



RADIO TEST REPORT

Test Report No.: 10046907S-A

Applicant : Sony Corporation
Type of Equipment : Digital Stereo Transmitter
Model No. : TMR-HW300
FCC ID : AK8TMRHW300
Test regulation : FCC Part15 Subpart C: 2013
Test result : Complied

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2. The results in this report apply only to the sample tested.
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: August 8 to 18, 2013

Tested by: 
Hikaru Shirasawa
Engineer of WiSE Japan,
UL Verification Service

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



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

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Shonan EMC Lab.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Sony Corporation
Brand Name : SONY
Address : 2-10-1 Osaki, Shinagawa-ku, Tokyo, 141-8610 Japan
Telephone Number : +81-50-3750-7634
Facsimile Number : +81-50-3750-6572
Contact Person : Shigeru Higai

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

2.1 Identification of E.U.T.

Type of Equipment : Digital Stereo Transmitter
Model Number : TMR-HW300
Serial Number : Refer to 4.2 of this report.
Rating : DC 5V (AC 100-240V, 50/60Hz)
Country of Mass-production : China
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : August 8, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: TMR-HW300 (referred to as the EUT in this report) is a Digital Stereo Transmitter.
The EUT plays the sound from external audio equipment through the wireless function.

Clock frequency(ies) in the system : RF: 24MHz

<Radio part>

Equipment type : Transmitter
Frequency of operation : 2406-2478MHz
Bandwidth : 3MHz
Channel spacing : 3MHz
Type of modulation : GFSK
Antenna type : Pattern
Antenna gain : 2.81dBi
Antenna connector type : Integral
ITU code : F1D
Operation temperature range : -10 to +45 deg.C

FCC 15.31 (e)

The stable voltage (DC3.3V/1.8V) is constantly provided to RF Module from the host device regardless of input voltage. Therefore, the EUT complies with the requirement.

FCC 15.203

The equipment and its antenna comply with the requirement since the 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 : FCC Part 15 Subpart C: 2013, final revised on June 11, 2013 and effective July 11, 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 has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report10046907S-C.

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	20.0dB Freq.: 0.29389MHz Detector: Average Phase: N Mode: Tx 2478MHz	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	* See data	Complied
Maximum peak conducted 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	5.9dB Freq.: 12030.000MHz Polarization: Vertical Detection: Average Mode: Tx 2406MHz	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 v03 r01 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

3.3 Addition to standard

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

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

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

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3.4 Uncertainty

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

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

*1: SAC=Semi-Anechoic Chamber

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

Conducted emission test

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

Radiated emission test

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

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3.5 Test location

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Telephone number : +81 463 50 6400

Facsimile number : +81 463 50 6401

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 checked="" 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 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 checked="" 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 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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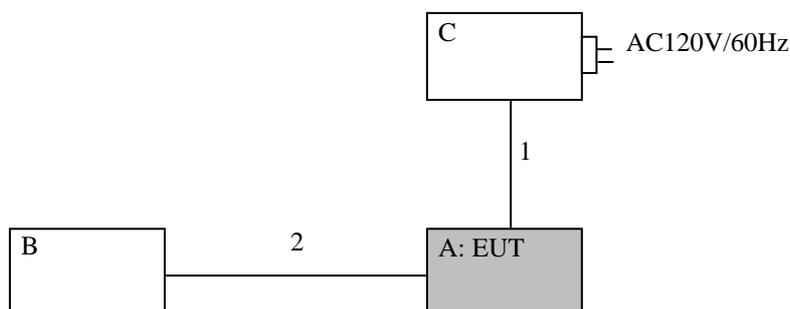
SECTION 4: Operation of E.U.T. during testing

4.1 Operating mode

Test item	Mode	Tested frequency	Power setting	Worst data rate
All items	Transmitting	2406MHz, 2442MHz, 2478MHz	Fixed	Fixed
Software used for the test: AM88x0_Sony_HDX2721_TX_V010_Release_20130812				
Software version: V010_Release_20130812				

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

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Digital Stereo Transmitter	TMR-HW300	*1)	SONY	EUT
B	Cassette-Coder	TCM-400DV	-	SONY	-
C	AC Adaptor	AC-P5004A	1323500019105	SONY	-

*1) Antenna terminal conducted tests: 0001, Radiated emission tests: 0002

List of cables used

No.	Name	Length (m)	Shield (Cable)	Shield (Connector)	Remarks
1	DC	2.0	Unshielded	Unshielded	-
2	Stereo mini	1.0	Unshielded	Unshielded	-

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SECTION 5: Conducted emission

5.1 Operating environment

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

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

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

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector. The conducted emission measurements were made with the following detection of the test receiver.

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

5.5 Results

Summary of the test results : Pass
Refer to APPENDIX 1.

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SECTION 6: Radiated emission

6.1 Operating environment

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

6.2 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 EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Photographs of the set up are shown in APPENDIX 3.

6.3 Test conditions

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

6.4 Test procedure

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

The radiated emission measurements were made with the following detection.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 400Hz Detector: Voltage	RBW: 100kHz VBW: 300kHz

*1) Average Power Measurement was measured based on 12.2.5.3 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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

Worst case:

Antenna polarization	Carrier (Band edge)	Spurious			
		Below 1GHz	Above 1GHz		
			1-2.8GHz	2.8-15GHz	15-25GHz
Horizontal	X	Y	X	X	X
Vertical	Z	Z	Z	Z	Z

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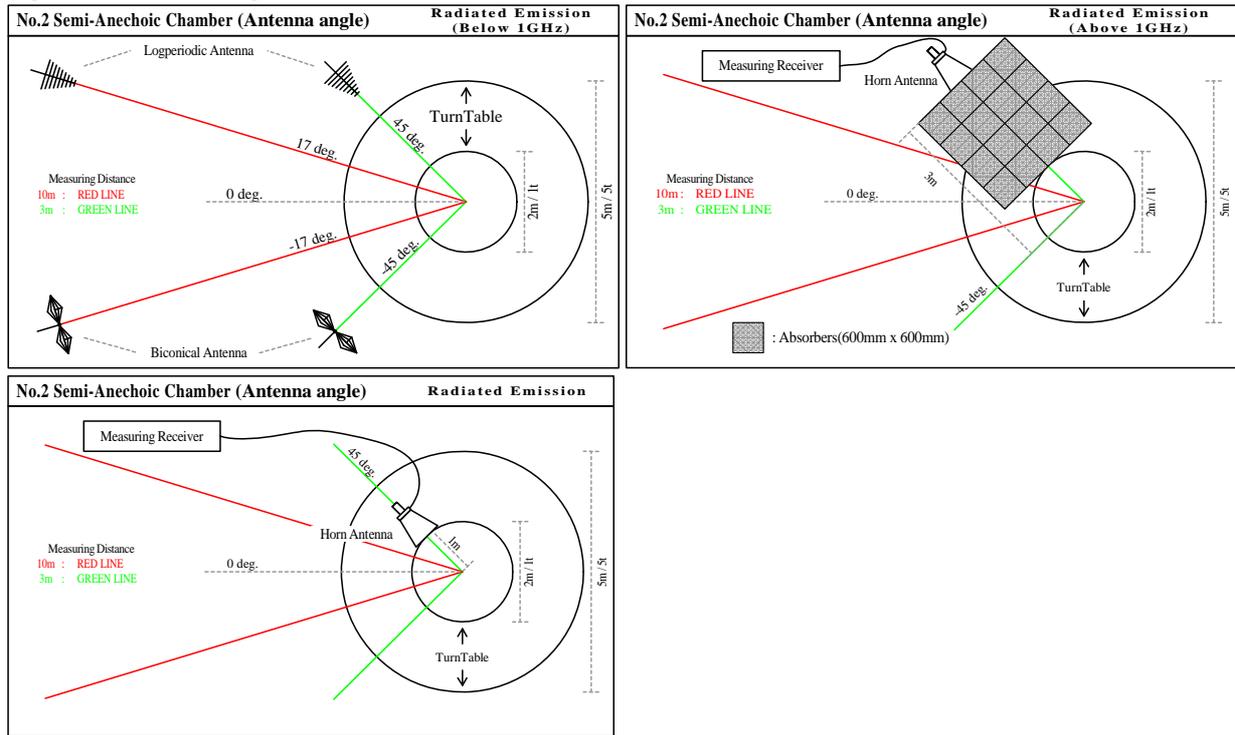
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Figure 1. Antenna angle



6.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2399.67MHz and 2400MHz are below the 20dBc. Refer to the data.

6.6 Results

Summary of the test results : Pass
* No noise was detected above the 5th order harmonics.

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 1.

SECTION 8: 6dB bandwidth & Occupied bandwidth (99%)

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port. The test was measured based on Method 8.1 Option 1 and 8.2 Option 2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1.

SECTION 9: Maximum peak conducted output power

Test procedure

The Maximum Peak Output Power was measured with a power meter connected to the antenna port. The test was measured based on Method 9.1.3 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1.

SECTION 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
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 1.

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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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DATA OF CONDUCTED EMISSION TEST

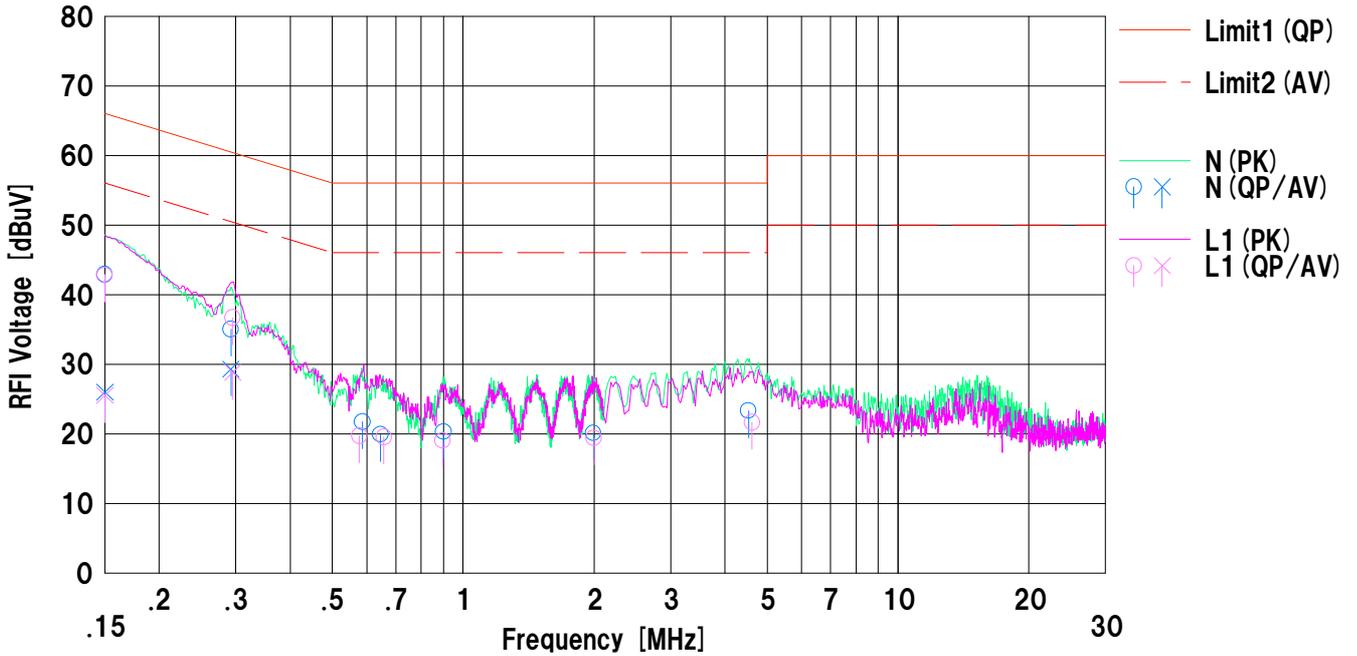
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2013/08/18

Company : Sony Corporation
Kind of EUT : Digital Stereo Transmitter
Model No. : TMR-HW300
Serial No. : 0002
Remarks : -

Mode : Tx 2406MHz
Order No. : 10046907S
Power : AC120V/60Hz, SinglePhase
Temp./Humi. : 27deg.C. / 70%RH

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

Engineer : Hikaru Shirasawa



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	30.3	13.4	12.6	42.9	26.0	66.0	56.0	23.1	30.0	N	
2	0.29244	22.4	16.7	12.6	35.0	29.3	60.4	50.4	25.4	21.1	N	
3	0.58701	9.1	---	12.6	21.7	---	56.0	46.0	34.3	---	N	
4	0.64611	7.3	---	12.6	19.9	---	56.0	46.0	36.1	---	N	
5	0.90200	7.7	---	12.6	20.3	---	56.0	46.0	35.7	---	N	
6	1.99340	7.4	---	12.7	20.1	---	56.0	46.0	35.9	---	N	
7	4.53100	10.5	---	12.8	23.3	---	56.0	46.0	32.7	---	N	
8	0.15000	30.2	12.9	12.6	42.8	25.5	66.0	56.0	23.2	30.5	L1	
9	0.29480	24.1	16.2	12.6	36.7	28.8	60.3	50.3	23.6	21.5	L1	
10	0.57700	7.1	---	12.6	19.7	---	56.0	46.0	36.3	---	L1	
11	0.65771	6.9	---	12.6	19.5	---	56.0	46.0	36.5	---	L1	
12	0.89705	6.4	---	12.6	19.0	---	56.0	46.0	37.0	---	L1	
13	2.00000	6.7	---	12.7	19.4	---	56.0	46.0	36.6	---	L1	
14	4.62150	8.8	---	12.8	21.6	---	56.0	46.0	34.4	---	L1	

DATA OF CONDUCTED EMISSION TEST

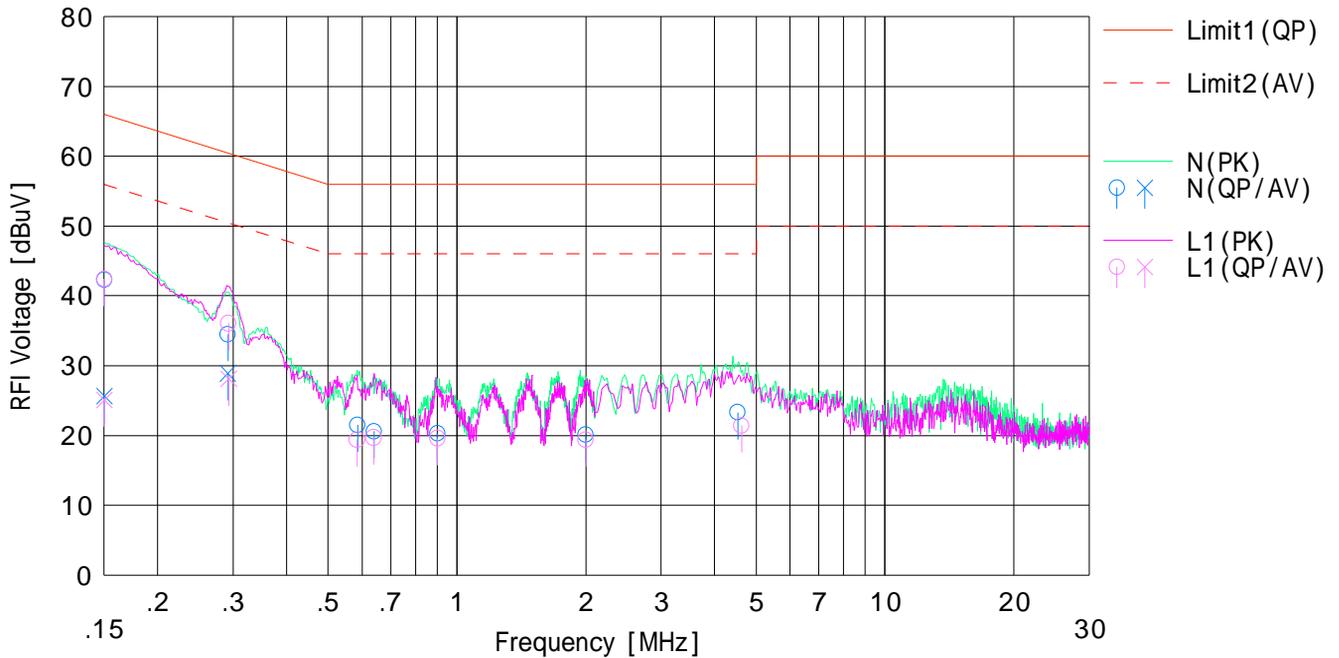
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2013/08/18

Company : Sony Corporation
Kind of EUT : Digital Stereo Transmitter
Model No. : TMR-HW300
Serial No. : 0002
Remarks : -

Mode : Tx 2442MHz
Order No. : 10046907S
Power : AC120V / 60Hz, SinglePhase
Temp./Humi. : 27deg.C. / 70%RH

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

Engineer : Hikaru Shirasawa



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	29.7	13.0	12.6	42.3	25.6	66.0	56.0	23.7	30.4	N	
2	0.29190	21.9	16.3	12.6	34.5	28.9	60.4	50.4	25.9	21.5	N	
3	0.58612	8.9	---	12.6	21.5	---	56.0	46.0	34.5	---	N	
4	0.64132	8.0	---	12.6	20.6	---	56.0	46.0	35.4	---	N	
5	0.90103	7.7	---	12.6	20.3	---	56.0	46.0	35.7	---	N	
6	2.00050	7.4	---	12.7	20.1	---	56.0	46.0	35.9	---	N	
7	4.53135	10.5	---	12.8	23.3	---	56.0	46.0	32.7	---	N	
8	0.15000	29.8	12.5	12.6	42.4	25.1	66.0	56.0	23.6	30.9	L1	
9	0.29319	23.5	15.5	12.6	36.1	28.1	60.4	50.4	24.3	22.3	L1	
10	0.58482	6.8	---	12.6	19.4	---	56.0	46.0	36.6	---	L1	
11	0.63962	7.1	---	12.6	19.7	---	56.0	46.0	36.3	---	L1	
12	0.90082	7.0	---	12.6	19.6	---	56.0	46.0	36.4	---	L1	
13	1.99950	6.7	---	12.7	19.4	---	56.0	46.0	36.6	---	L1	
14	4.62335	8.6	---	12.8	21.4	---	56.0	46.0	34.6	---	L1	

DATA OF CONDUCTED EMISSION TEST

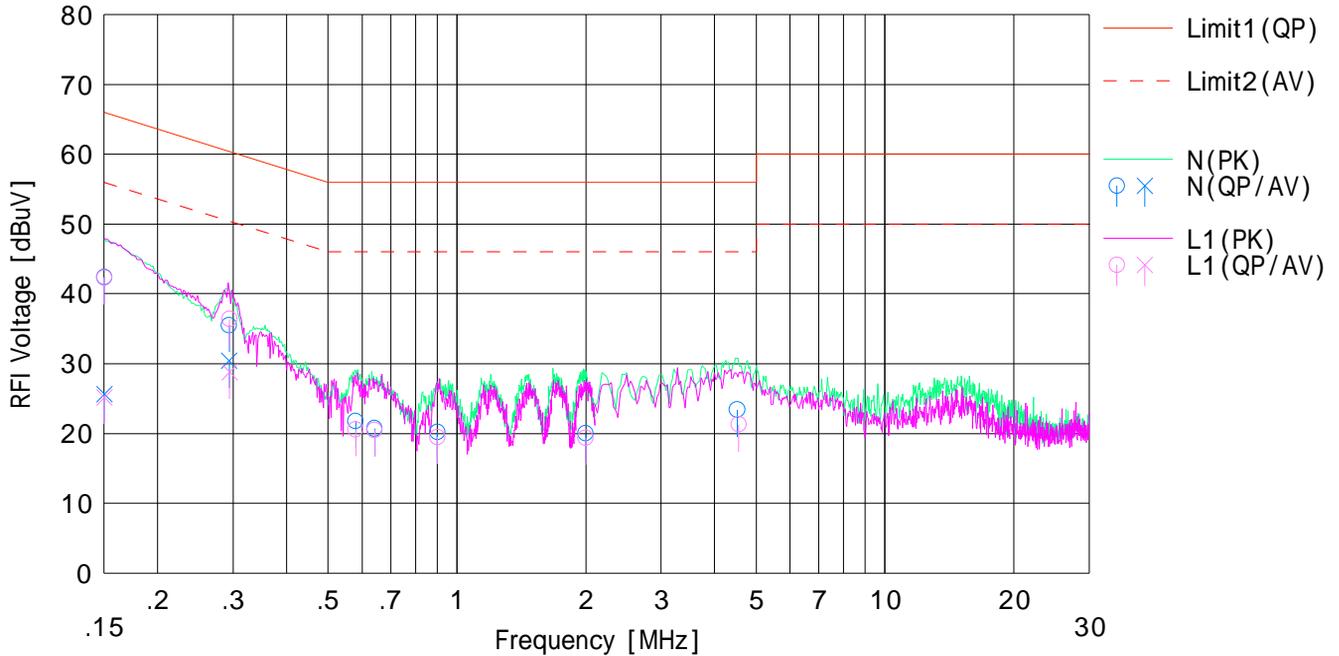
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2013/08/18

Company : Sony Corporation
Kind of EUT : Digital Stereo Transmitter
Model No. : TMR-HW300
Serial No. : 0002
Remarks : -

Mode : Tx 2478MHz
Order No. : 10046907S
Power : AC120V / 60Hz, SinglePhase
Temp./Humi. : 27deg.C. / 70%RH

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

Engineer : Hikaru Shirasawa

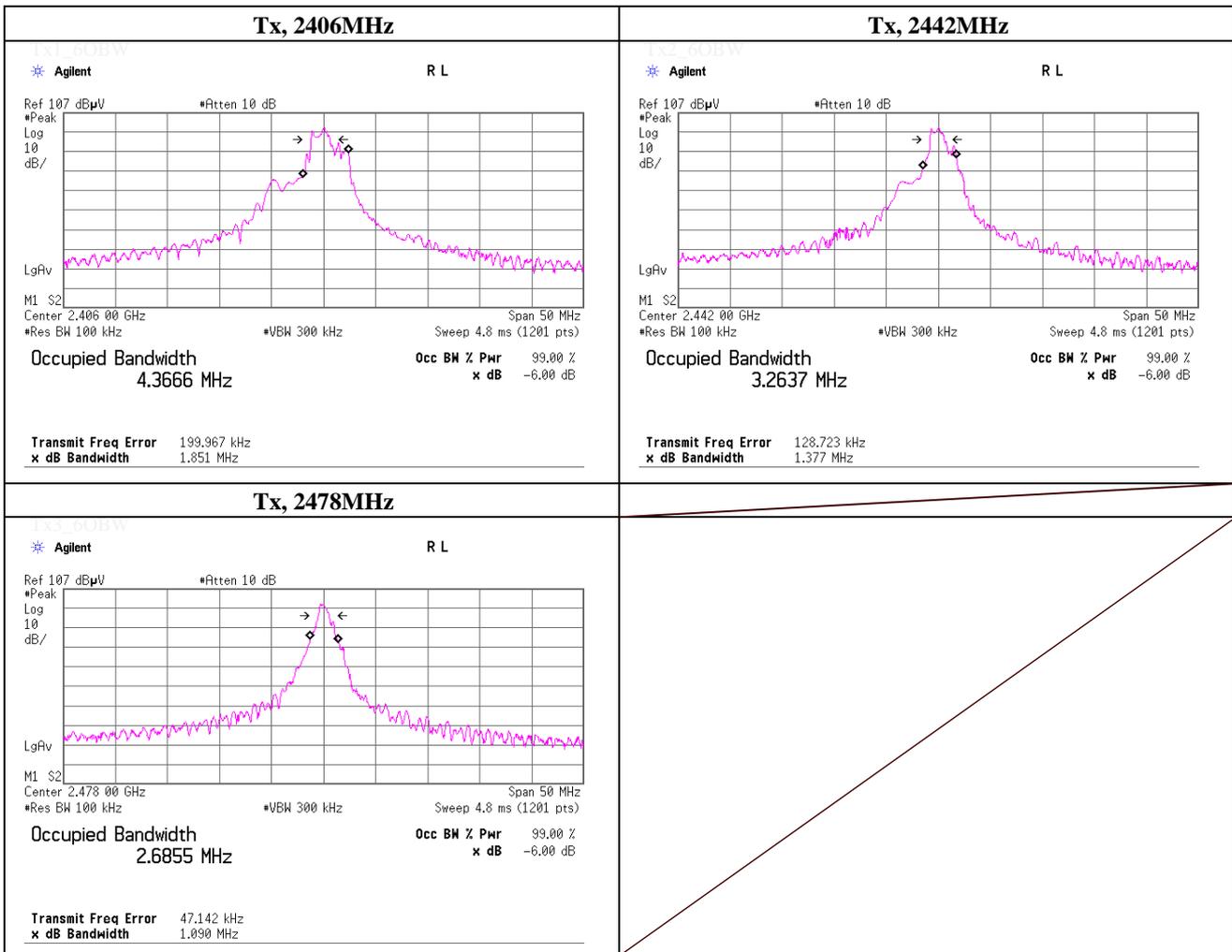


No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	29.8	13.0	12.6	42.4	25.6	66.0	56.0	23.6	30.4	N	
2	0.29389	22.9	17.8	12.6	35.5	30.4	60.4	50.4	24.9	20.0	N	
3	0.58050	9.2	---	12.6	21.8	---	56.0	46.0	34.2	---	N	
4	0.64281	8.1	---	12.6	20.7	---	56.0	46.0	35.3	---	N	
5	0.90040	7.6	---	12.6	20.2	---	56.0	46.0	35.8	---	N	
6	2.00153	7.3	---	12.7	20.0	---	56.0	46.0	36.0	---	N	
7	4.52271	10.6	---	12.8	23.4	---	56.0	46.0	32.6	---	N	
8	0.15000	29.7	12.6	12.6	42.3	25.2	66.0	56.0	23.7	30.8	L1	
9	0.29420	23.8	16.2	12.6	36.4	28.8	60.4	50.4	24.0	21.6	L1	
10	0.58099	8.0	---	12.6	20.6	---	56.0	46.0	35.4	---	L1	
11	0.64259	7.9	---	12.6	20.5	---	56.0	46.0	35.5	---	L1	
12	0.90001	6.9	---	12.6	19.5	---	56.0	46.0	36.5	---	L1	
13	2.00000	6.7	---	12.7	19.4	---	56.0	46.0	36.6	---	L1	
14	4.55370	8.5	---	12.8	21.3	---	56.0	46.0	34.7	---	L1	

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	August 8, 2013	
Temperature / Humidity	26deg.C , 54%RH	
Engineer	Hikaru Shirasawa	
Mode	Tx	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2406.0000	1.851	> 0.500
2442.0000	1.377	> 0.500
2478.0000	1.090	> 0.500



Maximum Peak Conducted Output Power (PKPM1)

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
 Date August 8, 2013
 Temperature / Humidity 26deg.C , 54%RH
 Engineer Hikaru Shirasawa
 Mode Tx

(* 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	2406.0	-8.18	1.40	9.62	2.84	1.92	30.00	1000	27.16
Mid	2442.0	-7.95	1.40	9.63	3.08	2.03	30.00	1000	26.92
High	2478.0	-8.24	1.41	9.63	2.80	1.91	30.00	1000	27.20

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.2 Semi Anechoic Chamber
Date August 17, 2013 August 18, 2013
Temperature / Humidity 23 deg.C , 63%RH 27 deg.C , 70%RH
Engineer Hikaru Shirasawa Hikaru Shirasawa
Mode Tx, 2406 MHz

(* 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.	147.463	QP	31.2	15.0	8.8	31.8	23.2	43.5	20.3	228	285	
Hori.	405.510	QP	33.6	16.7	8.0	31.7	26.6	46.0	19.4	100	335	
Hori.	688.138	QP	32.4	20.4	9.3	31.6	30.5	46.0	15.5	167	325	
Hori.	2390.000	PK	50.3	27.2	14.3	35.1	56.7	73.9	17.2	100	324	
Hori.	2743.000	PK	45.7	27.9	14.6	35.1	53.1	73.9	20.8	100	0	
Hori.	4812.000	PK	46.5	30.8	6.9	34.7	49.5	73.9	24.4	100	267	
Hori.	7218.000	PK	44.7	36.2	8.6	35.1	54.4	73.9	19.5	100	126	
Hori.	9624.000	PK	44.9	38.3	9.6	35.3	57.5	73.9	16.4	100	0	
Hori.	12030.000	PK	46.0	39.2	11.1	35.3	61.0	73.9	12.9	100	0	
Hori.	2390.000	AV	33.1	27.2	14.3	35.1	39.5	53.9	14.4	100	324	
Hori.	2743.000	AV	32.3	27.9	14.6	35.1	39.7	53.9	14.2	100	0	
Hori.	4812.000	AV	34.8	30.8	6.9	34.7	37.8	53.9	16.1	100	267	
Hori.	7218.000	AV	32.0	36.2	8.6	35.1	41.7	53.9	12.2	100	126	
Hori.	9624.000	AV	31.8	38.3	9.6	35.3	44.4	53.9	9.5	100	0	
Hori.	12030.000	AV	31.8	39.2	11.1	35.3	46.8	53.9	7.1	100	0	
Vert.	40.456	QP	29.2	14.6	7.1	31.9	19.0	40.0	21.0	100	322	
Vert.	49.152	QP	34.6	11.6	7.3	31.9	21.6	40.0	18.4	100	165	
Vert.	147.460	QP	40.1	15.0	8.8	31.8	32.1	43.5	11.4	100	81	
Vert.	153.677	QP	35.0	15.2	8.9	31.8	27.3	43.5	16.2	100	70	
Vert.	168.002	QP	37.5	16.0	9.1	31.8	30.8	43.5	12.7	100	67	
Vert.	706.588	QP	23.6	20.6	9.4	31.5	22.1	46.0	23.9	100	240	
Vert.	2390.000	PK	47.7	27.2	14.3	35.1	54.1	73.9	19.8	103	257	
Vert.	2743.000	PK	46.5	27.9	14.6	35.1	53.9	73.9	20.0	100	0	
Vert.	4812.000	PK	48.4	30.8	6.9	34.7	51.4	73.9	22.5	115	214	
Vert.	7218.000	PK	46.0	36.2	8.6	35.1	55.7	73.9	18.2	100	0	
Vert.	9624.000	PK	45.6	38.3	9.6	35.3	58.2	73.9	15.7	100	359	
Vert.	12030.000	PK	44.9	39.2	11.1	35.3	59.9	73.9	14.0	100	0	
Vert.	2390.000	AV	32.9	27.2	14.3	35.1	39.3	53.9	14.6	103	257	
Vert.	2743.000	AV	33.5	27.9	14.6	35.1	40.9	53.9	13.0	100	0	
Vert.	4812.000	AV	36.7	30.8	6.9	34.7	39.7	53.9	14.2	115	214	
Vert.	7218.000	AV	32.6	36.2	8.6	35.1	42.3	53.9	11.6	100	0	
Vert.	9624.000	AV	33.1	38.3	9.6	35.3	45.7	53.9	8.2	100	359	
Vert.	12030.000	AV	33.0	39.2	11.1	35.3	48.0	53.9	5.9	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).

*The 10th harmonic was not seen so the result was its base noise level.

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 Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2406.000	PK	95.4	27.3	14.3	35.1	101.9	-	-	Carrier
Hori.	2399.670	PK	48.7	27.3	14.3	35.1	55.2	81.9	26.7	
Hori.	2400.000	PK	54.3	27.3	14.3	35.1	60.8	81.9	21.1	
Vert.	2406.000	PK	92.9	27.3	14.3	35.1	99.4	-	-	Carrier
Vert.	2399.670	PK	46.6	27.3	14.3	35.1	53.1	79.4	26.3	
Vert.	2400.000	PK	50.1	27.3	14.3	35.1	56.6	79.4	22.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 13GHz)) - Gain(Amplifier)

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date August 17, 2013 August 18, 2013
Temperature / Humidity 23 deg.C , 63%RH 27 deg.C , 70%RH
Engineer Hikaru Shirasawa Hikaru Shirasawa
Mode Tx, 2442 MHz

(* 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.	167.998	QP	28.8	16.0	9.1	31.8	22.1	43.5	21.4	190	151	
Hori.	405.513	QP	32.8	16.7	8.0	31.7	25.8	46.0	20.2	100	304	
Hori.	688.138	QP	32.3	20.4	9.3	31.6	30.4	46.0	15.6	162	329	
Hori.	2783.000	PK	45.0	28.0	14.7	35.1	52.6	73.9	21.3	100	359	
Hori.	4884.000	PK	47.0	31.0	6.9	34.8	50.1	73.9	23.8	122	254	
Hori.	7326.000	PK	45.2	36.2	8.5	35.2	54.7	73.9	19.2	100	0	
Hori.	9768.000	PK	45.2	38.5	9.5	35.4	57.8	73.9	16.1	100	359	
Hori.	12210.000	PK	45.6	39.2	10.9	35.1	60.6	73.9	13.3	100	0	
Hori.	2783.000	AV	32.2	28.0	14.7	35.1	39.8	53.9	14.1	100	359	
Hori.	4884.000	AV	34.8	31.0	6.9	34.8	37.9	53.9	16.0	122	254	
Hori.	7326.000	AV	31.3	36.2	8.5	35.2	40.8	53.9	13.1	100	0	
Hori.	9768.000	AV	32.2	38.5	9.5	35.4	44.8	53.9	9.1	100	359	
Hori.	12210.000	AV	32.0	39.2	10.9	35.1	47.0	53.9	6.9	100	0	
Vert.	40.459	QP	29.0	14.6	7.1	31.9	18.8	40.0	21.2	100	359	
Vert.	49.152	QP	34.2	11.6	7.3	31.9	21.2	40.0	18.8	100	134	
Vert.	147.456	QP	39.5	15.0	8.8	31.8	31.5	43.5	12.0	100	67	
Vert.	153.601	QP	36.3	15.2	8.9	31.8	28.6	43.5	14.9	100	69	
Vert.	168.003	QP	38.4	16.0	9.1	31.8	31.7	43.5	11.8	100	70	
Vert.	624.010	QP	28.9	19.4	9.0	31.6	25.7	46.0	20.3	100	250	
Vert.	2783.000	PK	45.5	28.0	14.7	35.1	53.1	73.9	20.8	100	0	
Vert.	4884.000	PK	47.1	31.0	6.9	34.8	50.2	73.9	23.7	100	223	
Vert.	7326.000	PK	44.3	36.2	8.5	35.2	53.8	73.9	20.1	100	0	
Vert.	9768.000	PK	45.2	38.5	9.5	35.4	57.8	73.9	16.1	100	359	
Vert.	12210.000	PK	45.4	39.2	10.9	35.1	60.4	73.9	13.5	100	0	
Vert.	2783.000	AV	32.2	28.0	14.7	35.1	39.8	53.9	14.1	100	0	
Vert.	4884.000	AV	34.7	31.0	6.9	34.8	37.8	53.9	16.1	100	223	
Vert.	7326.000	AV	31.0	36.2	8.5	35.2	40.5	53.9	13.4	100	0	
Vert.	9768.000	AV	32.2	38.5	9.5	35.4	44.8	53.9	9.1	100	359	
Vert.	12210.000	AV	32.0	39.2	10.9	35.1	47.0	53.9	6.9	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).

*The 10th harmonic was not seen so the result was its base noise level.

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

UL Japan, Inc.**Shonan EMC Lab.**

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.2 Semi Anechoic Chamber
Date August 17, 2013 August 18, 2013
Temperature / Humidity 23 deg.C , 63%RH 27 deg.C , 70%RH
Engineer Hikaru Shirasawa Hikaru Shirasawa
Mode Tx, 2478 MHz

(* 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.	147.459	QP	30.0	15.0	8.8	31.8	22.0	43.5	21.5	254	127	
Hori.	405.507	QP	33.3	16.7	8.0	31.7	26.3	46.0	19.7	100	318	
Hori.	576.016	QP	31.6	18.8	8.8	31.6	27.6	46.0	18.4	100	201	
Hori.	2483.500	PK	56.4	27.4	14.4	35.0	63.2	73.9	10.7	100	177	
Hori.	2484.080	PK	58.5	27.4	14.4	35.0	65.3	73.9	8.6	100	177	
Hori.	2827.000	PK	45.3	28.0	6.6	35.1	44.8	73.9	29.1	100	0	
Hori.	4956.000	PK	47.8	31.2	7.0	34.8	51.2	73.9	22.7	100	244	
Hori.	7434.000	PK	44.7	36.3	8.4	35.4	54.0	73.9	19.9	100	0	
Hori.	9912.000	PK	45.2	38.7	9.4	35.6	57.7	73.9	16.2	100	0	
Hori.	12390.000	PK	44.7	39.1	10.6	34.9	59.5	73.9	14.4	100	0	
Hori.	2483.500	AV	34.0	27.4	14.4	35.0	40.8	53.9	13.1	100	177	
Hori.	2484.080	AV	33.8	27.4	14.4	35.0	40.6	53.9	13.3	100	177	
Hori.	2827.000	AV	32.3	28.0	6.6	35.1	31.8	53.9	22.1	100	0	
Hori.	4956.000	AV	35.9	31.2	7.0	34.8	39.3	53.9	14.6	100	244	
Hori.	7434.000	AV	31.3	36.3	8.4	35.4	40.6	53.9	13.3	100	0	
Hori.	9912.000	AV	31.8	38.7	9.4	35.6	44.3	53.9	9.6	100	0	
Hori.	12390.000	AV	31.6	39.1	10.6	34.9	46.4	53.9	7.5	100	0	
Vert.	40.458	QP	28.4	14.6	7.1	31.9	18.2	40.0	21.8	100	357	
Vert.	49.157	QP	34.3	11.6	7.3	31.9	21.3	40.0	18.7	100	146	
Vert.	147.457	QP	40.4	15.0	8.8	31.8	32.4	43.5	11.1	100	64	
Vert.	153.602	QP	36.1	15.2	8.9	31.8	28.4	43.5	15.1	100	67	
Vert.	168.003	QP	38.1	16.0	9.1	31.8	31.4	43.5	12.1	100	82	
Vert.	576.010	QP	29.0	18.8	8.8	31.6	25.0	46.0	21.0	267	90	
Vert.	2483.500	PK	57.8	27.4	14.4	35.0	64.6	73.9	9.3	142	258	
Vert.	2484.080	PK	59.2	27.4	14.4	35.0	66.0	73.9	7.9	142	258	
Vert.	2827.000	PK	45.4	28.0	6.6	35.1	44.9	73.9	29.0	100	0	
Vert.	4956.000	PK	46.6	31.2	7.0	34.8	50.0	73.9	23.9	100	217	
Vert.	7434.000	PK	44.6	36.3	8.4	35.4	53.9	73.9	20.0	100	0	
Vert.	9912.000	PK	45.2	38.7	9.4	35.6	57.7	73.9	16.2	100	359	
Vert.	12390.000	PK	44.9	39.1	10.6	34.9	59.7	73.9	14.2	100	0	
Vert.	2483.500	AV	34.4	27.4	14.4	35.0	41.2	53.9	12.7	142	258	
Vert.	2484.080	AV	34.1	27.4	14.4	35.0	40.9	53.9	13.0	142	258	
Vert.	2827.000	AV	32.3	28.0	6.6	35.1	31.8	53.9	22.1	100	0	
Vert.	4956.000	AV	35.0	31.2	7.0	34.8	38.4	53.9	15.5	100	217	
Vert.	7434.000	AV	31.1	36.3	8.4	35.4	40.4	53.9	13.5	100	0	
Vert.	9912.000	AV	31.7	38.7	9.4	35.6	44.2	53.9	9.7	100	359	
Vert.	12390.000	AV	31.5	39.1	10.6	34.9	46.3	53.9	7.6	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).

*The 10th harmonic was not seen so the result was its base noise level.

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

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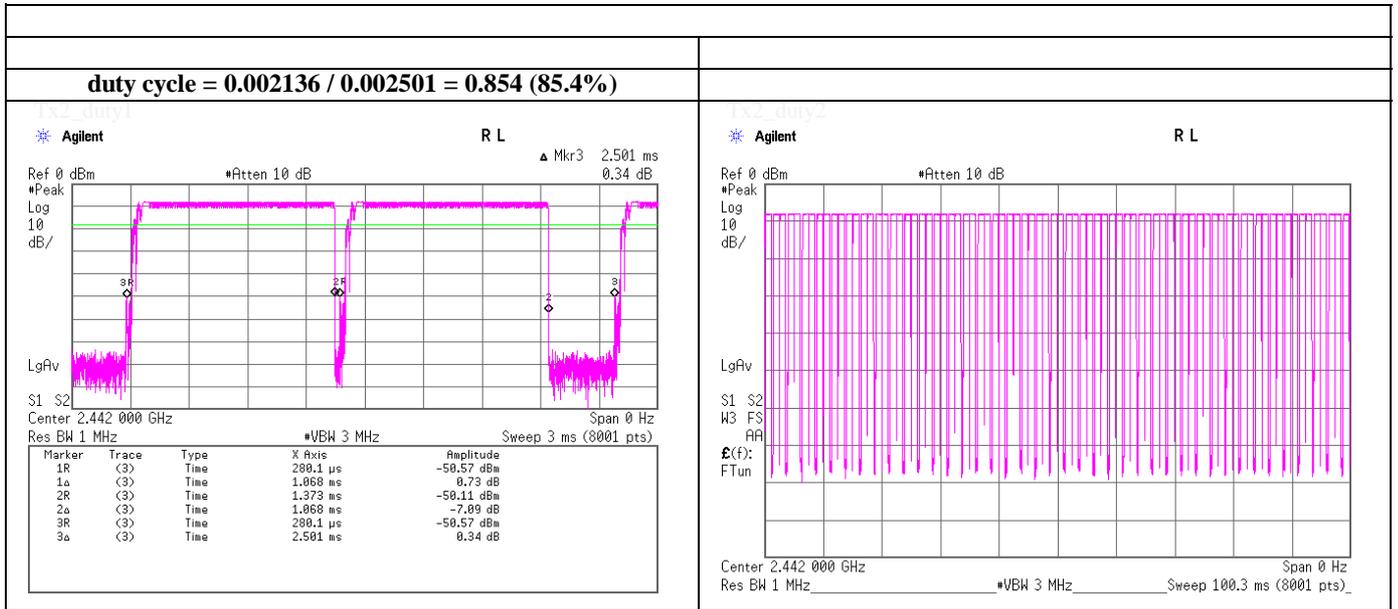
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Burst rate confirmation

Tx



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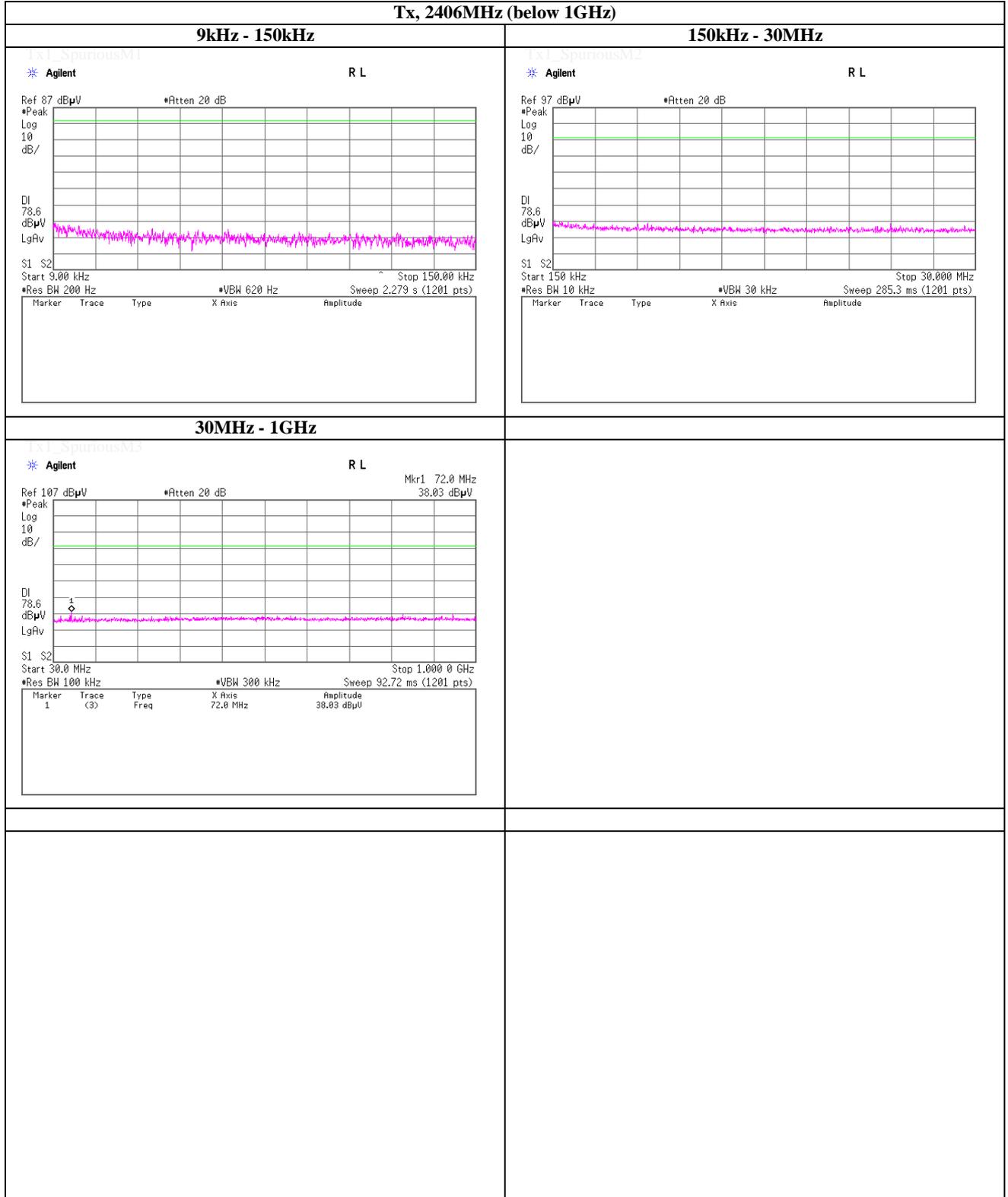
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(Reference chart) Spurious emission (Conducted)

Tx



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Shonan EMC Lab.

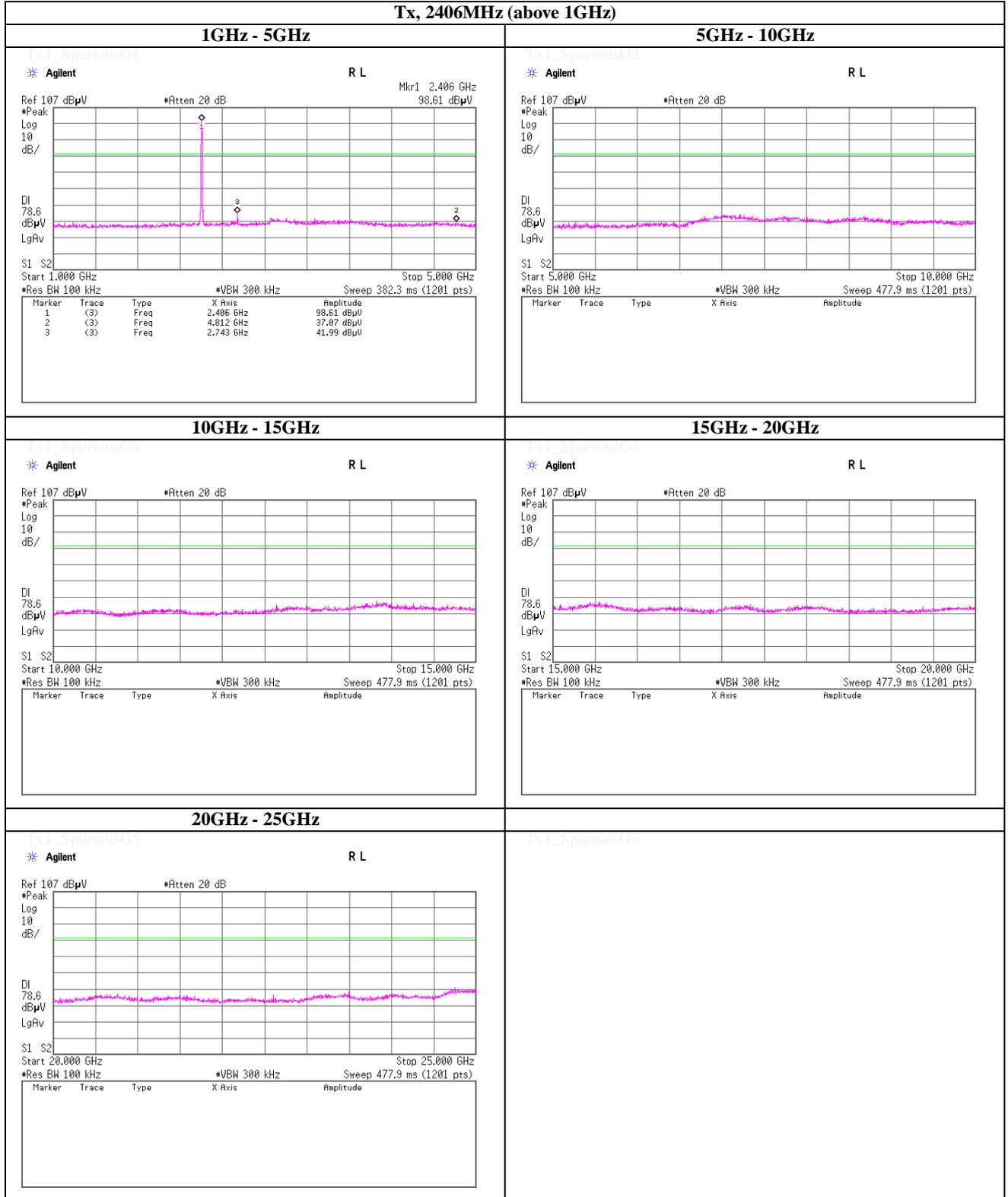
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(Reference chart) Spurious emission (Conducted)

Tx



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Shonan EMC Lab.

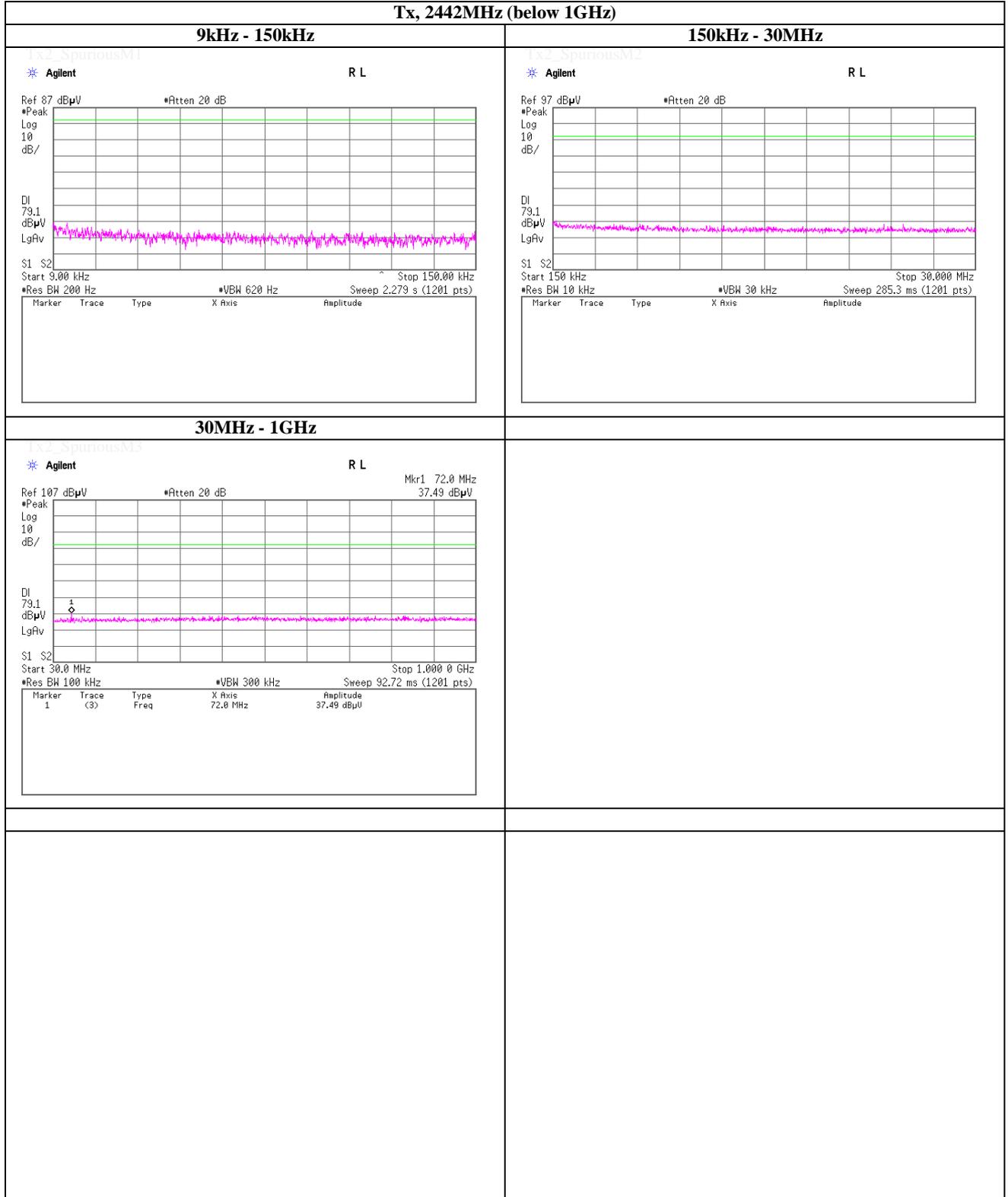
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(Reference chart) Spurious emission (Conducted)

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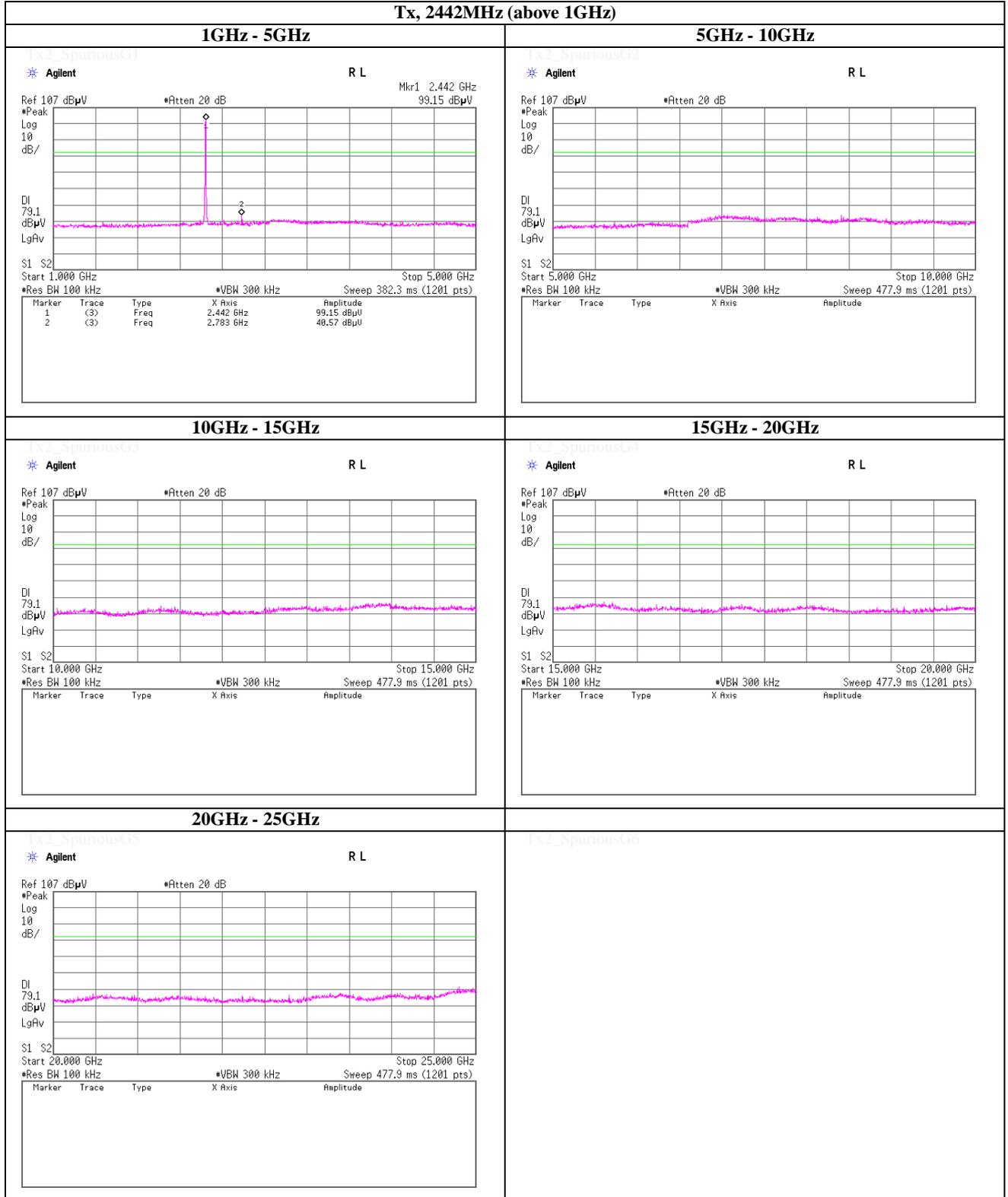
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(Reference chart) Spurious emission (Conducted)

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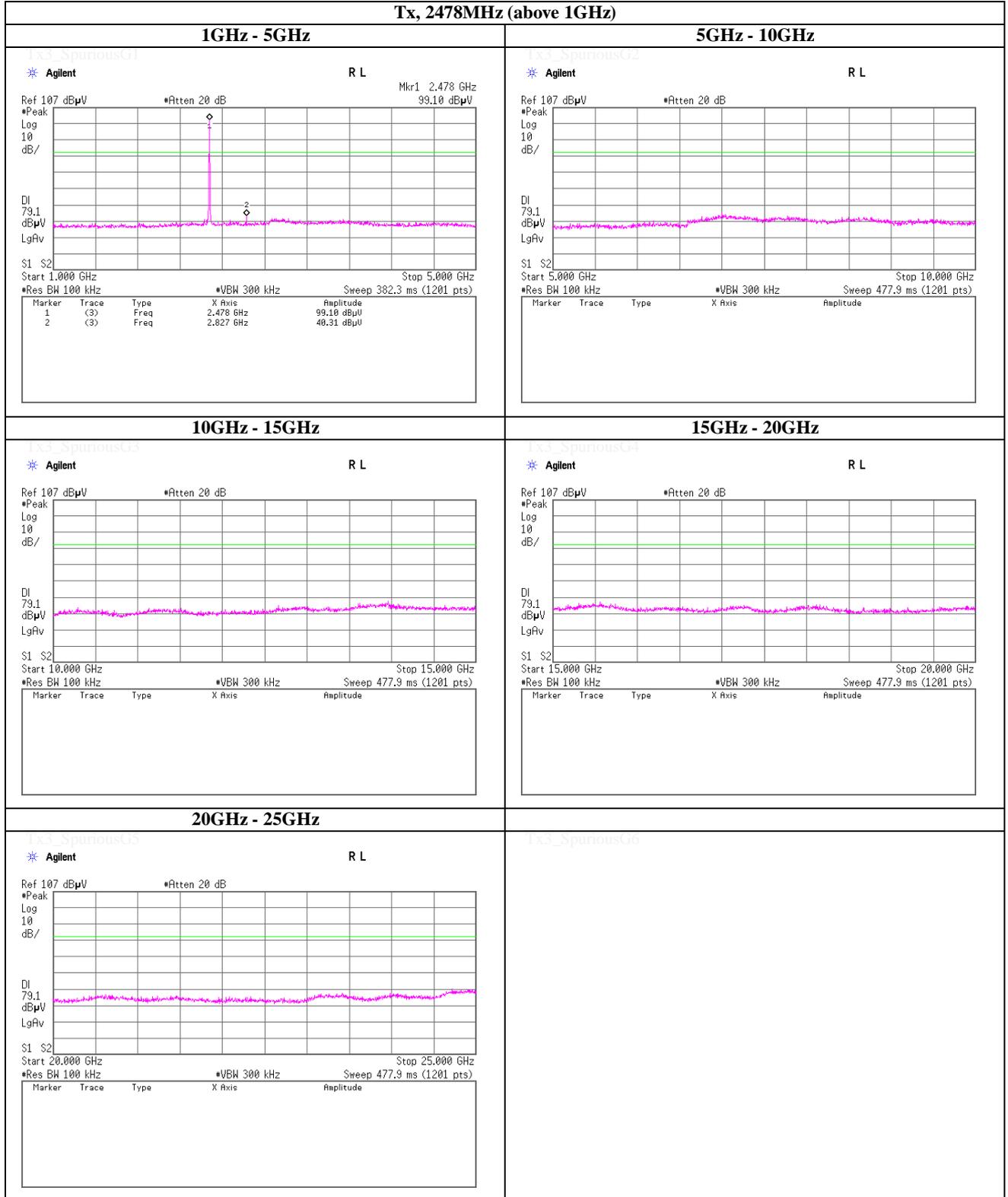
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(Reference chart) Spurious emission (Conducted)

Tx



UL Japan, Inc.

Shonan EMC Lab.

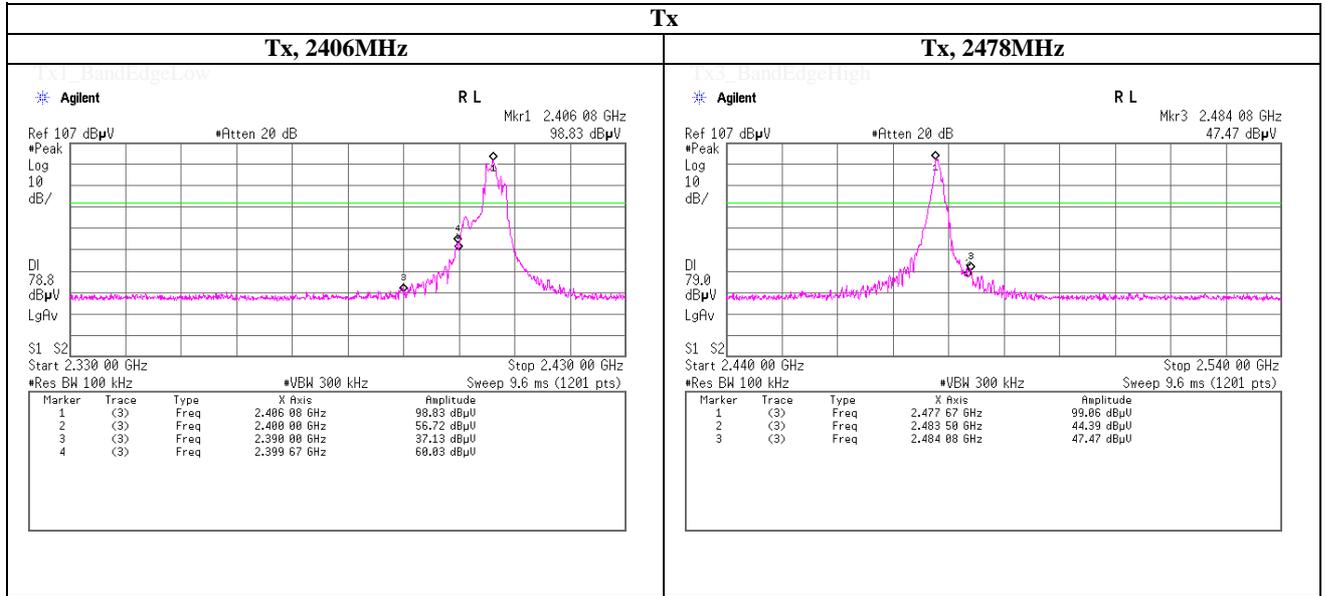
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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(Reference chart) Spurious emission (Conducted)

Band Edge compliance



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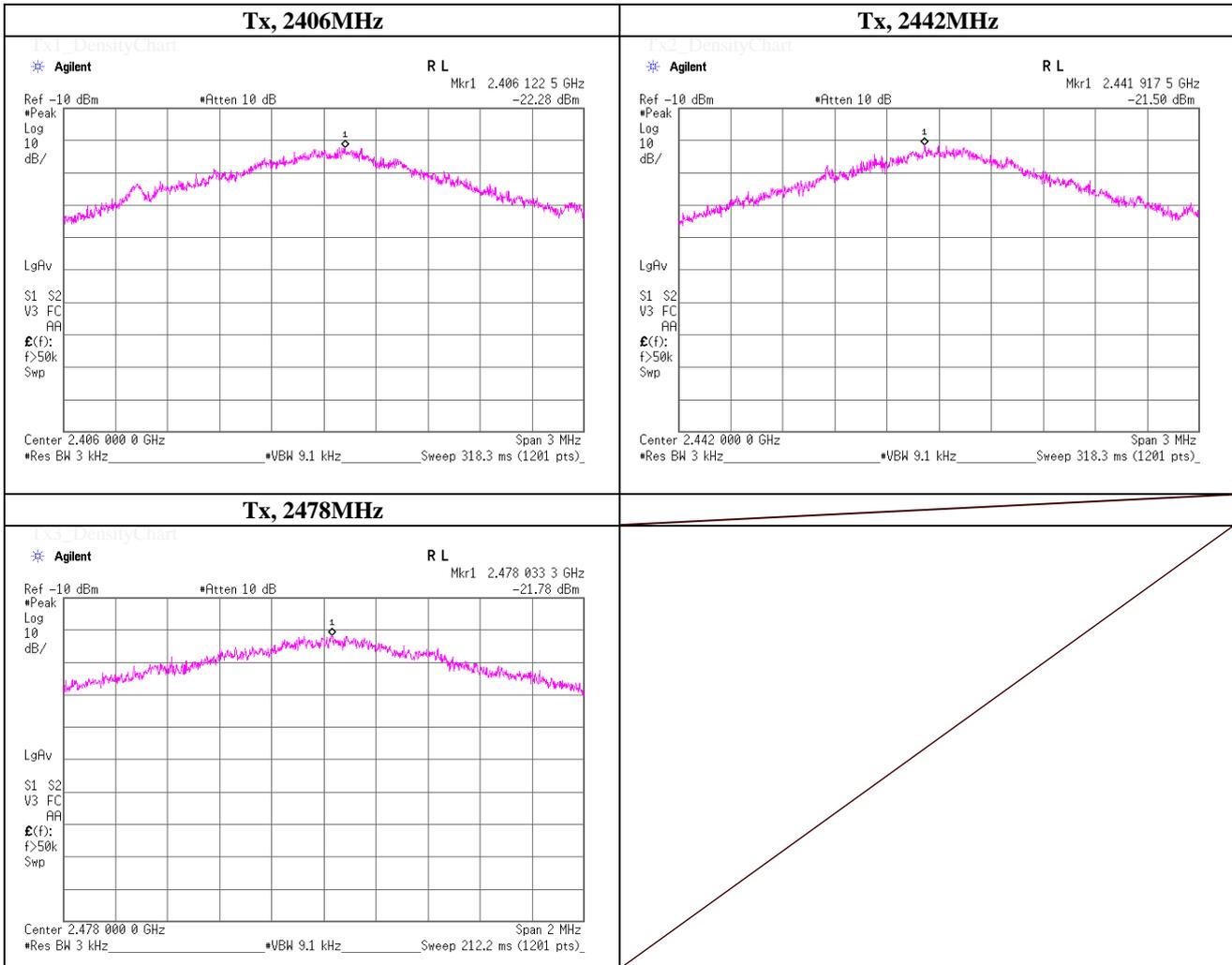
Maximum Power Spectral Density

(PKPSD)

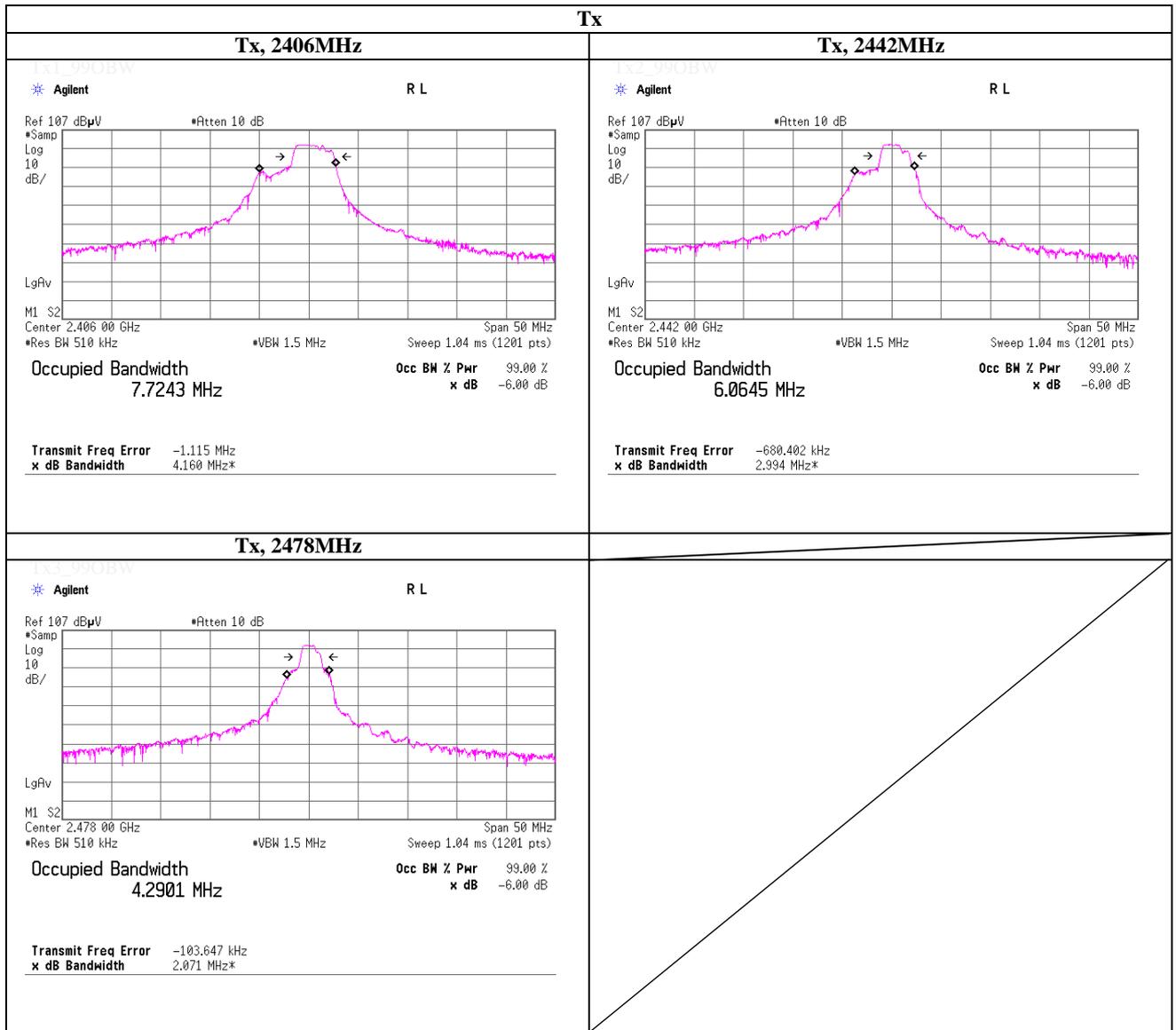
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	August 8, 2013	
Temperature / Humidity	26deg.C , 54%RH	
Engineer	Hikaru Shirasawa	
Mode	Tx	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2406.0000	2406.12	-22.29	1.40	9.62	-11.27	8.00	19.27
2442.0000	2441.92	-21.51	1.40	9.63	-10.48	8.00	18.48
2478.0000	2478.03	-21.78	1.41	9.63	-10.74	8.00	18.74

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



99% Occupied Bandwidth



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Test Report No : 10046907S

APPENDIX

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
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12
SCC-G30	Coaxial Cable	Junkosha	MWX241-02000KM SKMS	SEP-20-12-00 4	AT	2012/09/26 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2012/11/15 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT	2013/03/07 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2013/07/06 * 12
KAF-04	Pre Amplifier	Agilent	8449B	3008A01600	RE	2013/04/03 * 12
SCC-G02	Coaxial Cable	Suhner	SUCOFLEX 104A	46498/4A	RE	2013/04/09 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2013/05/22 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2012/08/17 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2013/02/27 * 12
SSA-01	Spectrum Analyzer	Agilent	N9010A-526	MY48031482	RE	2013/04/09 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE,CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFLMF)	-	RE,CE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2012/12/18 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2012/12/18 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2013/03/16 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2013/02/12 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2012/08/07 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2012/11/18 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2013/04/03 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2013/04/03 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2012/11/18 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE,CE	2012/09/03 * 12
SCC-B12/B13/SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	CE	2013/04/03 * 12
SLS-02	LISN	Rohde & Schwarz	ENV216	100512	CE	2013/02/21 * 12
SAT3-05	Attenuator	JFW	50HF-003N	-	CE	2013/02/12 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2013/03/07 * 12

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

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

Test Item :

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