2	27.3	14.1	41.1	34.5	53.9	19.4	100	83	
Vert.	4850.000	AV	46.8	31.2	6.6	41	43.6	53.9	10.3	100	241	
Vert.	7275.000	AV	35.3	36.7	8.3	41.4	38.9	53.9	15.0	100	0	
Vert.	9700.000	AV	32.3	38.4	9.3	38.8	41.2	53.9	12.7	100	0	
Vert.	12125.000	AV	32.5	39.3	10.5	39.2	43.1	53.9	10.8	100	0	

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).

Distance factor : 15GHz -26.5GHz : 20log(3.0m/1.0m)= 9.5dB

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
 Date May 18, 2012 May 19, 2012
 Temperature / Humidity 24 deg.C , 49%RH 25 deg.C , 39%RH
 Engineer Wataru Kojima Akio Hayashi
 Mode Tx, 2450 MHz
 Tx, Transmitting, PN9

(* 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.	497.785	QP	40	17.7	9.4	32	35.1	46	10.9	176	155	
Hori.	4900.000	PK	53.3	31.3	6.7	40.9	50.4	73.9	23.5	100	90	
Hori.	7350.000	PK	47.7	36.8	8.5	41.4	51.6	73.9	22.3	135	199	
Hori.	9800.000	PK	44.2	38.6	9.4	38.8	53.4	73.9	20.5	100	0	
Hori.	12250.000	PK	44.8	39.3	10.7	39.2	55.6	73.9	18.3	100	0	
Hori.	4900.000	AV	45.7	31.3	6.7	40.9	42.8	53.9	11.1	100	90	
Hori.	7350.000	AV	35	36.8	8.5	41.4	38.9	53.9	15.0	135	199	
Hori.	9800.000	AV	32.6	38.6	9.4	38.8	41.8	53.9	12.1	100	0	
Hori.	12250.000	AV	32.2	39.3	10.7	39.2	43	53.9	10.9	100	0	
Vert.	48.000	QP	39.8	11.7	6.8	32.2	26.1	40	13.9	100	154	
Vert.	100.229	QP	41	9.8	7.3	32.1	26	43.5	17.5	100	260	
Vert.	334.091	QP	34.2	14.8	8.7	32	25.7	46	20.3	100	136	
Vert.	373.340	QP	37.5	15.7	8.9	32	30.1	46	15.9	100	297	
Vert.	467.680	QP	34.9	17.3	9.3	32	29.5	46	16.5	100	172	
Vert.	497.785	QP	41.1	17.7	9.4	32	36.2	46	9.8	214	2	
Vert.	4900.000	PK	53.4	31.3	6.7	40.9	50.5	73.9	23.4	100	57	
Vert.	7350.000	PK	47.3	36.8	8.5	41.4	51.2	73.9	22.7	100	0	
Vert.	9800.000	PK	44.2	38.6	9.4	38.8	53.4	73.9	20.5	100	0	
Vert.	12250.000	PK	44.6	39.3	10.7	39.2	55.4	73.9	18.5	100	0	
Vert.	4900.000	AV	46	31.3	6.7	40.9	43.1	53.9	10.8	100	57	
Vert.	7350.000	AV	34.8	36.8	8.5	41.4	38.7	53.9	15.2	100	0	
Vert.	9800.000	AV	32	38.6	9.4	38.8	41.2	53.9	12.7	100	0	
Vert.	12250.000	AV	32.2	39.3	10.7	39.2	43	53.9	10.9	100	0	

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).

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

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date May 18, 2012 May 19, 2012
Temperature / Humidity 24 deg.C , 49%RH 25 deg.C , 39%RH
Engineer Wataru Kojima Akio Hayashi
Mode Tx, 2475 MHz
 Tx, Transmitting, PN9

(* 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.	497.788	QP	38.9	17.7	9.4	32	34	46	12.0	177	171	
Hori.	2483.500	PK	48.3	27.5	14.2	41.1	48.9	73.9	25.0	100	135	
Hori.	4950.000	PK	54.8	31.4	6.7	40.9	52	73.9	21.9	107	260	
Hori.	7425.000	PK	46.1	37	8.5	41.5	50.1	73.9	23.8	100	0	
Hori.	9900.000	PK	44	38.8	9.4	38.8	53.4	73.9	20.5	100	0	
Hori.	12375.000	PK	43.7	39.4	10.7	39.2	54.6	73.9	19.3	100	0	
Hori.	2483.500	AV	36.1	27.5	14.2	41.1	36.7	53.9	17.2	100	135	
Hori.	4950.000	AV	47.6	31.4	6.7	40.9	44.8	53.9	9.1	107	260	
Hori.	7425.000	AV	35.2	37	8.5	41.5	39.2	53.9	14.7	100	0	
Hori.	9900.000	AV	32.2	38.8	9.4	38.8	41.6	53.9	12.3	100	0	
Hori.	12375.000	AV	31.8	39.4	10.7	39.2	42.7	53.9	11.2	100	0	
Vert.	48.000	QP	38.5	11.7	6.8	32.2	24.8	40	15.2	100	83	
Vert.	100.230	QP	50.2	9.8	7.2	32.1	35.1	43.5	8.4	100	132	
Vert.	124.445	QP	39.7	13.1	7.4	32.1	28.1	43.5	15.4	100	64	
Vert.	373.340	QP	40.1	15.7	8.9	32	32.7	46	13.3	100	125	
Vert.	467.644	QP	40.8	17.3	9.3	32	35.4	46	10.6	100	189	
Vert.	497.788	QP	43	17.7	9.4	32	38.1	46	7.9	100	187	
Vert.	2483.500	PK	47.4	27.5	14.2	41.1	48	73.9	25.9	100	183	
Vert.	4950.000	PK	54.1	31.4	6.7	40.9	51.3	73.9	22.6	100	130	
Vert.	7425.000	PK	46.1	37	8.5	41.5	50.1	73.9	23.8	100	0	
Vert.	9900.000	PK	43	38.8	9.4	38.8	52.4	73.9	21.5	100	0	
Vert.	12375.000	PK	43.7	39.4	10.7	39.2	54.6	73.9	19.3	100	0	
Vert.	2483.500	AV	34.4	27.5	14.2	41.1	35	53.9	18.9	100	183	
Vert.	4950.000	AV	47	31.4	6.7	40.9	44.2	53.9	9.7	100	130	
Vert.	7425.000	AV	34.5	37	8.5	41.5	38.5	53.9	15.4	100	0	
Vert.	9900.000	AV	32.2	38.8	9.4	38.8	41.6	53.9	12.3	100	0	
Vert.	12375.000	AV	31.8	39.4	10.7	39.2	42.7	53.9	11.2	100	0	

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).

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

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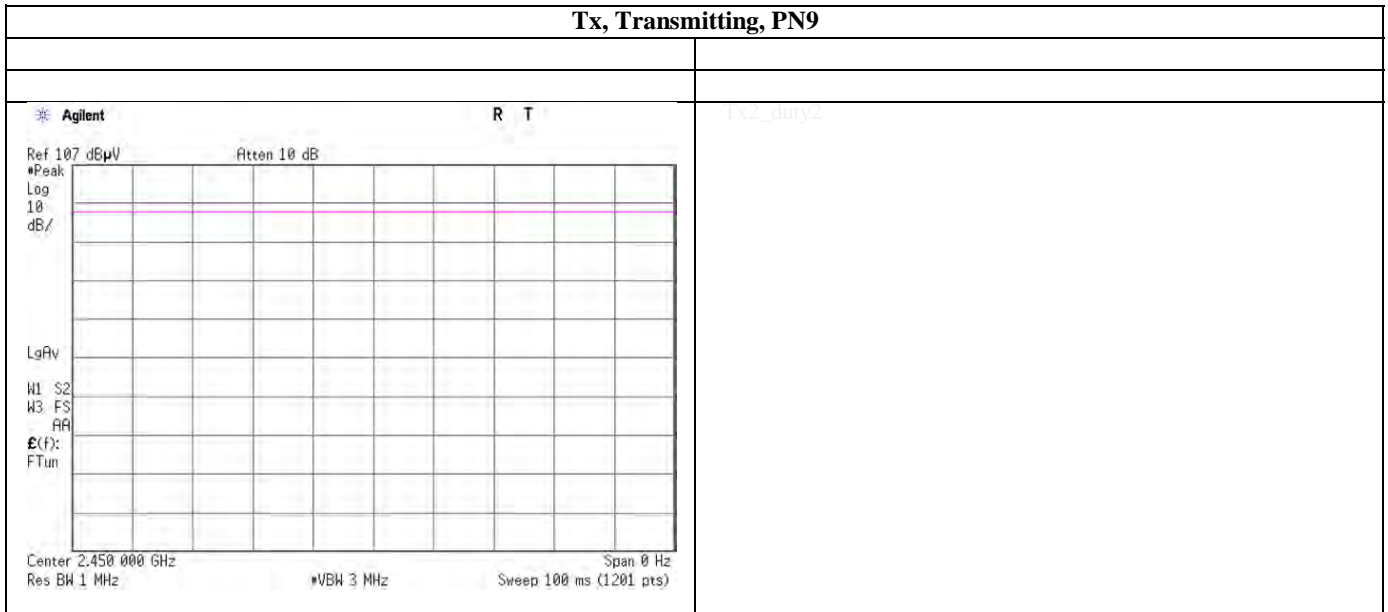
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Burst rate confirmation

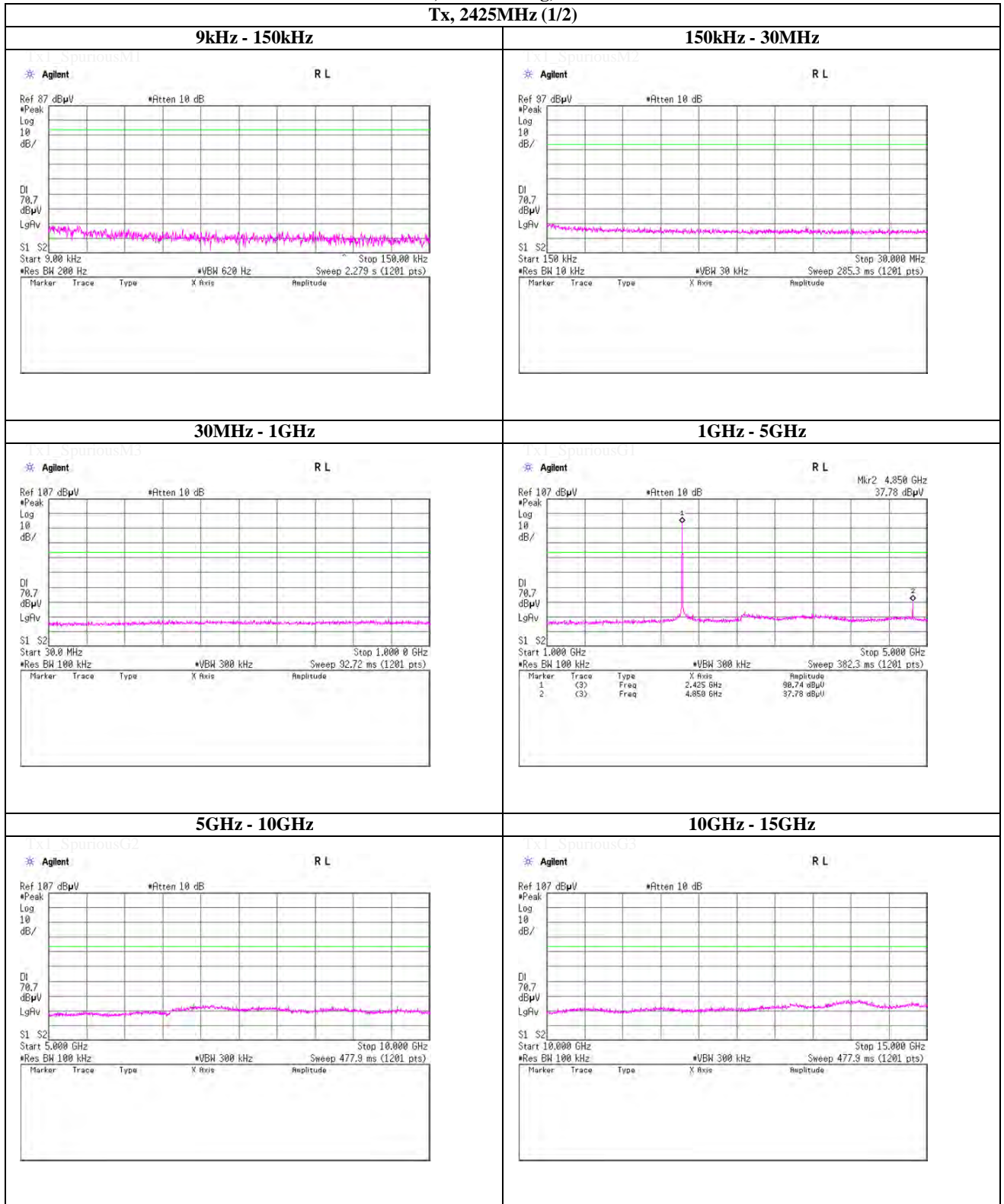


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Spurious emission (Conducted)

Tx, Transmitting, PN9

Tx, 2425MHz (1/2)



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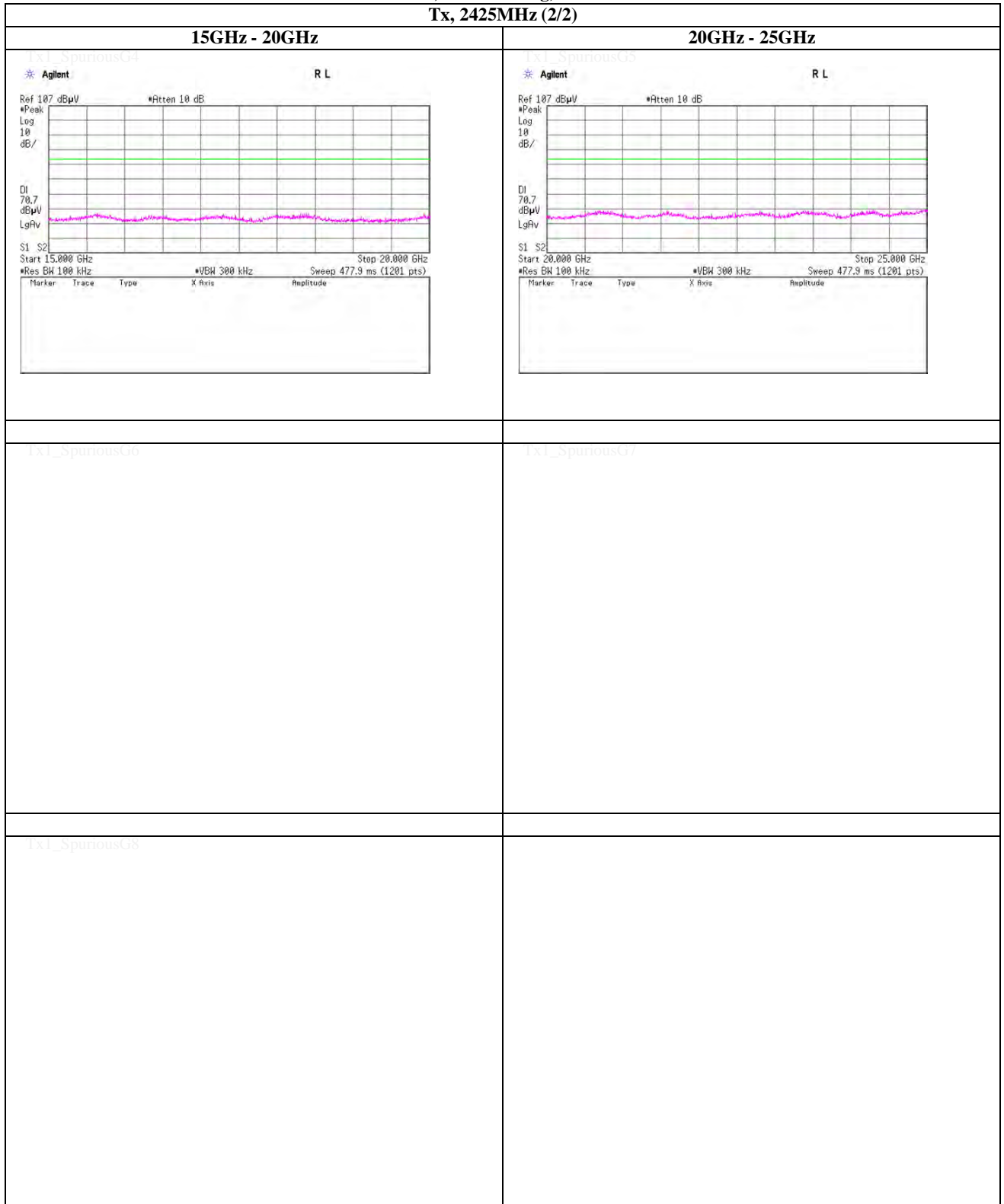
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Spurious emission (Conducted)

Tx, Transmitting, PN9

Tx, 2425MHz (2/2)



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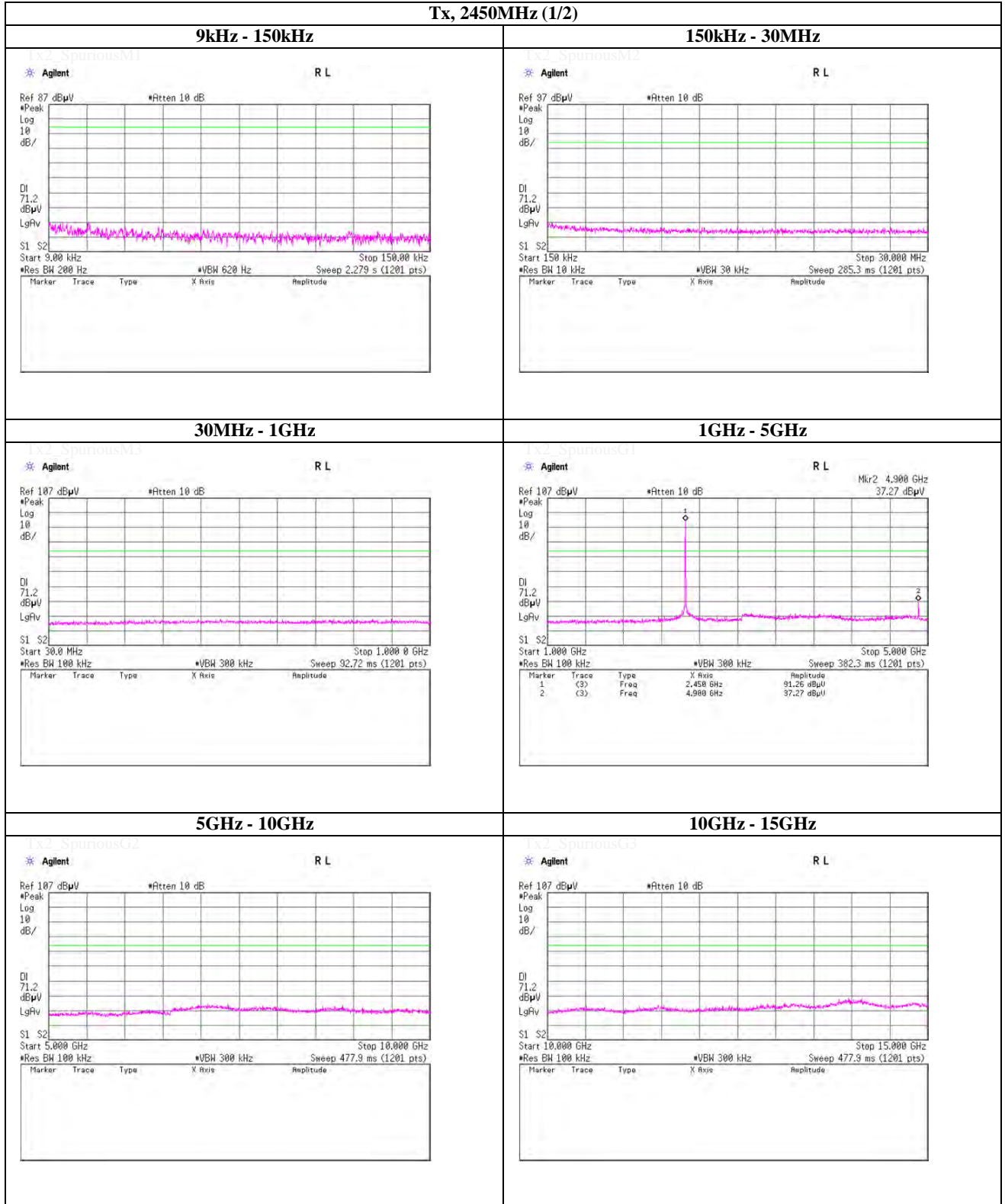
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Spurious emission (Conducted)

Tx, Transmitting, PN9

Tx, 2450MHz (1/2)



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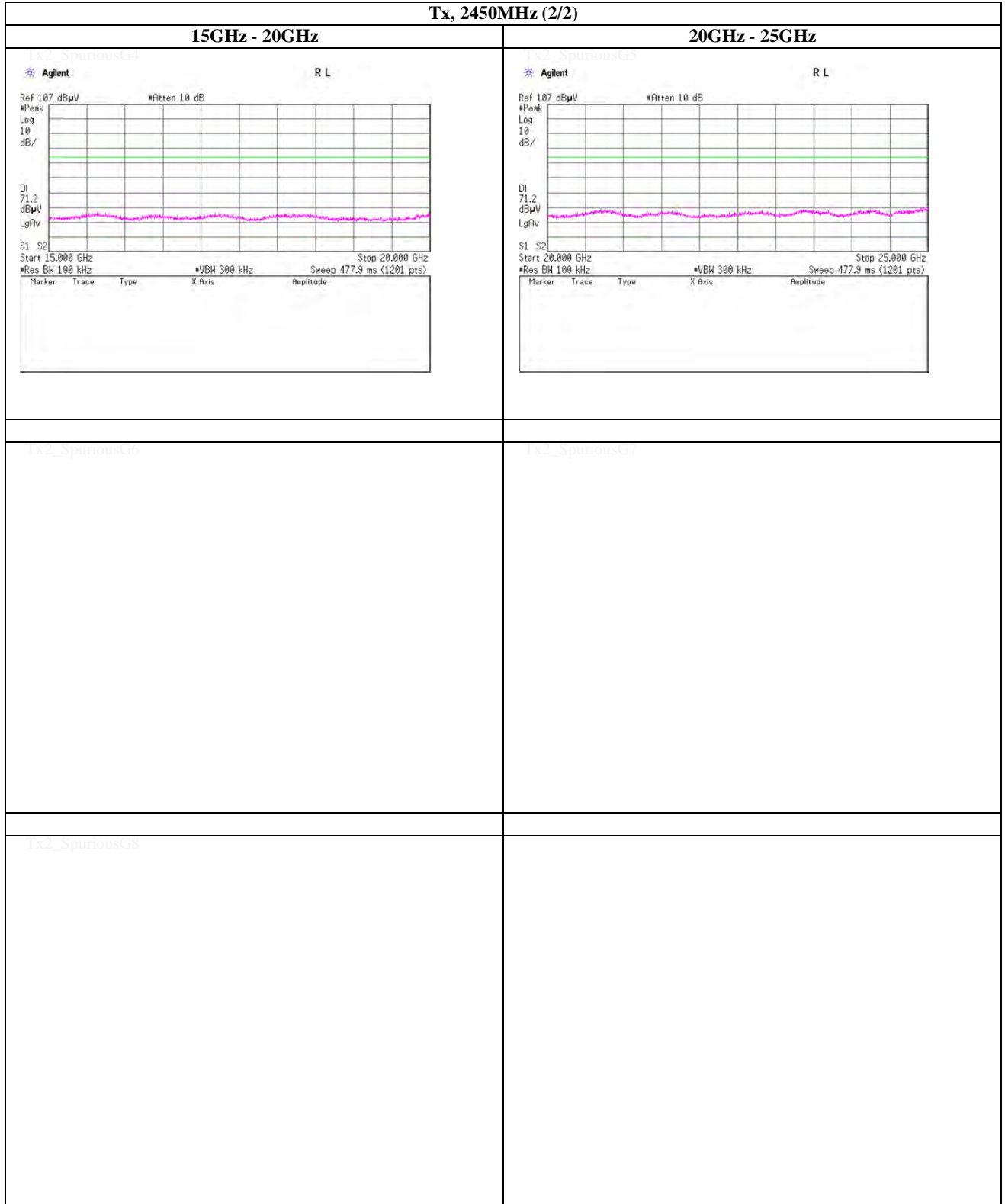
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Spurious emission (Conducted)

Tx, Transmitting, PN9

Tx, 2450MHz (2/2)



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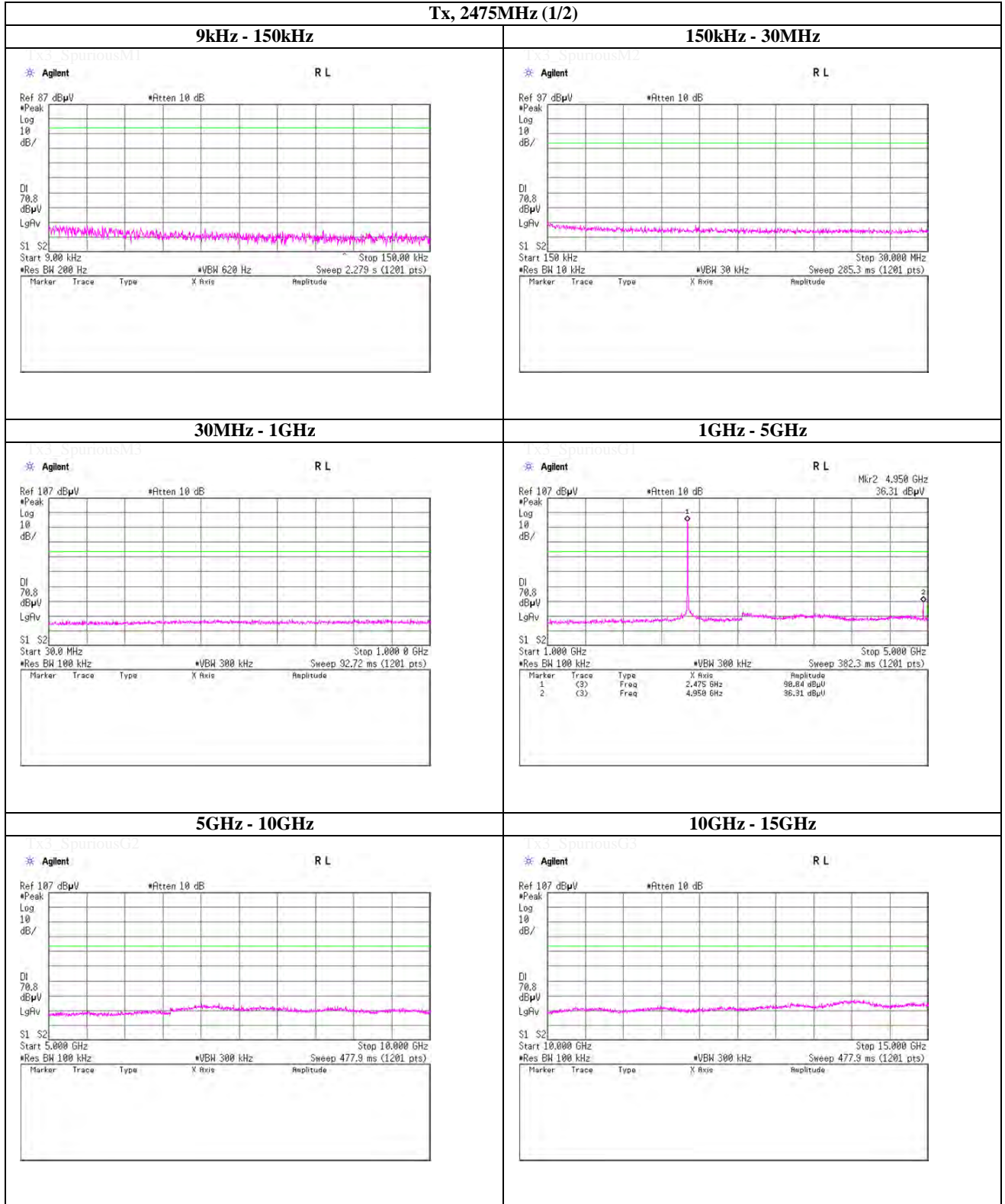
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Spurious emission (Conducted)

Tx, Transmitting, PN9

Tx, 2475MHz (1/2)



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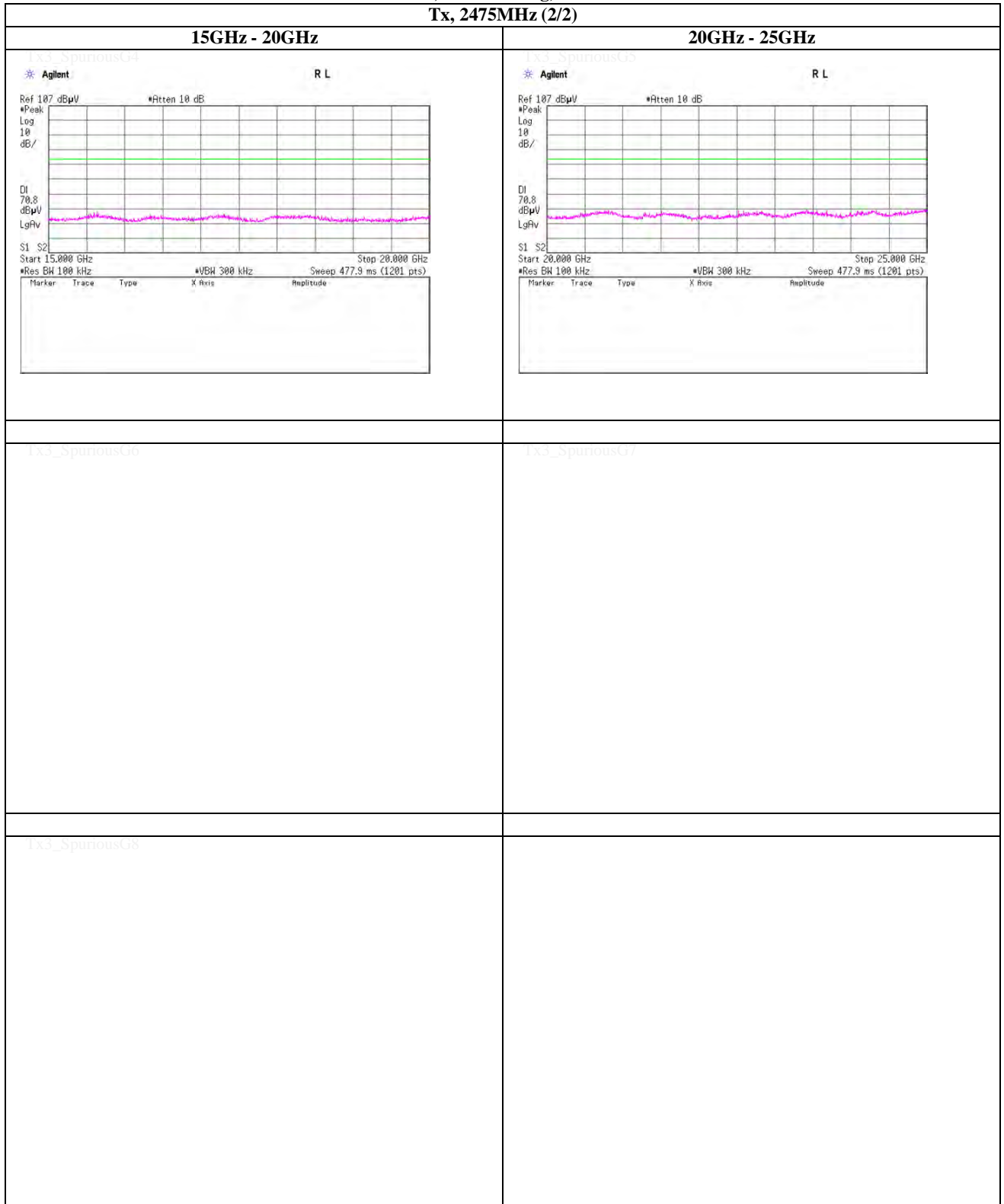
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Spurious emission (Conducted)

Tx, Transmitting, PN9

Tx, 2475MHz (2/2)



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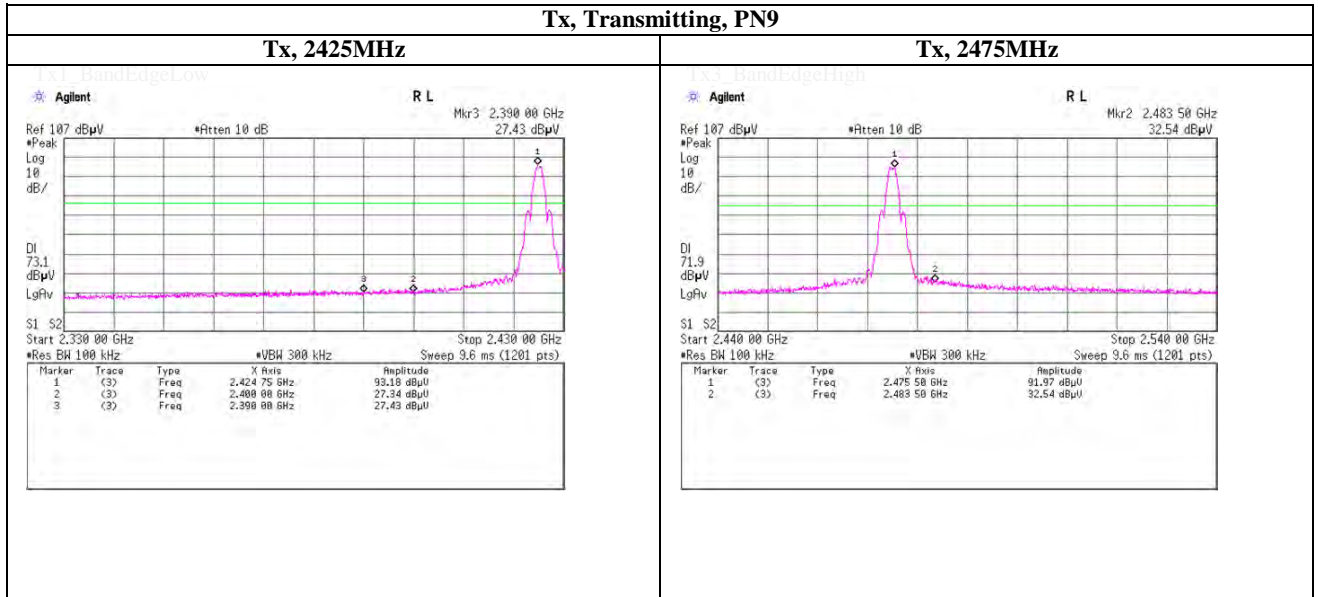
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Spurious emission (Conducted)

Band Edge compliance



UL Japan, Inc.

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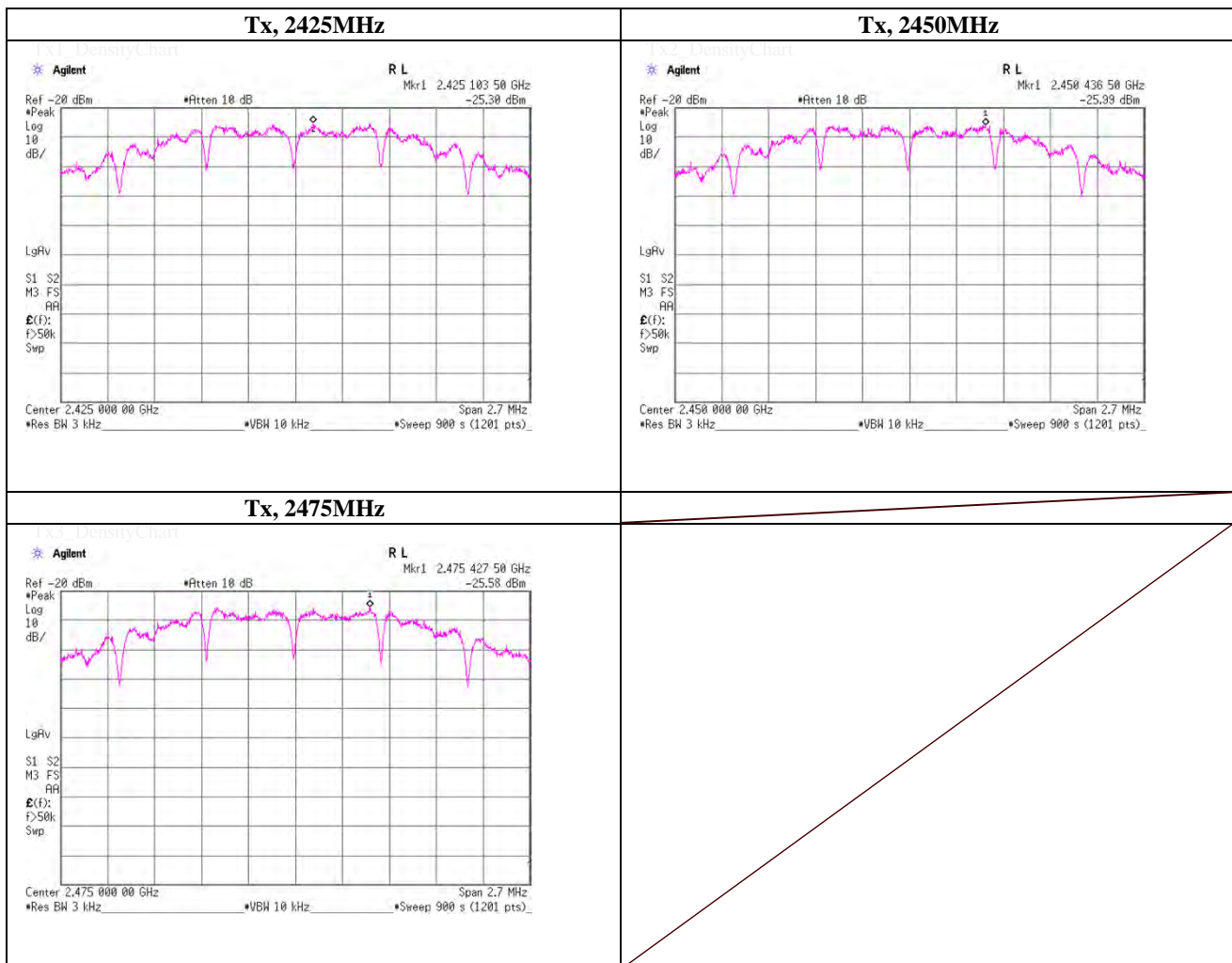
Power Density

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	May 18, 2012	
Temperature / Humidity	26deg.C , 52%RH	
Engineer	Akio Hayashi	
Mode	Tx, Transmitting, PN9	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2425.0000	2425.10	-25.30	1.09	10.00	-14.21	8.00	22.21
2450.0000	2450.44	-25.99	1.09	10.00	-14.90	8.00	22.90
2475.0000	2475.43	-25.58	1.10	10.00	-14.48	8.00	22.48

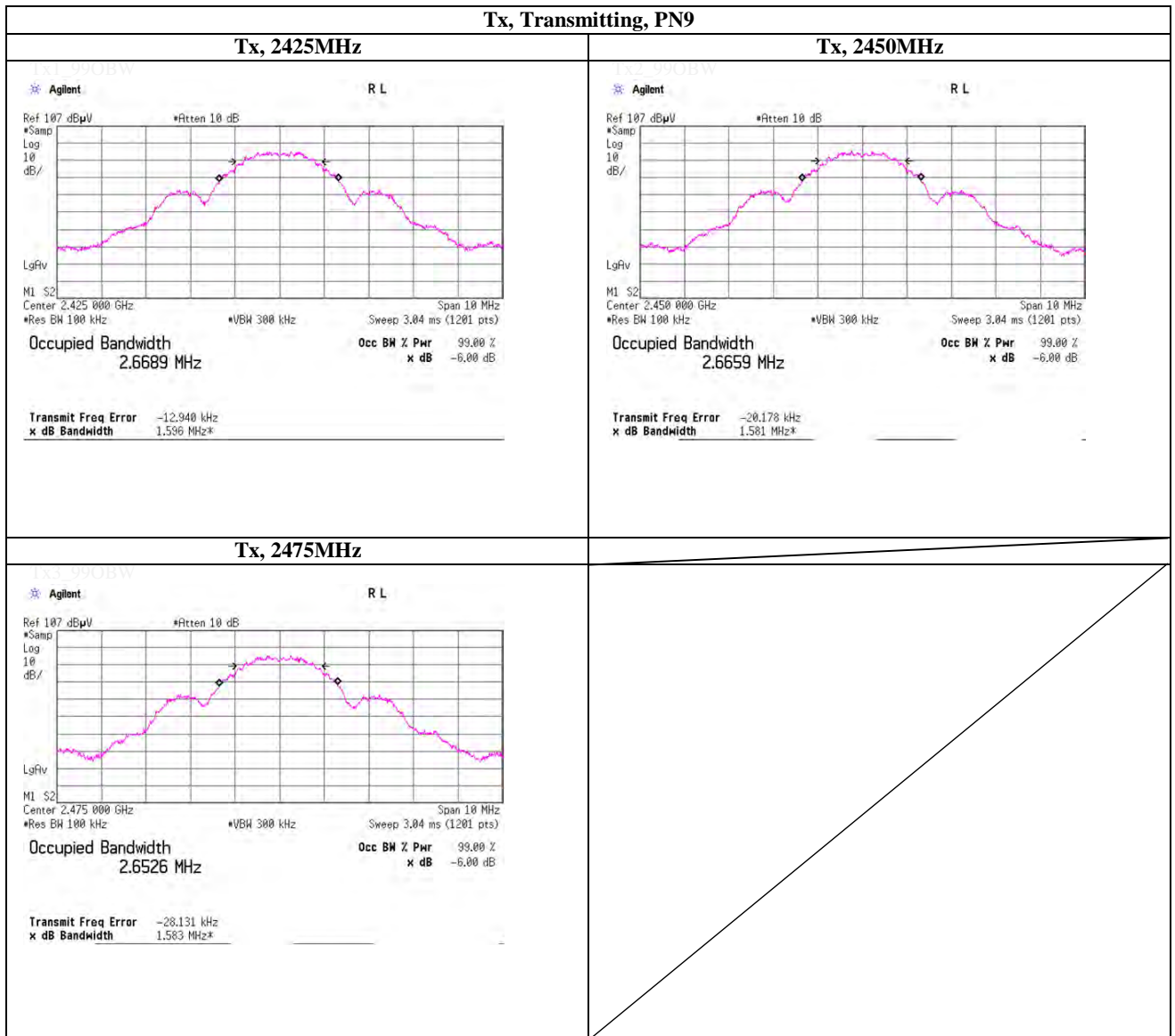
Sample Calculation:

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



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99% Occupied Bandwidth



UL Japan, Inc.

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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)
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	03/26/2012 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	04/19/2012 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	04/19/2012 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	12/05/2011 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	04/06/2012 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	03/12/2012 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271 (RF Selector)	CE	04/10/2012 * 12
SLS-01	LISN	Rohde & Schwarz	ENV216	100511	CE	02/20/2012 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	02/17/2012 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	03/26/2012 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	CE,RE	02/07/2012 * 12
SJM-10	Measure	PROMART	SEN1935	-	CE,RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,MF)	-	CE,RE	-
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	02/10/2012 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	02/10/2012 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	10/23/2011 * 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	04/10/2012 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	10/23/2011 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	02/06/2012 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	09/23/2011 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	07/19/2011 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	04/10/2012 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	05/27/2011 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	08/28/2011 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	03/16/2012 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	12/27/2011 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	12/27/2011 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	03/30/2012 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	03/12/2012 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	03/12/2012 * 12

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

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

Test Item :

- CE: Conducted emission ,
- RE: Radiated emission ,
- AT: Antenna terminal disturbance voltage